Minnesota Academic Standards
Science

You are accessing word files of the drafts that include public comments. All public comments will appear in red, following the notation, public comment: Specific comments to a particular standard will be added directly under that standard. General comments to a grade level or strand area will be added just under the first grade level strand area reference. Comments of a general nature, (for example, comments on the process or the timeline) will be added at the very end of the draft documents and will not be grouped by type or category. MDE staff are working diligently to add your comments to the annotated versions and intend to update these files every week. Please note, due to time and staff limits, public comments will be copied and pasted directly from the survey. Spelling, grammatical and/or other errors will appear as submitted.

Public comments on the Science or Social Studies Standards First Drafts are being collected online from the Minnesota Department of Education (MDE) Web site, www.education.state.mn.us or can be faxed, 651-582-8728 or mailed, 1500 Highway 36 West, Roseville, MN 55113, attn: N. Prouty. The public is also encouraged to attend one of the public hearings throughout our state and submit their comments directly.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
KINDER GARTEN	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will raise questions about the world around them, make careful observations, and seek answers to them.	▪ Students will observe and describe common objects using simple tools. ▪ Students will follow appropriate safety rules concerning the use of goggles, heat sources, electricity, glass, and chemicals and biological materials.
			Public comment: The structure of the sentence makes the "seek answers to them" ambiguous. How about: The student will raise questions about the world around them and seek answers to those questions through careful observations.	▪
KINDER GARTEN	III. EARTH AND SPACE SCIENCE	B. The Water Cycle, Weather and Climate	The student will recognize weather changes.	▪ Students will observe and describe daily and seasonal changes in weather.
KINDER GARTEN	IV. LIFE SCIENCE	B. Organisms	The student will understand that there are living and nonliving things.	▪ Students will compare and contrast living and nonliving things.
KINDER GARTEN	IV. LIFE SCIENCE	G. Human Organism	The student will understand that they have five senses.	▪ Students will observe and describe the environment through their five senses.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
			Public Comment: As the student moves through the primary grades: how about going beyond just observation, and including other science process skills. The student will raise questions about the world around them and seek answers to those questions through careful use of science process skills of observation, classification, prediction, comparison and application, so by the time the student has finished with the second grade, the student is asking questions, and seeking answers to the questions using the scientific method for young children.	▪
GRADE 1	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will raise questions about the world around them, make careful observations, and seek answers to them.	▪ Students will observe, describe, measure, compare, and contrast common objects using simple tools.
GRADE 1	II. PHYSICAL SCIENCE	A. Structure of Matter	The student will understand that materials have physical properties.	▪ Students will describe objects in terms of color, size, shape, weight, texture, flexibility, and attraction to magnets.
GRADE 1	II. PHYSICAL SCIENCE	E. Forces of Nature	The student will understand that forces can act at a distance with no substance in between.	▪ Students will observe and describe that magnetism and gravity can affect objects without being touched.
GRADE 1	III. EARTH AND SPACE SCIENCE	B. The Water Cycle, Weather and Climate	Student will recognize weather cycles.	▪ Students will observe, record, and describe characteristics in daily weather and seasonal cycles.
GRADE 1	IV. LIFE SCIENCE	B. Organisms	The student will understand that plants and animals have life cycles.	▪ Students will observe and describe plant and animal life cycles.
GRADE 1	IV. LIFE SCIENCE	D. Heredity	The student will understand there is variation among individuals of one kind within a population and offspring are very much but not exactly like their parents and like one another.	▪ Students will describe ways in which many plants and animals closely resemble their parents. ▪ Students will match adult animals and plants to their offspring.
GRADE 1	IV. LIFE SCIENCE	F. Flow of Matter and Energy	The student will understand that organisms have basic needs.	▪ Students will observe and describe basic needs of organisms, including, but not limited to, nutrients, air, water and shelter.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 1	IV. LIFE SCIENCE	G. Human Organism	The student will understand that the human body is made up of parts.	▪ Students will observe and describe major features of the body including, but not limited to, eyes, nose, heart, skin, arms, legs and muscles.
GRADE 2	I. HISTORY AND NATURE OF SCIENCE	A. Scientific World View	The student will understand that science is a human endeavor practiced by civilizations throughout the world.	▪ Students will know that when a science investigation or experiment is repeated, we expect to get a very similar result.
GRADE 2	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will raise questions about the world around them, make careful observations, and seek answers to them.	▪ Students will observe, describe, measure, compare and contrast common objects using simple tools. ▪ Students will organize observable data and describe patterns. ▪ Students will follow appropriate safety procedures in their investigations. For example, the safe use of goggles, heat sources, electricity, glass, and chemicals and biological materials.
GRADE 2	II. PHYSICAL SCIENCE	A. Structure of Matter	The student will know that materials exist in different states.	▪ Students will observe and identify three states of matter.
GRADE 2	II. PHYSICAL SCIENCE	D. Motion	The student will understand that objects move in various ways.	▪ Students will observe and describe how objects move in a straight line, zigzag, back-and-forth, round-and-round, and fast and slow. ▪ Students will observe that a push, pull, and spin are forces that can make objects move.
GRADE 2	III. EARTH AND SPACE SCIENCE	A. Earth Structure and Processes	The student will understand basic earth materials.	▪ Students will observe and describe the basic earth materials, such as rocks, soils, waters and gases.
GRADE 2	III. EARTH AND SPACE SCIENCE	B. The Water Cycle, Weather and Climate	The student will understand the water cycle.	▪ Students will observe and describe the cycle of water as it moves through the environment. ▪ Students will observe and describe the relationship between the water cycle and the weather.
GRADE 2	III. EARTH AND SPACE SCIENCE	C. The Solar System	The student will understand some relationships between the earth, moon and sun.	▪ Students will observe that the sun supplies heat and light to the earth. ▪ Students will observe that the sun and the moon are not always in the same place.
				▪ **Public comment:** Omit bullet 2: too simple
GRADE 2	IV. LIFE SCIENCE	B. Organisms	The student will understand that plants and animals have life cycles.	▪ Students will observe, describe, compare and contrast plant and animal life cycles.
GRADE 2	IV. LIFE SCIENCE	C. Diversity and Interdependence or Life	The student will understand that organisms live in different environments that are suited to their needs.	▪ Students will observe and describe some features that plants and animals have that allow them to live in specific environments.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 2	IV. LIFE SCIENCE	E. Biological Populations Change Over Time	The student will understand that biological populations change over time.	▪ Students will observe that some kinds of organisms that once lived on earth have completely disappeared, including, but not limited to, dinosaurs, trilobites, mammoths, giant tree ferns, and horsetail trees.
				▪ Public Comment: Students will understand that our evidence for extinction comes from fossils, and some of the ways in which fossils are formed .(e.g. burial in ocean or river deposits, volcanic ash, sandstorm.)
Public Comment: "Re: above benchmark, Why these? Too specific."				
GRADE 2	IV. LIFE SCIENCE	F. Flow of Matter and Energy	The student will understand some relationships among organisms.	▪ Students will observe and describe predator and prey relationships. ▪ Students will compare and contrast plant eaters and meat eaters.
GRADE 2	IV. LIFE SCIENCE	G. Human Organism	The student will understand that people have needs.	▪ Students will know that people need water, food, air, waste removal and a particular range of temperature in their environment, just like other animals.
GRADE 3	I. HISTORY AND NATURE OF SCIENCE	A. Scientific World View	The student will understand the relationship between science and the environment.	▪ Students will understand that science should be used responsibly. ▪ Students will understand that science is a tool that can help investigate and solve environmental concerns.
Public Comment: "Grade 3, Strand I, Sub A - too young to discuss why science should be used responsibly (you'd have to teach the ways science can be harmful, etc) and this age is too young for that discussion."				
GRADE 3	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will understand the nature of scientific investigations.	▪ Students will ask questions that can be investigated scientifically. ▪ Students will participate in a scientific investigation. ▪ Students choose appropriate tools and materials for measurement, and/or observation and/or construction in scientific investigation. ▪ Students will follow appropriate safety behavior in their investigations. For example, the use of goggles, heat sources, electricity, glass, and chemicals and biological materials.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 3	II. PHYSICAL SCIENCE	C. Energy Transformations	Students understand the characteristics and properties of sound and light	▪ Students will explore the different sounds that are produced by changing vibrating objects. ▪ Students will know that sound travels through air, water and other materials. ▪ Students will know that sound can be reflected as an echo. ▪ Students will know that something can be heard when sounds enter the ear. ▪ Students will know that light travels in a straight line until it stopped by an object. ▪ Students will know that light can be reflected. ▪ Students will know that an object in seen when light from the object enters the eye.
GRADE 3	III. EARTH AND SPACE SCIENCE	A. Earth Structure and Processes	The student will describe the properties of rocks and minerals.	▪ Students will group rocks and minerals based on shared physical characteristics.
GRADE 3	III. EARTH AND SPACE SCIENCE	B. The Water Cycle, Weather and Climate	The student will describe the weather in terms of temperatures, wind speed, wind direction, precipitation, and sky cover.	▪ Students will measure and record weather conditions using common instruments. ▪ Students will identify major cloud types such as cumulus, cirrus, and stratus.
GRADE 3	III. EARTH AND SPACE SCIENCE	C. The Solar System	The student will understand the characteristics and relationships of objects in the Solar System.	▪ Students will know that the earth is one of several planets that orbit the sun, and the moon orbits around the earth. ▪ Students will recognize and understand why the appearance of the moon changes over the month. ▪ Students will understand difference between rotation and revolution and their connection to day and night and the year. ▪ Students will identify the relative sizes, distances, movement and basic characteristics of objects in the solar system. ▪ Students will know that the Earth's gravity pulls objects towards it without touching the objects.
Public Comment: "Grade 3, Strand III, Sub C - No need for this grade to memorize the sizes/distances/movements of objects in the solar system. They wouldn't learn it, just know it by rote which is useless."				
GRADE 3	IV. LIFE SCIENCE	B. Organisms	The student will recognize that plants and animals have different structures that serve different functions.	▪ Students will know plants and animals have structures that serve different functions in growth, survival, and reproduction. ▪ Students will know that plants have different structures from animals that serve the same necessary functions in growth, survival and reproduction. ▪ Students will know examples of diverse life forms in different biomes, such as oceans, deserts, tundra, forests, grasslands, wetlands and some of the structures that allow them to survive in that biome.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
				Public Comment: I don't know if this is the best place for these comments, but this is the only place biomes are mentioned: **Minnesota – land of 10,000 lakes:** Minnesota is a freshwater state, with 12,000 lakes, the largest Great Lake, streams, rivers, and wetlands. Oceans and wetlands are mentioned in the standards, but not lakes and streams. Minnesotans should graduate with a basic understanding of the structure and function of lakes, streams, wetlands, and groundwater. ▪ **Minnesota – land of three major biomes:** Moving south to north, the Minnesota landscape changes from prairie, to mixed deciduous forest to northern coniferous forest. This is unique, as is the fact that Minnesota is a headwaters state – water runs out of the state and not in. More content specific to Minnesota's landforms and environments should be included.
Public Comment: "Grade 3, Strand IV, Sub B - How can they identify organisims within a biome without knowing what a biome is - too much for this grade."				
GRADE 3	IV. LIFE SCIENCE	C. Diversity and Interdependence or Life	The student will understand an organism's patterns of behavior are related to the nature of that organism's environment.	▪ Students will know that many organisms depend on living and dead plants and animals for food. ▪ Students will know organisms interact with one another in various ways besides providing food including, but not limited to, pollination, seed dispersal, and parasite removal. ▪ Students will know changes in an organism's habitat are sometimes beneficial to it and sometimes harmful.
GRADE 3	IV. LIFE SCIENCE	D. Heredity	The student will understand many characteristics of an organism are inherited from the parents of the organism, but other characteristics result from an individual's interactions with the environment	▪ Students will differentiate between observed characteristics of plants and animals that are fully inherited, and characteristics that are affected by the climate or environment. ▪ Students will identify similarities and differences between parent and offspring.
Public Comment: "Grade 3, Strand IV, Sub D - inherited vs. received by climate - too advanced for 3rd grade."				
GRADE 3	IV. LIFE SCIENCE	F. Flow of Matter and Energy	The student will understand some relationships among organisms.	▪ Students will know energy is transferred through food chains. ▪ Students will compare and contrast herbivores, carnivores, and omnivores. ▪ Students will know that the food animals consume can be traced back to plants.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 4	I. HISTORY AND NATURE OF SCIENCE	A. Scientific World View	The student will understand the relationship between science and the environment.	▪ Students will understand that science and inventions should be used responsibly. ▪ Students will understand that science is a tool that can help investigate solutions to environmental problems.
GRADE 4	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will participate in scientific investigations.	▪ Students will collect, organize, analyze and present data. ▪ Students will understand that conditions must be kept the same in order to compare investigations. ▪ Students will recognize that evidence and logic, not merely opinion, are necessary to support scientific understandings. ▪ Students will choose appropriate tools and materials for measurement, and/or observation and/or construction in scientific investigation. ▪ Students will follow appropriate safety rules in their investigations. For example, the use of goggles, heat sources, electricity, glass, and chemicals and biological materials.
GRADE 4	II. PHYSICAL SCIENCE	A. Structure of Matter	The student will know that materials exist in different states and can change from one to another.	▪ Students will distinguish between three states of matter. ▪ Students will know that matter can change and exist in one or more states. ▪ Students will know that heating and cooling can cause a change between states. ▪ Students will know that solids have a definite shape and that liquids take the shape of their container.
Public Comment: "Grade 4: Strand II, Sub A - States of matter is too advanced for 4th grade."				
GRADE 4	II. PHYSICAL SCIENCE	C. Energy Transformations	The student will understand basic electricity and its application in everyday life.	▪ Students will know that an electrical circuit requires a complete loop through which an electric current can pass. ▪ Students will demonstrate simple electrical circuits using components such as wires, batteries and bulbs. ▪ Students will identify objects and materials that conduct electricity and objects and materials that are insulators. ▪ Students will know how to produce and study the effects of static electricity.
Public Comment: "4th Grade, Strand II, Sub C - Kids this age should not be doing demonstrations using batteries, wires and electrical currents."				
GRADE 4	II. PHYSICAL SCIENCE	E. Forces of Nature	The student will know that a relationships exists between electricity and magnetism.	▪ Students will demonstrate how a wire and magnet can be used to generate electric current. ▪ Students will demonstrate how an electric current can make something magnetic.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 4	III. EARTH AND SPACE SCIENCE	B. The Water Cycle, Weather and Climate	The student will understand that water on Earth cycles and exists in many forms.	▪ Students will be able to explain and describe the water cycle involving the processes of evaporation, condensation, precipitation, and collection. ▪ Students will describe the role of the sun in the water cycle. ▪ Students will describe the distribution of water on Earth. ▪ Students will describe the quality of water using physical characteristics.
				Public Comment: **Groundwater:** Historically groundwater has been omitted in teaching about the water cycle. Due to the importance of groundwater to drinking water supplies, an understanding of the source, movement, and pollution of groundwater is important. Remember, "Groundwater comes from the sky!" ▪ **Watersheds – where weather meets the land:** The concept of watersheds is key to proper management of land and water resources. Land management influences on how rain and snow melt moves across and through the landscape, and how this movement affects water quantity and quality. Management of water and land in Minnesota is based on watersheds – this is a concept students need to know.
GRADE 4	III. EARTH AND SPACE SCIENCE	D. The Universe	The student will understand the patterns and movements of celestial objects in the sky.	▪ Students will observe that the patterns of stars in the sky appear to slowly move from east to west across the sky nightly and different stars can be seen in different seasons and locations. ▪ Students will know that planets look like stars but over time they appear to wander among the constellations. ▪ Students will understand that stars are like the Sun, some being smaller and some larger, but so far away that they look like points of light. ▪ Students will know that telescopes magnify distant objects in the sky and dramatically increase the number of stars we can see.
GRADE 4	IV. LIFE SCIENCE	A. Cells	The student will know that all organisms are composed of cells, which are the fundamental units of life, some organisms are single cells, but other organisms are multi-cellular	▪ Students will understand that cells are very small and will utilize a microscope to observe single cell organisms and single cells within a multi-celled organism ▪ Students will know that all living things consist of one or more cells. ▪ Students will know that cells need food, water and air; a way to dispose of waste; and an environment that they can live in. ▪ Students will know that cells vary greatly in appearance and perform very different roles in an organism.

Public Comments:

"Grade 4, Strand IV, Sub A - learning cells is way too advanced for this grade."

"Cells benchmarks are more difficult than those of 6th grade. Most teachers will not be able to operate a microscope if they have one. These 2 should be switched. "

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 4	IV. LIFE SCIENCE	C. Diversity and Interdependence or Life	The student will know that living things can be sorted into groups in many ways according to their varied characteristics and structures.	▪ Students classify plants and animals according to their physical characteristics. ▪ Students learn that features used for grouping depend on the purpose of the grouping.
				▪ **Public Comment:** Students will know the principal characteristics that distinguish fish, amphibians, reptiles, birds, mammals, insects, spiders and land molluscs.
GRADE 4	IV. LIFE SCIENCE	G. Human Organism	The student will understand the function of basic organs, major systems, growth and development of the human body.	▪ Students will identify the major organs of the following systems: digestive, circulatory, nervous, skeletal/muscular, and respiratory, within the human body. ▪ Students will identify the functions of the major organs and the systems of the human body. ▪ Students will know there is a usual sequence of physical and mental development among human beings.
Public Comment: "Grade 4, Strand IV, Sub G - Learning organs and all the systems is too advanced for Grade 4."				
GRADE 5	I. HISTORY AND NATURE OF SCIENCE	A. Scientific World View	The student will develop an expectation that there is order in the natural world and it is discoverable.	▪ Students will understand that when a science investigation or experiment is repeated, a similar result is expected.
			The student will understand the usefulness and consequences of science in our interaction with the natural world.	▪ Students will understand that science is a tool that can help investigate solutions to environmental problems. ▪ Students will understand that science should be used responsibly.
GRADE 5	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will understand the process of scientific investigations.	▪ Students will perform a controlled experiment using a specific step-by-step procedure. ▪ Students will support their statements with evidence from various sources. ▪ Students will choose appropriate tools and materials for measurement, and/or observation and/or construction in scientific investigation. ▪ Students will follow appropriate safety behavior in their investigations. For example, the use of goggles, heat sources, electricity, glass, and chemicals and biological materials.
GRADE 5	II. PHYSICAL SCIENCE	C. Energy Transformations	The student will understand that energy exists in many forms and can be transferred in many ways.	▪ Students will know that heat can move from one object to another by conduction and that some materials conduct heat better than others. ▪ Students will know that things that give off light also give off heat. ▪ Students will know that things that absorb light collect heat and may become warmer.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 5	II. PHYSICAL SCIENCE	D. Motion	The student will understand the principles and advantages provided by simple machines.	▪ Students will use the principle of a simple machine to describe the use of levers, incline plane, wheel and axel.
GRADE 5	III. EARTH AND SPACE SCIENCE	A. Earth Structure and Processes	The student will understand that the surface of the earth changes due to slow processes, such as erosion and weathering, and rapid processes, such as landslides, volcano eruptions, and earthquakes.	▪ Students will recognize the natural processes that cause rocks to break down into smaller pieces. ▪ Students will explain how waves, wind, water, and ice shape and reshape the earth's surface. ▪ Students will describe how humans prepare for and react to rapid Earth processes such as floods, tornadoes, earthquakes, and volcanoes. ▪ Students will recognize the different composition and properties of soil. ▪ Students will describe how humans prepare for and react to erosion.
				Public Comment: ▪ **Soil erosion is both a natural process and one caused by human activity:** The standard only represents soil erosion as a natural process that humans react to, and not a process that humans can cause through their land use decisions. Human caused soil erosion is the greatest source of water pollution and an increasing cause of world hunger.
			Public Comment: (this would be best offered in grade 4.) Students will gain a general understanding of geologic time.	▪ **Public Comment:** Students will be able to successfully extract and use information from charts/tables showing animal or plant life over geologic time, and retain a general grasp of the time lengths involved (through 600 million years).
GRADE 5	IV. LIFE SCIENCE	E. Biological Populations Change Over Time	The student will know biological populations change over time.	▪ Students will know that individuals of the same species differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing and pass those differences on to successive generation. ▪ Students will know extinction of a species occurs when the environment changes and adaptive characteristics of a species are insufficient to allow its survival ▪ Students will know that fossils can be compared to one another and to living organisms according to their similarities and differences.
			Public Comment: (5^{th} or 4^{th} grade?) The student will be able to place humans and their ancestors within geologic time.	▪ **Public comment:** Students will understand that humans and their predecessor species are a fairly recent development in geologic time, and that humans and their ancestors seem to have arisen in Africa.
			Public Comment: (This standard would be best taught in grade 4.) and suggest that it read: The student will understand the evolutionary order in which the vertebrates arose in the course of geologic time.	▪ **Public comment:** Students will know these evolutionary sequences: fish, amphibians, reptiles, dinosaurs, birds. Students will know that fossils can be compared to one another and to living organisms according to their similarities and differences.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 5	IV. LIFE SCIENCE	F. Flow of Matter and Energy	The student will know that matter and energy flow into, out of, and within a biological system.	▪ For a given ecosystem in Minnesota, students will identify major living and non-living components. ▪ Students will understand some source of "energy" is needed for all organisms to stay alive and grow. ▪ Students will understand that food webs describe the relationships among producers, consumers, and decomposers in an ecosystem. ▪ Students will know organisms are growing, dying, and decaying, and their matter is recycled.
GRADE 6	I. HISTORY AND NATURE OF SCIENCE	A. Scientific World View	The student will understand that science is a way of knowing about the world that is characterized by empirical criteria, logical argument, and skeptical review.	▪ Students will distinguish between scientific evidence and personal opinion. ▪ Students will explain why scientists often repeat each other's investigations to be sure of their results. ▪ Students will know that scientists assume that nature is the same everywhere and that it is understandable and predictable.
Public Comment: "Grade 6 - It appears everything in here is really for a Jr. High kid, not a 6th grader."				
GRADE 6	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will understand that scientific inquiry is used by scientists to investigate the natural world in systematic ways.	▪ Students will identify questions that can be answered through scientific investigation and those that cannot. ▪ Students will give examples of how different domains of science use differing bodies of scientific knowledge and employ different methods to investigate questions. ▪ Students will know that observations and explanations can be affected by bias or strong beliefs about what should happen in particular circumstances. ▪ Students will understand that a system is an organized group of related objects or components that form a whole.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 6	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will conduct scientific investigations.	▪ Students will use appropriate tools and Systems International units for measuring length, time, mass, volume, and temperature with suitable precision and accuracy. ▪ Students will follow a specific step-by-step procedure for a scientific investigation. ▪ Students will present and explain data and findings using multiple representations including tables, graphs, physical models, and demonstrations. ▪ Students will use appropriate technology and mathematics skills to access, gather, store, retrieve and organize data. ▪ Students will explain how the student's scientific investigations relate to established scientific principles. ▪ Students will apply established safety rules and guidelines in conducting scientific investigations inside and outside the classroom.
GRADE 6	I. HISTORY AND NATURE OF SCIENCE	C. Scientific Enterprise	The student will know that science and technology are highly vigorous human efforts that both influence and are influenced by civilizations worldwide.	▪ Students will know that people of all backgrounds and with diverse interests, talents, qualities, and motivations engage in fields of science and engineering. ▪ Students will identify different disciplines of science and engineering. ▪ Students will understand that scientists sometimes work in teams and sometimes work alone, but all communicate extensively with others. ▪ Students will know that colleges and universities, business and industry, research institute and governmental agencies are major settings in which scientists and engineers work. ▪ Students will explain that technology is the application of science in order to find solutions to societies' wants and needs. ▪ Students will identify appropriate problems that can be solved using technological design or scientific inquiry.
GRADE 6	I. HISTORY AND NATURE OF SCIENCE	D. Historic Perspectives	The student will understand how scientific discovery, culture, societal norms, and technology have influenced one another in different time periods.	▪ Students will cite examples of various individuals throughout history who made discoveries and contributions in science and technology. ▪ Students will relate student experiences in scientific investigation to the experiences of scientists throughout history.
GRADE 6	II. PHYSICAL SCIENCE	A. Structure of Matter	The student will use the idea that matter is made of small particles called atoms to explain that matter can exist in different states and that each state exhibits distinct physical properties.	▪ Students will know that matter can exist as solid, liquid, gas or plasma. ▪ Students will know that a change in temperature or pressure can change the state of a substance. ▪ Students will know that there are about one hundred different elements with unique properties that combine in many ways.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 6	II. PHYSICAL SCIENCE	B. Chemical Reactions	The student will use the idea that matter is made of small particles called atoms to explain how matter combines in a variety of ways to form all living and non-living substances.	▪ Students will give examples of elements, compounds and mixtures. ▪ Students will classify a substance as a mixture or pure substance.
GRADE 6	II. PHYSICAL SCIENCE	C. Energy Transformations	The student will understand that energy is a property and cannot be created or destroyed, but only changed from one form into another.	▪ Students will know that energy exists as heat, chemical energy, mechanical energy and electrical energy. ▪ Students will recognize that most of what goes on in the universe from exploding stars and biological growth to the operation of machines and the motion of people involves some form of energy being transformed into another. ▪ Students will recognize that energy in the form of heat is almost always one of the products of energy transformation. ▪ Students will identify different forms of energy in everyday situations. ▪ Students will identify transformations of energy from one form to another in everyday situations. ▪ Students will know that energy in stored in many ways.
GRADE 6	II. PHYSICAL SCIENCE	D. Motion	The student will understand the nature of force and motion.	▪ Students will use a frame of reference to describe the position, direction, speed and motion of an object. ▪ Students will determine the average speed of an object by measuring distance and time. ▪ Students will know the difference between average speed versus speed at a particular time.
GRADE 6	II. PHYSICAL SCIENCE	E. Forces of Nature	The student will understand that the structure and motion of objects in the universe are governed by different forces.	▪ Students will know that every object exerts gravitational force on every other object. ▪ Students will know that gravitational force between two objects depends on how much mass the objects have and on how far apart they are. ▪ Students will know that gravitational force is hard to detect unless at least one of the objects has a lot of mass. ▪ Students will know that electric currents and magnets can exert a force on certain objects and each other. ▪ Students will recognize that gravitational forces are weak compared to electric and magnetic.
GRADE 6	III. EARTH AND SPACE SCIENCE	A. Earth Structure and Processes	The student will understand the Earth's composition and structure.	▪ Students will know that the Earth is comprised of layers including the lithosphere, hydrosphere, and atmosphere.
GRADE 6	III. EARTH AND SPACE SCIENCE	B. The Water Cycle, Weather and Climate	The student will understand how the atmosphere interacts on Earth.	▪ Students will identify the composition and structure of the atmosphere. ▪ Students will recognize that air masses circulate in the atmosphere. ▪ Students will describe the temperature and pressure variations that exist in the layers of the atmosphere.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 6	III. EARTH AND SPACE SCIENCE	C. The Solar System	The student will understand the composition and structure of the solar system and the Earth's place in it.	▪ Students will compare the characteristics of Earth with the characteristics and movement patterns of the other planets, their satellites, and other objects in our Solar System. ▪ Students will know that the Sun is a medium-sized star and is the closest star to Earth. It is the central and largest body in the Solar System and is located at the edge of a galaxy. ▪ Students will explain the length of day, length of year, phases of the Moon, eclipses, tides and shadows through the regular and predictable motions of the Earth and Moon.
GRADE 6	IV. LIFE SCIENCE	A. Cells	The student will understand that all organisms are composed of cells, which are the fundamental units of life that carry on the many functions needed to sustain life.	▪ Students will know that cells are the fundamental units of life. ▪ Students will know that most organisms are single cells. ▪ Students will know that all organisms are composed of cells.
GRADE 6	IV. LIFE SCIENCE	B. Organisms	The student will understand living systems, at all levels of organization, demonstrate the complementary nature of structure and function.	▪ Students will know a variety of body plans and external structures in plants and animals that serve specific functions for survival.
GRADE 6	IV. LIFE SCIENCE	C. Diversity and Interdependence or Life	The student will understand that within the diversity of living organisms, patterns of similarities, differences and complex interactions exist between organisms and with the physical environment.	▪ Students will identify organisms that interact with each other as producers, consumers, and decomposers in a food chain. ▪ Students will identify organisms that interact with each other as herbivores, carnivores, and omnivores through food webs. ▪ Students will compare/contrast predator/prey, parasite/host, producer/consumer relationships. ▪ Students will classify organisms based on the details of external features. ▪ Students will know that all individuals of a species that exist together at a given place and time make up a population, and all populations living together and the physical factors with which they interact compose an ecosystem.
Public Comment: "Benchmark 4 (organisms) is same as under B, doesn't fit with this list. "				
GRADE 6	IV. LIFE SCIENCE	D. Heredity	The student will understand that heredity information is contained in genes that determine characteristics of organisms that are inherited.	▪ Students will know that some traits are inherited and other result from interactions with the environment. ▪ Students will know that reproduction is a characteristic of all living things and why it is essential for the continuation of a species.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 7	I. HISTORY AND NATURE OF SCIENCE	A. Scientific World View	The student will understand that science is a way of knowing about the world that is characterized by empirical criteria, logical argument, and skeptical review.	▪ Students will explain, using examples, that for most core knowledge in science, there is much experimental and observational confirmation. ▪ Students will understand how scientific knowledge is subject to change as new evidence becomes available, or as new theories cause scientists to look at old observations differently. ▪ Students will explain how scientists distinguish among fact, hypothesis, theory and law. ▪ Students will use accepted physical, conceptual, and mathematical scientific models to explain natural phenomena.
Public Comment: "Drop last benchmark under sub-strand A; conceptually too deep for 7th grade. "				
GRADE 7	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will understand that scientific inquiry is used by scientists to investigate the natural world in systematic ways	▪ Students will know that scientists use different kinds of investigations and methods depending on the questions they are trying to answer. ▪ Students will distinguish among observation, prediction, and inference. ▪ Students will know that hypotheses are valuable even if they turn out not to be true. ▪ Students will know that an understanding of mathematics and the use of technology are essential in determining how a scientific investigation is conducted and the explanations that can be made. ▪ Students will explain why an experiment must be repeated many times and yield consistent results before the results are accepted as correct. ▪ Students will know that systems have boundaries, components, resources, flow and feedback.
Public Comment: "4th benchmark and also the last benchmark – what do these mean? If they mean what we think they mean, too deep for 7th grade. "				

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 7	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will design and conduct scientific investigations.	▪ Students will identify a question that can be answered with a scientific investigation with available knowledge and tools. ▪ Students will formulate a testable hypothesis based on prior knowledge. ▪ Students will systematically observe, organize, and record relevant qualitative and quantitative data in a clear and accurate way. ▪ Students will use appropriate tools and Systems International units for measuring length, time, mass, volume, and temperature with suitable precision and accuracy. ▪ Students will recognize that a variable is a condition that may influence the outcome of an investigation and know the importance of manipulating one variable at a time. ▪ Students will write a specific step-by-step procedure for a scientific investigation. ▪ Students will construct reasonable models, predictions and explanations based on collected data or evidence presented in tables or graphs and make inferences based on patterns or trends in the data. ▪ Students will present and explain data and findings using multiple representations including tables, graphs, mathematical and physical models, and demonstrations. ▪ Students will use appropriate technology and mathematics skills to access, gather, store, retrieve and organize data. ▪ Students will explain how the student's scientific investigations relate to established scientific principles. ▪ Students will apply established safety rules and guidelines in conducting scientific investigations inside and outside the classroom.
GRADE 7	I. HISTORY AND NATURE OF SCIENCE	C. Scientific Enterprise	The student will know that science and technology are highly vigorous human efforts that both influence and are influenced by civilizations worldwide.	▪ Students will know that the development of technology drives scientific investigation and explanations and that scientific knowledge drives the development of technology.
GRADE 7	I. HISTORY AND NATURE OF SCIENCE	D. Historic Perspectives	The student will understand how scientific discovery, culture, societal norms, and technology have influenced one another in different time periods.	▪ Students will cite examples of various individuals throughout history who made discoveries and contributions in science and technology. ▪ Students will cite examples of how the prevailing culture of a time influenced scientific and technologic advances. ▪ Students will relate student experiences in scientific investigation to the experiences of scientists throughout history.
GRADE 7	II. PHYSICAL SCIENCE	A. Structure of Matter	Use the idea that matter is made of small particles called atoms to explain that matter can exist in different states and that each state exhibits distinct physical properties.	▪ Students will distinguish between mass and volume. ▪ Students will use the properties of substances to classify them into groups with common properties. ▪ Students will compare and contrast the mass, shape and volume of solids, liquids and gases.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 7	II. PHYSICAL SCIENCE	B. Chemical Reactions	The student will use the idea that matter is made of small particles called atoms to explain how matter combines in a variety of ways to form all living and non-living substances.	▪ Students will distinguish among elements, compounds and mixtures.
GRADE 7	II. PHYSICAL SCIENCE	C. Energy Transformations	The student will understand that energy cannot be created or destroyed, but only changed from one form into another.	▪ Students will understand that adding or taking away heat from a system with a constant mass will result in temperature change. ▪ Students will recognize that heat moves in predictable ways, moving from warmer objects to cooler ones until both reach the same temperature. ▪ Students will give examples of the movement of heat by convection, conduction and radiation. ▪ Students will know that energy can be transferred through waves. ▪ Students will know that vibrations move at different speeds in different materials, have different wavelengths, and set up wave-like disturbances that spread away from the source. ▪ Students will know that waves have many different forms, some visible, some not. ▪ Students will demonstrate that light from the sun is made up of a mixture of many different colors of light. ▪ Students will demonstrate that the light given off or reflected by objects is made up of a mixture of colors of light. ▪ Students will know that human eyes respond to visible light, a narrow range of wavelengths of electromagnetic radiation, and that differences of wavelength within that range are perceived as differences in color.
GRADE 7	II. PHYSICAL SCIENCE	D. Motion	The student will understand the nature of force and motion.	▪ Students will represent the motion of an object on a graph. ▪ Students will interpret distance vs. time graphs. ▪ Students will distinguish between velocity and speed. ▪ Students will know that acceleration is a change in speed or direction.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 7	III. EARTH AND SPACE SCIENCE	A. Earth Structure and Processes	The student will understand Earth's composition and structure.	▪ Students will explain how land forms are created through forces such as folding, faulting, volcanic eruptions, deposition of sediment, and weathering and erosion. ▪ Students will explain how features on the Earth's surface are constantly changing through a combination of slow and rapid processes such as weathering, erosion, sediment deposition, landslides, volcanic eruptions, and earthquakes. ▪ Students will understand the concept of plate tectonics including the organization of the Earth into plates and the processes that move them. ▪ Students will describe the various processes and their interactions that are involved in the rock cycle. ▪ Students will interpret successive layers of sedimentary rocks and their fossils to document the age and history of the Earth. ▪ Students will know how constructive and destructive Earth processes can affect the evidence of Earth's history. ▪ Students will be able to use various characteristics to classify and identify rocks and the minerals that comprise them.
Public Comment: "Local geology is not mentioned. Benchmark #1: Add local. Change to Students will explain how local landforms are created through forces such as folding, faulting, volcanic eruptions…and erosion and give a local example of each. Benchmark #6: Students will know…affect the evidence of Earth's history, ex. glaciers in Minnesota. "				
GRADE 7	III. EARTH AND SPACE SCIENCE	B. The Water Cycle, Weather and Climate	The student will understand how the Earth's atmosphere interacts in the Earth's system.	▪ Students will explain how the processes of evaporation, condensation, and precipitation affect weather patterns. ▪ Students will know that the sun is the principal energy source of winds, ocean currents, and the water cycle. ▪ Students will know that changes in the composition of the atmosphere, ocean temperature, and geologic events can impact the Earth's climate. ▪ Students will explain how the tilt of the Earth's axis and the Earth's revolution around the Sun affect seasons and weather patterns.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
				Public Comment: **Groundwater:** Historically groundwater has been omitted in teaching about the water cycle. Due to the importance of groundwater to drinking water supplies, an understanding of the source, movement, and pollution of groundwater is important. Remember, "Groundwater comes from the sky!" ▪ **Watersheds – where weather meets the land:** The concept of watersheds is key to proper management of land and water resources. Land management influences on how rain and snow melt moves across and through the landscape, and how this movement affects water quantity and quality. Management of water and land in Minnesota is based on watersheds – this is a concept students need to know.
GRADE 7	III. EARTH AND SPACE SCIENCE	C. The Solar System	The student will understand the composition and structure of the solar system and the Earth's place in it.	▪ Students will be able to explain the length of day, length of year, phases of the Moon, eclipses, tides, and shadows through the regular and predictable motions of the Earth and Moon.
GRADE 7	IV. LIFE SCIENCE	A. Cells	The student will understand that all organisms are composed of cells, which are the fundamental units of life that carry on the many functions needed to sustain life.	▪ Students will distinguish between single and multi-cellular organisms. ▪ Students will distinguish between plant and animal cells. ▪ Students will know that cells repeatedly divide for growth and repair.
GRADE 7	IV. LIFE SCIENCE	B. Organisms	The student will understand living systems, at all levels of organization, demonstrate the complementary nature of structure and function.	▪ Students will explain the organization of whole organisms in a living system including populations, niche, and communities. ▪ Students will explain how organisms are organized into specialized cells, tissues, organs and organ systems that perform specialized functions. ▪ Students will know that organisms can react to internal and environmental stimuli through behavior.
Public Comment: "3rd benchmark: Change to 'Students know…react to internal and environmental stimuli. (The 'behavior' part confuses the issue.) "				
GRADE 7	IV. LIFE SCIENCE	C. Diversity and Interdependence or Life	The student will understand that within the diversity of living organisms, patterns of similarities, differences and complex interactions exist between organisms and with the physical environment.	▪ Students will use and create dichotomous keys to classify organisms based on the details of external and /or internal features. ▪ Students will give examples of ways humans can alter the equilibrium of ecosystems, including human population growth, technology, and consumption; human destruction of habitats (through direct harvesting, pollution and atmospheric changes). ▪ Students will give examples of how environmental neglect or degradation can lead to potentially irreversible effects.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
Public Comment: "Change standard to 'Students will understand that there is unity and diversity within organisms and complex interactions with the environment.' Benchmark #1: Fits in sub-strand B with organisms. Benchmark #2: Drop text within parentheses. (Too much for 7th grade.) Benchmark #3: Drop entirely. (Is already part of #2.)"				
GRADE 7	IV. LIFE SCIENCE	D. Heredity	The student will understand that heredity information is contained in genes that determine characteristics of organisms that are inherited through asexual and sexual reproduction.	▪ Students will know that inherited traits result from information contained in genes located on chromosomes of each cell. ▪ Students will know that each gene carries a single unit of information and can influence more than one trait. ▪ Students will know that inherited traits can be determined by one or many genes. ▪ Students will identify the criteria established to define and distinguish species. ▪ Students will explain how flowering plants reproduce sexually.
Public Comment: "Benchmark #3: Drop. This is too complex for 7th grade. Already covered in 9-12 in depth. Benchmark #4: Drop. Repeat of what is in sub-strand B. "				
GRADE 7	IV. LIFE SCIENCE	E. Biological Populations Change Over Time	The student will understand how evolution provides a scientific explanation for the fossil record of ancient life forms, as well as the striking similarities observed among the diverse species of living organisms.	▪ Students will know the concept of extinction and that extinction is common. ▪ Students will know that fossils document the appearance of many life forms. ▪ Students will give examples how fossils record the diversification of many life forms.
Public Comment: "Benchmark should be flipped with 8th grade sub-strand E. BUT drop benchmark #2, and 3 and 4 combined. "				
GRADE 7	IV. LIFE SCIENCE	F. Flow of Matter and Energy	The student will understand how the flow of energy and the recycling of matter contribute to a stable ecosystem.	▪ Students will know all energy within an ecosystem originates from the sun. ▪ Students will know that plants use the energy in light to make sugars out of carbon dioxide and water. They use or store this food/sugar. Organisms eat plants for the food/sugar and energy, and produce carbon dioxide and water.
GRADE 7	IV. LIFE SCIENCE	G. Human Organism	The student will understand human body systems and their relationship to good health.	▪ Students will give examples of the effects of how environmental factors can lead to diseases and other risks to human health.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
Public Comment: "This should be in 8th grade HEALTH. "				
GRADE 8	I. HISTORY AND NATURE OF SCIENCE	A. Scientific World View	The student will understand that science is a way of knowing about the world that is characterized by empirical criteria, logical argument, and skeptical review.	▪ Students will explain how scientific knowledge is subject to change as new evidence becomes available, or as new theories cause scientists to look at old observations differently. ▪ Students will know that science can sometimes be used to inform ethical decisions by identifying the likely consequences of particular actions. ▪ Students will explain how scientific claims are subject to peer review, where scientists evaluate explanations proposed by other scientists by examining and comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, replicating investigations, and suggesting alternative explanations for the same observations. ▪ Students will explain the development, usefulness, and limitations of scientific models in the explanation and prediction of natural phenomena.
GRADE 8	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will understand that scientific inquiry is used by scientists to investigate the natural world in systematic ways.	▪ Students will give examples of how different domains of science use differing bodies of scientific knowledge and employ different methods to investigate questions. ▪ Students will know that scientific investigations involve the common elements of systematic observations, carefully collected, relevant evidence, logical reasoning, and some imagination in developing hypotheses and explanations. ▪ Students will know that an understanding of mathematics and the use of technology are essential in determining how a scientific investigation is conducted and the explanations that can be made. ▪ Students will know that scientists may conduct investigations in a simple system and make generalizations to more complex systems. ▪ Students will know that scientists and engineers have ethical codes regarding living things and impact on the environment.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 8	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will use multiple skills to design and conduct scientific investigations.	▪ Students will identify a question that can be answered with a scientific investigation with available knowledge and tools. ▪ Students will formulate a testable hypothesis based on prior knowledge. ▪ Students will systematically observe, organize, and record relevant qualitative and quantitative data in a clear and accurate way. ▪ Students will use appropriate tools and Systems International units for measuring length, time, mass, volume, and temperature with suitable precision and accuracy. ▪ Students will specify variables to be changed, controlled, and measured. ▪ Students will use sufficient trials and adequate sample size to ensure reliable data. ▪ Students will write a specific step-by-step procedure for a scientific investigation. ▪ Students will construct reasonable models, predictions and explanations based on collected data or evidence presented in tables or graphs and make inferences based on patterns or trends in the data. ▪ Students will present and explain data and findings using multiple representations including tables, graphs, mathematical and physical models, and demonstrations. ▪ Students will explain how variability affects measurements and calculations. ▪ Students will be able to use appropriate technology and mathematics skills to access, gather, store, retrieve and organize data. ▪ Students will establish cause effect relationships based on gathered and established evidence. ▪ Students will explain how the student's scientific investigations relate to established scientific principles. ▪ Students will be able to apply established safety rules and guidelines in conducting scientific investigations inside and outside the classroom.
GRADE 8	I. HISTORY AND NATURE OF SCIENCE	C. Scientific Enterprise	The student will know that science and technology are highly vigorous human efforts that both influence and are influenced by civilizations worldwide.	▪ Students will evaluate the documentation and verifiability of information from a variety of sources. ▪ Students will know that technological solutions have intended benefits and unintended consequences. ▪ Students will use scientific inquiry and the technological design process to solve problems. ▪ Students will know that technological changes and scientific advances are often accompanied by social, political, and economic changes. ▪ Students will recognize that science and technology are influenced by social needs, attitudes, values, and limitations, and cultural backgrounds and beliefs.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 8	I. HISTORY AND NATURE OF SCIENCE	D. Historic Perspectives	The student will understand how scientific discovery, culture, societal norms, and technology have influenced one another in different time periods.	▪ Students will cite examples of various individuals throughout history who made discoveries and contributions in science and technology. ▪ Students will cite examples of how the prevailing culture of a time influenced scientific and technologic advances. ▪ Students will relate student experiences in scientific investigation to the experiences of scientists throughout history. ▪ Students will cite examples of how science contributed to revolutions or changes in agriculture, manufacturing, sanitation, medicine, warfare, transportation, information processing, or communication.
GRADE 8	II. PHYSICAL SCIENCE	A. Structure of Matter	The student will use the idea that matter is made of small particles called atoms to explain that matter can exist in different states and that each state exhibits distinct physical properties.	▪ Students will use evidence to explain that matter is made of small particles called atoms, which are too small to see. ▪ Students will describe the states of matter in terms of the space between atoms and/or molecules. ▪ Students will give evidence that the space between atoms and/or molecules is smallest in a solid, and greatest in a gas. ▪ Students will know that equal volumes of different substances usually have different masses. ▪ Students will know that an atom is the smallest unit of an element that maintains the characteristics of the element. ▪ Students will differentiate between an atom and a molecule. ▪ Students will understand that atoms combine to form molecules that are the smallest unit of a compound. ▪ Students will know that all pure substances have characteristic properties of solubility, density, melting point and boiling point and that characteristic properties are independent of the amount of the sample of substance. ▪ Students will use characteristic properties to identify elements and compounds.

Public Comment:

"No mention is made regarding the student's ability to determine density using an objects mass and volume. Although density is mentioned as a characteristic property of a pure substance and that characteristic properties are used to identify elements and compounds (grade 8, strand-physical science) I believe more emphasis needs to be placed on the students ability to determine density and to understand the concept of the comparison of an objects mass to its volume as a distinguishing feature in identifying properties of pure substances."

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 8	II. PHYSICAL SCIENCE	B. Chemical Reactions	The student will use the idea that matter is made of small particles called atoms to explain how matter combines in a variety of ways to form all living and non-living substances.	▪ Students will distinguish among elements, compounds, and heterogeneous and homogeneous mixtures. ▪ Students will use characteristic properties to separate mixtures. ▪ Students will differentiate between physical changes and chemical changes. ▪ Students will recognize that no matter how substances within a closed system interact, the total mass of the system remains the same. ▪ Students will show how the idea of atoms and molecules explains conservation of mass.
GRADE 8	II. PHYSICAL SCIENCE	C. Energy Transformations	The student will understand that energy is a property and cannot be created or destroyed, but only changed from one form into another.	▪ Students will understand that energy is a property of many substances. ▪ Students will compare and contrast heat energy, chemical energy, mechanical energy and electrical energy. ▪ Students will know that potential energy is stored energy and is associated with gravitational or electrical force, mechanical position, or chemical composition. ▪ Students will differentiate between kinetic and potential energy and identify situations where kinetic energy is converted into potential energy and vise versa. ▪ Students will use the idea that matter is made of small particles to explain the movement of heat in conduction and convection. ▪ Students will know that electromagnetic waves have ranges of wavelengths such as radio waves, microwaves, infrared wave, visible light, ultraviolet light, and x-rays.
GRADE 8	III. EARTH AND SPACE SCIENCE	A. Earth Structure and Processes	The student will understand Earth's composition and structure.	▪ Students will explain how earthquakes, volcanoes, sea-floor spreading, and mountain building are a result of the movement of crustal plates.
GRADE 8	III. EARTH AND SPACE SCIENCE	B. The Water Cycle, Weather and Climate	The student will understand how the atmosphere interacts with the Earth system.	▪ Students will understand how radiation, conduction and convection of energy in and out of the atmosphere affects weather and climate. ▪ Students will know that the wind, ocean currents, and layers of the atmosphere are produced by gravitational forces and unequal heating of the Earth. ▪ Students will demonstrate how the rotation of the Earth affects the winds and ocean currents. ▪ Students will predict or forecast the weather based on collected data.
GRADE 8	III. EARTH AND SPACE SCIENCE	C. The Solar System	The student will understand the composition and structure of the solar system and the Earth's place in it.	▪ Students will know that the Sun is the principle energy source for the solar system and that this energy is transferred in the form of radiation. ▪ Students will know that energy that travels through space in the form of waves as electromagnetic radiation and that some types electromagnetic radiation can be seen as color and others are made of wave lengths that are too long or too short to be seen.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 8	III. EARTH AND SPACE SCIENCE	D. The Universe	The student will understand the composition and structure of the universe.	▪ Students will know that the universe consists of many billions of galaxies, each containing many billions of stars and that there are vast distances measured in light years that separate these galaxies and stars from one another and from the Earth. ▪ Students will know common types and life cycles of stars in the universe. ▪ Students will explain how Doppler evidence suggests that our universe is expanding, moving away from the Earth and indicates support for the Big Bang theory of the origin of the universe.
Public Comments: "8th grade science, benchmark above: "Big Bang Theory" is still under debate – scientists are still debating the evidence. " "Regarding same standard, I believe in a different "origin" – please leave this out completely. It is too controversial—we should leave it out. It violates my faith. Why push parents out of the public school system? "				
GRADE 8	IV. LIFE SCIENCE	A. Cells	The student will understand that all organisms are composed of cells, which are the fundamental units of life that carry on the many functions needed to sustain life.	▪ Students will know that cells convert energy from food for the production of materials necessary for life, including cell growth and cell division. ▪ Students will explain that multi-cellular organism have specialized cells that perform specialized functions.
GRADE 8	IV. LIFE SCIENCE	B. Organisms	The student will understand living systems, at all levels of organization, demonstrate the complementary nature of structure and function.	▪ Students will compare and contrast specialized functions of digestion, circulation, respiration, reproduction, excretion, control and coordination and movement in multi-cellular organisms including humans ▪ Students will know that an organism's ability to regulate its internal environment enables it to grow, reproduce and obtain resources in a constantly changing environment. ▪ Students will know that organisms' behavioral response may be determined by heredity and past experience.
Public Comment: "Benchmark #1: Change 'compare and contrast' to 'understand.' Benchmark #2 and #3: Too complex at this level—belongs in 9-12. "				

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 8	IV. LIFE SCIENCE	C. Diversity and Interdependence or Life	The student will understand that within the diversity of living organisms, patterns of similarities, differences and complex interactions exist between organisms and with the physical environment.	▪ Students will give examples of relationships that are mutually beneficial and competitive. ▪ Students will be able to taxonomically group organisms to the appropriate kingdom. ▪ Students will know that living and nonliving factors affect the number and types of organisms that an ecosystem can support. ▪ Students will explain the factors that affect the number and types of organisms an ecosystem can support including available resources; abiotic factors, and disease. ▪ Students will be able to explain how the interrelationships and interdependencies among organisms generate stable ecosystems. ▪ Students will be able to explain how the amount of life an environment can support is limited by the availability of matter, energy, and the ability of the ecosystem to recycle materials.
Public Comment: "Benchmark #4: Change to students will explain factors that may affect viability of organisms in an ecosystem. Drop #6 (same as #4). "				
GRADE 8	IV. LIFE SCIENCE	D. Heredity	The student will understand that heredity information is contained in genes that determine characteristics of organisms that are inherited through asexual and sexual reproduction.	▪ Students will compare and contrast the advantages and disadvantages of sexual and asexual reproduction.
GRADE 8	IV. LIFE SCIENCE	E. Biological Populations Change Over Time	The student will understand how evolution provides a scientific explanation for the fossil record of ancient life forms, as well as the striking similarities observed among the diverse species of living organisms.	▪ Students will be able to explain how a species' biological adaptation in structure, function and behavior enhances its reproductive success and survival in a particular environment. ▪ Students will understand that there is scientific evidence of common ancestry among some organisms. ▪ Students will give examples of how characteristics of some species do not allow survival when the environment changes. ▪ Students will give examples of physical characteristics of an organism that changes the organisms' chance of survival. ▪ Students will explain how diversity of species can develop through gradual processes over generations.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 8	IV. LIFE SCIENCE	F. Flow of Matter and Energy	The student will understand how the flow of energy and the recycling of matter contributes to a stable ecosystem.	▪ Students will explain how energy is transferred through food chains and food webs in an ecosystem. ▪ Students will explain how the amount of useable energy available to organisms decreases as it passes through a food chain and/or food web. ▪ Students will know that the total amount of matter in a closed system remains the same as it is transferred between organisms and the physical environment even though the matters location or form changes.
Public Comment: "Drop benchmark #3. Too complex for 8th grade. "				
GRADE 8	IV. LIFE SCIENCE	G. Human Organism	The student will understand human body systems and their relationship to good health.	▪ Students will explain how many factors related to human health can be controlled and some cannot be controlled. ▪ Students will know that protection from disease is a specialized function in multi-cellular organisms. ▪ Students will know that disease in organisms can be caused by intrinsic failures of the system or infection by other organisms. ▪ Students will use systematic approach to think critically about risks/benefits of a variety of hazards.
Public Comment: "All benchmarks belong in Health. "				
GRADE 9–12	I. HISTORY AND NATURE OF SCIENCE	A. Scientific World View	The student will understand the nature of scientific ways of thinking and that scientific knowledge changes and accumulates over time, some scientific ideas are incomplete, and opportunity exists in these areas for new advances.	▪ Students will be able to distinguish among hypothesis, theory, and law as scientific terms and how they are used to answer a specific question. ▪ Students will be able to explain how scientific innovations and new evidence can challenge accepted theories and models, including cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease, Big Bang theory. ▪ Students will know that scientific explanations must meet criteria to be considered valid, including that they must be consistent with experimental and observational evidence about nature, logical, respect the rules of evidence, be open to criticism, and report methods and procedures. ▪ Students will recognize how traditions govern the conduct of science, including ethics, peer review, conflict, and consensus.
Pubic Comment: "Regarding 2nd benchmark above: Clever – just a distraction – attempt to get intelligent design into curriculum. "				

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 9–12	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will design and conduct a scientific investigation and evaluate the results of that investigation, understand and use the processes of scientific investigation to design, conduct, describe, and evaluate these investigations.	▪ Students will be able to design and complete a scientific experiment using the scientific method including questioning, testing, hypothesizing, analyzing data, making conclusions based on evidence, and comparing conclusions to the original hypothesis and prior knowledge. ▪ Students will be able to distinguish between qualitative and quantitative data. ▪ Students will be able to apply mathematics to analyze and support conclusions and models. ▪ Students will be able to identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions. ▪ Students will be able to apply established safety rules and guidelines in conducting scientific investigations inside and outside the classroom.
Pubic Comments: "First bullet: How will you test whether they can design and complete an experiment? " "4th bullet: CHANGE 'sources of error' TO 'sources of uncertainty.' "				
GRADE 9– 12	I. HISTORY AND NATURE OF SCIENCE	C. Scientific Enterprise	The student will explain the relationship between science and technology and how both are used in our world.	▪ Students will be able to analyze an example of a way you use the scientific method in your daily life. ▪ Students will compare and contrast the goals and career opportunities of engineering/technology and science. ▪ Students will provide an example of a need/problem explained by science and solved by engineering/ technology. ▪ Students will describe the different scientific and engineering disciplines involved in a common household item. ▪ Students will provide an example of how technology facilitated a rapid advancement in science.
Pubic Comments: "Bullet #1: CHANGE 'use the scientific method in' TO 'use scientific methods in.' Much research has been published and rational thought refutes the notion of 'the scientific method.'" "Bullet 1: I don't believe there is A Scientific Method and I seriously doubt many people carry out science in their daily lives. If this was the case, science would have been developed long before the 1600's. " "4th bullet: Drop the 'household item' benchmark. " "5th bullet: Drop 'Students will provide an example of how technology facilitated a rapid advancement' benchmark. "				

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 9–12	I. HISTORY AND NATURE OF SCIENCE	D. Historic Perspectives	The student will recognize the historical and cultural context of scientific endeavors and how they influence each other.	▪ Students will be able to trace the development of a scientific advancement, invention, or theory through time and its impact on society. ▪ Students will provide an example of a scientific advancement contributed by another civilization. ▪ Students will compare and contrast the differences between scientific theory and other bodies of knowledge, including cultural beliefs, and the importance of each in a science discussion.
Pubic Comments: "Bullet #2: 1) What qualifies as 'another civilization?' 2) What qualifies as a 'scientific advancement?' Question: How will this be assessed on a statewide test? " "First benchmark should have students trace an idea through acceptance in the general scientific community. " "Drop the 'other civilization' benchmark. " "Students will compare scientific knowledge to other types of knowledge. "				
GRADE 9–12	II. PHYSICAL SCIENCE	A. Structure of Matter	The student will understand the nature of matter including their forms, properties and interactions.	▪ Students will identify protons, neutrons, electrons as the major components of the atom, their mass relative to one another their arrangement, and their charge. ▪ Students will be able to explain the relationship of an element's position on the periodic table to its atomic number and mass. ▪ Students will compare and contrast the properties of an element and its isotopes and how isotopes can be used in research, medicine, and industry. ▪ Students will use the periodic table to identify regions, families, groups and periods, and to predict atomic size, number of bonding electrons and reactivity of elements. ▪ Students will be able to explain how atoms form compounds through ionic and covalent bonding. ▪ Students will compare and contrast the four states of matter in terms of structure and magnitude of intermolecular forces.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
Public Comments: "In reference to the 9-12 Physical Science Standards: 1. What about basic wave motion (i.e. refrlection, refraction, diffraction and interference)? This could easily fit into 'energy transformations'. 2. Is this all conceptual? No quantitative treatment, with the exception of work, energy and power where quantitative treatment is specified? 3. 'electricity moving through a circuit'? Wouldn't 'current' be a better choice? And, are we going to assume conventional current or the flow of negative charge? 4. What about electromagnetism? That is a huge topic that cannot be properly understood until the 9-12 level (if even then)." "Grade 9-12: Physical Science: What happened to Chemistry? There are some brief mentions but not specific topics such as litmus tests, compounds, the periodic table of elements. Also, there needs to be a mention again of using science equipment in a responsible manner." "Last bullet: What 4th state of matter do they want? Plasma or Bose-Einstein condensate? " "Students should be able to use the Kinetic Model of Matter to explain states of matter and predict pressure temp volume relationships. This should replace benchmark II A, 6, 5."				
GRADE 9–12	II. PHYSICAL SCIENCE	B. Chemical Reactions	The student will understand that the conservation of atoms in chemical reactions leads to the ability to calculate quantities of products and reactions in chemical changes of matter.	▪ Students will describe chemical reactions using words and symbolic equations. ▪ Students will observe, measure, and calculate quantities to demonstrate conservation of matter in chemical changes. ▪ Students will be able to explain how temperature, surface area, agitation, and catalysts influence the rate of reaction. ▪ Students will differentiate between complete and reversible reactions. ▪ Students will distinguish between a chemical reaction and a nuclear reaction.
Public Comments: "2nd bullet: Get rid of the word calculate. This is stoichiometry – cannot be done in 9th grade. " "4th bullet: How will the students differentiate between complete and reversible reactions? In terms of …the arrow, Keq, experimentation, amount of product? Reversible Reactions – How much? And in what terms? Keq values, stress on the equilibrium" "4th bullet: Developmentally, reversible reactions should NOT be done in 9th grade. " "5th bullet: How will the student differentiate between chem & nuclear reactions? In terms of what? How much information for nuclear reactions? Different types? Predicting products? Balancing? "				

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 9–12	II. PHYSICAL SCIENCE	C. Energy Transformations	The student will identify, analyze, and measure relationships with energy forms, transformations, and transfers.	▪ Students will know that potential energy in stored energy and is associated with gravitational or electrical force, mechanical position, or chemical composition. ▪ Students will differentiate between kinetic and potential energy and identify situations where kinetic energy is converted into potential energy and vise versa. ▪ Students will distinguish between current and static electricity. ▪ Students will distinguish between AC and DC current. ▪ Students will explain how electricity travels through circuits. ▪ Students will know that electricity in the movement of charged particles. ▪ Students will describe the production, storage, transmission of electricity. ▪ Students will know that photons behave as both particles and waves. ▪ Students will explain how the energy of the waves described the electromagnetic spectrum is used in research, medicine and industry. ▪ Students will be able to use the Law of Conservation of Energy to explain changes in energy in physical and chemical changes. ▪ Students will compare and contrast the amount of energy released through chemical reactions and nuclear fission and fusion. ▪ Students will describe the risks and benefits of fossil fuels, renewable sources, and nuclear power as sources of usable energy.

Public Comments:

"Drop benchmark #1 (first bullet).
Drop benchmark #3.
Drop benchmark #5.
Change # 6 to Relate electricity to the movement of charged particles and explain why the charged particles move.
Drop benchmark #8 or photons as particles and waves.
Add to benchmark #9 that students should understand why these waves for medicine, etc.
Drop #12. "

"Benchmark #10: What about the Law of Conservation of Matter? "

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 9–12	II. PHYSICAL SCIENCE	D. Motion	The student will understand the nature of force and motion.	▪ Students will explain the relationship between force, mass, and acceleration. ▪ Students will know that an object that is not being subjected to a net force will continue to move at a constant speed and in a straight line (Inertia). ▪ Students will know that if more than one force acts on an object in a straight line, the forces will reinforce or cancel one another, depending on their direction and magnitude. ▪ Students will know that unbalanced forces will cause changes in the speed or direction of an object's motion. ▪ Students will use the concepts of inertia, force, velocity, and mass to describe the motion of an object. ▪ Students will describe the effect of friction and gravity on motion. ▪ Students will describe the relationship among energy, work and power both conceptually and quantitatively.
Public Comments: "Physical Science Strand Sub strand motion, benchmark 'students will explain the relationship between force amss and acceleration' should read 'students will be able to apply the relationship between force, mass and change in speed or direction'. The concept of acceleration is advanced, and many students will not understand the concept until they take physics in 12th grade. I doubt even 9th graders taking physics will get this concept." "Drop bullets #1, #2, #4. Change #5 to describe motion with acc., vel., time, position. Add: Explain how Force, Mass affect the changes in motion of an object. Drop #6. Add: Students will understand and explain why all objects accelerate at the same rate in free fall. "				
GRADE 9–12	II. PHYSICAL SCIENCE	E. Forces of Nature	Understand the forces of nature and their application in the real world.	▪ Students will be able to identify the gravity, electromagnetic, weak and strong nuclear forces as the four forces of nature. ▪ Students will be able to recognize that the nuclear forces that hold the nucleus of an atom together are usually stronger than the electric forces that would make it fly apart. ▪ Students will describe the electrical force that exists between any two charged objects and distinguish between attraction and repulsion between charged objects.
Public Comments: "2nd bullet: How much detail do we want to give for nuclear forces so that the students understand this concept? " "Change first benchmark (#1) to understand what factors affect the presence and sizes of these forces. "				

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 9–12	III. EARTH AND SPACE SCIENCE	A. Earth Structure and Processes	The student will understand how the interaction of the atmosphere, biosphere, lithosphere, hydrosphere and space has resulted in ongoing change of the Earth system over geologic time.	▪ Students will identify the internal and external sources of energy for the Earth. ▪ Students will demonstrate understanding of the laws of thermodynamics as they apply to the cycling of materials and transfer of energy in the Earth system. ▪ Students will give examples of how biological processes have played significant roles in determining the character of the atmosphere, biosphere and lithosphere over time. ▪ Students will be able to use the theory of plate tectonics to explain relationships among earthquakes, volcanoes, mountains, mid-oceanic ridges and deep-sea trenches. ▪ Students will be able to describe how glaciers, gravity, wind, temperature changes, waves, and rivers cause weathering and erosion. ▪ Students will describe the rock cycle and compare and contrast the processes responsible for the formation of igneous, sedimentary, and metamorphic rocks. ▪ Students will use evidence such as fossils, rock layers, ice caves, radiometric dating, and globally gathered data, to explain how Earth has changed or remained constant over short and long periods of time. ▪ Students will be able to apply an integrated understanding of chemistry, physics, and biology to the analysis of global change issues, such as ozone depletion, greenhouse warming and overpopulation. ▪ Students will be able to use globally gathered data to describe how Earth systems interact to create our climate and ecosystems.

Public Comment:

"Benchmark #2: What about law of conservation of matter?
Benchmarks #5-7: How will Minnesota kids learn how this geology relates to/is located in Minnesota? "

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 9–12	III. EARTH AND SPACE SCIENCE	B. The Water Cycle, Weather and Climate	The student will understand the relationships between the global atmospheric processes driven by energy from the sun, the Earth's tilt, rotation, revolution, the influence of land and water, and the impact of human affairs.	▪ Students will be able to explain how the transfer of energy and motions of the Earth all contribute to global atmospheric processes. ▪ Students will be able to trace cyclical movement of an element through the lithosphere, hydrosphere, atmosphere, and biosphere. ▪ Students will demonstrate the effect of the Earth's tilt, rotation, and revolution on the seasons, day length, and tides. ▪ Students will identify, investigate and predict the factors that influence the quality of water and how it can be reused, recycled and conserved. ▪ Students will be able to identify, analyze and evaluate the factors that may influence weather and climate, and describe both their short and long term effects on the environment. ▪ Students will discuss the impact of human activity and natural resource use on the Earth's climate. ▪ Students will be able to connect the biotic and abiotic factors that affect the evolution of the Earth's environment and structure. ▪ Students will explain how specific chemical reactions or reaction series have major implication for climate conditions and ecosystem change.
GRADE 9–12	III. EARTH AND SPACE SCIENCE	C. The Solar System	The student will connect the formation and characteristics of our solar system and its components to the conditions necessary for life.	▪ Students will be able to explain how the sun, earth, and solar system formed. ▪ Students will be able to compare and contrast the nature of the planets taking into account their composition, mass and distance from the sun. ▪ Students will be able to describe the remotely sensed evidence from current technology that has been used to understand the early history of the solar system. ▪ Students will be able to compare and contrast the environmental parameters that make life possible on Earth with conditions found on the other planets of our solar system.
GRADE 9–12	III. EARTH AND SPACE SCIENCE	D. The Universe	The student will understand that astronomical data reveals the structure, scale, and changes in the stars, galaxies, and universe over time.	▪ Students will recognize that stars, galaxy, and universe change over time. ▪ Students will recognize that the visible mass of the universe consists of billions of galaxies, each of which is a gravitationally bound cluster of billions of stars. ▪ Students will understand that stars produce energy from nuclear reactions, primarily the fusion of hydrogen to form helium. ▪ Students will be able to identify that the processes in stars that lead to the formation of other elements. ▪ Students will describe the evidence from current technologies that has been used to understand the early history of the universe.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 9–12	IV. LIFE SCIENCE	A. Cells	The student will comprehend that all living things are composed of cells and the life processes in a cell are based on molecular interactions.	▪ Students will be able to relate cellular structures and organelles to their functions. ▪ Students will be able to differentiate between prokaryotic and eukaryotic cells in terms of their structure and complexity. ▪ Students will compare and contrast the structures found in typical plant and animal cells. ▪ Students will be able to explain the role of the cell membrane as a highly selective barrier (diffusion, osmosis, active transport). ▪ Students will describe the role of enzymes as catalysts in metabolism and cellular synthesis of new molecules. ▪ Students will be able to differentiate between the processes of photosynthesis and respiration in terms of energy flow, reactants, and products. ▪ Students will describe how cell functions are regulated through intercellular and extra cellular signaling (hormones, neurotransmitters, proteins). ▪ Students will describe and compare the processes of mitosis and meiosis and their role in the cell cycle.
Public Comment: "Benchmark #7 is too complex, drop it. "				
GRADE 9–12	IV. LIFE SCIENCE	B. Organisms	The student will classify, compare, and contrast the diversity of organisms on earth and their modes of accommodating the requirements for life.	▪ Students will relate the structure, complexity and organization of organisms (all organ systems) to their methods of obtaining, transforming, releasing, and eliminating the matter and energy used to sustain the organism. ▪ Students will be able to explain the development of multicellular organisms from a single cell through the regulation and expression of different genes. ▪ Students will recognize that organisms have innate and/or learned behavioral responses to internal and external stimuli, including the tropic responses in plants. ▪ Students will be able to identify significant adaptations that have allowed life to evolve from single-celled aquatic organisms to multicellular terrestrial organisms over a period of more than 3.5 billion years. ▪ Students will be able to use scientific evidence, including the fossil record, homologous structures, embryological development, or biochemical similarities, to classify organisms showing probable evolutionary relationships and common ancestry.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
Public Comment: "Benchmark #1: Students will understand that structure dictates function of all parts of organisms. Drop #3. # 4 and 5: Move to E. "				
GRADE 9–12	IV. LIFE SCIENCE	C. Diversity and Interdependence or Life	The student will describe how the environment and interactions between organisms can affect the number of species and the diversity of species in an ecosystem.	▪ Students will be able to describe the factors related to matter and energy in an ecosystem that influence fluctuations in population size and determine the carrying capacity of a population. ▪ Students will be able to explain how adaptations of species and co-evolution with other species are related to success in an ecosystem. ▪ Students will identify the types of symbiotic relationships (mutualism, commensalism, parasitism) that occur in a stable ecosystem. ▪ Students will predict and analyze how a change in an ecosystem, resulting from natural causes, changes in climate, human activity, or introduction of invasive species, can affect the number of organisms in a population and the biodiversity of species in the ecosystem.
Public Comment: "Benchmark #2: Drop 'and co-evolution.' Benchmark #4: Drop 'resulting from…invasive species.' "				

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 9–12	IV. LIFE SCIENCE	D. Heredity	The student will explain how inherited characteristics are encoded by genes.	▪ Students will be able to explain that the instructions for the characteristics of all organisms are carried in nucleic acids (DNA and RNA). ▪ Students will be able to define the relationship between DNA, genes, and chromosomes. ▪ Students will describe the structure and function of DNA and distinguish between replication, transcription, and translation. ▪ Students will know that different species of multicellular organisms have a characteristic diploid number chromosomes, and that in typical humans there are 22 autosomal pairs and two sex chromosomes (XX for female and XY for male). ▪ Students will describe how genetic information is transmitted from parents to offspring through the process of meiosis and fertilization as they relate to chromosome recombination and sexual reproduction. ▪ Students will be able to use Mendel's laws of segregation and independent assortment and a Punnett Square to determine the genotype and phenotype of a monohybrid crosses. ▪ Students will differentiate between dominant, recessive, co- dominant, incompletely dominant, polygenic, and sex-linked traits. ▪ Students will be able to explain how somatic and germ-line mutations in the DNA sequence of a gene may be silent or result in phenotypic change in an organism and/or its offspring. ▪ Students will determine the factors that affect the rate of mutations, including, but not limited to, ionizing radiation and chemicals. ▪ Students will recognize that biochemical analytical techniques allow for sophisticated analysis with applications such as forensic science, genetic engineering of plants, and medical applications and their societal impacts.

Public Comment:

"Benchmark #8: Students will be able to explain how mutations may or may not cause changes in organisms and/or offspring.
Benchmark #9: Students will recognize the factors that may cause mutations.
Benchmark #10: Change to Students will recognize current techniques in biotechnology have major impact on various aspects. "

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 9–12	IV. LIFE SCIENCE	E. Biological Populations Change Over Time	The student will explain how evolution provides a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms.	▪ Students will understand that species change over time and the term biological evolution is used to describe this process. ▪ Students will describe how natural selection, the mechanism of biological evolution, causes the differential survival of groups of organisms as a consequence of: a. the potential for a species to increase its numbers; b. the genetic variability of offspring due to mutation and recombination of genes; c. a finite supply of the resources required for life; d. the ensuing selection based on environmental factors of those offspring better able to survive and produce reproductively successful offspring. ▪ Students will be able to predict the success or failure of a population of organisms over time based on genetic variability of offspring, the ability to reproduce, and the exposure to changing environmental factors. ▪ Students will be able to describe how genetic variation between populations is due to different selective pressures acting on each population, which can lead to speciation/a new species. ▪ Students will recognize that a great amount of time, approximately 3.5 billion years, is necessary to explain the variation of species that has produced the great diversity of life currently present on earth and found in the fossil record.

Public Comment:

"Change #1 and #2 to: Students will understand that species change over time through natural selection which is the driving force for evolution.
Benchmark #3: Drop #3; emphasize #4 (which it is really a part of.) "

Grade Level	Strand	Sub-Strand	Standard	Benchmarks
GRADE 9–12	IV. LIFE SCIENCE	F. Flow of Matter and Energy	The student will describe and explain the cycling of matter and flow of energy through an ecosystem's living and non-living components.	▪ Students will be able to explain the relationship between abiotic and biotic components of an ecosystem in terms of cycling of water, carbon, oxygen, and nitrogen. ▪ Students will know that all matter tends to become more disorganized and that living systems require a continuous input of energy in order to maintain their chemical and physical organizations and prevent death. ▪ Students will identify that the primary source of energy for life and fossil fuels is derived from the sun, and explain how sunlight energy is transformed into chemical energy by photosynthesis in organisms. ▪ Students will identify and distinguish producers, consumers, and decomposers, and explain the transfer of energy through the trophic levels. ▪ Students will describe how respiration releases chemical energy by the breakdown of molecules and store the energy. ▪ Students will understand that energy flows through different levels of organization of living systems (cells to communities) and between living systems and the physical environment as chemical elements are recombined in different ways. Each recombination results in storage and dissipation of energy.
Public Comment: "Change #2: Entropy affects biological systems. Combine #4 and #5. Students should understand that photosynthesis and cellular respiration are the methods where energy is transported between ecosystems. Benchmark #4: Drop (part of 3 and 5). Benchmark #6: Drop (covered in 3 and 5). "				
GRADE 9–12	IV. LIFE SCIENCE	G. Human Organism	The student will relate the structure and function of human organ systems to the ability to maintain a stable internal environment (homeostasis) despite changes in the outside environment.	▪ Students will explain how major organ systems in humans have functional subunits with specific anatomy that perform the function of that organ system. ▪ Students will understand and describe the basic anatomy and physiology of the nervous system and sense organs. ▪ Students will be able to describe how the function of individual systems within humans is integrated to maintain a homeostatic balance in the body. ▪ Students will be able to illustrate how feedback loops in the nervous and endocrine system regulate conditions in the body. ▪ Students will realize that behavioral biology has implications for humans since it provides links to psychology, sociology and anthropology.
Public Comment: "This sounds wonderful, but drop benchmark #5 and increase the number of requirements for science so we actually have time to do this. "				

General Public Comments:

This integrated cross over in Life Science with Earth/Physical Sciences needs to re-vamped. Some schools don't teach LS in 7th grade. Let the districts administer the benchmarks when they have completed the coursework. EX> We don't give Drivers Permits until after they can pass the test why should we assess kids before they have the skills to be successful. I would need a triple major from college to teach this..... Is the state willing to pay me to go back and get the coursework to do this???

As I read the new science standards I realized that the secondary ed science teachers would be out of compliance with No Child Left Behind law. The reason being we are only certified to teach a certain subject. By stranding the material through all grade levels we have watered down the curriculum for all students at every level. We also will have less qualified teachers teaching in middle school. The generalist license requires one class for each science discipline. That means we have a person who knows a little about a lot when our kids need real science teachers, not elementary teachers with a specialty. By real science teachers I mean people who have majored in a science discipline (which is what No Child Left Behind call for) in college and have a teaching license. Science teachers are scientist who teach. By stranding the curriculum middle schools especially will have to be restructured to accommodate the curriculum thus getting rid of the middle school model we all seem to love. If the standards are passed as is, I would be inclined to leave teaching because this is an indication that we are all about knowing very little about a lot. The old addage comes to mind, a mile wide and an inch deep. I am sure I would not be the only teacher to leave thus giving Minnesota another teacher shortage in the sciences. I don't think this is what we want. Our current science curriculum is well thought out and very detailed. It followed the National Standards and did not surpass them. The current model surpasses the National Standards. Is there something this Edcation Commissioner knows that the National Science Board doesn't know about how to educate kids in science? This puts all kids at a disadvantage in knowing anything about the many disciplines of science. By putting teacher in the classroom with broad foundation and no depth will significantly hurt the students of Minnesota and there education process.

I am embarassed and deeply alarmed at what I read here. In addition to nationalistic propaganda, the standards completely eliminate environmental science, throw doubt on evolution theory, and feature a
"government bad, business good" bias. If we don't stop these now,
Minnesota's public schools will fall back forty years. The information here is enough to make me want to move away from Minnesota, or home school my kids. I cannot afford private schooling.

Two of the most pressing problems that our children will inherit: Global Warming and Depletion of Fossil Fuels, are not mentioned anywhere in the standards. These are some of the most significant issues that our children will face. Global Warming is an internationally accepted fact in the scientific community. Even the EPA has published data supporting global warming that was suppressed for political reasons. Do not let our education become politicized at the expense of the facts. Depletion of fossil fuels will become very acute in our children’s lifetime. Oil production in this country peaked in the 1970’s and has declined ever since. World proven resources are finite and will run out unless alternative sources of energy and strategies to avoid dependence fossil fuels are implemented.

For the History Strand: I am concerned with how the benchmarks will be tested on the state test. They are very general in nature, suggesting an open essay would be appropriate. If this is not the intention for assessment, these benchmarks must be made much more specific - naming names, technologies, and advances.
Earth and Space Science: The inclusion so many standards to be met at the 9-12 level may lead to severe reductions in the number of course choices open to senior high students. It is my recommendation that these standards be left to the 5-8 grades where earth science has been taught with success in our district.
Life Science Strand: Substrand F, second benchmark seems much too specific to be its own benchmark and should be thrown out. Substrand G, the final benchmark "Students will realize that behavioral biology has implications for humans since it provides links to psychology, sociology and anthropology." is too general and should also be thrown out (or be made too specific.)
I do support the remainder of the standards. The benchmarks include topics that we have agreed in our district to be important. My greatest concern is simply - time. The list is extensive and our time to teach is finite as is the time allocated for standardized testing.
Thank you for providing this venue for responding to the standards as they are produced.

Most schools in our area teach specific sciences once students are in 7th grade. It looks like the new standards are more of a general science, because it expects students to have a knowledge of earth science, life science and physical science. Since teaching licences within the sciences became so specific, why are the subjects now becoming more generalized?

My concerns are that the strands are very broad and cover a multitude of ideas and concepts. As a teacher I find that instead of uncovering a scientific concept and helping my students reach a true and geniune understanding I am merely lightly covering the surface of a plethora of ideas, and that the standards as written in the draft are making my instruction

even more of a challenge. I believe the standards are too diverse. I am also concerned that there are currently no textbooks, supplementary reading materials, or physical materials to instruct my students on all of these topics. I would like to see standards that cohesive, integrated, and provide a true understanding of science. I believe it is also important for funding and materials to be provided to use for instruction.

My comments are in reference to the K-6 portion of the science standards. Obviously they are based on the National Science Standards, but they are far too grade level specific. If this specific content is to be taught at the grade levels suggested, then every school district in Minnesota will have to drastically overhaul their science curriculum and make major material purchases to accompany the new curriculum. Funds do not exist to accomplish this!

At the sixth grade level and to a lesser degree, fifth grade and fourth grade, there is far too much content! The united states has long been guilty of having science curriculum that is a mile wide and an inch deep. By cramming so much curriculum into these grade levels we are falling into the same trap!

I noticed that fourth graders are expected to use a microscope to view cells. Why? I believe that developmentally, fourth graders cannot be expected to accomplish this with understanding. In the National Science Education Standards, the study of cells is included for grades 5-8, not grade four. It is a huge mistake to take higher grade level concepts and content and move it to earlier ages!!

Positive student attitudes towards science are extremely important. How will these new standards help accomplish that?

Since these new standards are quite rigorous, how will elementary teachers be trained to teach them effectively? The majority of our elementary teachers are generalists and science may be their weakest area when it comes to training.

Please take my comments into serious consideration.

I find it frustrating to see the sciences generalized to be taught in pieces at the middle level and disgree with the idea for three reasons. First, the science teachers will not be specialized for that particular area. Second, the middle level is a time for steady consitent mentorship. The split of life science, physical science, and earth science may lead to students switiching teachers every trimester leading to a lesser student-teacher relationship. Third, the equipment and science supplies are costly! The earth science units where I teach 8th grade are rotated in order for the supplies to be shared. Finally, I have experienced a similar generalized middle level science curriculum when I taught in the state of Washington. The depth of the subject was lost. Please leave the responsibility of blending earth science, life science, and physical science to the teachers!

The standards will require us to cover way to many topics in a school year. This means that we will not be able to give quality time or information to cover the many subjects we need to teach. Fewer topics will give us time to give students a quality not rushed education. Why fix a subject that is not broken.Minnesota science education rates extremely high. Where will all of the money come from to allow use to teach all of these topics. We will need 3-4 seperate books and lots more lab equipment to cover all of the subjects required. This must be fixed !!!!!!!

MN has ranked tops in the world in Earth science. Why in the world would you change?
I don't think making 7th and 8th grade a general science is a good idea.Switching from geology to genetics in the same year makes little sense. What is the rationale for this? This is a very, very, bad idea. Please reconsider.

Good:
-The interdisciplinary concept seems to work well with how the brain learns - having to recall the information and build on it from year to year.

Questions/Concerns:
- Have you looked into districts and states that are already using this interdisciplinary approach to find out how it’s working? (New Richmond, WI, for example)

- Will there be adequate time (and money) for teachers to work with each other to totally revamp their curriculum and lesson plans - so that they have good lessons, not lessons that are just thrown together the day before? I believe it takes about takes 5 years to develop really good lessons (a full year’s worth). And if we are not given time to revamp our curriculum it will take even longer - especially in areas/topics where the teacher is not very familiar with.

- What do we do if a teacher is not certified to teach all the topics (life, earth & physical)?

- We may end up teaching facts to teach to the test, and therefore we may have less time to teach skills, technology, etc.

- Will there be money to buy the extra supplies and t extbooks that will be needed.

- The standards are trying to be specific, yet there seems to be some key units missing: for example in 8th grade they learn to taxonomically group organisms to the appropriate kingdom. Yet I don't see where they are supposed to learn about the kingdoms of Monerans (bacteria), Viruses (don't have their own kingdom), Fungi & Protist. The only 2 kingdoms mentioned are Plants and Animals, but only briefly.

Conclusion - I'm not totally against the idea of an interdisciplinary approach, I just think how we are step up now is pretty good. I'm concerned that teachers will not be given enough time to revamp their lessons - so they are good lessons. Plus will there be money to buy new and extra supplies?

Grade 3, Strnad IV sub B - I disagree that 3rd graders can't learn biomes. I teach it to them all time.

I am an earth Science Teacher. The standards seem appropriate. However, it would be best to place all the Life Science standards in 7th grade and the Earth Science in 8th grade. Licensure issues and textbook issues would become complicated if the standard remains as is. Another consideration may be to simply list grade 7 or 8 next to each Life Science and Earth Science standard. Earth Science is already an integration of many sciences. It makes sense to have a consistant theme throughout the year.

Where is the data coming from that 50% of the the middle level schools are teaching general science and 50% have courses identified as Physical, Life, and Earth Science. My experience (outstate) is almost all schools have the Physical, Life and Earth Science course. This is being used as a justification that the new standard will require 50% of the school to change no matter what. My experience and the experience of my fellow science teachers is the 50-50 state is incorrect.

The standards for science and social studies have gone from being too broad to being too specific. The only way that teachers could do justice to so many specific items is if we were provided with a curriculum which covered all of that material. If the idea is to have all MN educators providing the same information to all children, then maybe we need to have a standard curriculum for all schools. Where did all these pieces come from?
Speaking for second grade, the number of items in the standards for both social studies and science is way too many. If teachers are expected to make sure that students are successful, the amount of information must be reasonable and we must have access to good teaching materials that address the chosen items.
Thank you for considering teacher comments.

The science standards look fine; however the benchmarks show specific content to be taught at each grade. If this is what will be expected, districts will need to write additional curriculum and purchase additional materials.

Perhaps you should have some spelling standards... I noticed that particular is incorrectly spelled on the first page.

For grade 4 (or possibly 5), the following standard (or something like it), under the "Earth Structure & Processes" Sub-Strand, is missing: "Students will gain a general understanding of geologic time."
The associated Benchmark should read something like this: "Students will be able to successfully extract and use information from charts/tables showing animal or plant life over geologic time, and retain a general grasp of the time lengths involved (through 600 million years)."
This standard & benchmark could also be included among the life sciences, if preferred. Paleontology is at the intersection of the two. The grade 2 treatment of some prehistoric life is too young to do geologic time. By grade 4 the students can understand the idea of a million (because they've multiplied 1000 by 1000, because they can imagine 20 filled metrodomes, or 1000 meter sticks with 1000 mm marked on each one; etc.).
I have submitted detailed discussion of this and a few other suggestions in writing at the St. Paul hearing. Please ask for a copy of my submissions. They include:
Science Standards Need Evolution in Elementary Too
Integrating Evolution More Effectively into the Elementary Curriculum

Untitled: 3 pp. of suggestions regarding specific benchmarks, including this one.
A Saint Paul Board of Education Resolution from 1993 that mandated inclusion of prehistoric life, geologic time, and evolution, including the evolution of humans in Africa, as part of the grades 4-6 curriculum.
Coverage of Evolution in 9th Grade Pre-IB Biology. This class, which is based on international standards, shows the kinds of content that students will encounter. My remarks deal with the threads that should be picked up in elementary school as part of the spiraling curriculum supporting the higher levels.

The following documents were submitted to the Committee at the public hearing in St. Paul. The documents are mostly applicable to science at grades 4-5. I have been dealing with these matters off and on for over 10 years, so I ask that you give them due consideration.
1. Science Standards Need Evolution in Elementary Too.
2. Integrating Evolution More Effectively into the Elementary Curriculum.
3. UNTITLED-- top line reads, "Proposed additions are in italics; proposed deletions are in strikethrough." 3 pp. of suggestions on specific standards and benchmarks.
4. The text of the resolution passed by the Saint Paul Board of Education in support of teaching a "Life Through the Ages" curriculum, including "prehistoric life, geologic time, and evolution" (including human evolution).
5. Coverage of Evolution in 9th Grade Pre-IB Biology. This is a memo I sent to others associated with the St. Paul District, quoting a study guide for the evolution unit in a 9th grade pre-IB Biology course, and suggesting how elements of this subject matter should extend down into elementary school.

Grade 4, Diversity and Interdependence of Life Sub-Strand.
Revise Standard slightly to read: "The student will know that living (and formerly living) things can be sorted into groups in many ways according to their varied characteristics and structures."
Another benchmark also needs to be added here, as follows:
"Students will know the principal characteristics that distinguish fish, amphibians, reptiles, birds, mammals, insects, spiders, and land molluscs."
Rationale: Although I support the constructionist approach to learning to a great extent, this approach must lead students back to some of the general principles involved. There is some arbitrariness to all classifications, granted, but approach implicit in these two benchmarks takes this to an extreme. It does little good to classify plants and animals (as in benchmark #1) if the teacher stops after the students have sorted animals by whether or not they have wings (insects, bats, birds), etc. The students should learn at least a little, in the end, about the differences between the principal kinds of animals found in their own environments (hence I limited molluscs to land molluscs).
How can a student go through elementary school without getting some grasp of what a mammal as contrasted with a bird, etc., is or isn't "about"? You may think that the added benchmark that I am proposing is implicit in the first two, but it is not!
(There seems to be a great fear of introducing students to terms like arthropods, etc., in elementary. That is not necessary, but avoiding teaching about the different kinds of animals is sheer nincompoopery.)
Indeed, you should probably add that students should know the difference between deciduous trees, evergreen & ferns too.

These comments pertain to the Biological Populations Change Over Time sub-strand.
A new standard is needed in 4th or 5th, as follows:
"The student will understand the evolutionary order in which the vertebrates arose in the course of geologic time."
A new benchmark with this standard should be roughly as follows:
"Students will know these evolutionary sequences: fish--> amphibians--> reptiles--> mammals; and
reptiles--> dinosaurs--> birds."
I would put these into the same unit with a benchmark that you currently have in grade 5, namely, that "Students will know that fossils can be compared to one another and to living organisms according to their similarities and differences."
Indeed, such comparisons can be made, but part of the point of such a lesson is to arrive, eventually or along the way, at the evolutionary connections and linkages.

There is a very good, hands-on activity that can help instruct students in prehistoric life, geological time, and evolution.

I am a parent, not a teacher, but this is one little "unit" I did teach, as a guest instructor in a 3rd grade class. A more in-depth unit should take a week.
The idea is simple-- provide each student with an adding-machine type roll of paper, to be cut into 6 meter lengths. Each centimeter = 1 million years. Tools required include a rubber band (for rolling it back up/storage), rulers and a few pair of scissors, plus implements for drawing pictures. Every student makes their own representation of geologic time and life on earth. (Later, students are informed that the earth is about 7.5 times older.) Students cut paper from the roll to the right length. The teacher writes the principal geologic eras and periods on the blackboard (e.g., Cretaceous, Jurassic & Triassic periods in the Mesozoic era), and the date at which each one began and ended. The students use arithmetic scaling techniques to draw dividing lines on their 6 meter rolls, representing each of the the periods and eras. The teacher might add a list of some of the key animals and plants and their starting dates on the blackboard. The students can use the resource books in the room to find pictures of those same animals and plants, or others, for drawing onto their geologic time scale in the appropriate places.
When I tried this with third graders (4th can better understand the concept of millions of years), the kids were all over the floor and out in the hallways busily working. They almost automatically get a sense of the evolutionary order in which life arose as part of the process. THEY HAD A GREAT TIME AND THEY ALL HAD A NEAT PRODUCT WHEN THEY WERE DONE. These products can even be posted for an open house or whatever.

There are many references to the "Flow of Matter and Energy". Energy DOES NOT flow. Energy is not a "substance". It cannot flow. It is teaching wrong science when it is taught and it really screws up basic scientific thought when it is part of a standard.

As looking at the science standards I did not see a section, "students understands that humans are drastically effecting, changing and destroying natual environments" (in a way no other species has done before) nor does it stress that "humankind is part of earth's ecological system and therefore will be effected by changes in ecological systems, climate change and pollution."

1st comment - you give us pages upon pages of materials to look through and then give us a three line window to compose a response, that's just not nice. 2 Please try to teach these children as much as possible before puberty, when pleasing your peers become more important than pleasing your parents.

The benchmark, "Students will follow appropriate safety rules concerning the use of goggles, heat sources, electricity, glas, and chemicals and biological materials." is inappropriate for the five and six-year-olds in kindergarten. The curriculum would not include the use of any of the materials mentioned.

I think these standards look strong, solid and complete. By basing them on the National Science Standards, we are getting the opinions of hundreds of professionals who have already put hundreds of hours into this. Well done!!!

As a retired elementary school teacher who worked on the Profiles of Learning and writing science curriculum for our school district, I was astounded at how many standards and benchmarks are supposed to be covered at each grade level. This looks like our outcomes of twenty years ago. I can tell you with certainty that an elementary teacher does not have nearly enough time to cover all of this material. It seems to me that we have learned that lecture and worksheets aren't the best way to teach science with understanding. How will educators be able to teach children all of these benchmark in the time given to them? With 20+ years of teaching experiences, I know that less is better. In other words, children need to go through a process to really understand all of these complicated standards. Children aren't learning best by just memorizing a few facts and then spitting them back out. Please review the latest research on how children learn best and at what developmental level they may even be able to learn. Way too much, not enough time to cover this much information and not relevant to the developmental levels of chidren. Why do we have to start all over again so many times, throwing everything out. How much money is wasted doing this all over again. Politics does not belong in writing curriculum - current educational research should tell us the best practices to use when educating our students.

The topics that need to be covered must be put into grades. For example let districs decide which grade will cover the life Science requirements etc. Not each grade teach a scattered amount of subjects. To properly teach the topics they bust be able to build within a year not bits and pieces throught many years. This will not work. Great topics just need to let us focus on a genre and build and conect to properly teach.

On page 4 of the science standards:Earth
and Space Science and Life Science standards and benchmarks have come out of
the old 1980's Addison/Wesley Science Book!

The Physical Science Standard is for grades 9-12. This, itself, causes some confusion. Are we saying that a student should have covered all this content in ninth grade physical science or are we assuming that all students will take chemistry and physics as 11th and 12th graders before taking an exit test on all this content? Certainly all students will not take

chemistry and physics and surely this is too much content for ninth grade physical science. Whatever happened to teaching less better, using lab experiences, rather than worrying so much about covering content? All this content cannot be covered realistically in anything but a lecture/textbook, superficial, surface-coverage format. Educational research shows this is not the best way for students to learn.

I teach second grade at Prairie Elementary in Worthington along with six other teachers. We do not have the materials or time to adequately teach to all 18 benchmarks. In 2nd grade we concentrate on Reading & Math and have only 1 hour per week to teach science.
We do hands-on science experiments with kits and do not have science textbooks. 2nd grade is responsible to teach both the AIR & WEATHER and the BALANCE & MOTION Foss kits. We also have 2 old Scholastic Science Kits called ENERGY & STAYING WELL. These kits make it possible for us to teach:
1. History & Nature p. 2 - Scientific Inquiry - is taught with our experiments.
2. Physical Science p. 2 - Motion - The student will understand that objects move in various ways.
3. Physical Science p. 2 - Structure of Matter - The student will know that matter exists in different states.
4. Earth & Space Science is partially covered in the (Foss) Air & Weather Kit.
5. Life Science p. 3 - Human Organism -the student will understand that people have needs.
If we are required to teach all of the benchmarks the students will recieve a watered-down science education that only skims the surface. It would take the excitement out of science and destine the students to rote memorization. School districts are having enough financial difficulties without being forced to purchase textbooks which were not the recommendation of the district science committee.
It is our concensus that 2nd grade should have fewer standards and the standards we use should have less specific benchmarks.

These new standards are trying to squeeze in too much content for meaningful, retained learning. Educational research keeps encouraging us to think in terms of inquiry-based learning. This takes time! Less is better! But now we will have the state dictating that we cover all this content, much more than the Profiles of Learning required. Are we supposed to forget everything we know about effective teaching and learning and go back to trying to cover a "mile-wide and inch-deep curriculum"? Experiences in lab and outside in the field are indespensable, but, they would have to be thrown out of the curriculum to cover all these benchmarks.

I am very concerned about these new standards that may be implemented for science. As I look over the standards, I am amazed at how many of these specific benchmarks are not taught at my grade level. I am concerned that as educators we do not have enough time to cover all of these standards and benchmarks. In order to be able to teach all these benchmarks our school would have to have the funds to order new materials. I believe no money has been allocated toward this endeavor. I feel strongly that students would be overwhelmed with the amount information that would have to be mastered at the fourth grade level. I hope that time is taken to revise these standards so that they are attainable for both teachers and students.

I am writing on behalf of the proposed science standards for fifth grade. We recently ordered new textbooks based on our current units. These units were created based on the standards that were already implemented. We are not up for ordering new textbooks for 6 more years. We do not have the time or the funds to implement these proposed standards. We have a lack of funds and we don't have the time to implement these standards. We do not have the time to create a new curriculum based on these standards. the standards presented to us do not match our current curriculum. We will have to completely revamp our curriculum. These standards are taught, but just not all in fifth grade. They are taught across the board. I honestly do not think it is possible to teach 7 science units in one year if we really want to focus on the skills. It is not as though we are only teaching one subject.

Jr High Science is for most of the schools in the state, 7th grade Life Science, 8th grade Earth Science and 9th grade Physical Science. I would urge the committee to change the benchmarks to reflect that. Also , if the test is given in the 8th grade, there should be little Physical Science material. We need to test over what the students have learned.

I was informed by my daughter's school of this change in the standards for Science & Social Studies. What is wrong with what is in place? If we go and change the standards how does that effect the material needed in class vs. what we already have to use for class. My understanding is that Minnesota students are one of the higher ranked states in at least Science when testing. So why change to a program similar to Virginia who do not test out very high??? With the shortage of school funding why are we going to spend more dollars on new standards. Can't the old standards be revised, keep the subjects as they are and make revisions as necessary to what already is is place and seems to be working. Are you bored??

If it ain't broke, why fix it??

After reviewing the Minnesota Academic Standards for Science, it is apparent that the new standards don't coincide with our current 6th grade curriculum. Is there a reason for that? Will the state provide us with training, new curriculum, and an extended school day to teach it? It is virtually impossible to cover all of the 17 proposed standards in our already short school day. Teachers are expected to also teach the reading and math standards. I am very willing to do what I need to do to educate my students, but I need to be inserviced extensively on these new concepts, and I also need the curriculum to teach it. I would like to also say how age inappropriate the standards are. Please reconsider rewriting these standards. I am extremely discouraged as an educator and parent. Thank you.

I believe there are far too many areas of science to be covered. Most testbooks/Foss/etc. cover only 3-4 areas per year. This has seven different areas.

I am responding to the draft science standards from the perspective of a science teacher who has served on a number of committees that created and revised national, state, and district science standards over the past twenty plus years. I have also spent several years doing research in geology, so I have experienced the gathering and testing of scientific data in the workplace. On the whole I feel the committee has done a commendable job given the short time line and relatively small group developing the standards. However, the work so far has some inaccuracies, cognitively inappropriate statements, and other deviations from national standards which need to be addressed before the final version of the state document is created.

An example of an inaccuracy is the reliance on the term "scientific method" in the proposed high school standards. Although appropriate investigative methodology is critical to good experimental science, the reliance on a single method to explain scientific inquiry is both limiting and inaccurate. I recommend the brief discussion on page 144 of the national science standards from the National Research Council and a more detailed paper in the October 2002 issue of the "The Science Teacher", the high school journal of the National Science Teachers Association. Other inaccuracies and misplaced emphases exist in the proposed state standards as well.

Standards and benchmarks that describe developmentally inappropriate goals for students are also present in the proposed state document and differ from the construction of the national standards. A glaring example is the proposed eighth grade standard statement: "Students will understand the structure and composition of the Universe." The national standards do not even address deep space astronomy until the high school level because of the sophisticated evidence supporting current scientific thought. More subtle examples abound in benchmark statements. The national K-4 standard for changes in the earth and sky related to the moon's shape reads: "Objects in the sky have patterns of movement. … The observable shape of the moon changes from day to day in a cycle that lasts about a month." The proposed state benchmark for third grade reads "Students will understand why the appearance of the moon changes over the month." Explaining the changing phases of the moon requires conceptual understandings of light and the earth/moon relationship considerably beyond the developmental skills of third graders. A rationale for emphasizing observation skills in grades K-4 rather than expecting sophisticated conceptual explanations is given on pages 130 and 134 of the National Research Council publication.

The lack of developmental appropriateness in some proposed state standards is a weakness for two reasons. First, when students are taught ideas before they have the cognitive development needed for complete understanding, misconceptions often occur that are hard to address and change later. Second, the learning of science knowledge is best done when students simultaneously are able to apply scientific thinking processes. A significant portion of the public refusing to "believe" a scientific idea for which an overwhelming body of supportive evidence exists reflects a lack of understanding of how scientific ideas are generated, tested, discussed, retested, and refined over a period of time. The debate over global warming, acceptable levels of air pollution, funding for space exploration, and other critical issues of our time can only be valid when citizens are able to apply good scientific thinking processes.

Achieving this kind of science literacy is possible when students are able to use the same processes when they learn science concepts in the first place. Teaching students concepts without using scientific process skills ultimately results in scientific illiteracy and a general lack of understanding of what science is. A proposed third grade benchmark states "Students will identify the relative sizes, distances, movement, and basic characteristics of objects in the solar system." While this may be a good exercise in memorization, it is a poor exercise in scientific thinking because third graders are not yet able to examine the evidence used to gather those facts nor yet have the conceptual framework to visualize accurately what the benchmark demands. Why does this matter? The learner develops a misperception of what science is and is not, and cannot to apply scientific literacy later in the discussion of those facts.

The National Science Education Standards published by the National Research Council in 1996 had the input of over ten thousand scientists, educators, and community members, many of whom were from Minnesota. The document is the best attempt at defining developmentally appropriate learning of science concepts for K-12 students. I urge the state science standards committee to align their work with the national standards. Where the proposed state document adds, removes, or significantly changes the national standards, a conscious rationale should be made to explain the changes. I am not suggesting that Minnesota should not deviate from the national publication. Indeed, updating and providing a local context may well improve our state standards. I am asking, however, that changes be developmentally appropriate, encourage scientific literacy, and reflect the best current scientific thinking.

Thank you for the huge amount of work that you have done in developing a set of standards and benchmarks that on the whole are well done. They do need revision, however. I will be sending additional comments about the grade level specific grouping of the K-8 standards and concerns our teachers have with specific standards and benchmarks.

I attended the Town meeting on the new Academic Standards held in Princeton, Sept. 30. I have the following specific comments on the Science Standards, Draft 9/4/03, for the specific items shown below, documented in page. no./Grade Level/Strand/Sub-Strand format.

Retain the language used in various History and Nature of Science sections (5/4/I/B; 8/6/I/A; 12/7/I/A-B; 12/7/I/A; 12-13/7/I/B; 17/8/I/A-C; 22/9-12/I/A; 23/9-12/B,D) re definitions and good practices used in science, especially definition and differentiation of hypotheses, theories, proof/disproof, challenges, and documentation.

Retain the language used in various Earth/Space Science and Life Science sections (2/2/IV/E; 4/3/IV/D; 5/4/I/B; 7/5/IV/E; 11/6/IV/D; 16/7/IV/D-E; 20/8/III/A,D; 22/8/IV/E; 26/9-12/III/A; 27/9-12/III/D; 28/9-12/IV/B; 29/9-12/IV/C-D; 30/9-12/IV/E-F) re standards in geological history and origins and in evolution and other biological processes.

Do not under any circumstances add comparisons or references to Creation Science, Creationism, Intelligent Design, or other cultural/religious postulates and beliefs. They do not describe science and should only be mentioned in the sections (8/6/I/B; 17/8/I/C; 22/9-12/A; 23/9-12/I/B,D) that define valid challenges to these aspects of science and other cultural beliefs and differences.

Fundamentalist challenges to Evolution, origins of life and the Universe, and other scientific knowledge are largely a phenomenon of the American Christian Right. Although such critics have these beliefs, they have not provided valid challenges to Evolution, etc. Therefore, such fallacious arguments should have no standing in a public school science curriculum. Such beliefs are based on personal and organizational interpretations of both religious writings and discussion, but are even further influenced by misinterpretation and lack of knowledge of scientific principles and practices. In the specific example of Evolution, such critics seem uniformed on what the Theory of Evolution says and more importantly, what it doesn't say. They also seem uniformed on definitions of what is life, and what makes humans human. Therefore, their views are just that (not even theories which can be tested) and should have no standing as a science or scientific thinking (Creation "Science" is a misnomer). To borrow from one of their phrases, Creationism is not "the other side of the coin," just as Evolution is not "just a theory."

Like the probable majority of scientists who also share religious beliefs, even Christian, I do not agree with their religion-based interpretations, loosely lumped under Creationism. I don't challenge their right to hold these beliefs within their cultural setting. However, I don't want to allow them to purvey their beliefs as science or knowledge within the public school system.

Since the views of Creationists, et al., seem to be partially due to an inadequate - or even fallacious - education in science, they should not be permitted to perpetuate their severely limited views - misinformed, uniformed -- in the public school system. The American populace needs a better education in the sciences than they typically have been getting. Perhaps if the Creationist critics had received an adequate education in the sciences, they could understand what science is and yet maintain their religious beliefs and values, the core of which is not and cannot be addressed by science. I know that many of us, probably a majority, manage quite well with this duality of thought and belief.

Note especially to the Science Committee members present at the Town Meeting in Princeton, Tues., Sept. 30. Be cautious about incorporati

I hope you are not considering making 7th and 8th grades as general science courses. It baffles me why you would want to teach earth science concepts and life science concepts in the same year. Students might go from learning about cells to learning about plate tectonics within a few weeks. There would be no natural ebb and flow to lessons. With 8th grade

earth science as it is taught now, basic concepts are built upon throughout the year with a logical progession of the concepts. Jumping from topic to topic doesn't provide the needed knowledge base and critical thinking skills that students require.

As a high school principal and former science teacher I am concerned that the science standards seem to be across the sciences at the different grade levels. Seventh grade typically has a year long course in Life Sciences and do not cover any material involved with earth and space or physical sciences. Yet the standards refer to 7th graders receiving instruction in all the science disciplines. The same is true for 8th graders, who typically take a year long course in earth and space science. If these students are going to be tested by state tests on these standards, they will not have had an opportunity to learn the material until a later grade. Nineth graders typically take a course in physical science as well. The standards need to be both grade specific and also subject specific for each grade. Thank you, Greg Lund, Principal, Norman County East High School

I am a scientist in the dept of medicine at the University and have 3 children. I think adding a "discovery" piece to the draft would be very useful in engaging children in science and creating minds that explore and create. I would think about talking about scientists and great discoveries and how they discovered what they did.... I would be happy to help if needed.

The science standards focus on "memorization of facts the students must know" At least the math standards we got in the spring concentrated on four Big Ideas, allowing districts to plug in appropriate curriculum that reflects Best Practice.
Notice the outlined "Qualities of Best Practice in Teaching Science" (See Best Practice, page 111) making use of the National Science Education Standards.

Look at the 1989 report, "Science for All Americans: A Project 2061 Report on Literacy Goals in Science, Mathematics, and Technology" which includes a full section on "Effective Learning and Teaching".

Notice "Best Practice", p. 121, "Rather than checking whether students have memorized certain items of information, assessments need to probe for students" understanding, reasoning, and the utilization of knowledge."

Considering the abundance of research. Why then do our new standards contain astronomy in third grade? It is time the State of Minnesota stop ignoring research, best practice, and learning professionals in Minnesota?

Joe Premo is only one resource we used as we developed curriculum based on current research and Best Practice.

Questions: If we cover the Big Ideas, can we use our adopted Foss units which address these but may not include the exact topic at the exact grade level. Do we need to have dictated the exact topic of study for grade 3 in earth science? What's wrong with Water? Do we have to do magnetism and electricity in Grade 4? Our third graders thrive on that physical science unit, and we based the science fair last year on their work. Will they allow for this flexibility? Could we include astronomy in reading instead of science (According to Joe Premo and my read of Best Practice, it can't be conceptualized for hands-on science and is inappropriate as such--It makes great reading.)

Even Joe Nathan in his column in the PB said these MN standards need a lot of work. Are we minding the research?

The "Benchmarks" category on page 10 of the working draft for 6th grade physical science is incorrect. Energy does not "exist" as heat. Heat is a by-product of a transfer of energy from one form to another. It would be more appropriate to consider energy as being either kinetic or potential (and then to energy forms which are witnessed as the result of transferred energy

9-12 Life Science :
Most look very good and reflect the national benchmarks. I am very releived to see that evolution - a central biology concept -has remained in the curriculum. I am relieved that the opinions of non-science majors have not outweighed scientific knowledge in this process. I get tired of the "I don't care about facts! I know what I know!" stance of too many of those in the state who are trying to influence science teaching.

My one concern about the Life Science standards is the "tacked on" part about human anatomy. To cover the other life science topics in the depth called for will leave little time for anatomy . . Also, the standard is . . WEIRD! A few very specific points (about neurology!), a few hopelessly general points. Those "benchmarks" aren't going to lead to very standardized coverage of the topic and will make testing of content knowledge hit or miss. I strongly recommend moving all anatomy stuff to middle school OR making it a separate

optional standard, OR being JUST as specific in its benchmarks in relation to ALL body systems as you are for the nervous system, OR make the benchmarks very general and have the test questions be fairly shallow and broad.

About 9-12 Earth Science - will all students have to meet this? If so, can there be an option to do a standard in Physics or chemistry instead? Most high school students want to take bio. chem and physics to get into college. Since "Physical Science" is the typical 9th grade science and then bio (10), chem (11), and Physics (12), I'm not clear on how Earth science would fit in . Plus, MORE frighteningly, WHO is going to teach those classes? Precious few people are certified in Earth Science. I love earth science . . but could there be more options for kids to choose from to complete their science standard?

9-12 History of Science: is this to be completed IN a phyical science, biology, or earth science class? I hope so.

Keep the standards high. Kids learn best when they are challenged.

I disagree with some of the comments about specific standards being too advanced for the grade levels indicated. For instance, states of matter is not too advanced for fourth graders. Fourth graders can understand whether a substance will pour or not, or whether it will take the shape of a container, etc. I also disagree with the comment that learning about cells is too advanced for fourth graders. At this age they are very curious and imaginative. Seeing cells under a microscope will help encourage them to imagine things that can't be seen (so that later on they can expand this to atoms)! I agree with the comment about density needing to be introduced by the eighth grade.

The standards are too weak on chemistry! Students should be introduced to acids and bases, litmus tests and precipitation reactions (e.g. hard water) in grade school. They can also learn about the usefulness of such reactions (such as testing the soil pH to make sure your blueberries grow well, or better yet, do experiments with the students to determine how well various plants grow at different pHs). The concepts should then be expanded upon in middle and high school. The limiting reagent concept is never mentioned in the standards. If the current standards resemble these standards, it is no wonder we get students in college chemistry classes that don't even understand the difference between a heterogenous and homogeneous mixture.

I have some concern over the level of detail in the "benchmark" area, because achieveing ALL benchmarks seems unrealistic for some of the lower grades, especially; I am concerned that the teachers of this subject matter be listened to very carefully on this point. I am not a teacher, just a concerned citizen.

I would like to encourage teaching at least a little from each discipline each year. Science is very interdisciplinary in our current world. It is also a disservice to the physical sciences to put them off until the end. This gives students the mistaken impression that the physical sciences are harder or less important or less fun. Teach qualitative and simple quantitative aspects of all of the sciences early and build upon what they have learned. Grouping a few grade levels together may be appropriate to provide flexibility to the teachers, but science teaching needs to become more interdisciplinary at all levels. I frequently get students in my college chemistry classes that say they don't remember their chemistry because they took it two years ago. This points out that one year of biology, one year of physics, and one year of chemistry is not sufficient. A capstone interdisciplinary course may be what the students need to reinforce what they learned in these separate courses.

Middle school students would be best served by integrated science standards that are designated for the grade band 6 - 8, thus leaving to the individual school districts to determine at which grade level specific content is taught. An integrated science standard with identified learning goals to be met by the end of 8th grade will enable middle schools to make use of best practice instructional strategies that engage the attention and enthusiasm of middle school students and to make the most of unique interdisciplinary programs at the middle level and creative talents of current middle school teachers.

As a high school science teacher, I would like to see someone make a proposal for the courses that students should take in order to meet all of the high school science standards. Currently, students generally take physical science (9th) biology (10th), chemistry and physics (11,12). Courses like Earth space science and environmental are optional. Where would this course material be added? We already have more content than we have time to cover.

As a science teacher for the past 22 years, and after working diligently on a half dozen committees that developed the Grad Standards, I can only say that these new standards appear to be the same ones we dealt with before -- except that instead of process skills, we will now be testing on tiny bits of memorized data. I understand that testing process skills is virtually impossible in a paper and pencil test -- but that IS the nature of science. I am sad to see the passing of a hands-on approach to finding out what kids know. I believe that this paper and pencil approach will leave many young people looking like they know less than they do. I know it will appear so with my own son, though my daughter will probably look

fine on paper. Years ago we piloted (Robbinsdale District 281) a true, hands on science test. Yes it was hard to administer. Yes it took time. But I believe the end result better reflected what our students knew. Isn't THAT what testing is supposed to be about?

I think the Standards are reasonable per age group - and the strands are clear and consistent.
If science were a matter of "majority rules" we would still be teaching an 'earth centered' solar system. Individuals who classify the current creationist arguments as science are confusing belief with data. Belief is what one has in the absence of data. Please do not sacrifice our children's future and our state's standing to pacify biblical literalists.

9-12 Physical Science Standard: Currently in our high school, our ninth graders take physical science. However, some of the concepts described in the physical science standard are above and beyond what we believe ninth graders are able to UNDERSTAND. However, these concepts are covered in our chemistry and physics courses, but not all students take these courses. Furthermore, it is important to know when the science test will be given. If it is given after Biology, I believe the students will not be adequately prepared to answer the physical science standard questions and the Earth science standard questions. It should also be noted that our school operates on the 4 block system, they they are only given a semester to learn this information, and for how extensive the physical science standard is, this is not enough time. Specifically, some of the benchmarks under the "Chemical Reactions" sections are for Chemistry and Physics classes, not 9th grade Physical Science students.

I am a university professor with a Ph.D. in Botany. I generally find your standards for the history of science and for the life sciences to be excellent and to be in tune with the expectations of science and scientists today.

It appears to me that if these standards are implemented as the draft is written we are moving from process to content/fact based paper pencil rote memorization.

I feel that in a sense that I will be micromanaged. Part of the nice thing that many schools do in middle school is have a "team" approach with their students. This would definately eliminate the team approach to teaching in that someone who is specifically licensed in a science area may need to teach a couple of different grades each year. Thus eliminating any continuity in students science education. What is wrong with staying with specific disciplines during a given year (for example 7th grade life science, 8th grade earth science, 9th grade physical science...)?

Use the word field forces in the standard to familiarize kids with science lingo.

Under F. Flow of matter add:
Students will learn that our bodies house friendly bacteria that help us to digest food and carry on other bodily functions.

Add a standard that science needs to be observable, repeatable and factual.
Give examples of disproved theories from the past and analyse how they were determined to be false.

Under water cycle have kids explain how they get water from the faucet and how that water can be contaminated.

Page 2 part C Diversity and Interdependance of life: Use the word habitat and be able to define it. Explain that our bodies are a habitat for yeast and friendly bacteria.

bottom of page two add Students will explain how people have caused animals to be endangered and extinct.

Page 3 G Human organism: Not that wild animals do not need waste removal. This is only for humans and captive animals.

Under scientific world view: Kids should be able to give examples of how people have caused environmental concerns.

I have been teaching science at the middle school level for over 30 years, and upon reviewing the draft of the science standards I feel compelled to respond.
The standards and benchmarks cover the entire spectrum of science fields. This approach contradicts the TIMMS report. Minnesota 8th graders rank 2nd in world.
Our country's response to the launch of Sputnik was to divide the major fields of science into specific areas so that students could go more into depth, and understanding within the specific science field. I find these new standards and benchmarks so broad that, if adopted, would bring us back to “pre-Sputnik” science, a curriculum that would be an inch deep and a mile wide,overall learning would diminish, and we would again be lagging behind other industrialized nations of the world.

My question is why are we going back to a general science curriculum? If one looked at why our math scores are low, it's because math curriculum adopted this wide spectrum view of this discipline, and it failed. Do we want to repeat this with our science curriculum?
My suggestions would be to keep science broad based through 6th grade, and then to focus more in depth through high school. I suggest Life science core in 7th grade, Physical science in 8th grade, along with chemistry, and earth science in 9th grade. 10th grade through 12th would be electives based on the student's interest and talents. This is not new. But, it has been very successful in the past.
To sum it up, Science is a process that has created a tremendous amount of information. It is not the intent to try and "teach" all of this information. It needs to be taught as a process, so that students have the necessary skills to access the information when needed, and not try and memorize a collection of facts that are not static, but continually change as more information is provided.

There are WAY too many benchmark. We want kids developing a scientific world view. What they need to know is that by doing science you assume the universe is governed by laws of nature and no amount of wishful thinking can change these laws. In addition students should understand that science is what we as humans have developed as a way to keep us from fooling ourselves (paraphrasing R. Feynman)

I teach at a small charter school that does not offer highschool courses in Astronomy and Earth Science. Do these benchmarks now dictate that we have to offer these courses in order to fulfill these requirements at the highschool level?
Also, students are required to take 3 years of science in order to graduate at our highschool. What happens if their choices do not encompass all of the benchmarks that are listed?

After reading the draft standards in detail and reading the various comments from the public, I have two observations. The State of Minnesota has no business writing standards nor adopting Federal standards. Each community has elected representatives to handle the business of 'public' education (determining administration, policy, staff, cirriculum, etc.). Any effort on the state level to replace that is inappropriate and on the Federal level is unconstitutional. Accademic choices need to be made by local School Boards who are elected for that purpose and are accountable to local citizens. Rear echelon beurocrats appointed at the state or (heaven forbid) Federal level mandating cirriculum (CCE) are an outrage and entirely out of touch. A casual perusal of the comments on these standards thus far so indicate.

These standards will result in rote memorization rather than learning important, process related, concepts. For example, how do we know that F=ma? Should there be advanced concepts such as how calculus is related to motion?

I am a third grade teacher from Foley, MN. I am concerned about your efforts to create specific standards in each grade level. I am hoping that you will give some flexible movement of standards within the grades. For example, one of the standards pertains to weather,and climate. In Foley that standard is done in depth at Fourth grade. While it is possible for me to teach weather, it is done so well in fourth grade and they have spent years collecting materials and creating fun lessons. Our current science books have ideas and pictures to add to our lessons. I am very concerned for districts like ours and others that are experiencing budget cuts to have to fork out money for new science books and materials. I am hopeful that you will give out standands that you would like covered in grades K-6 and then give the districts the flexibility to place that curriculum in a grade level that works for them. I know that your concern is children that move from one district to another might miss concepts. This is a valid concern. It would be very expensive for our state to align the curriculum in all districts. I believe that if children have been taught basic reading, researching, evaluating, computer skills, and self questioning techniques, they will be able to research a topic on their own and learn about it for themselves. Research states that much of what a child memorizes if forgotten. But, if they have the learning tools to learn when they want to, I believe we have been successful in teaching them. Please carefully consider the impact of your decisions. Thank you!

Genes are not the only determining factor. Enviromental factors (social/emotional->hormonal, as well as enviroment of the cell and surrounding molecules is vital in expression). You see this with brain development, and it is passed on through family systems. Genes are ONE very important component, but not the only one.

The reason for the need for this change is misinformation is worse that no information.

These science "standards," as currently presented, reflect not actual standards of science, but rather, standards for the historical study of science. For actual science education it is necessary to evaluate students' ability to engage in the process of inquiry: the scientific process. As an elementary science teacher, I find this current list altogether too fact-based. This can be clearly seen by the predominance of the phrase "student will know." Knowing something is the simplest level (recall) in Bloom's Taxonomy of higher level thinking skills. As a former member of the National Council of Science Teachers, I have to vociferously dissent at this savaging of our previously high quality of science education in Minnesota. Learning about science history is important and has its place in the standards, but it cannot be allowed to dominate the teaching of actual processes of science. Our future economic vibrancy across all of the technological and scientific industries in Minnesota demand that we develop students' skills with a process approach.

Specific Standards are great , but we should work with a textbook company so that teachers have the tools needed to teach the students these standards. It would be a waste of time for individual teachers to develop curricula about rocks,heat/light conduction, simple machines etc.

As the parent of two children in 8th and 11th grades and as a licensed elementary school teacher, I have some concerns about the proposed science standards. In general I feel that the inclusion of so many standards at each grade level will result in sacrificing depth for breadth of coverage. This tends to result in students who know a bunch of facts, but are not able to connect them with the larger principles of science. I am especially concerned about the proposed standards for middle school. Many educators believe that the reason why Minnesota 8th graders scored so high on the science portion of the TIMMS test was because of the way middle school science is structured here, concentrating on Life Science in 7th grade and Earth Science in 8th grade. This structure allows students to achieve a thorough, in-depth understanding of those disciplines. The proposed standards would do away with that kind of focused structure. I would prefer to see the standards at each grade level be more deeply focused on a few major scientific areas rather than spread about so broadly.

Strand II. Substrand B - magnatism is too abstract for age group
Strand IV. Substrand D - too many plants offspring do not have characteristics of adult

Grade 4 Science: there are way too many strands included in this standards document! It seems like we are just asking students to regurgitate facts reminiscent of our old science textbooks (boring) of the past! That is the only way that we could "cover" that many benchmarks in the 35 minutes/day we share with social studeis (did you check those standards???) and health! Our district carefully adopted Foss Science and placed science units into each grade level knowing we could perhaps teach two units or three/year. We would have to get rid of those wonderful science units and buy books to be able to take the multiple choice test that these standards obviously are leaning towards. What a shame!

As a fifth grade teacher, I find most of the fifth grade science standards to be very appropriate to this age group and specific enough to be assessed. However, I am concerned about the quantity of material expected in the proposed standards (we cannot do justice to all of these standards in one school year) and I am concerned about the abstract nature of two of the standards: Energy Transformations (II.C.) and Biological Populations Change Over Time (IV.E.) Although my fifth graders would enjoy discussions in these areas and many would demonstrate understanding of these concepts, most would show much greater ability to comprehend these concepts at an older age. In order to do justice to the curriculum, I strongly encourage legislators to vote for quality in an appropriate curriculum rather than quantity.

The language for for grade 1,, sub-strand D, Heridity, is a bit strange and unclear. In particular, the term "kind" is not precise. Also its not clear what "individuals of one kind within a population" means. I suggest using the term "species" in the standard. That term at least has a reasonable amount of agreement among biologists, at least for plants and animals. I'm not suggesting that first graders can't use the general term "kind", but that the standard should be written with more precise, scientific language. Perhaps "variation among individuals of a species" or "variation among individuals within a population". Also this sentence needs some punctuation, or to be split into multiple sentences. There are at least three concepts here.

I would like to take issue with several of the standards in the science area, mostly having to do with life science. My first issue is the one that starts to be taught in 8th grade. It is the part about "using Doppler technology the student will discover evidence that the universe is expanding and therefore supports the Big Bang theory". This could not be further from the truth, so why are we teaching things to our children that are not true? Another issue is the teaching of humans and our activities are upsetting the ecosystems, therefore causing ozone depletion, global warming and other such things. This is not true. As far as human activities causing problems in the atmosphere, it pales in comparision to the contaminates put into the atmosphere by just one volcanic eruption. The last major issue I have is with the teaching of evolution. In the standards, it appears that evolution will be taught as fact rather than the theory that it is. The statement, in particular, that is plainly false is that the earth is about 3.5 billion years old and that all of the life took that long to evolve from a single cell organism to a multi-celled organism. All of this is bunk. Again, I ask why teach things that are false to our children? Especially when there is nothing being taught that is counter to evolution like Intelligent Design or Creation. I and a majority of people do not think that teaching things that are false without any form of rebuttal is right to mandate upon our children. I really hope and pray that you will reconsider these issues I have raised and come up with a better plan or for sure my children will not be participating in those aspects of science when they are taught or maybe we will send our kids to a private school where they will be taught the truth!

We are members of the district #877 Science task force and are representing grades 1,2, and 4. Our district currently uses the Delta full option Foss Science program. This is our first year implementing the full program. We have used various kits as part of our science curriculum in the past. As we are looking through the standards and benchmarks we have some concerns in the following areas:
1. Each grade level teaches a life, physical, and earth unit. Our concern in 1st and 2nd grade is that the benchmarks Our concern in fourth grade is that we don't have space science as an option in the FOSS kits. The sub-strand, The Universe that is listed as one of the standards does not fit into our grade level as an option.

Please !!!!! take a look at the FAST program. It is Foundational Appraoches to Scientific Teaching. It slowly builds piece by piece on concepts by connecting them to each other until a large concept is fully understood and discovered by using hands on labs.It connects kids to phenomena in their everyday lives and explains the phenomenas. It is all about buoyancy, gases, environment,wildlife,soils,density etc.It follows the scientific methods for each problem. It gets them to share data and problem solve. It is very inquiry based. Real life stuff that will help us create future problem solvers for America's ever changing and increasingly complex world.it is based out of Hawii. CALL 952-440-5540 FOR MORE INFO ON FAST.
THERE IS NO WAY THAT WE CAN GIVE KIDS A QUALITY EDUCATION BY COVERING FRAGMENTS OF SO MANY TOPICS IN ONE YEAR AND COVER TINY PIECES THAT DO NOT CONNECT TO EACH OTHER. THEN A YEAR LATER THEY GET A LITTLE MORE AND SO ON AND SO ON. by the time they get the concept a little more in depth the following year the previous info will be lost.THIS WILL MAKE THEM GAIN NO NEW KNOWLEDGE. THIS IS NOT A GOOD WAY TO TEACH TOPICS. WAY TOO MANY FRAGMENTS. THE KIDS WILL SUFFER AND NEGITIVE RESULTS WILL BE QUICKLY REAVEALED.

The concepts of gravity and magnetism affecting objects without touching them are too abstract, even the basic idea of gravity is magical to first graders.

Why are we going back to testing that's a mile wide and an inch deep. We can try to cram all this information into their heads without the understanding that comes through experimenting and discovery. It looks like we're going back to trying to cram a whole text book into the students in one year-as they hate it!

First, the standards are way to general. If you were to study any of the topics that the standards present, you would only have about two months for each. Science is a subject that is so huge that you need to build for one discpline to another. With the standards the way they are now, you do not allow time and instruction to be built upon. Instead by the time you start getting into detials you have to move on to the next topic. Science is a subject that has some many layers upon layers. Basically you are making a ditch that is a mile wide and an inch deep. There are Five major subjects in science. Earth, Life, Chemistry, Physics and Physical. Within each of these levels there are many sub-sections. For Example. Earth science: Rocks, Minerals, Plate-techonics, Oceangrophy, Weather, Space. And with in those sub-sections there get divided into more small units. Inorder for a kid to get just some knowledge of these sudjects you need to spend close to a year on each. With the new standards you limit the students knowledge becuase of the time restraints.
Secondly. The money it would take to provide all the schools with proper books and material for each standard. Are we not in a budget crisis to begin with?

The following two standards need to be eliminated from the forst grade curriculum. Students will observe and describe that magnetism and gravity can affect objects w out being touched. They have a hard time in first grade describing themselves! Let alone the concept of magnetism. Also they are going to have fun playing with magnets but will not grasp the concept.

The second standard needs to be eliminated Students will match adult animals and plants to their offspring. Seedlings are never going to resemble thier adult plant this just seems too confusing for a first grader!

I was very impressed with the standard as layed out in the Science draft. I think the people working on this are headed in the right direction. Coverage of material science, genetics, geology, and astronomy seem like an excellent mix.

I'm a computer programmer so I was a little disapointed that computer science was not included in the curiculum, but perhaps a focus on the fundemental is best. That said, I think coverage the applicaiton of science is important. For example, the use of electricity in computers to preform computatiions. The use of forces in engineering to design bridges and space craft, etc.

In the life science strand I cannot find a benchmark that includes understanding viruses. Such a benchmark could read something like "Students will understand that viruses are unable to replicate by themselves" or "Students will understand that viruses are required to infect cells in order to replicate".

I am an 8th grade science teacher and was dismayed to see the new science standards. The new standards are very broad with no depth to them. We are required to cover everything but nothing very well. For instance, in 7th grade students learn about genes and chromosomes but in 8th grade we have to pick up the idea of heredity as an after thought to explain the differences between asexual and sexual reproduction. In order to do that we will need a review of some sort. It seems like a waste of time when there is so much content to cover. Also in 7th grade students are required to learn about the concept of extiction and that extiction is common. However, the fact that it is happening at much faster rate compared to in the past is not mentioned.
The high school has science standards that are listed as 9-12 but we have very specific standards in 8th grade. I think there should be a middle level so that districts can make some decisions concerning how material should be covered

Minnesota already does well in the area of science education. It may need fine tuning but it does not need an overhaul!

1. Which standard should 9th grade physical science follow?
2. Are students now required to take Earth Science in High School?
3. Why are Chemistry and Physics lumped together?
4. Although most of the Chemistry sections of the Physical Science Standard are well written, why are intermolecular forces (A. Structore of Matter), reaction rates, catalysts, and complete and reversible reactions (B. Chemical Reactions) included as benchmarks?
4. Why are stoichiometry, Gas Laws, and Acid/Base chemistry absent from the Chemistry standards?

It has been suggested that schools in Japan have succeeded with the approach that it is better to cover fewer subjects with more depth than more subjects with less depth. I believe the standards for 6-8 as written will force teachers to give an overview of too many things. In other words, students will learn a little of everything and a lot of nothing.

1 -Physics - need this a lot - I teach MIS at a univ; part of the course covers the history of computers; physics was and is essential to the development of the computer industry;
2 - concentrating on a specific topic eash year in HS makes sense - economically and using the strength of the teacher;
3 - I taught a LOT of science when I was a 4,5,6 grade teacher. Students at this age LOVE science - they can't get enough. THe HS tutors who came were amazed at the eagerness shown by my students - they enjoyed it also. My students loved the projects, the experiments (yes, a 4th grade teacher can learn to use a microscope) - everything.
4 - Re; creationism - I had students where believed in creationism. So, I said they didn't have to believe evolution but they had to understand it. They (and their parents) were ok with this.

We just spent $20,000 on new FOSS Sicence Kits and found that they do not align very closely with the state standards. We are concerned about how we are going to be able to fill all the holes.

I am very impressed with the scope of the standards in science. What I find most appealing is the balance between factual information and the process by which those facts are known. Importantly, discussion of hypothesis, opinion, laws of science are important to understanding how the validity of information changes over time. The interaction between science and culture is also imporant to understanding the ethical framework in which scientific investigation is conducted. I also liked the involvement of students in conducting experiments. The challenge is to reward them for the conduct of the experiment and interpretation of the data and not base the grade on a right answer. I am greatly troubled by the reported frequency (>90%) of high school students who admit to falsifying data on lab reports. If we get to the end of the science curriculum with that result, we've missed the important lesson on ethical behavior within science.

typo on benchmark #2? "Students will know most organisms are single cells." perhaps made up of single cells?

May not have the right category. Tripped over the benchmark: "nature is the same everywhere....that it is understandable and predictable." the issue may be that Nature is a very broad term. In the biological aspect of nature, there is value in respecting and understanding differences.

- Great set of standards; though, they might be a bit agressive in their goals.
- Please try to teach SI units from the beginning; they are the units used in scientific research (& much more easier too).
- Evolution is a theory and can/should certainly be challenged; but creationism/intelligent design is just a belief (i.e. no scientific basis to reject/accept it) of a small minority of people in this world. Please keep this in mind.

Please reconsider! My district just spent thousands of dollars for Elementary Science curriculum. We teach 3 huge units in 4th grade. Water, Magnetism & Electricity, and we've just added the Human Body(previously taught in 3rd and 5th). We spent a huge amount of time scoping and sequencing units to avoid yearly repetition. SatandardIIID.is taught in 3rd grade. It does not fit into ANY ofthe 4th grade curriculum. StandardsIVA and IVC WERE taught in 4th grade Foodchains unit, but that unit was moved to 3rd grade. HELP.....we can't keep up with you people! How many units do you think we can reasonably teach in one grade? We also have to fit in Social studies and Health units(besides Reading,Spelling, Language,Vocab,Math, handwriting,music, Phy Ed, keyboarding, media adn library skills). Don't you want us to teach to mastery? If so, you need to prioritize key topics, and remember that we have them for 61/2 hours for 178 days. How much can we throw at them and expect them to absorb? Science IS NOT the only topic being taught.
Be reasonable...reconsider....prioritize!

I am a fifth grade teacher at Tatanka Elementary in Buffalo Minnesota. I have a few problems with the new standards for the following reasons:

1. Our school just adopted the FOSS science kits to give our students a strong science background. Each grade level (1-5) teaches three indepth science units. If the new standards are put in place, we will need several supplemental resources added to our current curriculum. Our district has poured thousands into the new curriculum, and we simply cannot afford supplemental materials.

2. Our students are consistent in science. They recieve high test scores and the background we are giving them already is giving our students great success on standardized science tests. Demanding that we introduce new curriculum to meet new benchmarks when we already do so well seems unecessary to me.

Thank you

The focus on memorization and lack of emphasis on process skills does not address science best practice which says we should teach our students to think like scientists and give them the tools to find the answers to their questions. The current proposed standards are going backward to memorization of facts which requires lower level thinking on Bloom's taxonomy. If we have to dedicate our class hours to memorizing facts we will be taking away from the larger questions and problem solving. I feel that our job is to help students discover the tools and methods to answer their own question, thus creating lifelong learners.

We've done a good job at our high school of integrating technical writing in Science 9, where labs are done to answer a purpose/problem or to gain a skill rather than just to do hands-on activities. STudents are then asked to write a report supporting their conclusions with the data they gathered. I'm very concerned that the standards would take us in the direction of book work because of the extent of facts the standards would require us to cover. Labs take time to perform and process. I don't think it's possible to do a good job of solid lab work and cover the array of information in the proposed standards.

With regard to the standards proposed in grades K-8, a much more realistic approach would be to cut them back and to designate the levels as K-2, 3-5, 6-8 to allow depth and teaching our students to think, write, and act as scientists.

The Science Standards are much too content driven and there are too many detailed benchmarks. These standards promote a "memorize and forget" curriculum in which the process of science is lost. There is little room here to connect science to students' lives and show them HOW science is done - - that it is an active process, not a collection of facts. When students come to my college classes from High school what they lack is not content, but the ability to think critically about scientific issues and apply this to their lives. These standards are regressive and move us away from many of the positive reforms is science eduation. I encourage you to look at the Benchmarks for Science Literacy developed by the American Association for the Advancement of Science which leave much more room for teacher creativity than do these content driven, prescriptive standards.

Grade 4 Strand II, Sub C - Great hands on! My kids did this easily as 3rd and 4th graders at home and in 4-H! easy, not dangerous and very fun!

4th grade Strand II Sub A: Simple. Water: liquid, solid, gas. Kids love it.

My comment is for the Kindergarten Nature of Science standard that states children need to know safety rules. Nothing we will do with them requires such or involves harmful materials. Save this for later.

For Grade 1 standard in Physical Science - push back the magnetism and gravity issues for a later grade.

The document benchmark reading plants and animals should read plants and/or animals so that grade levels do not have to teach both types of FOSS science kits. There would be a lot of repeating the same kit each year otherwise.
Where will money come from to provide the new textbooks/curriculum materials in areas not previously covered at a grade level?

Earth Science:
If students are required to take three years of science, one of them being Biology, why is there so much emphasis on Earth Science? Where is Chemistry? I realize that Physical Science is an introduction to both Physics and Chemistry, but in order to truly teach Biology, especially at the cellular level as the Benchmarks outline, they need to have a better foundation in Chemistry. The Earth Science is covered for three years in middle school and should certainly be encouraged as an elective at the high school, but more emphasis

should be placed on Chemistry and Physics, as those are the courses that are offered at higher learning institutions as introductory courses. Most college freshmen do not take Earth Science as an intro science course, instead they take Chemistry or Biology.

The physical science standards written for grades 7 and 8 are typically taught in a 9th grade physical science course. The grade 9-12 physical science standards are taught in physics and chemistry. If the 7th and 8th grade physical science standards are not included in the 9-12 standards but taught in 9th grade, students will not be able to get high school science credit for them. It will be nearly impossible for all students to attain 3 credits of science if they cannot count the science taken in 9th grade physical science.

Biology Stand:
I am generally pleased with your Benchmarks for Biology. However, I believe the Human Organism sub-strand needs to be taken out. I teach a general Biology Course for juniors and seniors, which, by default, almost covers most of sub-strands, A - F, and we can barely make it through those in one year. The Human Organism sub-strand is simply too much, especially with the nervous system which is so complex. Why not include the muscular system then too, as students will not understand the purpose of the nervous system unless they see it integrated and used within another system such as the musculo-skeletal system? It is simply too much information to cover within one school year. The Human Anatomy course should be offered as an elective one-semester course and it can be encouraged that students take it along side the Biology course. Also, the benchmarks in life science focus very much on the cellular level, which is good; however, a student cannot really understand these cellular concepts without a good foundation in Chemistry. One year of Physical Science is not going to prepare them for the chemistry they need to use in Biology, which brings me back to the Earth Science strand: Ease up on the Earth Science and focus more on Chemistry. It is in Chemistry that the foundation for success in Biology is built. Biology will be a required course, and we want students to be successful. The jobs in science today are in the molecular fields of Biology, not earth science. I think we would be doing our students a disservice by neglecting Chemistry and Physics.

Grade 9-12/Organisms
Is this benchmark implying that macro-evolution is fact as opposed to the theory which it is? Are students given the option to identify other origins of the human species other than macro-evolution. If they are not, I believe you will face much opposition from the community. Please specify that this is a theory which students will be taught and provide opportunities for students to explore more than just this one theory.

Hiring teachers with appropriate licensure for Earth and Space science is very difficult. (These licenses are few and far between.) If Earth science standards are listed for 9-12, all students will have to take this course--there are not enough people with licenses to teach this--currently employed by districts and otherwise.

I am a third grade teacher and after reviewing the new standards for science, I was eager to add my input! I STRONGLY feel that there are way too many standards for our grade level and to do a unit justice, the list needs to be narrowed to only a select few. The standards which are age appropriate are the Plants and Animals unit, the weather unit and the solar system. The standards for weather, sound and light, and rocks are above the comprehension of 8-9 year olds. If you would truly like me to do a thorough job with the science standards, the list MUST be condensed! Students can only achieve higher level learning when they are given the time to do so. With the standards for science listed as they are, this level of learning will not take place.

"With current budget crunches, we cannot keep current textbooks in the hands of students in most classes. At first review, it appears that we will need a physical science, life science and earth science textbook for each student in grade 6-10 as the standards for each grade cover each of these areas. Please group standards by grade level - general in grade 6, life science in grade 7, earth science in grade 8 and physical science in grade 9. Everything cannot be covered in each grade."
"At the middle level, I would suggest lumping all the earth, life, and physical science strands together - as has been done at the 9-12 level. The reason being, at those grade levels, the concentration tends to be on earth science one year, life science one year, and physical science for one year - similiar to the high school teaching biology one year and chemistry one year.
The benchmarks are very specific. This is what we've been waiting to see!"
"Our science department is very disappointed in what we see for the science standards. We are not in favor of incorporating all three strands, life, earth and physical at each grade level - especially at the junior high/ middle level. Our belief is that this promotes horizontal vs. vertical learning and too much emphasis on 'getting through all of it '. Licensing issues will be a problem especially for districts with a more veteran staff that have the 7-12 science licenses in a specific discipline. This would add to the already difficult task of finding qualified science teachers - especially in out-state areas. We seriously hope that the committee takes a good look at this and reconsiders this format. Allow the subject matter to be taught at teach grade level ie: Life Science 7; Earth Science -8 Physical Science - 9. Thank you for your consideration to our recommendations!"
"You shouldn't spread academic areas over several years. Example: Life science should stay in 7th grade only. No other disciplines should be covered that year.
Wouldn't it make more sense to have a set of middle school science standards to be addressed in grades 6-8 similar to the high school standards (9-12) rather than separating the benchmarks by grade? Many of the standards seem to be redundant from 6th to 7th to 8th with only slight additions. I feel it would be more prudent to assign each standard and its

strands to grades 6-8 as a whole. This would allow for the professional judgement of teachers and administrators to ensure that all benchmarks are met in context within these grades with a minimum of redundancy. It is just as effective to teach a unit on cells that combines the 6th and 7th grade standard benchmarks (Life Science IV A) as it is to separate the first three benchmarks into the 6th grade curriculum."
Minor nitpick: The standard repeatedly refers to units in 'Systems International' (meaning metres, kilogrammes, seconds); I think this should be written either International System (SI) or as Systeme International (in French).
I congratulate the State Board on preparing a very fine set of science standards, which could well be a model for other states to adopt."
"Be careful of making the curriculum a mile wide and an inch deep. I looked at the 7th grade science standards and it is jam packed with too much(Earth and Physical)
We need to focus on essential questions and concepts."
"As a long time respected science teacher in Minnesota, I question the standards. You have left out some entire topics such as light and sound in Physics, and such real life needs in Chemistry such as pH and Acid Bases. I also question if we are doing too much of breadth and not depth. I feel we have taken a step back in time and not moving into the 21st Century!!!"
"I see the high school standards are listed as 9-12, yet grades below that are listed by grade. To allow for flexibility with staff and minimize the impact on schools, districts and classrooms, would it be possible to group standards into a range of grades such as K-2, 3-5 and 6-8? Thus the content would need to be covered within that range of grades to allow for coverage of content, yet where programs are already in place, would allow some flexibility to maintain at least portions of current programs that are close to the recomended standards."
"The science standards are fatally flawed in that they almost completely erase all study of the interaction between humans and their environment. I would imagine that the particular ideological biases of your administration ensured this bias. Yet it is inappropriate for any party to so thoroughly distort science in our public schools.
I find it curious that in grade 8 you require students to know that scientists and technicians have ethical standards to prevent their work having a negative impact on the environment. How do you expect students to understand this very real ethical principal when your standards hardly admit that such impacts could occur?
There are other serious problems with the so-called 'science' of your standards. (Such as your tentative approach to evolution theory.) I am ashamed and disappointed in my state. Please start over without the ideologues on the team."
"I notice that there is no separate physics section to the draft. Certainly many of the topics listed under physical science could be expanded upon (e.g. not only photons exhibit both particle and wave properties -- everything does).
There are also major pieces of a physics course which are not mentioned. These include thermal physics (including entropy), Einstein's relativity (both special and general), our current understanding of the fundamental nature of the universe (e.g. the quark model of particles, neutrinos, and so on). There is more, too, but I sense that you're not yet ready to produce a physics draft."
"I am very concerned with the middle school standards. It seems that the way they are written is that they want us to teach a little of Life, Earth and Space, and Physical Science each year. Currently at South Saint Paul School District, we teach 7th grade Life Science, 8th Grade Earth Science, and 9th grade Physical Science. It seems as if the state is looking at a more integrated science program at the middle level. If so, that will call for a major revision in our curriculum, as well as a need for textbooks that have this integrated science or a need to buy each grade level a set of each of the subject matter textbooks.
It is also a concern with licensure. Life Science teachers usually cannot teach Earth or Physical Science, Earth Science teachers cannot teach Physical Science or Life Science and Physical Science licensure cannot teach Life or Earth. With the new licensure, which started a couple of years ago, each of the licenses stated above can teach 7th grade life science and 8th grade earth science but none of them except for Physical Science can teach Physical Science. This also doesn't take into account all of the teachers who were licensed before 2001 who do not have this licensure.
At the high school level, it groups all areas 9-12 so there it looks as if you can break each grade into a subject matter, but it is unclear.
"I have some concerns regarding how logistically the standards-related material will be presented. The way I understand it, students at the middle school level will be responsible for content in the general areas of life, physical and earth/space science. How exactly will these be taught since Minnesota science licensure is very specific to subject area? Many schools teach a specific content area at a grade level (i.e. 6th grade physical, 7th grade life, 8th grade earth science). The proposed standards as currently grouped seem like they would present a huge staffing problem for many districts. It would seem to make more sense to group content by grade level rather than superficially dabbling in each area at every grade level."
I am disappointed that the standards are so subject specific. Why do students need to study 'rocks and minerals' in third grade? What if they didn't study them until 4th? I would rather see ranges (such as covered in grades 1 or 2) so school districts and schools can clump ideas together. This looks a mile wide and an inch deep to me."
"I am in my 24th year of teaching and truly enjoy teaching Science at Centennial Middle School. I am very concerned about that the History & Nature of Sci., Physical Sci., Earth Sci., and Life Science would need to be covered in each grade. Currently our 6th grade staff works extremely hard and we all do our best to give our students a quality education in

Physical Science,Forces of Motion/Transfer of Energy Chemicals/Mixtures & Solutions. We have put a lot of time, energy and money to accomplish this. Our school is in the process of budget cuts that exceed 2.2 million dollars. I am very concerned that in the process of changing to the new proposed standards which need to be taught in each grade we will be doing a disservice to our students."
"This may already be part of the process. It was not clear in the standards. The SI method should be exclusive begining in Kindergarten. We are the only country in the world still using foot/pound. Most of our machinery uses SI and our food is maked in SI units (in parethesis). Our children are already behind the rest of the world when we waste time teaching them an obsolete measurement method. Thanks."
"As a middle school science teacher, I am concerned that we will have a shortage of teachers depending on how NCLB is interpreted. Current teachers with middle school endorsement will have to become 'highly qualified' in order to continue. Science teachers are currently licensed for 7 through 12. If the curriculum is integrated, teachers will have to become highly qualified in all three areas. It also raises issues about elementary licensed teachers teaching 6th grade in a middle school. Will they need to earn new licenses? These are just some logistical problems."
"As a teacher of Middle School Science, I am wondering if much thought has been given to the current structure of Middle School Science across the state of Minnesota. Most school through out the state currently teach Life Science, Earth Science, and Physical Science as separate grade level classes (7th, 8th and 9th respectively). As the standards are presented in the rough draft, these 3 topics are to be covered in all middle grade levels. My concern is that there are very few school in the state that will have access to general science texts that will teach these 3 areas for 3 different levels of students (particularly, 7th, 8th and 9th grade) as well as for those teachers only licensed for Life, Earth or Physical Science who are teaching at the middle level. Will provisions be made to acquire new texts? Will some teachers be forced to teach at the highschool level or risk losing their jobs? Or will there be provisions allowed for these teachers?"
"The idea of integrated life, earth, and physical science offered in jr. high is ok, but the vast majority of text books are not so intergrated. We (and every other school I know of) offers Life science, earth science and physical science as separate classes for each grade. This also allows for expertise development among the teachers and a deeper focus on the subject material because you don't have to try to cover 2 other science areas that year also. Scientific inquiry, research, and experimentation are the universal topics that transcend specific science areas, and in my opinion, this is where the integration should be. I'd rather cover one subject in depth for a whole year than to try and cover more topics at just a superficial level."
"Currently our school separates the life, earth and physical sciences into three years. (7th, 8th and 9th) Your new standards will change that. I believe that taking a whole year to study one type of science gives our students a better, more in-depth view of each type of science. I sure hope you leave room for the schools to choose this method of teaching science.
We as a department looked into curriculum and decided for our students that this was what would be the best. We felt that the integrated curriculum only touched on the surface of each of these sciences and that it was better to immerse the student in each core science. We are able to do that by giving them a year of each.
I believe that they finish with a better grasp of each. I would like to see you keep the focus of 7th, 8th and 9th grade sciences on one part of science per year (life, earth and physical)
"
"We need to know when our kids will be tested on these standards as well as the standards. The state will assume we're failing the standard if we teach them about chemical reactions and stoichiometry in 11th grade and they're tested on it in 10th grade. Knowing the timing is critical in designing our curriculum."
"Summary of comments collected from classroom teachers at Shakopee District 720:
Elementary teachers say that the K-5 standards are a mile wide and an inch deep. They do not align at all with our current curriculum which is very hands on in nature and deals with different science content each year throughout elementary.
Middle school teachers say that the standards do not align with current curriculum or texts. Most middle level materials are focused on only one area of science - life science, earth science, and physical science. There should be more latitude ragarding how the content standards are addressed at the middle level.
High school science teachers say that the 9-12 standards align pretty well with our current program."
"WWWAAAAYYYYYYY to advanced for 8-9 year-olds. Come into the classroom and observe their development before requiring such advanced knowledge...Some would pass as high school standards...
We are teaching reading and Math too??!!!"
"Every public middle school that I know of has Life Science, Earth Science, and Physical Science at a specific grade level. Why are the standards written combining all three subject areas in each grade?
Did the people that wrote the standards realize the amount of time it takes to teach some of these things? Shouldn't the standards be something that can be realistically taught in a school year and not a document that can only be completed if we 'speed teach'?"
The Scientific process (ie. hypotheses, tests, conculsions)needs to be introduced before grade 5, probably in grade 2 or 3 in the basic sense of having a prediction about what should

happen, making observations and then seeing if the results verify what was predicted or not.
Atoms NEED to be intoduced before grade 6. The idea that all matter is made up of atoms and atoms are made up of protons, neutrons and electrons
Should probably introduce the concept of the scientific difference between a hypothesis, theory and law before high school. Students will hear these terms used incorrectley referring to scientific and pseudo-scientific claims well before high school and should hve been introduced to the true definitions of the terms at this time.
"In general I felt the science standards were reasonable with the exception of the standard on the solar system. Many of the benchmarks in this are much too abstract and far away for students of this age to comprehend. They certainly can observe the moon and its changes, but will have difficulty with the causes of seasons of the year."
"Since Minnesota currently licenses teachers specifically in Chemistry and Physics, why do the science standards place these two disciplines under the strand 'Physical Science?' It seems that a 9th grade Physical Science course would be inadequate to acheive the stated benchmarks of the Physical Science (sic Chemistry/Physics)standard. Yet, some districts may be tempted to acheive this standard in a 9th grade 'Physical Science' class. A 9th grade Physical Science class taught by teachers not licensed in both Chemistry and Physics could easily be insufficient in scope in any or all sub-strands. Shouldn't the 'Physical Science' strand be divided into the separate strands titled 'Chemistry' and 'Physics?' This would ensure that all teachers will be teaching within their licensed area."
"Why is physical science and earth science requirements in the 7th grade area. The state only allows us to have 1 on our teaching lic. We would all have to have a triple major from college to teach these standards. Life -Earth-Physical science majors. Not realistic...."
"In the seventh grade science requiremnts, there is reference to Life Science, Earth Science and Physical science, if teachers are going to teach all of these subjects will they need a license to do so. I think that is a new requirement under the 'NO child Left behind' act? Will the state pick up the bill for all the science teachers who have to go back and get multiple licenses? Also, it appears as if we a moving towards a curriculum that consists of a little of this and a little of that. Is this what we want? I think kids benefit more from a curriculum that focuses on details and depth,verses a curriculum that touches the surface of everything. These standards do not even come close to matching what is currently being taught in grade levels."
"The science standards don't address the Physical Science's"
"Too much in one year: physical, life and earth science strands are included at 6th, 7th and 8th grades. Currently our 7th graders focus on life science and our 8th graders on earth science. Further our textbooks are not general science tests but rather are specific to life or earth science. Why not list the life science strand in 7th grade and the earth science in 8th."
"It is a laudable effort, a carefully sequenced presentation of essential scientific concepts of inquiry and fact which every graduate should recognize, and build for life experience."
"I really doubt the integrity of any committee that would allow life science, earth science and physical science to be taught in each grade level. The system that 95% of schools in Minnesota already use. The committee must change this proposal."
"The Benchmark regarding earth layers is factually incorrect. The hydrosphere and atmosphere are NOT considered layers of the Earth by earth scientists. If you think about it, there is no hydrosphere 'layer' that can be defined because it is discontinuous. You might consider the atmosphere a layer that lies outside of the earth. The way the benchmark is written is very imprecise. The earth is layered in two ways: compositionally (crust, mantle, and core) and mechanically (lithosphere, asthenosphere, mesosphere, outer core, inner core)."
"I am very concerned w/ the apparent total reconstruction of how middle grade science will be taught. Currently, most school districts in the state are teaching 7th grade Life Science, 8th grade Earth Science and 9th grade Physical Science. According to the newly proposed standards, these three grade levels would teach an integrated science curriculum. I am concerned mostly in the area of textbooks. Where will the money come from to purchase these new (and hard to find) integrated text books for these grade levels? Is it necessary to re-invent the wheel? Can we not teach the proposed standards in congruence to the current state-wide set-up for grade-level teaching?"
"Data and research prove with regards to education 'less is more'. The amount of material that is going to be crammed into the physical science standard is way beyond what should be taught. Students learn less when there is less depth and more content not vice versa. My suggestion is reducing the content covered. There is too much content that is going to have to be covered in the life science standard. There is more content with this standard than with the profiles. The anatomy/physiology piece should be covered in an elective science like human anatomy. The material suggested can not possibly be covered with enough depth that students will retain it. Dabbling in topics and subjects does not promote long term retention of information i.e. LEARNING!!"
"Wow! We are already packing so much content into the year, and now we are supposed to do more and have more testing interuptions. I teach biology and chemistry, and I do not see how it will be possible to accomplish all of this. I do not see how it is possible to do all of the biology standards in one year. Right now we do not even touch human anatomy and physiology (Health covers it a little). This seems like another top down idea that is going to flop like the rest of them. Please just let us teach and stop testing our kids to death."
"Looks like a good job. Due to the fact that students in HS are only required to take 3 years of science they will not be able to cover ALL the science standards. There needs to be options. This could be a whole Quarter in itself. Way too much. History of science could be a new course. Can a few of these benchmarks fit into other cateogories? Otherwise take them out."

"I am not in favor of changing the present configuration of 7-12 science education in Minnesota. I find that the elements of Earth Science, Astronomy, Geology, Meteorology, and Oceanography have a complexity and relevance to daily and future life, which support their being taught within a one-year course. However, I do see that these topics do not necessarily need to be taught together. In fact, an integrated approach to teaching these topics makes more sense than subdividing them further. For example, there are relationships between Physical Science, motion, and Astronomy. However, I trust my ability to incorporate these relationships in my course in a way which supports the 9th grade Physical Science teachers without having to redesign my course. Therefore, I advocate keeping the present configuration of science education in Minnesota mindful that my part in it is to support the future education of students and the work of my colleagues in this concerted effort. "
" 'Simple tools' is not defined.
Local science is not mentioned! Local geology is important!
The middle level transition from life science, earth science, and physical science to one third each year will lead to budget problems within schools due to the increased (triple!) amount of textbooks and equipment that would be required.
Think global. Teach local.
By embedding the standards into the already existing life, earth, physical sciences, students will lose the depth of these subject areas. For example, in earth science, atoms and compounds are discussed when learning about minerals, matter, planets, stars, and the atmosphere; which allows students to connect the topic to real world uses and continually apply their knowledge of atoms. Separating the sciences even more, into the thirds, at the middle level would lead to less engagement, less depth, more re-teaching.
I like the increased amount of environmental awareness emphasized throughout the standards. "
"The combining of middle level sciences into Life, Physical, Earth/Space Science seems to be a waste of time, energy, and money. The current system of focusing on specific subjects per grade level has and does work well. In combining the subject areas each year, topics will have to be dropped to take time to review, new tests will have to be developed, and teachers will have to undergo additional training. Each year, teachers cover topics as review that related to the previous year's curriculum. Each subject builds upon the previous subject and teachers are able to relate topics throughout the year. "
"Most of these standards completely leave out any requirement that students understand what is science, and the creation and validation of scientific models. This is the whole point of science. Please, please try to have these ideas included.
Also, there are far too many benchmarks in lower grades and none of them deal with real important issues. "

I have spent countless hours looking over, reflecting, thinking, and rereading the draft science standards for Minnesota. During the time analyzing these draft standards I have looked at them with various eyes. I am the science department chairperson at our local 6-8 middle school, a current 8th grade science teacher, and an expecting parent. In order to attempt to be brief I have just lettered my comments.

A) The draft standards take all individual local control and flexibility out of every grade until the 9-12 grouping. It would seem more practical to group the standards into levels or grades, such as was done with the 9-12 standards. Perhaps groupings such as K-2, 3-5, 6-8, and 9-12, would be more logical.

B) Not all schools systems in Minnesota are grouped K-8 then 9-12, but rather we have a plethora of groupings. Since I began teaching in Bloomington we have transisitioned from a K-6, 7-9, and 10-12 system to a K-4, 5-6, 7-8, 9-12 system to a K-5, 6-8, 9-12 system of school groupings. Or perhaps allow districts to develop their own groupings and be accountable to cover the required material over whatever system they set up. Also, due to laboratory situations, are all grades prepared with resources to handle the standards where they are placed. In other words are gas burners, water, electricity, appropriate ventilation, and most importantly, safety features present to be able to teach up to the standard? See Comment A for a way to partially solve this issue.

C) Please remember the often left out middle years (call them 6-9ish grades) where licensing of teachers often overlaps. Example: a teacher may teach science under a K-8 Elementary General Science License, while right next door a teacher may have a 9-12 Life Science License with Middle School Licensure. Which would have a better in-depth knowledge on Life Science? Or General Science (such as proposed with the draft)? Depending on how you mandate the standards seems to favor one type of license over another - if so this will make no sense to the licensed teachers who are "left holding no job." Or perhaps will the Department of Education take this into consideration and change the science licensure again over the middle years? I have no simple answer to the license question except allow the districts to group the Benchmarks together as suggested in Comment A above.

D) With any standards based effort the teachers and students will need materials to study, investigate, and use as resources. Having just gone through our District's revision of Textbooks, looking at all types (integrated texts (some Physical Sci, Earth Sci. and Life Sci in every grade text) vs. course specific texts (one text dedicated to a particular science subject) vs. mini-texts (a set of 15 mini-text books, basically each mini-text is a chapter/unit of larger course specific text) no text or series of texts seems to match the random assortment of standards from each of the four Major Areas in science. Is the State then going to provide materials which are inline with the standards for each level?

E) After reviewing the Benchmarks within the Sub-Strands entitled "Scientific Enterprise" and "Historical Perspective" in the History of Science Strand I am not sure what is expected. They seem quite vague and nondescript, moreover they seem like students need to make lists or gather information or write reports to accomplish many of the Benchmarks. I may be on a limb but how does someone evaluate whether a "student will know that science and technology are highly vigorous human efforts that both influence and are influenced by civilizations worldwide" and "student(s) will understand how scientific discovery, culture, societal norms, and technology have influenced one another in different periods of time." Even the Benchmarks seem vague, is the point to "cite examples," "relate," "evaluate," or "recognize" exactly what or who or how or .... ? I guess I need more specific wording or examples of what to do, how to judge and evaluate, and what some of them mean.

F) Follow my math here: I added up each grade levels number of Benchmarks as outlined in the draft. K=5, 1st=9, 2nd=17, 3rd= 30, 4th=32, 5th=20, 6th=49, 7th=70, 8th=82, and 9th-12th grades=115. It seems like it is not such a logical progression, we have lowered the total Benchmarks in 5th grade and really increased them in 7th & 8th (even at a rate that is greater than the 9th-12th grade level (assuming that every student must soon take two years of high school science (remember that one of them must soon be Biology) to graduate allows me to average the Benchmarks to basically 58 per grade in high school (remember this estimation is for only two years of high school science that (thankfully) will soon affect all our upcoming high school students)). Now, of course the number of Benchmarks has nothing to do with there difficulty, but the number does affect in-depth study. Perhaps the draft is concentrated too much (maybe move or eliminate Benchmarks) in some grades?

G) Since grades seven and eight have so many Benchmarks to cover in on year, I am afraid of general studying versus in-depth investigation. Example: 8th grade's 82 Benchmarks means covering and evaluating a Benchmark basically every other day of class. Yikkes, talk about a laundry list of cover this, evaluate this, repeat with a new "this" every other day. Where is the time for in-depth discussion, role play, evaluation, laboratories, field trips, and computer room time (especially to do research)? Or don't we care about that in the "new" testing of facts? Many of the most impressive learning environments take time to produce, rather than rush through. Example: It would be great to use the new draft (p. 19, Stand I, Sub-Strand D the 4th Benchmark to have an in-depth debate over "how science contributed to your idea of what was the greatest change in government (revolution), agriculture, manufacturing, sanitation, medicine, warfare, transportation, communication, or information processing (which I am unsure what that really is). which will take time to do properly, much longer than the two days time average which the large number of Benchmarks seem to dictate. But the reality is to create a great learning environment for a evaluation and learning technique such as the example takes more than two day to do. When forced to become "Accountable" in covering the numerous Benchmarks, many great lessons, like the example, will go by the wayside because of time concerns, and will often be replaced by basic factual learning and regurgitation of some facts that may be relevant to one place in history and time. Perhaps, it is better to learn, understand, relate, and live particular skills rather than learn a lot of stuff and not be able to use it? Somewhere there is a happy medium between rote learning (due to time and amount of material to cover in many grades within the new draft science standards) and strictly process based learning (the old Graduation Standards). Once again I suggest it is better to learn and use your knowledge now and in the future rather than have facts or ideas stored or forgotten about in your brain.

H) In my reading over the draft, I often found a Benchmark or part of a Benchmark repeated from one grade level to another. Example: on page 11, the third Benchmark in Stand III, Sub-Strand C is basically identical to page 15, the first Benchmark in Stand III, Sub-Strand C. Another oddity is that the Sub-Strands and Benchmarks seem to have no continuity to them or where they are placed. Example: The Life Science Sub-Strand Heredity, one you read the Benchmarks in grade 1 + 3 are quite

similar, then the one's for grades 6, 7, and 8th grade are again related. It seems more logical to continue with similar ideas at one time rather than dibble one Benchmark here and another two there so that a topic gets brought up in isolation. Furthermore, I am concerned that this "dibbling" a related Benchmark here and there over the years or repetition of topics will become "we already did that" by the students as similar labs, examples, and projects get used over and over again just adding and extra piece to meet the Benchmark. Rather to an increase in exposure and more concepts the students are repeating or skimming similar concepts often year after year. This repetitiveness of Benchmarks and Sub-Strands often occurs in student's studies year after year, rather than allowing in-depth focus on a new or different topic.

I) Accountability is a good and proper goal of education, but isn't the greater goal to aid in creating a responsible member of the country? Currently one way that schools are accountable to "do a good job educating students" are in the forms of yearly tests. Please note I left out a student's or parent's accountability because it seems we shifted that to the "schools." Even in some topics (reading, math, and writing) we have Graduation Tests, where a student must score at lease 75% correct to graduate. In the search for accountability in science it seems the state has a different view from. Maybe we all need to look at some kind of test or tests in science. May I suggest a "Graduation" like test offered to all students in an advanced grade (say 11th) which covers all four major Stands within the science discipline.

Or even give the science test (covering all four Strands) as a yearly test much like the current MCA's and CALT's are given. That way everyone can see areas of growth and weakness (especially given that some Strands may not be covered in detail until later in a child's academic career.) Then, at a predetermined grade the students could take the Science Graduation Test (see the next paragraph for more details on the Grad. Test.)

Or perhaps, three or four mini-tests where each test covers one Strand. Students then would take a test in "Life Science," "Earth and Space Science," "Physical Science," and "History of Science" or perhaps roll the History of Science Strand (due to its awkward evaluation problems within some sub-strands as I mentioned in Comment E) into the other three tests. Once the tests are created - it would be a natural fit for school districts to align curriculum within each discipline. I am not suggesting the state mandate that a certain Strand test be given in grade X, but allow the individual districts to place the Strand tests where they feel it is best for their local situation - as long as they get them all accomplished. Thus, District Q may give the Life Science test during 6th grade, the Earth and Space Science Test in 8th grade and the Physical and History of Science Test(s) in 10th grade. While District Z may choose to may give Earth and Space Science Test in 7th grade and the Physical and History of Science Test(s) in 8th grade, and the Life Science Test in 9th grade.

J) Parents want to know what is the general theme of each class. That was made clear to me a few years ago. The students were enrolled in classes with generic titles such as " 7th grade Math" and "7th grade Science." Of course no student, or worse yet parent, knew what was taught in each class. Now, it seems simple to say that math was taught in "7th grade math" but what, general math, fractions, pre-algebra? Now we have "CMP Math, " Pre-Algebra," CPM Math," among others, and the students and parents know what is taught in each math course. Seventh grade science used to be a meshing of Life Science and Physical Science, but students and parents would wonder when we were to cover "chemistry" or "space" or whatever because the title of the class was too broad and general. Once we (the District) aligned the science curriculum with Graduation Standards we renamed the class "Life Science" and hardly anyone wonders what is covered in the class now. I bring this up because it seems that the draft science standards forces science courses to do two things. The first is become more basic and general, the second is due to generalness not have a very good explanatory name.

Well, I hope you have enjoyed hearing my thoughts on the new draft of science standards. I really welcome your comments and feedback to my comments. I look forward to hearing from you personally and watching the draft evolve into a more useable, workable, sensible, and simple to understand (for a parent's sake) document.

I am concerned that the new standards are being completely redone instead of just refining the old. What was put in place before I'm sure took a lot of effort and thought. I think it is a waste of time, energy and resources to completely redo it. It seems to me that time well spent would be to refine what we already have and improve upon the existing standards. I am a 7th grade life science teacher, with a life science license. With the new standards I will be teaching earth and physical science concepts. Will I be allowed to teach 7th grade with only a life science licensure, because the standards for 7th grade have many concepts for earth and physical science? Also will their be funding for adoption of new text books to coordinate with the new standards.

Are arts standards being developed? Will they be given equal importance to other areas? I have heard rumolr that the new state standards will make it more difficult for students to get a good arts education. I hope you will take into consideration the tremendous value that arts (music, visual and performing arts) have in education today. How are you going to guarantee that the arts will not take a back seat to science, social studies, math and communications?
Most Committee members from 9-12 are from a single suburban district(Chaska). Why wasn't a small rural district represented? A large metro school?
Our second grade team feels the science standards are developmentally appropriate, witht he exception of the "safe use of goggles, heat sources, electricity, glass and chemicals" because this is not something we would have second graders using. Even though we feel these standards are appropriate our curriculum doesn't cover some of them nor would we have time to cover this much.
I have attended a public meeting on the state science standards and have reviewed them carefully. My comments are somewhat general in nature with a specific comment to support my position. I see that effort was made to utilize the national science standards, but I am concerned with the developmentally appropriateness of the placement of these standards. An example is the study of the cell in the 4th grade curriculum with use of a microscope. Most 4th grade students would not beable to manage the skill required to use a monocular microscope. The standards that you are looking to replace were well aligned with the national standards. Why is there so much deviation from those standards. In the fourth grade curriculum only one standard, the one dealing with night time sky, correlates with the curriculum already in place in the school where I teach. Where will the money and time come from to develop the new propsoed curriculum.
Science is also a study of process, it is the spot where so much of what is learned in other subjects comes together and is applied. There is very little if any use of the scientific procees and developing an understanding of inquiry. We are replacing understanding science with trival pursuit.
As a board member of the Minnesota earth science teachers' association and a practicing earth science teacher, I thank you for including earth science concepts throughout the K-12 standards draft. My concern is with the implementation of the standards. With the proposed middle school standards possibly making science courses less discipline specific there may be problems with facilities, textbooks, and staff development. Many middle school rooms (and some high school rooms) do not have proper access to lab equipment, gas, electricity, and water. Many middle school textbooks are aligned with specific existing courses such as life science, physical science, and earth science. To move these books from teacher to teacher would be inefficient; to purchase new books for the new standards would be needlessly expensive. A significant number of high schools require earth science in the ninth grade. To move these teachers, texts, and facilities to a middle school setting would be both difficult and costly.

A major concern is staff development and teacher training. Life long physical science teachers will be teaching earth science, earth science teachers will be teaching life science, etc. While these teachers are capable professionals and are certainly able to present the course material to students, we run the risk of transforming science teachers into "mile wide and inch deep" generalists. Some may even gloss over curriculum for which they lack specialized preparation and training while emphasizing the subjects with which they are most familiar. Earth science may be minimized among other subjects.

(more comments beyond the 2000 character limit to follow)
As a board member of ..... continued

Teaching science is so much more than subject matter. For many teachers, earth science teachers in particular, teaching is a passionate craft. These are individuals who take the time to concentrate on specialized subject matter and constantly seek new ways to engage students in the course. Courses are continuously and incrementally improved through careful inquiry based instruction rather than being totally transformed with every passing trend. The success of this approach has been documented by a recent TIMSS study (http://www.scimathmn.org/timss8.htm) that places Minnesota earth and life science students well above the international average of the top countries.

To minimize the potential problems with facilities, equipment, texts, and training, I recommend a flexible approach to standards implementation. Maintain the current local control over deciding which science courses will be offered at each grade level. For example existing eighth or ninth grade required earth science courses should remain at the current grade level rather than being blended into a general middle school course.
Some districts have found great success with a program beginning with general sixth grade science (including earth and space systems) and seventh grade life science. This is followed by an eighth grade physical science course as a stepping stone to high school earth science, biology, chemistry, and physics. All four classes benefit from a physical science background, and earth science in particular benefits because a background in topics such as gravity and density leads to increased understanding of astronomy, meteorology, and geology. With Minnesota's rich tradition of mineral extraction and refinement, our infamous weather, and current citizen concerns over land use and groundwater pollution, students and citizens deserve to have in-depth earth science taught by knowledgeable and specialized professionals.

RE: the Scientific Worldview Substrand:
I am opposed to the idea of teaching only the evolutionary theory. Your own words in the substrand state that good science involves peer review and offering alternative explanations for observations, so it strikes me as inconsistent that you would mandate only one point of view.
1st of all, it's bad science to limit debate. 2ndly, if the theory is fact, why can it not stand on its own merit? 3rdly, it is very controversial because of a lack of evidence. Other things which suggest that evolution is a flawed theory:
a) irreducible comlexity
b) evidence of a young earth
c) entropy
d) lack of fossil evidence. Available fossils show that life appeared suddenly, and that life forms were fully developed.
e) simple statistics
Our children and society and science itself will suffer if truth is not presented and valued in this arena. If children are taught that they are not very different from animals, should we be surprised if they have no impulse control? If we teach them that evolution proves that they are accidents of the universe, should we be surprised at their hopelessness? God loves you. May He help you do the right thing in this matter. Thank you for your consideration of my point of view and for reading this. Sorry it got kind of long.
Greetings,

I have spent countless hours looking over, reflecting, thinking, and rereading the draft science standards for Minnesota. During the time analysising these draft standards I have looked at them with various eyes. I am the science department chairperson at our local 6-8 middle school, a current 8th grade science teacher, and an expecting parent. In order to attempt to be brief I have just lettered my comments.

A) The draft standards take all individual local control and flexibility out of every grade until the 9-12 grouping. It would seem more practical to group the standards into levels or grades, such as was done with the 9-12 standards. Perhaps groupings such as K-2, 3-5, 6-8, and 9-12, would be more logical.

B) Not all schools systems in Minnesota are grouped K-8 then 9-12, but rather we have a plethora of groupings. Since I began teaching in Bloomington we have transisitioned from a K-6, 7-9, and 10-12 system to a K-4, 5-6, 7-8, 9-12 system to a K-5, 6-8, 9-12 system of school groupings. Or perhaps allow districts to develop their own groupings and be accountable to cover the required material over whatever system they set up. Also, due to laboratory situations, are all grades prepared with resources to handle the standards where they are placed. In other words are gas burners, water, electricity, appropriate ventilation, and most importantly, safety features present to be able to teach up to the standard? See Comment A for a way to partially solve this issue.

C) Please remember the often left out middle years (call them 6-9ish grades) where licensing of teachers often overlaps. Example: a teacher may teach science under a K-8 Elementary General Science License, while right next door a teacher may have a 9-12 Life Science License with Middle School Licensure. Which would have a better in-depth knowledge on Life Science? Or General Science (such as proposed with the draft)? Depending on how you mandate the standards seems to favor one type of license over another - if so this will make no sense to the licensed teachers who are “left holding no job.” Or perhaps will the Department of Education take this into consideration and change the science licensure again over the middle years? I have no simple answer to the license question except allow the districts to group the Benchmarks together as suggested in Comment A above.

D) With any standards based effort the teachers and students will need materials to study, investigate, and use as resources. Having just gone through our District’s revision of Textbooks, looking at all types (integrated texts (some Physical Sci, Earth Sci. and Life Sci in every grade text) vs. course specific texts (one text dedicated to a particular science subject) vs. mini-texts (a set of 15 mini-text books, basically each mini-text is a chapter/unit of larger course specific text) no text or series of texts seems to match the random assortment of standards from each of the four Major Areas in science. Is the State then going to provide materials which are inline with the standards for each level?

E) After reviewing the Benchmarks within the Sub-Strands entitled “Scientific Enterprise” and “Historical Perspective” in the History of Science Strand I am not sure what is expected. They seem quite vague and nondescript, moreover they seem like students need to make lists or gather information or write reports to accomplish many of the Benchmarks. I may be on a limb but how does someone evaluate whether a “student will know that science and technology are highly vigorous human efforts that both influence and are influenced by civilizations worldwide” and “student(s) will understand how scientific discovery, culture, societal norms, and technology have influenced one another in different

periods of time." Even the Benchmarks seem vague, is the point to "cite examples," "relate," "evaluate," or "recognize" exactly what or who or how or .... ? I guess I nee
General:
I believe that chemistry is short-changed as a subject. There should be specific sections addressing inorganic chemistry, organic chemistry, biochemistry, physical chemistry, and nuclear chemistry.

Physics is likewise shortchanged. There needs to be concentrated information on mechanics, materials, astrophysics, and nuclear physics, and it would be useful if some of it used the mathematics that should be available to these students—at least algebra and trigonometry.

It is my impression that there is an emphasis here on "proving" evolution. Despite it being called a "theory" with some consistency, there is a lack of counter-evolutionary evidence presented.

4-II-C At some point, the concept and uses of semiconductors should be introduced.

9-12-III- A "Students will be able to apply an integrated understanding of chemistry,
physics, and biology to the analysis of global change issues, such as ozone
depletion, greenhouse warming and overpopulation."

Students will not have a sufficient integrated understanding or background to properly analyze these contentious issues and will be guided by the opinions of the instructor. This is not scientific inquiry but indoctrination. The subject can be discussed and the understanding developed, but it most be done objectively.

9-12-III-D Students could also be introduced to the notion of "dark matter" and the "missing mass" to stimulate their interest in science.

9-12-IV-F "Disorganization" should use the thermodynamics term "entropy."

The science standards are comprehensive and progress from a simple to a complex view, as one would expect for knowledge presented during academic development of the student.

However, as a college educator, I find the curriculum far too content heavy and far too light on the process of science. Educators know that students learn best by doing, not listening, not memorizing, not regurgitating. There is too much reliance on memorization of factoids and too little emphasis on application and problem solving. Content can always be mastered, but students today need help learning HOW TO FIND ANSWERS and HOW TO THINK THROUGH PROBLEMS. The science curriculum proposed, and in fact I would generalize to all K-12 education standards, produces a lazy student who can't think analytically. The content proposed for the 9-12 standards is exactly the same content that any introductory set of college science courses would cover. We should not be repeating the content from high school to college; we should be building on it. As a college educator I find that my freshman students really don't know or remember anything from their high school science courses, because they memorized it in the context it was presented and have no ability to apply it, even if they do remember it.

My recommendation is to back off some of the heavily laden content objectives and build in some process oriented exercises that encourage students to think through a problem and use resources to solve that problem. Cookbook labs that make students follow directions are HORRIBLE and should be greatly reduced in the new curriculum. Problem solving exercises, and even problem based learning based on case studies would be extremely helpful in preparing college-bound students.
B. Scientific Inquiry-Benchmark-Students will follow appropriate safety rules concerning the use of goggles, heat sources, electricity, glass, chemicals and biological materials.

This part of the benchmark is not developmentally appropriate for kindergarten children. I would be very concerned if I had to use heat sources, electricity, glass, or chemicals and biological materials with kindergarteners. I believe it is a safety issue. I use eye droppers with water for experiements on paper and fabric-it's enough of a challenge to keep the water on the specific piece of paper or fabric. I'd hate to see what they would do with chemicals!

The use of simple tools such as magnifiers, eye droppers,(no need for goggles if they are not using chemicals) is totally appropriate for kindergartners to observe and describe

common objects, even living organisms such as fish etc.
Several comments that deal with the spiral approach to the middle lever/junior high level science standards
1. converting to the spiral approach will cause almost all districts in the state to buy new textbooks for all students - a crushing financial burden
2. the science disciplines are exceedingly detailed. Colleges recognize this by giving us degrees in our majors - ex. bio, chem, etc. Science majors get their certifications in their majors. You will ask probably 90% of all middle level teachers to teach out of their area(s) of certification.
3. What about junior highs - in which I teach. What will happen to the 9th grade teacher? What kind of certification? Often they have to teach 7th or 8th grade as well - their certification? Or the converse - will a 7th or 8th grade teacher be able to teach 9th grade? There are still a large number of junior highs (not middle schools). Please do not pretend they do not exist.
3. What is the impetus behind spiral education?
4. It looks as if the overlap -ex. history and nature of science - is extensive.
grade 7 - students are not developmentally ready for the graphing of speed.
grade 7 - acceleration to far, far, far too conceptual for grade 7.
They have not had the math for it and they are too young for the meaning. At best, they will be able to learn the definition - with no idea of its meaning. Do we really want that??
grade 8 - describing the states of matter in terms of the space between atoms/molecules - The space between atoms/molecules is too difficult for these young minds. I would bet if you ask parents on the committee what is between the atoms and molecules in a gas, you would be treated to a surprise.
In many schools, 6th grade is housed in the elementary school - how does that teacher do all the things it is supposed to in science during the elementary day? Not enough time.

Once one teacher misses covering a topic that is a basic building block for the next year, the spiraling is lost. Either it will take too long to play catch-up the following year, or the next teacher will just proceed with their standard and the kids will suffer from lack of the basic beginning.

So many of the teachers have a biology degree as their major. With a spiral type of curriculum, it is a natural that they will teach what they know and love the best. By separating out the disciplines as we now do in the junior high, we make sure all is covered (words from one of our Nobel Prize winners in Chem).

Needless to say, I do not, for many reasons, agree with the spiral curriculum. There are often many good ways to organize anything, what we have in junior high science works - our scores show it. Although it is common to us, remember it is new and unique to each student as they come through. It is our Nth time, but only their first.

1. Will there be standards for the upper levels of science? (Chemistry, Physics, etc?)
General Science vs. subject specific courses for lower level students?

2. Are the standards too rigorous for the lower (K-8) levels? How will teacher's promote inquiry science will so much content knowledge to cover. Are middle school minds ready for all of these conceptual topics? How well with mathematics keep up?

3. How can we fit the new 9-12 earth science standards into our currently packed curricula? Who will fund the developing of these courses (lab materials, teachers, teacher education and licensure endorsement, textbooks, space to hold another class?
4. Where will Earth Science chronologically fit into the HS curriculum?

What are licensure issues 6-8 with general science offerings? Will a teacher with a 5-9 general science license be qualified to teach an integrated science program?
In general, I think that the science standards are a good road map for the kinds of things students should know and teachers should be using to organize curriculum. However, the problem of testing and teaching to all of the Benchmarks seems ridiculous. Our students do not take enough science classes as juniors and seniors in enough topic areas to come close to "learn" all the benchmarks described. Most students are taking only 1 or 2 more science classes beyond their sophomore year. The level of formal reasoning and shear number of benchmarks that are suggested can not be reasonably taught or tested. Ninth grade physical science can not be a replacement for High School Chemistry and Physics. To say that students have been given a chance to really "learn" the physical science content standards, they should be taking physical science classes beyond ninth grade. Most do not. Students and parents do not seem to be in favor of increasing class requirements. In order to address the scope of the Benchmarks described in the Draft, I believe that our students would have to increase their science credits to include at a minimum Chemistry, Physics and Earth Science. This does not seem possible given current trends, parental interest and

lack of funds to supply and teach those additional students. Additionally, the Science Standards test that does come out of this process must be instructionally valuable to the teacher. I need to have a test that is focused on some specific science literacy skills and not cover all of Chemistry, Physics, Life Science and Earth Science. This means that it should focus on as few as 3-5 basic objectives for science literacy. I can not imagine how you would design a reasonable test that might measure attainment of the huge list of benchmarks listed. Science Standards testing will not improve our science teaching or student learning if we try to measure all the benchmarks listed.
I like the content but feel everything is so vague. How detailed do we get. Example, if we need to teach about hormones, does mentioning 2 or 3 in lecture do or do they really have to get it? That would take activities and labs. Also, there is no way in one school year to do all that you ask unless school extends through summer. It seems like you want us to go back to lecture to get it all in but we know how useless that is in the long run. Can we see a copy of the test the year before it is given? How are we to know otherwise.
The 5th grade standards are ridiculous. We are trying to teach these kids to read and write at grade level and you want to dump this on us, too. We spent thousands of dollars on the FOSS science curriculum becuase that is what the old standards were based on. Now you throw out new standards. They do not match FOSS. When will this end? The legislature continues to underfund education and our community refuses to pass a levy. How are we supposed to meet these new goals with 31 students and no help?
Minnesota is a leader in the area of Science education-we have been number one in the nation for quite some time in this area. Why would you want to "fix" what is not broken? Why not have other states take a close look at how we teach Science in this state? Why have students learn lots of isolated facts and so doing take away the hands-on Science which has indeed made us number one? Again, I ask...why fix what is not broken? Let the other states learn from us, lets not copy from a state with less results.
I have content comments for the physical science standards. More specifically, I am alarmed that magnetism and waves are not present in the standards. Both topics are considered "core" physics concepts. Both have real world applications directly evident in the lives of students. I feel that the omission of these concepts significantly lowers the scientific validity of a state level science standards document.
I was heartened to hear Commissioner Yecke's publicly reported concerns that the general public does not seem to understand this document is a working draft and that it will be trimmed before final implementation. I hope that by her comments she is implying there will be a major reduction in the sheer volume of standards and benchmarks in K-12 science.

Being an eighth grade science teacher I am greatly concerned about the vast amount of material that students are expected to learn during their middle school years. There are almost as many standards and benchmarks in grades 6 to 8 as there are in K-5 and 9-12 combined!!! In eighth grade alone there are 86 specific benchmarks. That is a pace of just over 2 benchmarks per week in a 40 week school year. If a basic skills test in science is placed in 8th grade, then all of these benchmarks would need to be met before the test; an impossible task indeed. Of course many benchmarks can be combined during the teaching and learning process. However, even given this caveat the pace of curriculum to meet the benchmarks will leave many students with a thoroughly INcomplete understanding of science. There will not be enough time to ponder, investigate, question and analyze various scientific phenomena and the data to support the theories explaining the phenomena. These time consuming learning processes are the keys to understanding the list of scientific facts laid out in the detailed benchmarks.
One problem I see with this is an overlapping of subject areas between grades. In theory this works well, however, teachers are liscensed to teach specific subject material to specific grade levels. For example an earth science teacher may not be liscensed to teach anything but earth science, or at the very least may not be proficient enough in other subject matter to do an exemplary job at that subject. Traditionally things have been structured by grade level/subject matter. i.e. 7th grade is life science, 8th grade earth science, 9th grade physical science and so forth. If overlapping is going to be the norm, I fear students will lose out because of unprepared, untrained, or unwilling teachers.
District 831 Science Curriculum Sub-Committee Report
on Minnesota’s Proposed Science Standards
We would like to thank the committee members for the time and effort invested to develop a comprehensive set of testable outcomes. We affirm that learning must be measurable and outcomes clearly stated. We represent students and teachers in the Forest Lake Area, a school district of 240 square miles and 7500 students.

Our comments are presented in three categories: the strands as specified in the draft document, the loss of flexibility in scheduling and student options, and roadblocks to the implementation of these standards.

Strands
It appears that the proposed standards are moving toward learning by rote and memorization rather than process and experience learning.
Grades K-6. The basic strands included are consistent throughout grades 1 through 6. Children have better retention of science learning if they have experiences with the concept. They do not remember or understand well if they just read or hear a lecture. It is our belief that science experiences are essential but they will require time. Time constraints will need to influence the number of standards possible to teach in a grade level in one year. The number of standards and benchmarks becomes a time management concern in grades 3 through 6. If there are any lab experiences included, the breadth of the content would be difficult to accomplish given the time required for teaching reading, writing, math and social

studies, plus the other areas that are included in grades K-6. If the learning will be textbook-driven instead of experience learning, then the vocabulary levels will become too difficult and developmentally inappropriate for younger learners.
Grades 7-12 Science-literate citizens need to be fluent in the methods of scientific research rather than the specifics of a select number of topics. It is the process of how to acquire knowledge (rather than the knowledge itself) which will most benefit the student and society

Strand I. History and Nature of Science
The proposed Minnesota standards for the nature of science insure that experimentation and inquiry will take place in the science classroom, and we commend the selection of these standards.. As information rapidly increases, memorization of a specific set of facts is less useful than knowing how to access information. Students must identify the components of a problem to be solved and then plan strategies to find a solution. The skills needed for problem-solving are to ask testable questions, find information that applies to a topic, recognize bias, design procedures to test a hypothesis, and evaluate conclusions based on reproducible evidence or biased opinion. This can only be accomplished through inquiry and experimentation. We believe that the assessment of such skills cannot be accomplished through a multiple-choice format and are concerned about the design of the MCA test in place of performance-based assessment packages.

The Kindergarten benchmarks for safety rules for use of goggles, etc. are not appropriate because none of the kindergarten standards require the use of those tools. The 6th grade benchmarks say nothing of specific tools and their safe use, although some of the standards, like chemical reactions could require safety tools in labs.

The placement of benchmarks that require evaluating the cultural, social, economic, and technological impacts of science are not age-appropriate.

Strand II. Physical Science.
A major concern is the placement of concepts which require ratio thinking or precision lab work at grade levels where they are developmentally inappropriate. The new standards place density and solubility concepts in grade 8. These are topics involving proportionality, but Piaget's research shows that students develop that ability from ages 14-17. Other examples of inappropriate placement are energy exchanges - between potential and kinetic energ
Grade 2: IV E. The Benchmark should also mention that new species have appeared as well as former species disappearing.
Grade 3, IV - Retain B,C,D
Grade 4, I - retain B and Benchmark 3 (evidence and logic)
Grade 5, I - A - retain
III - A - retain
IV - E, retain with benchmarks
Grade 6, I - retain A, B, C, D
Grade 7, I - retain A, B
III - retain A. B with Benchmarks. Another Benchmark should add an understanding of the amount of time involved in these processes.
Grade 7, IV - retain D, E with Benchmarks
Grade 8, I - retain A, B, C with Benchmarks
Grade 8, III - retain B with Benchmarks
Grade 8, IV - retain E with Benchmarks
Grades 9-12, I - A. The last part of this Standard, "some scientific ideas . . . advances" should be deleted, as should the second Benchmark. These invite unjustified doubt. Science is always open to rigorous challenge by new, valid and peer-reviewed evidence.
Grades 9-12, D - retain with Benchmarks.
Grades 9-12, III - retain A, with Benchmarks - but in Benchmark 7 is there a typo? ("ice caves" instead of "ice cores"?)
Grade2 9-12 - III - retain C, D with Benchmarks
Grades 9-12, IV - retain B, C, E with Benchmarks.
J. C. Green, Ph.D.
I am a high school life science teacher at an ALC. I have a few concerns that I would like to share regarding the standards.
** By requiring all students to take life, earth, and physical science at the high school level, there are going to be serious licensure issues. For instance, due to the small size of our

school I would be required to teach classes outside of my life science licensure because we are too small to have an earth, life, and physical science teacher.
** The standards are much too wide and not deep enough. They will require students just to memorize facts, not to delve deep into topics to understand the concepts involved. In an ideal world all the information in the standards is important, but implementing and teaching this information in a meaningful way will be impossible.
** How is it possible to test students on physical science concepts learned in the ninth grade when the test will be at the end of 11th grade? I'm a fairly intelligent person and I couldn't retain information for 2 years like they will be required to do.
** Finally, how much money, time, and energy is wasted by changing standards and curriculum every few years?

Thank you.

The standards you have set are not age appropriate to the cognitive levels of the average student. For example, a fourth grade student may be able to repeat a memorized text regarding the water cycle, but most would not understand the concepts behind this. Your standards are filled with content that is not appropriate for the bulk of the students. You will be setting very exclusionary criteria that favors those children that is not appropriate for the general population. I do not support these standards and implore you to reconsider this action!
I am referring to Grade 7,

III. Earth and Space Science,

A. Earth and Space Science,
Standard "The student will understand Earth's composition and structure"

3rd Benchmark "Students will understand the concept of plate tectonics including the organization of the Earth into plates and the processes that move them.

I am an Earth Science teacher at Faribault Middle School. We have done much research on this topic. According to the Atlas of Science Literacy, page 53, the concept of understanding plate tectonics in it's entirety is a 9-12 benchmark. The student's are cognitively ready to learn about all of the inner forces that move the plates. They may be ready for an introduction, but not for the complete understanding.

I would like to see this benchmark removed.
For grade 6-8 committee members,
I spoke at a meeting at the Zoo School. I would like to reiterate on the web.

Licensure for science teaching does not currently allow us to teach Earth, Life, and Physical Science in grades 6-12. We are licensed in specific areas.

To solve this issue we need the 6 - 8 benchmarks to be multi-graded (6 - 8) instead of Grade 6, Grade 7, Grade 8 specific. Each school then can place the certified teachers in the correct area to benifit children most.
1.Make the standards more specific if you are going to have a paper/pencil test (students will describe the structure and function of DNA and distinguish between replication, translation, and transcription) – this is a bit hard to do with choices A/B/C/D and others are even harder to do this way.
2.Make the test have problems to “solve” where students are required to show work (in other words – make essay and word problems).
3.Make a variety of tests (one for each subject) to be given at the end of the year. That way one school can teach biology in 9th grade and another in 10th grade, and the students will have the knowledge much more in their heads than if they are tested after 3 years. The biology test would be given at the end of the biology year. (I recognize this will cost more, but this would also give a better guide as to where students are, and would be easier for the students to do.)
4.Give a guide with the test subjects so the teacher can make sure those areas being tested are covered, and more importantly that the students are not “surprised” when they take the test. (Obviously, the test questions can stay secret, but letting the students know that DNA structure is on the test will not hurt).
5.Cut down the number of standards and benchmarks. Right now, if I took one week per benchmark in biology I would be past one school year. (some of the materials could take a week to do)

6.Scrap Life Science Human Organism standard
7.Make benchmarks less wordy and more understandable by using more concrete terms and simple language. Examples: “Students will be able to illustrate how feedback loops in the nervous and endocrine system regulate conditions in the body.” – what does this mean – do you want the students to learn about the sympathetic and para-sympathetic nervous system and epinephrine and nor-epinephrine and how that all works? This is from the Human Organism strand – as I said earlier a great thing for anatomy class, not general biology.
These questions deal with how we are going to assess the students. How are the assessments going to be presented? Is this going to be a paper/pencil multiple choice test? (Some of the standards do not lend themselves to paper/pencil tests)
When are the students going to be assessed? Once at the end of four years, or yearly? (If you only assess them once at the end of 4 years you are being extremely unfair to both the students and the teachers. We do not even ask our college students to do this.)
The number of standards seems like an awful lot (I know it is still in a working format) and are you basically requiring schools to now require 4 years of science?

Is the test going to be a HIGH STAKES test? If so will the students have chances to retake it? Are you going to let us as teachers know what will be on the tests (not questions, but subjects)?

Finally, you say you want input on these standards and then limit me to 2000 characters (not fair).
I am disappointed that the standards do not include more on environmental education. Over the years, several studies and legislative directives state the need for and ask for sufficient environmental education, to provide for an educated citizenry. Yet, it is not included in the 9-12 grades level, both in Science and Social Studies. More depth on various environmental issues and their social impacts needs to be required, in both standards. Environmental Systems needs to be reinstated in the science standards. Natural and Managed Systems needs to be reinstated in the social studies standards. Furthermore, environmental education is easily taught as an integrated, interdisciplinary subject - a proven education model.
Please add more requirements for a more thorough study of the environment.
Middle Level Standards:
The proposed standards merely list a series of disjointed facts to memorize. Certain concepts and higher level thinking skills need to be addressed. The pendulum swings back and forth with standards. The profiles were at one extreme and the new standards seem to be at the other. There is a medium between strict memorization of facts and "show what you know" thinking skills. In real life, our students will use both!
Seventh and Eighth grade science need 2 years of distinct science courses. There is a limit to how much information can be taught by a single teacher. Labs are slower than lectures, but students will learn the facts but also passion for inquiry. Cramming too much information in a blast of lectures, which is the only way that all the information can be covered, will raise a generation of children who hate science, will not pursue science, will not see the value of science!! Children who love science become doctors, nurses, researchers, engineers, and yes..teachers.
Minnesota Statues Section 115A.073 (1998), has goals for Environmental Education for all. With the exception of soil erosion, there is almost no mention in the standards of the impact we have on the environment. Do we plan on pretending that global warming does not exist? Do we plan on ignoring pollution? How can students make informed decisions, if they are not given taught the skills and knowledge they need?
The proposed benchmark reads:

Students will use evidence such as fossils, rock layers, ice caves, radiometric dating, and globally gathered data, to explain how Earth has changed or remained constant over short and long periods of time.

The above lines of evidence are merely the tools with which earth scientists refine their reconstructions of earth history. Students must understand the conceptual framework in which these lines of evidence are used, namely the basic principles of stratigraphy. Steno’s Principles (superposition, original horizontality, and original lateral continuity) were elucidated in the 17th century, and were used to reconstruct the history and establish the ancient age of the earth long before any absolute age dating methods were developed.
No mention is made in the Earth and Space Science Standards regarding non-renewable earth resources. This is a prominent gap in the earth science curriculum for any number of reasons.
First, the future supply of such resources – fossil fuels, metals and industrial minerals – is an issue today’s students will be confronted with during their lifetimes. Fully informed participation as citizens in any number of environmental, social, and economic policy debates is to a great degree dependent on understanding the processes responsible for the formation and occurrence of these resources. The earth science curriculum is the most appropriate forum to introduce students to the scientific background behind the global

distribution, finite nature, and scarcity of earth resources.
Second, extraction of non-renewable earth resources is a $1.44 billion industry in Minnesota, and plays - and will continue to play – a leading role in our economy. Students should have at least a basic understanding of the scientific background to this key industry.
Finally, a significant reason for society's interest and research in earth science is the demand for non-renewable earth resources. A well-balanced earth science curriculum would acknowledge this relationship.
I feel the standards are too broad at the junior high level. I believe that life science, earth science, and physical science should each be taught for a full year and the standards should be written to reflect this specialization.
Many of the benchmarks proposed seem to be very difficult for third grade students. I feel the material you are considering is way too deep for third grade students. For example, under Life Science, the following is listed: Students will know examples of diverse life forms in different biomes, such as oceans, deserts, tundra, forests, grasslands, wetlands, and some of the structures that allow them to survive in that biome. Right now we teach the children about oceans, deserts, and forests, but we don't go into an indepth discussion even of these. Remember, our children are only 8-9 years old. Much of what is proposed, I feel, could be age-appropriate if it is greatly simplified and very specific (and narrow) outcomes are given.
I feel (as do most other educators)that science is best learned with hands-on activities -- are we able to do that with all these new standards and benchmarks? Reading and Math subjects should have benchmarks with no child left behind, but not so much with Science and other areas in the elementary years. Are these new Standards a good use of taxpayers' money? Are the schools going to have to buy different textbooks and materials from what they have now? I think we have great programs in place already in our schools in Minnesota in the science areas. (Yes, there's always room for improvement, but why are we trying to 'reinvent the wheel'? as it seems you are doing!!) Please listen to our teachers and principals and re-evaluate what you are doing!!
HISTORY AND NATURE OF SCIENCE - Students will understand that when a science investigation or experiment is repeated, a similar result is expected. Same benchmark for grades 2, 4, and 5. But, they are under the standard "The student will understand that science is a human endeavor practiced by civilizations throughout the world" in grades 2 and 4, and under the standard: "The student will developp an expectation that there is order in the natural world and it is discoverable" in grade 5. They should all be under the same standard, preferably the one for grade 5.
Students will understand that science is a tool that can help investigate and solve environmental concerns. Same benchmark for grades 3, 4, and 5. Too redundant. Pick one grade only.

Students will understand that science should be used responsibly. Same benchmark for grades 3, 4, and 5. Only, in grade 5, it is listed under a different standard. Only need it listed in one grade.
HISTORY AND NATURE OF SCIENCE:
Three standards that all mean nearly the same thing. Should be combined into one that can be used by several grade levels:
The student will understand the nature of scientific investigations; The student will understand the process of scientific investigations; and The student will participate in scientific investigations.
Under the standard, "The student will understand basic electricity and its application in everyday life," at teh fourth grade level, add a benchmark related to "The student will understand how to use electricity safely."
Nice selection of science topics that lend themselves to inquiry skills, as well as building knowledge of science concepts and terminology. Quite doable and likely to inspire an interest in science among elementary students and teachers.
Under the standard, "The student will understand that energy exists in many forms and can be transferred in many ways," add a benchmark: Students will identify ways in which energy can be conserved. (gr. 5)
HISTORY AND NATURE OF SCIENCE - Under the standard, "The student will understand the usefulness and consequences of science in our interaction with the natural world," add a benchmark related to conservation of resources, reduce, reuse, recycle, etc. Perhaps at grade 3 to replace "Students will understand that science is a tool that can help investigate and solve environmental concerns."
Combine the standards: "The student will recognize weather cycles" and "The student will describe the weather in terms of temperatures, wind speed, wind direction, precipitation, and sky cover."
The standards, "The student will understand the water cycle" (grade 2) and "The student will understand that water on Earth cycles and exists in many forms" (grade 4) should be combined into one standard and used consistently for both grades (if you really think it should be taught in two grades). Better yet, pick one of the grades and avoid the redundancy.
Delete the standard: The student will understand that the human body is made up of parts. It is too obvious and broad.

Delete the benchmark: The student will observe and describe major features of the body including but not limited to eyes, nose , heart, skin, arms, legs, and muscles. Replace it with a benchmark for first grade: The student will identify the five senses and their related body parts (under the standard: The student will understand that they have five senses)
The fourth grade benchmark "Students will identify the major organs of the following systems: digestive, circulatory, nervous, skeletal/muscular, and respiratory, within the human body" is too broad for one grade. I suggest that you focus on one or two systems each year over grades 2-4. For example, grade 2: digestive and nervous systems
grade 3: skeletal/muscular
grade 4: circulatory and respiratory
A) The draft standards take all individual local control and flexibility out of every grade until the 9-12 grouping. It would seem more practical to group the standards into levels or grades, such as was done with the 9-12 standards. Perhaps groupings such as K-2, 3-5, 6-8, and 9-12, would be more logical.

B) Not all schools systems in Minnesota are grouped K-8 then 9-12, but rather we have a plethora of groupings. Since I began teaching in Bloomington we have transisitioned from a K-6, 7-9, and 10-12 system to a K-4, 5-6, 7-8, 9-12 system to a K-5, 6-8, 9-12 system of school groupings. Or perhaps allow districts to develop their own groupings and be accountable to cover the required material over whatever system they set up. Also, due to laboratory situations, are all grades prepared with resources to handle the standards where they are placed. In other words are gas burners, water, electricity, appropriate ventilation, and most importantly, safety features present to be able to teach up to the standard? See Comment A for a way to partially solve this issue.
C) Please remember the often left out middle years (call them 6-9ish grades) where licensing of teachers often overlaps. Example: a teacher may teach science under a K-8 Elementary General Science License, while right next door a teacher may have a 9-12 Life Science License with Middle School Licensure. Which would have a better in-depth knowledge on Life Science? Or General Science (such as proposed with the draft)? Depending on how you mandate the standards seems to favor one type of license over another - if so this will make no sense to the licensed teachers who are “left holding no job.” Or perhaps will the Department of Education take this into consideration and change the science licensure again over the middle years? I have no simple answer to the license question except allow the districts to group the Benchmarks together as suggested in Comment A above.

D) With any standards based effort the teachers and students will need materials to study, investigate, and use as resources. Having just gone through our District’s revision of Textbooks, looking at all types (integrated texts (some Physical Sci, Earth Sci. and Life Sci in every grade text) vs. course specific texts (one text dedicated to a particular science subject) vs. mini-texts (a set of 15 mini-text books, basically each mini-text is a chapter/unit of larger course specific text) no text or series of texts seems to match the random assortment of standards from each of the four Major Areas in science. Is the State then going to provide materials which are inline with the standards for each level?
) After reviewing the Benchmarks within the Sub-Strands entitled “Scientific Enterprise” and “Historical Perspective” in the History of Science Strand I am not sure what is expected. They seem quite vague and nondescript, moreover they seem like students need to make lists or gather information or write reports to accomplish many of the Benchmarks. I may be on a limb but how does someone evaluate whether a “student will know that science and technology are highly vigorous human efforts that both influence and are influenced by civilizations worldwide” and “student(s) will understand how scientific discovery, culture, societal norms, and technology have influenced one another in different periods of time.” Even the Benchmarks seem vague, is the point to “cite examples,” “relate,” “evaluate,” or “recognize” exactly what or who or how or .... ? I guess I need more specific wording or examples of what to do, how to judge and evaluate, and what some of them mean.
Follow my math here: I added up each grade levels number of Benchmarks as outlined in the draft. K=5, 1st=9, 2nd=17, 3rd= 30, 4th=32, 5th=20, 6th=49, 7th=70, 8th=82, and 9th-12th grades=115. It seems like it is not such a logical progression, we have lowered the total Benchmarks in 5th grade and really increased them in 7th & 8th (even at a rate that is greater than the 9th-12th grade level (assuming that every student must soon take two years of high school science (remember that one of them must soon be Biology) to graduate allows me to average the Benchmarks to basically 58 per grade in high school (remember this estimation is for only two years of high school science that (thankfully) will soon affect all our upcoming high school students)). Now, of course the number of Benchmarks has nothing to do with there difficulty, but the number does affect in-depth study. Perhaps the draft is concentrated too much (maybe move or eliminate Benchmarks) in some grades?
Since grades seven and eight have so many Benchmarks to cover in on year, I am afraid of general studying versus in-depth investigation. Example: 8th grade’s 82 Benchmarks means covering and evaluating a Benchmark basically every other day of class. Yikkes, talk about a laundry list of cover this, evaluate this, repeat with a new “this” every other day. Where is the time for in-depth discussion, role play, evaluation, laboratories, field trips, and computer room time (especially to do research)? Or don’t we care about that in the “new” testing of facts? Many of the most impressive learning environments take time to produce, rather than rush through. Example: It would be great to use the new draft (p. 19, Stand I, Sub-Strand D the 4th Benchmark to have an in-depth debate over “how science contributed to your idea of what was the greatest change in government (revolution), agriculture, manufacturing, sanitation, medicine, warfare, transportation, communication, or information processing (which I am unsure what that really is). which will take time to do properly, much longer than the two days time average which the large number of Benchmarks seem to dictate. But the reality is to create a great learning environment for a

evaluation and learning technique such as the example takes more than two day to do. When forced to become "Accountable" in covering the numerous Benchmarks, many great lessons, like the example, will go by the wayside because of time concerns, and will often be replaced by basic factual learning and regurgitation of some facts that may be relevant to one place in history and time. Perhaps, it is better to learn, understand, relate, and live particular skills rather than learn a lot of stuff and not be able to use it? Somewhere there is a happy medium between rote learning (due to time and amount of material to cover in many grades within the new draft science standards) and strictly process based learning (the old Graduation Standards). Once again I suggest it is better to learn and use your knowledge now and in the future rather than have facts or ideas stored or forgotten about in your brain.

In my reading over the draft, I often found a Benchmark or part of a Benchmark repeated from one grade level to another. Example: on page 11, the third Benchmark in Stand III, Sub-Strand C is basically identical to page 15, the first Benchmark in Stand III, Sub-Strand C.

Another oddity is that the Sub-Strands and Benchmarks seem to have no continuity to them or where they are placed. Example: The Life Science Sub-Strand Heredity, one you read the Benchmarks in grade 1 + 3 are quite similar, then the one's for grades 6, 7, and 8th grade are again related. It seems more logical to continue with similar ideas at one time rather than dibble one Benchmark here and another two there so that a topic gets brought up in isolation.

Furthermore, I am concerned that this "dibbling" a related Benchmark here and there over the years or repetition of topics will become "we already did that" by the students as similar labs, examples, and projects get used over and over again just adding and extra piece to meet the Benchmark. Rather to an increase in exposure and more concepts the students are repeating or skimming similar concepts often year after year. This repetitiveness of Benchmarks and Sub-Strands often occurs in student's studies year after year, rather than allowing in-depth focus on a new or different topic.

Accountability is a good and proper goal of education, but isn't the greater goal to aid in creating a responsible member of the country? Currently one way that schools are accountable to "do a good job educating students" are in the forms of yearly tests. Please note I left out a student's or parent's accountability because it seems we shifted that to the "schools." Even in some topics (reading, math, and writing) we have Graduation Tests, where a student must score at lease 75% correct to graduate. In the search for accountability in science it seems the state has a different view from. Maybe we all need to look at some kind of test or tests in science. May I suggest a "Graduation" like test offered to all students in an advanced grade (say 11th) which covers all four major Stands within the science discipline.

Or even give the science test (covering all four Strands) as a yearly test much like the current MCA's and CALT's are given. That way everyone can see areas of growth and weakness (especially given that some Strands may not be covered in detail until later in a child's academic career.) Then, at a predetermined grade the students could take the Science Graduation Test (see the next paragraph for more details on the Grad. Test.)

Or perhaps, three or four mini-tests where each test covers one Strand. Students then would take a test in "Life Science," "Earth and Space Science," "Physical Science," and "History of Science" or perhaps roll the History of Science Strand (due to its awkward evaluation problems within some sub-strands as I mentioned in Comment E) into the other three tests. Once the tests are created - it would be a natural fit for school districts to align curriculum within each discipline. I am not suggesting the state mandate that a certain Strand test be given in grade X, but allow the individual districts to place the Strand tests where they feel it is best for their local situation - as long as they get them all accomplished. Thus, District Q may give the Life Science test during 6th grade, the Earth and Space Science Test in 8th grade and the Physical and History of Science Test(s) in 10th grade. While District Z may choose to may give Earth and Space Science Test in 7th grade and the Physical and History of Science Test(s) in 8th grade, and the Life Science Test in 9th grade.

Parents want to know what is the general theme of each class. That was made clear to me a few years ago. The students were enrolled in classes with generic titles such as " 7th grade Math" and "7th grade Science." Of course no student, or worse yet parent, knew what was taught in each class. Now, it seems simple to say that math was taught in "7th grade math" but what, general math, fractions, pre-algebra? Now we have "CMP Math, " Pre-Algebra," CPM Math," among others, and the students and parents know what is taught in each math course. Seventh grade science used to be a meshing of Life Science and Physical Science, but students and parents would wonder when we were to cover "chemistry" or "space" or whatever because the title of the class was too broad and general. Once we (the District) aligned the science curriculum with Graduation Standards we renamed the class "Life Science" and hardly anyone wonders what is covered in the class now. I bring this up because it seems that the draft science standards forces science courses to do two things. The first is become more basic and general, the second is due to generalness not have a very good explanatory name.

Grade 8 IV Life Sciences B. Organisms #1

Middle school students are experiencing great changes in their bodies and minds as they go through puberty. Providing them with an age-appropriate understanding of brain structure and function and its control of all the other organ systems will make science relevant for their lives. As a frontier of contemporary experimental science, neuroscience has the potential to motivate and excite students at a time when many loose interest in anything scientific. While digestion and lung function may be important, emphasizing these in lieu of a topic that explains how they themselves learn and develop, does them a disservice. Middle school students need to know how their synapses can be strengthened by practice and manipulated by street drugs. While textbook material is woefully poor in this area, excellent curricular material is available online or through the University.

The emphasis on content knowledge alone goes against the intent of the National Academy of Sciences National Science Education Standards and the American Association for the Advancement of Science Benchmarks 2061 which emphasize the process of inquiry and the critical thinking skills one develops through the doing and practice of scientific observation, experimentation and analysis. This curriculum appears geared to regurgitation only and as such will not serve to educate citizens with the critical thinking skills needed to embrace new technologies and to create innovative solutions in industry, business and social policy into the 21st century.
Minnesota Statues Section 115A.073 dated 1998, set specific goals for Environmental Education for all citizens. It states " Pupils and citizens should be able to apply informed decision making processes to maintain a sustainable lifestyle." In the 2002 Minnesota Report Card on Environmental Literacy, 90% of Minnesotans showed support for environmental education in K-12 schools, yet in the Science standards the Environmental Systems portion has been removed from the 9-12 grade level. Throughout the standards there is no focus on interactions or cause and effect relationships between humans and the natural world. How are we to have an environmentally literate citizenry if we don't show the connections between humans and the environment? There are many missing pieces that need to be added that would help reach benchmarks set in the Environmental Literacy Scope and Sequence. Examples of these benchmarks include: (grades K-2) natural and social systems may not continue to function if some parts are missing; (grades 3-5) social and natural systems may not function as well if parts are missing, damaged, mismatched or misconnected; (grades 6-8) social and natural systems are connected to each other and to other larger or smaller systems; (grades 9-12) it is not always possible to predict accurately the result of changing some part or connection between social and natural systems, and interaction between social and natural systems is defined by their boundaries, relation to other systems, and expected inputs and outputs. Looking across the grade levels as a whole there is a lot of repetition that often negates a sequential building of knowledge. For example, in both grades 1 and 2, "the student will understand that plants and animals have life cycles," and weather is studied in grades 1, 2 and 3. Environmental knowledge needs to be emphasized and built on in a logical fashion from K-12 in order to create a basic understanding of the natural world on which we live.
Standard 2; I do not think that it is appropriate to use "goggles, heat sources, electricity, glass, and chemicals and biological materials" in a Kindergarten classroom, let alone devoter time teaching safty of their use.
The Earth and Space Standards cover too much material.

You need to cut down on the topics.

It appears that you opened up a college text book and followed the table of contents.

The course is for high school students and that amount of material and topic depth as listed in the Earth Science standards is way too much.

In the Physical Science area there is not enough chemistry. You are missing a major component of the typical 9th grade curriculmn by not having more Chemistry standards.

Most of the standards are a mile wide and a mile deep. Again your committee are not realistic on what can be accomplished in a typical highschool classroom. You are pushing memorization and not enough application. Easy to test memory, but if the students can not apply knowledge, they have not learned anything.
In substrand B-benchmark 1-what are the simple tools?

In benchmark 2-do you really want us to teach kindergartners about chemicals and biological materials? Do you really want us to teach about electricity and heat sources?? How about replacing the benchmark with a simple -will teach students appropriate safety in the classroom regarding science materials.
I am a middle school science teacher. At a school forum regarding the integration of the 3 sciences at the middle level I heard that many districts don't support this change. It was said of surveys distributed 50% favored the proposed middle level changes. None of our science
department,received such a survey. If we had,we would have STRONGLY opposed such a proposed change.Our Commisioner said that this would need to be seriously looked at for potential change from the first draft. Sciences at the middle level need to remain full year courses. WE are very proud of the fact that we are able to teach IN DEPTH core subjects & provide differentiation and enrichment for our students that need it most.To try to incorporate all the strands into one year is a step backwards in progressive instruction. Empower school districts and their science teachers. Allow the teaching of these strands throughout the middle level years and not force all strands every year. I fear if we do not edit the first draft,the licensing and cost implications to our State and local school districts will be staggering. There are many vetran teachers licensed in a specific subject matter with a 7-12 endorsement.Do district's have to offer courses on a trimester basis? Do middle level teachers "bump" to the high school to stay within licensing requirements in order to stay "highly qualified"? Do we lose science teachers all together because of licensing restrictions in a time when we are in desparate need of qualified teachers in these areas? The cost for new materials, curriculum overhaul, supplies and staff development is overwhelming. I am so deeply troubled by this proposed change. We should be proud of the fact that we rank

second in the world on our science test scores. Let us please look at what we are doing well for our youth and enhance our current programming.
The middle school standards are overwhelming for that age group. There are too many to adequately cover them to a level where students know and understand the information.

Logistically covering all three strands at each grade level would be difficult with the absence of lab materials and books that cover all of these topics at age appropriate levels. It will cost school districts a lot of money to begin replacing books and buying lab equipment to meet student needs.

A suggestion would be to have the strands listed as 6-8 and have individual school districts determine at what grade level standards and benchmarks will be addressed.

It would be helpful to have clarification on the what the testing will focus on, either the standards or the benchmarks. I think it makes more sense to focus on the standards in the test. Teachers can then use the benchmarks as a guideline to help them teach to the standard, but the benchmarks would not be required curriculum.

There is also a concern in terms of teacher expertise at the middle school, being watered down. In our district most middle school science teachers have licenses in the field of life science, earth science or physical science. The proprosed standards for each grade level, will have teachers instructing students in subject areas, where they lack expertise. In the end, it adversely affects the education of students. It also works against the NCLB, which is working to ensure qualified teachers in every classroom.

It would also make sense to group the elementary levels as well, giving individual school districts the opportunity to meet the standards in a way that best fits their population.

It is also important to keep creationism out of the science classroom. It is not science. There have been several court cases documented by the NABT and NSTA that support this stand.

Thank you for taking time to receive input before developing final standards.
Any one of these units can be taught, but certainly not all of them. Currently most of MN schools teach 3-4 different areas, one from earth, life and physical science along with the scientific method. Most classes are limited to 30-40 minutes.
In our district, we are noticing the large emphasis on Earth and Space systems at the High School level. Does this mean that other Biological/Physical elective classes have to be cut? What about the students that are in need of these electives?
The amount of earth/space science the standards are expecting are ridiculous! In an age of technology in the fields of biology, physics and chem...the idea that all students are required to take a course about rocks and only take anat/phys, chem or phys as an elective is absurd. We need to prepare children to live in a world that they can understand and manipulate themselves in. The excessive over exposure to earth science does not do that for our children. It needs to be an elective choice! Also, have you thought about how few people are licensed to teach Earth Science at a high school level??????
Dump these too.
The benchmarks themselves are good, but the subjects (strands) and sub-strands should not cross grade levels. Part of the reason MN has been successful at teaching science at the middle school level (TIMSS report, 1995) is because of its consistency with curriculum at a given grade level (7th=Life, 8th=Earth, 9th=Physical). The proposed document is counterproductive to this already logical arrangement. The proposed document suggests that we (teachers) are supposed to teach a little something about a concept in seventh grade(eg. Structure of Matter). The student is then expected ot remember all of this information until the next year, so the next teacher can build on this already "learned" information. There are multiple problems with this; a) too much re-teaching, b) student mastery of the concept is improbable, c) teacher licensing/ expertise issues and, d) materials to teach the subject thoroughly may not be available to best teach students with. Thank you.
In a recent report on environmental literacy, 90% of Minnesotans showed support for environmental education (EE) in K-12 schools. This corresponds with national and state statistics. And yet, environmental systems and EE have been removed from the proposed standards. In this world natural systems and social systems are constantly interacting. In addition, Minnesota Statues Section 115A.073, set specific goals for EE. “Pupils and citizens should be able to apply informed decision making processes to maintain a sustainable lifestyle. In order to do so, citizens should: 1.) understand ecological systems; 2.) understand the cause and effect relationship between human attitudes and behavior and the environment; 3.) be able to evaluate alternative responses to environmental issues before deciding on alternative courses of action; and 4.) understand the effects of multiple uses of the environment.” In order to reach this goal it is important that EE remain a part of the new standards. In their current draft form, the Environmental Systems portion has been removed from the 9-12 grade level. In addition, there is almost no mention of the impact of humans on the environment and of the impacts of environmental degradation on humans. The interaction between the two is virtually absent with the exception of soil erosion. How can students (some of whom will become the industrial, political and public policy leaders

of tomorrow) “apply informed decision making processes to maintain a sustainable lifestyle?” It has been demonstrated that students become engaged in effective learning through EE. A nationwide study demonstrated that using the environment as an integrating context in multiple subject areas significantly improved student learning and behavior. Many students are better served through EE strategies than through more traditional science instruction. Environmental science/studies should also be required for students in every high school in Minnesota.
I am worried about the age appropriateness of Benchmark #2. I am not sure it is appropriate to have Kindergarten students around these items, especially not using them.
Benchmark "Students will understand that science should be used responsibly" could easily be manipulated to fit a particular political agenda. This should be dropped from lower grades and addressed in high school levels where students have the perspective to distinguish between scientific knowledge, research/experimentation, and applied technology and the corresponding different ethical issues.
Some of the standards did not seem to be developmentally appropriate for first grade students. First grade teachers fell our most important job is to teach students to read, and this takes much of our time each day. So many of us were wondering if there were too many science standards in listed.

General Comments from Moorhead (9/15/03):

"I have heard and know that class sizes are a problem here and in other places in the state. My son is in a high school science classroom with 34 students. Lab rooms are designed for 24-28 students for a reason. I’m frustrated at the amount of money that was spent on grad standards and the Profile (millions) only to have a new administration come in and spend millions to rework them. These millions could be redistributed to the individual schools to reduce class sizes and greatly improve the quality of a student’s education."

"Minnesota needs rigorous standards that ensure our citizens receive an education that will allow them to compete in a global economy. “INTELLIGENT DESIGN” is not science – it is theology, and belongs in a religious studies curriculum. Our students should be taught science in our science curriculum. “Intelligent design is theology masquerading as science. INTELLIGENT DESIGN has no place in science classes and should have o place in science curriculum standards."

"If we stick to the benchmarks as written, little time can be spent with inquiry based science, the science research supports as the best way students learn. I support keeping the middle level sciences as stand alone science, i.e., 7th grade Life Science, 8th grade Earth Science and 9th grade Physical Science. It is in these year-long stand alone science classes that students learn how to do science. Less is More!

"Important to state science standards precisely."

"In favor of science standards as written."

"Make-up of committee is a fine make-up."

"Ask scientists what they think – NABT, NSF, ASRS."

"Don’t present speculations."

"Science needs to be taught through inquiry – need small class sizes."

"Supreme Court does not mention Intelligent Design – slicked-up version of Creationism."

"Earth science should not be broken up – districts won’t offer them."

"Strongly support strong and well-balanced

- Take advantage of new discovery – Brain Research
- National documents
- Student investigation of natural phenomenon
- Time for meaning
- relevant"

"Too heavy in 9-12 benchmarks."

"Try to test for investigation process."

"Don't like early version of evolution."

"Green print for environmental education (going away)."

"Reflect best possible scholarship – who we are, how we got here."

"Guard against creationism in standards."

"Creationism is not science, it is religion."

"Applaud process of science – teach what is discovered."

"Science is a global process."

"Environmental science – Is it a required course?"

"Need to cover more than 4 senses/more than 3 states of matter."

"Of benchmarks, do not leave time for inquiry, explanation."

"Dislike 7th & 8th Life, Physical, Earth – Need year long science class: 7Th – Life; 8th – Earth; 9th – Physical Science."

"Need Earth Science – under minimum 1 year -- students need to learn about Earth Science."

General Comments from Fergus Falls (9/16/03):

"I would like to know if there will be any flexibility in grade placement for elementary standards. The reason I believe this would be advantageous is the reading series used in one of the schools I work with have a science connection unit at each grade level. At 5th grade, the theme is the Solar System, yet the solar system is addressed to some degree at almost every grade level except grade 5. Standards in 7th and 8th grade address all areas of science – physical, life and earth science – each year. Yet textbooks are not written that way. Generally 7th grade is life science and 8th grade is earth science or vice versa. The physical science standards for 7th and 8th grades are typically taught as a year of physical science in 9th grade. These standards need to be high school standards in order for students to meet the three-year credit requirement. The number of topics seems excessive, especially in 6th grade. In many of our schools, 6th grade is still an elementary year in a self-contained classroom that focuses on reading, language arts and math. Science is not taught everyday all year for 45 or 50 minutes. On a positive note, the Life Science standards at the high school level seem to be right on target."

"We need flexibility."

"Grade 5 – needs standard on Solar System."

"Textbooks usually do: 7th gr. – Life Science; 8th gr. – Earth Science; Move Physical Science to 9th grade."

"100%: 7th grade – Life Science; 8th grade – Earth Science; 9th grade – Physical Science; High School = Biology, Chemistry, Human Physiology. "

"Our 6th grade is self contained and we do not teach science every day."

"We spiral: Life, Physical, Earth in K-3, 4-6. Then in grade 7, teach one science per year."

"I want to see the Santorum language added here – I want the Santorum amendment in this document."

"Students should be able to hear about all theories, even controversial ones."

"Our teachers like the Physical and Life Sciences."

"Chemistry is well done, but needs more on solutions."

"Physics – well done, esp. in electrical. Needs to include energy changes, waves/light/sound, and some organic chemistry."

"Please denote standards for all and standards for advanced at the high school level."

"This year, in our newly selected science curriculum, second grade is emphasizing physical science. First and third grade are doing more life and earth science. This was decided so that teaching could have more depth. If we do everything every year, we will never do more than scratch the surface."

General Comments from St. Paul(9/22/03)

" When I think of science as a subject to be taught, I think of evidence, observation and measurable proven facts. I do not equate that with opinion, belief, philosophical thoughts. I was very disappointed that the theory of evolution was going to be taught as fact. We all know that the theory of evolution is a belief, an opinion held by some. Being a theory, it should be a clearly taught as such. How is it the flaws in evolution are not taught, nor is evidence that conflicts with this theory? The would be the scientific approach. The legislature gave direction that the standards be measurable and objective. Students are to learn and be tested on academic knowledge. The evolution theory does not contain scientific objective factual knowledge. The evolution theory does not contain scientific objective factual knowledge. It does not even apply scientific principles; it is just a theory held by some."

"Thanks for this opportunity to help our kids. I suggest we use the Santorum Language approved by congress to be used into the new standards. REF: On June 13, 2001, U.S. Senator Rick Santorum amended the Federal Better Education for Students and Teachers Act. Signed into law, we must not allow the censorship of evidence that does not support evolution. Students should be allowed to receive pros and cons of evolution. –Should be given the facts that show the problems with evolution. "Intelligent Design" should be offered also."

"My undergraduate background is in chemistry and biology. Have been an elementary classroom teacher and teacher of science for many years. Have worked with teachers over the years in in-service training in appropriate practices in the teaching of science. In-service training involves working on developing accurate purposeful content. Instructor at Gustavus Adlohus College. Doctorate in program in science and math education with a content science-supporting program in environmental science.

"Evolution is science. Religion is NOT. Teach evolution. Do not support or teach a single religion.

"The National Research Council has a well-accepted, well thought out set of national Science Standards. Many professionals invested years coming up with standard that would be acceptable for an entire nation. Why should we adopt standards for Minnesota that were developed in a hurry by a small group, doesn't make sense to me. If the national standards are good enough for a nation, why are they not appropriate for Minnesota? The current standards embrace a fractional approach to teaching science."

"I have a B.S. in Elementary Education with a minor in science and an M.A. in Counseling Psychology. First I'd like to thank Commissioner Yecke for this public forum. I've read through the science standards, and I applaud their exemplary focus on content and objective knowledge. I also appreciate how the scientific method is reflected throughout these standards. For ex., on page 17, the standards state: students will explain how scientific knowledge is subject to change as new evidence becomes available." And on page 22 the standards state: 'students will be able to explain how new evidence can challenge accepted theories and models, including cell theory, atomic theory, theory of evolution…' This is good science, as the scientific method required that all theories and even laws be tentative and open to new evidence. However, I'm concerned that some parts of the standards dealing with evolution seem to violate the scientific method. A brief review of this method may be in order, though this will be very basic for some of you. The scientific method begins with observation and leads to a hypothesis that must be tested. If test results contradict the hypothesis, scientists discard or revise the hypothesis, and continue testing until there are no observed inconsistencies between the hypothesis and the test results. A hypothesis that has been tested by large amounts of data may become a theory that has been successfully tested over several generations may eventually become a scientific law. As the standard state, 'scientific knowledge is subject to change as new evidence becomes available…' The gocentric theory of the solar system proposed by Ptolemy in the first century A.D. is a good example of a theory that was later challenged by the new evidence. Unfortunately, bias from the church suppressed the work of Copernicus, Kepler, Galileo and others. The geocentric viewpoint's deathblow did not come until 1687, with Isaac Newton's publication of heliocentric theory. Even scientific laws must be tentative. For example, Einstein and other scientists found that Newton's Laws could not explain certain problems. Quantum mechanics became the guiding principle, though Newton's Laws are still sufficiently accurate for most all aspects of daily activity.

An earlier draft of the new science standards that appeared briefly on the Department of Education Web site follows good scientific practice, in that it allows for such tentativeness. It does not portray evolution as above scientific scrutiny, but simply acknowledges evolution as a possible explanation. This draft was rejected by some on the committee who seemingly want to deny students the option of scientifically examining any evidence used to support evolutionary theory. For ex., 'the rejected draft states [emphasis mine]: The student will explain how evolution **may provide** a scientific explanation for the fossil record…' The accepted draft states '… evolution **provides** a scientific explanation for the fossil record…' The rejected draft draft states: 'Students will recognize that… approximately 3.5 billion years, **may be necessary** to explain the variation of the species…' The accepted draft draft states: 'Students will recognize that… approximately 3.5 billion years, **is necessary** to explain the variation of the species…' The wording in the original version provides consitency in promoting scientific integrity throughout the standards. The scientific method has been so instrumental in the advancement of science requires that all scientific theories and even laws at least be open to further testing. Minnesota students need to practice the scientific method – let's not encourage them to violate it.

"Scientific study should be taught with sound and provable ideas and distinguishing between theory and known fact. The Santorum amendment is part of H.R.1 and should be the guideline for controversial subject matter. Keep up the worthy efforts of establishing a foundation for learning."

"Need more evolution in early grades."

"Applaud scientific method in standards. Pg 22, 17 'this is good science.'"

"Evolution section violates scientific method."

"Disappointed that evolution to be taught as fact."

"Physical science in full."

"Evolution should not be taught as fact – not objective and measurable – need latest evidence on evolution – state mandates conclusion on evolution."

"Trust teachers."

"Environmental issues change fast."

General Comments from Willmar (9/24/03):

"Pleased that evolution is included in a science."

"The teaching of creationism has no place in the sciences."

"Evolution is a theory. Many of the foundations of it have been proven false. This is a "science" built on a shaky, sandy, weak ground."

"I do not want evolution taught as a fact. It is a theory. There are other theories out there. "

"If you can't teach creationism in science, why can't it be taught in history? The Declaration of Independence says 'all men are created… and endowed by our Creator…'"

"Theories are theories – to say otherwise is dogmatism. "

"Very usable. "

"The Profile raised the bar and I applaud it. "

"Best practice and research-driven strategies need to be in these standards. The framework was extremely useful. "

"Evolution is a theory. The Big Bang is a theory. I am a teacher and each of these is falsifiable. Creationism and intelligent design should not be mentioned at all. These cannot be mentioned at all. These cannot be proven true or false. "

"There are PBS shows on evolution and on intelligent design. There are university courses – even at the U of MN – on evolution and intelligent design. Our kids are exposed to these theories – alternatives to evolution – and we should not have our heads in the sand about this. "

"The breadth of the standards makes it impossible to teach them with depth. I'm very concerned about the rote knowledge requirements as well as the focus on facts rather than understanding. Way too much detail and not NEARLY enough opportunity to teach students to think. Please reduce the number of factoids and ensure that the future leaders of our country learn how to analyze, compare, relate, apply, synthesize and evaluate. Thank you! "

"I am a science college professor and I am very happy with these science standards. This is what I want students to know when they come to me. "

"Do not try to sneak intelligent design into the science standards. "

General Comments from Worthington (9/25/03):

"7th grade science should be life science, 8th grade should be Earth Science, and 9th grade should be Physical Science. "

"Our new textbook doesn't align with 3rd grade and 4th grade. "

"I don't see much problem with high school standards. "

"Science – we can do this, but have concerns about:
-- Reorganization (Life Science – 7th; Earth Science – 8th; Physical Science – 9th)
-- Money
-- Time for students; need more time. Need time to "do" science, not just facts and figures. "

"Need more "hands-on" exploration. "

"Need math background sooner for science standards. "

"Need fewer standards, with more rigor. "

"Most high school standards are doable. "

"Only one benchmark on environment – should be whole class. "

"First grade should have more hands-on (magnets, life cycles). "

"Completing and designing their own experiment would be time consuming, need resources. "

"Need more anatomy benchmarks. "

Need to have grade 7 life science and grade 8 earth science.

We just bought a new science curriculum and it doesn't match.

I am a middle school science teacher and we can do this!

Keep grade 6 as general science, 7 life science and grade 8 earth science.

I worry about my special ed and LEP students meeting these standards.

We want more time to do science, not just learn science. Please consider consolidating—a shorter document will give us more time for hands-on activities. We want kids to enjoy science—we want to make science rigorous and fun!

You should have allowed educators, not parents and non-educators, to write these standards. We are the professionals. It is insulting that only 40% of the committee was made up of teachers.

Page 25: Need more on environmentalism.

We have only 30 minutes a day to teach social studies, science and health. That's 30 minutes total.

Grade 1 – add magnets.

Please teach evolution for what it is – a theory.

Page 29, 9-12 in heredity – please include hereditary defects, such as Down's Syndrome.

9-12: Please include Jurassic, etc.

General Comments from Cloquet (9/29/03):

"Good comments on the Web. "

"Evolution – Observable – Do not step beyond these bounds. "

"Need a better definition of evolution – 7 different kinds – from cosmic to chemical to planetary to biological to organic. "

"Thank you for looking at K-2 as a range and not as specific. "

"We'd like to see science as a range for elementary level, middle and high school level. "

"We want enough time to give hands-on experiences in K-5. "

"For 6-7-8, give standards like for 9-12, and allow each district to teach them where they want. We need this flexibility. "

"Life Science – grade 7; Earth Science – grade 8. "

"In a K-6 school, the integrated approach would be good. "

"Good starting job – academically focused. "

"Evolution – Keep to rules of science – falsifiable, observable. "

"Big Bang is not reputable; it is theory. "

"Our hands-on curriculum may not work with standards. "

"Middle school standards should be lumped together by grade span (6-8 grades). "

"Be careful of depth vs. breadth – need to learn things inside and out. "

"6th grade may not be doing science everyday. "

General Comments from Princeton (9/30/03):

There is no question—creationism is a religious belief and not science. Evolution is a fact and cannot be disproven.

I want both evolution and creationism taught. Children should be able to choose which one they believe and not be forced to hear only one side.

Please use the Santorum amendment language. Students should know the controversies surrounding evolution.

As a teacher, I want to honor the complexness of our students.

Science-based creation science teaches that the universe started by someone, somehow. There is a lot of information out there.

Religion and faith are not testable-observable. Only evolution should be tested. Parents can address religion.

Evolution must be recognized as a theory. Intelligent design is an important theory that must also be addressed.

Gr. K, strand I, B, 1st standard, 1st benchmark: unclear, what do you mean--simple tools?

Gr. K, strand I, B, 1st standard, 2nd benchmark: use of goggles, etc. – inappropriate.

Teaching the groups of standards at middle school will be problematic due to licensure issues. NCLB: Many of our middle school science teachers are only licensed for life science. At the high school level, there will be licensure issues with all of the earth science classes.

Cells in 4th grade isn't developmentally appropriate.

Was the science atlas utilized in developing these standards?

Thanks for getting specific in science.

Energy transformation in 5th & 6th seems to overlap. Could these be meshed together? Motion combined also so it is in one or the other grade level allowing for more in-depth study.

Thanks for including inquiry.

I commend the social studies and science committees for the excellent drafts presented for review Sept. 30, 2003.

I suggest the science committee find ways to introduce a new branch of life science, glycobiology, to all grade levels because glyco-nutrients have been scientifically proven to enhance our immune system functions. Herbs, e.g., Ginkgo Biloba, for memory improvement.

If we must teach evolution, we need to at least teach creationism as most of us did not evolve from monkeys. If children are lied to about the beginning, how can they believe us (parent)?

Memory work is very helpful.

My biggest concern is the egocentric strand throughout the standards that seems to teach the American point of view as the "most important" view for our children to "buy into."

Another concern is the emphasis on rote learning – memorization of facts, times, dates, names – not the critical thinking skills involved in examining different points of view – skills our young people will use (and need) as they grow and develop into our nation's leaders.

What schools were surveyed about integrated science? What research supports integrated science? What is the reasoning behind picking integrated science?

Retain the language used in various History and Nature of Science sections (5/4/I/B; 8/6/I/A; 12/7/I/A-B; 12/7/I/A; 12-13/7/I/B; 17/8/I/A-C; 22/9-12/I/A; 23/9-12/B,D) re definitions and good practices used in science, especially definition and differentiation of hypotheses, theories, proof/disproof, challenges, and documentation.

Retain the language used in various Earth/Space Science and Life Science sections (2/2/IV/E; 4/3/IV/D; 5/4/I/B; 7/5/IV/E; 11/6/IV/D; 16/7/IV/D-E; 20/8/III/A,D; 22/8/IV/E; 26/9-12/III/A; 27/9-12/III/D; 28/9-12/IV/B; 29/9-12/IV/C-D; 30/9-12/IV/E-F) re standards in geological history and origins and in evolution and other biological processes.

Do no under any circumstances add comparisons or references to Creation Science, Creationism, Intelligent Design, or other cultural/religious postulates and beliefs. They do not describe science and should only be mentioned in the sections (8/6/I/B; 17/8/I/C; 22/9-12/A; 23/9-12/I/B, D) that define valid challenges to these aspects of science and other cultural beliefs and differences.

Fundamentalist challenges to Evolution, origins of life and the Universe, and other scientific knowledge are largely a phenomenon of the American Christian Right. Although such critics have these beliefs, they have not provided valid challenges to Evolution, etc. Therefore, such fallacious arguments should have no standing in a public schoool science curriculum. Such beliefs are based on personal and organizational interpretations of both religious writings and discussion, but are even further influenced by misinterpretation and lack of knowledge of scientific principles and practices. In the specific example of Evolution, such critics seem uninformed on definitions of what is life, and what makes humans human. Therefore, their views are just that (not even theories which can be tested) and should have no standing as a science or scientific thinking (Creation "Science" is a misnomer). To borrow from one of their phrases, Creationism is not "the other side of the coin," just as Evolution is not "just a theory."

Like the probably majority of scientists who also share religious beliefs, even Christian, I do not agree with their religion-based interpretations, loosely lumped under Creationism. I don't challenge their right to hold these beliefs within their cultural setting., However, I don't want to allow them to purvey their beliefs as science or knowledge within the public school system.

Since the views of Creationists, et al., seem to be partially due to an inadequate – or even fallacious – education in science, they should not be permitted to perpetuate their severely limited views – misinformed, uniformed – in the public school system. The American populace needs a better education in the sciences than they typically have been getting. Perhaps if the Creationist critics had received an adequate education in the sciences, they could understand what science is and yet maintain their religious beliefs and values, the core of which is not and cannot be addressed by science. I know that many of us, probably a majority, manage quite well with this duality of thought and belief.

Note especially to the Science Committee members present at the town meeting in Princeton, Tues., Sept. 30. Be cautious about incorporation of "Intelligent Design: and other similar philosophies. Although proponents have referred to similar views held by some scientists, the would be movement appears to be more of an attempt by Creationists and their ilk to "sneak under the radar" in attempts to legally incorporate their views into the pubic school curriculum.

Another general comment concerns funding. It's particularly unfortunate that these massive revision in the Minnesota Education system, affecting both teachers and administration, come at a time when there seems to be no hope of additional funding. Indeed, decreased funding seems to be the unfortunate (dangerous?) norm. Such mistakes will only perpetuate the "approved and not funded" approach of the US Congress re the mainstreaming of handicapped and otherwise disadvantaged students in to the country's public educational system. As was pointed out repeatedly by both Minnesota Senators (at least through last year), Congress has not funded such educational demands to the extent of their promises for decades. The current Administration seems to be perpetuating the insult by misguided programs such as "no student left behind". Dare to buck the flood of irrationality.

Another concerns political motives. I and others are not convinced that the new standards and other current reforms are solely intended for the educational benefit of the students. There seems to be much political hay to be made, often to the detriment of the educational system. Many of us are particularly that any perceived "failures" in the public educational system will provide perceived reasons for such measures as school vouchers, etc. I and others do not share these views and we will strongly resist diverting our tax dollars into private educational systems with their long lists of biases and often uniformed thinking.

General Comments from Hibbing (10/1/03):

"Physical Science – gravity/electromagnetic standard too hard. "

"Would like standards for all and standards for college bound. "

"Astronomy may be too hard (processes of stars). "

"Strongly want to see 9-12 standards for all and standards for advanced. "

General Comments from Bemidji (10/2/03):

"Science is about finding truth from verifiable fact. This cannot be done with evolution. "

"Intelligent design and evolution should both be discussed in public schools. "

"Preference: Grade 7 – Life Science; Grade 8 – Earth Science. "

"More on environmentalism is needed. "

"Evolution is fact and intelligent design should not be taught. "

"Science needs to have some practical applications. "

"If we can talk about the various world religions, why no be inclusive when it comes to creation and evolution? "

"Science and math should be integrated. "

"I prefer an integrated approach to science. "

"I support evolution. This does not make me an atheist. I have strong religious beliefs, but I see evolution as fact. "

"We are complex beings. There had to be a creator. We have to be intellectually honest to recognize that life did not occur by chance. "

"I do not find creationism or intelligent design to be scientific. "

"Intelligent design is both logical and scientific. "

"Not enough physics in high school. "

"Intelligent design and creationism have no part in standards. "

"May provide not in standards. "

"Address origin of life or don't go there. They are legitimate issues – public school needs to be careful. Intelligent design is a legitimate science question. Should be addressed and discussed critically in the public schools. Evolution within species is ok. "

"Not enough environmental education. "

"Need more cultural values in science (Native Americans). "

"Not clear what to do with non college-bound students (3rd year science). "

"Science teacher certification is too difficult. "

"Evolution progression is racist (monkey, Aborigini, Black, Spanish, White). "

"Very nice document overall. "

"Have to be intellectually honest and admit that evolution is theory. "

General Comments from Coon Rapids (10/9/03):

Creationism is illegal. Intelligent design is a thinly veiled type of creationism.

The beauty of evolution is its growth from simple to complex. Evolution is not a theory.

Leave these LOCAL.

New standards will take the focus away from closing the achievement gap.

Remove any reference to "consensus."

Please add more environmentalism.

Intellectual Design is wrong.

Contrary to what politicians have said, the Profiles weren't that bad.

Please include the Santorum language. I want my children to have the academic freedom to learn opposing views.

I strongly believe in evolution, but I would find it acceptable to teach creation, including Native American theories. This will lead to critical thinking skills.

Should move from concrete to abstract, and connectedness of concepts. We need balance between process and content.

This administration is pushing an agenda.

Requiring Earth Science at high school is going to make it hard for us.

Introduce children to micro and macro evolution and then leave it at that. Micro is defensible – macro is not.

Origin of the universe belongs in a college philosophy class, not in K-12 classrooms.

The scientific method breaks down if you only teach one version of our origin. Just leave it out.

Gr. 3, strand III, sub strand C: 3rd benchmark is too hard for grade 3.

Gr. 9-12, strand I, A, 4th benchmark: Include falsifiability of science. Also – science does not prove anything. A theory is a theory is a theory.

Gr. 9-12, strand IV, E, 1st benchmark: This evolution standard disallows intelligent design and creation. I would like to see the Bible taught in our schools, but I know this won't happen. I propose that evolution and intelligent design be given equal time.

Define the term Evolution more broadly – Do you mean natural selection?

Could easily teach scientific method without evolution.

General Comments from Apple Valley (10/13/03):

The 9-12 Biology standards are missing: the 6 Kingdom Classification system; STS – ethics of genetic engineering; viruses – lytic/lysogenic cycle, AIDS, immune response.

Do we need organ/organ systems in Biology? This is taught in Health classes in our district (196).

Earth Science, p. 27: States "students will be able to explain how the sun, earth and solar system formed." This should include the words, scientific theories, of how they formed. We do not know how for sure.

The theory of evolution is the official religion of ISD 196. I say "official" because the administration will allow no discussion whatsoever of any theory of the origin and development of species which contradicts the theory of evolution, nor will they permit the slightest criticism of the theory of evolution in the curriculum. I say "religion" because it requires a far larger leap of faith to believe in the theory of evolution, which is totally devoid of supporting evidence and relies entirely on supposition, faulty experimentation, and outright fraud than is required to be an adherent of any other relevant theory. The administration is skilled at suppressing, delaying, and obfuscating any mechanism which would lead to an honest examination of the flaws inherent in the theory of evolution, all the while insisting that class after class of students accept, absorb, and parrot back rote dogma arising from the theory of evolution. I served on the CIAC for 4 years, attempting each year to introduce discussion, which would enable students in ISD 196 to think, to use their God-given brains when examining the origin and development of species, only to be shunted aside by professional educators who are wedded to the theory of evolution.

Why are they so inexorably adamant that no crack in the official armor of the theory of evolution will be allowed? Why are they so devoted to an antiquated and obsolete theory, one which has been largely abandoned in higher academic circles? What is to be gained from refusing to allow our students to examine all sides of this issue?

I believe we parents and taxpayers are owed an answer to these questions. It's high time the ironclad lockbox of learning on this issue be opened to a full examination of the theory of evolution, warts and all, along with an honest opportunity for competing theories to gain clear, detailed, and thought-provoking examination.

High School: Strong emphasis on Earth Science – not necessarily a bad idea, but how will it be funded? To teach Earth Science in our district, we'd have to develop a new class. To teach the class, we'd have to hire a certified Earth Science teacher. (Needs to be certified by NCLF). How are you going to find a teacher certified in Earth Science and Biology, Physics or Chemistry? In addition, adding a new class in the current funding situation is fool hardy at best. We are fighting to survive, not looking to expand. What district has the extra funds to develop additional courses? What legislator will back a bill to fund additional courses? Is this an unfunded mandate? Also, as you ask more and more from the "core" classes, you lose the opportunity to develop a well-rounded student.

For the science standards, I believe a discrete course approach should be followed. Science material is very complicated and needs to be taught by teachers who have extensive training in one science area. I have a degree in chemistry and would be inadequately prepared to teach a generic class that included material in earth science or biology. I also believe that the committee should resist all attempts by the people who wish to include "intelligent design." Evolution is a theory that is the basis for our modern biology disciplines. Like the physics "theory of relativity," it has been accepted by a vast majority of the scientific community. We need to treat it with the respect that it deserves, not as just another theory to be studied along with other alternatives. (As I understand it, the Santorum amendment was not included in the No Child bill, but is a companion document. It is not federal law.)

What is the point of teaching the theory of evolution? Is it as one comment to the science standards from a college professor said: This is what I (I add the emphasis on "I") want students to know when they come to me—or is it some other more enduring reason?

Why can't evolution be taught in a group—teaching the evolution of man, earth, sun, solar system in the last parts of high school with the option for students to do alternative science work during that unit?

What allowance do you make for the high school teacher who does not hold the same believe in the evolution theory (prescribed in these standards be taught) to teach alternative beliefs of the formation of earth, for example, or to allow debate in the classroom about these alternative beliefs? Have discipline guidelines for these teachers also being established?

Recommended changes:

Problem: Teacher licensure does not correlate to state standard placement. Students benefit more from well-trained experienced teachers that teach in their chosen discipline. Elementary: Grades 1-6; Secondary: Grades 7-12 (Discipline-specific Physical, Life, Earth).

Solution: Change "grade 6," "grade 7," "grade 8" standards to "grades 6-8" standards. Teachers would continue to be place din their area of expertise and students will benefit from an experienced, motivated teacher.

Problem: Test placement may place some students in at-risk category because they haven't had experience in each benchmark yet.

Solution: Place test at end of 8th grade or in 9th grade to ensure all students have had experience in all benchmarks.

As a student, I see evolution as a theory, not as fact.

Need to hear all facts on evolution. Teach the controversy.

Good that Creationism is not in standards. Evolution is a theory that has stood the test of time. Congratulate the committee for recognizing this.

Please ensure use of Project 2061.

As a parent, I am a partner with the public schools. Neither side should be a dictatorship. So why are schools forcing evolution on all students?

Creationism should be taught at the kitchen table and in Sunday School.

I am tired of the lack of an honest discussion on evolution.

General Comments from Forest Lake (10/20/03):

References to cultural and societal impacts must be removed – they belong in social studies, not science.

Need more environmentalism.

Gr. 7 strand I, sub-strands A & B: too many benchmarks here.

Gr. 8, strand I, sub-strands A & B: too many benchmarks here.

Gr. 9-12, IV Life Science, E: Keep evolution in – otherwise would I teacher Genesis I or Genesis 2?

Gr. 9-12, IV Life Science, G: Omit this whole section – it's too much to cover.

We'd like flexibility over grade spans.

We need performance-based packages to assess these standards.

Please make grades 7 & 8 discipline specific.

We'd like to see economic and science standards met in agriculture courses.

America is a land of freedom, so we have a right to choose. Creationism should be taught in our schools.

After much study in college, I realized for the first time the many flaws in evolution. I should have been taught this in K-12! No one can scientifically prove evolution. It takes faith to believe in evolution.

I'd like for my tax dollars to NOT be used to support evolution.

The Kansas State Board of Education voted to not include macro-evolution in their state tests. This vote was great and bold, and honored micro-evolution. Macro-evolution is a flimsy idea.

Please address the factual errors in science. Some benchmarks do not match the standards.

Mass and volume is taught too late.

As a student, I'd like to hear both sides – both creation and evolution.

Safety was omitted from grade 1.

Earth and Space standards should be at one grade level.

Don't allow evolution to be watered down. The evidence is overwhelming. This is not a theory. If parents want to teach intelligent design, fine – they can do it at home. The State of MN should not be an accomplice to watering down evolution.

Evolution is not a theory. It is not just a guess. If you think you have an objection, teach other things at home. I believe in separation of church and state.

Evolution is highly improbable.

Jean Swenson's article is excellent and that approach will result in open minds among our students.

I strongly endorse the basic standards, but the benchmarks are at the lowest levels of knowing.

Please give flexibility on science licensure.

I resent that my children are being taught evolution. I am a Christian and this is not my belief, but I am a taxpayer too and do not want to pay the schools to teach my children beliefs that oppose our family's beliefs. Teach my children FACTS with my tax dollars.

Science standards ensure inquiry learning will take place.

Strand II – developmentally appropriate problems.

Strand III – Placement of earth and life science is a concern.

No proof of evolution – it is theory – rife with holes.

Micro evolution is proven, not macro – it is scientific assumption.

Systems International not used anywhere.

Need "black smoking" no contact with sun (gr. 7)

Organisms eat plants. Plants are organisms.

Wheel and axle spelling mistakes

Need "ions" in standards.

Middle level standards should be grouped by subpart -- strand III Earth and Space should be in middle level.

I am concerned that we are not fulfilling Minnesota Statute Section 115A.073 (1998). We do not do enough with environmental education with the new science standards. These need to be included. The MN Science Teachers Association has further comments on this issue.

Lumping together life, earth and physical science is impractical for a district to afford new textbooks when we are in the middle of an adopted textbook and expect the district to have the new curriculums adopted, in place and fully supplied by 2004-05 school year. Maybe 2010-11. Some other districts -- that may be too soon!

Evolution should be taught in the public schools as theory. Acceptance of the theory must not be required, only require knowledge of the theory. No mechanism of evolution has ever been demonstrated by experiment nor by natural observation (contrary to what textbooks claim). All evidence of gradual change can be interpreted differently. Strident defense of evolution is ideological, not scientific. Allow students to think!

In general, the science draft standards have some benchmarks that are not measurable or objective because they refer to cultural or societal impact.

Any references to "consensus" should be removed. If compromise is used, it is not science.

I would like to see the broad definition of "evolution" defined better. For example when using the term, is natural selection or common ancestry meant?

Students should be encouraged to critically analyze the evidence for universal common ancestry. The science standards are worded to obstruct any scientific evidence that conflicts with the theory of evolution by calling it "non-science". There is no fossil record to claim common ancestry, therefore it should not be taught as fact.

Claims that intelligent design is an attempt to push religion back into schools is a straw man's attempt to stifle critical thought. It has been incorrectly called Creationism, which is the Genesis account of our origins. What religion would be state sanctioned by teaching intelligent design? Intelligent design is not contrary to natural selection, but attempts to explain through science why we haven't found a missing link in the fossil record.

To take a stand to stifle any scientific theory, would stifle science. If you refuse to test one, and declare the other the winner just because it's the only one left standing, then how is that science? Good science will weed out bad science.

Summary of Evidence Against Evolution:

1) Mutations, which are supposed to be the building block of evolution, have never been observed to result in higher order, more complex genetic information.

- "All point mutations that have been studied on the molecular level turn out to reduce the genetic information, and not increase it."

- "To postulate that the development and survival of the fittest is entirely a consequence of chance mutation, or even that nature carries our experiments by trial and error through mutations in order to create living systems better fitted to survive, seems to me a hypothesis based on no evidence and irreconcilable with the facts."

2) Cells are far too complex to have arisen from a chance arrangement of chemicals. Each cell needs thousands of proteins, a genetic code to order the proteins, and a way to translate that genetic code. Sir Francis Crick, the Nobel laureate who co-discovered the structure of DNA, calculated that the probability ofjust one protein occurring by chance would be one in 10 to the 260^{th} power, or 10 with 260 zeroes after it. Most mathematicians say that something is for all practical purposes impossible if the probability is 10 to the 50^{th} power.

3) The human body has features that are "irreducibly complex," such as blood clotting, and the immune system, that cannot have evolved, because all the parts of those must be present for the system to work. If these systems had evolved gradually over eons, creatures would have bled to death or died from infection before the system was perfected.

4) There are no transitional forms in the fossil record to support the idea of common ancestry. That record shows complete animal forms, such as in the Cambrian explosion.

- "…our more extensive labor has still failed to identify any creature that might serve as a plausible immediate ancestor for the Cambrian faunas (animals)."

- "It is a mistake to believe that one fossil species or fossil 'group' can be demonstrated to be ancestral to another."

- My Question: DARWIN'S TREE OF LIFE. Why don't textbooks discuss the "Cambrian explosion," in which all major animal groups appear together in the fossil record fully formed instead of branching from a common ancestor—thus contradicting the evolutionary tree of life?

NCSE's Answer: Wells is wrong: fish, amphibians, reptiles, birds, and mammals all are post-Cambrian—aren't these "major groups"? We would recognize very few of the Cambrian organisms as "modern"; they are in fact at the roots of the tree of life, showing the earliest appearances of some key features of groups of animals—but not all features and not all groups. Researchers are linking these Cambrian groups; using not only fossils but also data from developmental biology.

My response in outline: a) The NCSE is wrong: Fish DID make their first appearance in the Cambrian explosion. b) The "major groups" to which my question refers are the animal phyla, Fish, amphibians, reptiles, birds and mammals are sub-groups (classes) of a single phylum. The NCSE is using semantics to give the illusion that the Cambrian explosion never happened. c) It is through assumption and extrapolation, not "fossils" and "data from developmental biology," that Darwinists are supposedly "linking" the Cambrian groups.

5) Taxonomy also shows a lack of transitional forms between the major animal divisions.

- "The general tendency to eliminate, by means of unverifiable speculations, the limits of the categories nature presents to us, is the inheritance of biology from the *Origin of Species*. To establish the continuity required by the theory, historical arguments are invoked, even though historical evidence is lacking. Thus are engendered those fragile towers of hypotheses based on hypotheses, where fact and fiction intermingle in an inextricable confusion."

- "If we are willing to accept the facts, we must believe that there never were such intermediates, or in other words, that these major groups have from the very first borne the same relation to each other that they bear today."

6) Molecular biology shows no evidence for the evolutionary sequence.

- "Instead of revealing a multitude of transitional forms through which the evolution of a cell may have occurred, molecular biology has only served to emphasize the enormity of the gap…[N]o living system can be thought of as being primitive or ancestral with respect to any other system, nor is there the slightest empirical hint of an evolutionary sequence among all the incredibly diverse cells on earth."

7) The embryological drawings by Ernst Haeckel purporting to show that human embryos develop nearly identically with animal embryos were faked. These drawings are still used in a number of high school and college biology textbooks.

- "This is one of the worst cases of scientific fraud…What he [Haeackel] did was to take a human embryo and copy it, pretending that the salamander and the pig and all the others looked the same at the same stage of development. They don't…These are fakes."

- My Question: VERTEBRATE EMBRYOS. Why do textbooks use drawings of similarities in vertebrate embryos as evidence for their common ancestry—even through biologists have known for over a century that vertebrate embryos are not most similar in their early stages, and the drawings are faked?

NCSE's Answer: Twentieth-century and current embryological research confirms that early stages(if not the earliest) of vertebrate embryos are more similar than later ones; the more recently species shared a common ancestor, the more similar their embryological development. Thus cows and rabbits—mammals—are more similar in their embryological development than either is to alligators. Cows and antelopes are more similar in their embryology than either is to rabbits, and so on. The union of evolution and developmental

biology—" evo-devo"—is one of the most rapidly growing biological fields. "Faked" drawings are not relied upon: there has been plenty of research in developmental biology since Haeckel—and in fact, hardly any textbooks feature Haeckel's drawings, as claimed.

My Response in Outline: a) Far from confirming the NCSE's claim that the early stages of vertebrate embryos are more similar than later ones, embryological research confirms that the claim is false. b) The NCSE's claim that "the more recently species shared a common ancestor, the more similar their embryological development" is also false. c) Textbooks claim that the various CLASSES of vertebrates resemble each other in their early stages. By focusing on taxonomic levels below classes, the NCSE is attempting to evade the issue. d) Although the NCSE claims that "faked" drawings "are not relied upon," a simple examination of biology textbooks shows that the NCSE is wrong.

8) Biology textbooks define homology as the similarity of structures due to common ancestry. It is used in a circular argument as proof of common ancestry.

Homology – My Question: HOMOLOGY. Why do textbooks define homology as similarity due to common ancestry, then claim that it is evidence for common ancestry—a circular argument masquerading as scientific evidence?

NCSE's Answer: The same anatomical structure (such as a leg or an antenna) in two species may be similar because it was inherited from a common ancestor (homology) or because of similar adaptive pressure (convergence). Homology of structures across species is not assumed, but tested by the repeated comparison of numerous features that do or do not sort into successive clusters. Homology is used to test hypotheses of degrees of relatedness. Homology is not "evidence" for common ancestry: common ancestry is inferred based on many sources of information, and reinforced by the patterns of similarity and dissimilarity of anatomical structures.

My Response in Outline: a) I thank the NCSE for conceding my main point: Homology (defined by modern Darwinists as similarity due to common ancestry) is not evidence of common ancestry. b) Yet many biology textbooks tell students that it is. When the NCSE launches its campaign to correct textbooks that treat the origin of life as part of evolution, it should also correct textbooks that treat homology as evidence for common ancestry. c) At the level of the animal phyla, common ancestry is not inferred from "sources of information" such as fossils, molecules or embryos; instead, it is assumed on theoretical grounds.

General Comments from Stewartville (10/21/03):

Please consider allowing science-based agriculture courses to be used to fulfill the new credit requirements. We need this flexibility. Thank you.

Good content. These standards turned out very well. Congratulations.

I want a constructivist approach to science. The assessments must reflect our teaching, which needs to be hands-on.

Too many standards at middle school.

Combine organisms and human organisms. Why differentiate?

In 9-12, there are only 2 references to human activity. Need more emphasis on environmentalism.

Thank you for following the national science standards. Thank you.

As a professional biologist, I love these standards. They are far superior to the Profile. You have brought back the scientific method!

Grade 8: The 2nd law of thermodynamics does not support the Big Bang Theory.

Grade 8 Life Sciences: States that the fossil records supports how biology changes over time --- This is FALSE. There are volumes of evidence refuting these.

Gr. 9-12 Life Sciences: Same – no evidence of species → other species – remove common ancestry is incorrect and is only assumed.

Huge difference between environmentalism and ecology. Ecology is science; environmentalism supports a radical social agenda using science.

"Adaptation of…" – co-evolution is assumed → ripe with observable relationships.

I appreciate the emphasis on facts.

It is wrong to shut out all criticism of evolution. I support inclusion of the Santorum amendment. This is reasonable so that students can see all sides of an issue. Even Senator Byrd supports this. Varying viewpoints should be welcomed as part of the education experience. There is significant evidence that evolution is false.

There is too much emphasis on the scientific method. It is not needed at each grade.

Please leave more time for application of the scientific method in opportunities for hands-on activities, such as science fair.

We need to "turn on" elementary students to science. We want to foster curiosity and hands-on experiences.

Your tests must not use reading. We need a listening and demonstration test.

Gr. 9-12, IV Life Science, E: Students need to know that here are many theories here. Dogmatic interpretation of evolution! Change this. All current scientific theories should be presented.

Gr. 9-12, IV Life Science, E, 5th benchmark: We need to challenge this 3.5 billion idea. It is unscientific approach.

6th graders cannot think three-dimensionally. This will make the standards too difficult for 6th graders.

Impressive. Content oriented.

Need inquiry, constructionist approach. Assessments should match content. Need more than simple facts.

Too many standards – K-5, middle school.

Standards turned out very well.

Sub-strands regarding organisms and human organisms can be combined.

Behavior biology can apply to all organisms.

Human activity on planet should be strengthened – environmentalism.

National standards are good – glad they are in here.

Really pleased with science standards – brought back the scientific method.

No evidence of scientific ancestry.

Teach ecology, not social agenda environmentalism.

Good emphasis on facts, interpreting facts.

Science standards should align with agriculture – animal science, plant science, biotechnology

Don't shout out criticism of Darwinian theory.

Weak on environmentalism.

9-12 students too heavy on Life Science, lacking in chemistry and physics.

Gr. 3, III, C. Solar System, 5th benchmark: Too difficult – superficial treatment of gravity.

Gr. 3, IV, F. Flow of Matter and Energy, 1st benchmark: too hard.

Gr. 6, III, C Solar System, 3rd benchmark: Too hard for 6th grade – does not match cognitive development.

Gr. 8, IV, E., Biological Populations Change Over Time: Fossil records cannot explain evolution. Should present evidence disputing evolution.

Big Bang – Universe – Conflicts with 2nd law of thermodynamics.

Gr. 9-12, III, D. The Universe, 3rd benchmark: Noble goal, but everyone doesn't need to know this.

General Comments from Albert Lea (10/22/03):

Please make grades 7 & 8 specific to Life Science and Earth Science.

Please do not require earth science at9-12. Most schools do physical science at grade 9 and biology at grade 10, with electives at 11 & 12.

We need more in-depth study and less overviews.

Please place these into grade bands, not grade specific.

Evolution is not a fact. There are other theories to explain origins. Do not limit students' thinking.

Present all evidence on controversial issues. My daughter's teacher skewed the teaching of evolution and her questions were ignored.

Biological evolution should not be the default theory. Please include the Santorum language and do not suppress the evidence against evolution.

Our founding fathers believed in a creator God. Evolution should not be foisted upon us in our public schools.

I plead with you – cannot the theory of evolution and intelligent design both be presented as theories?

Please include the doctrine of creationism along with evolution.

Teachers love kids, and in caring about kids it is important to teach the truth. Teaching evolution as fact suppresses this truth.

Please include family and consumer science standards here.

Please allow agricultural science courses to be used for science graduation credits. The U of M accepts agriculture coursework for entrance into the U.

Project 2061 standards are evident. These are good standards. Evolution is a fact – it is important. Other theories are not science based and should be omitted.

The federal government demands that we teach all year and then give one test at the end. This is inappropriate.

Evolution is the most broadly and well accepted fact in the scientific world today. It is so well documented that scientists can say that science is truth. Inteligent design is not based in science. Efforts by creationists are flawed.

We like the emphasis on the national standards, but the verbs in the standards/benchmarks are vague and unclear: "understand," "describe." We need more application, and more relating to one's personal life.

Need to be discipline specific for Life, Earth Science.

High school sequence – Schools will have to add 3rd science.

Physical science strand – Not developmentally appropriate for math required.

Life science strand – study of organs not broad enough.

National standards are on here – good. Project 2061.

Use grade bands, not grade level specifics.

Don't teach evolution as fact – share other theories.

Share all evidence for accepted theories.

Don't make biological evolution the default theory – support Santorum amendment.

Don't suppress knowledge from these students.

Need more than evolution in standards.

Include doctrine of creation with theory of evolution.

Teaching of evolution origins totally rejects truth.

Glad to see national science standards, keep biological evolution.

I appeal to you to include from the Congressional 2001 Better Education for Students an Teachers Act the language from the amendment by Pennsylvania Senator Rick Santorum: "Good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science… Where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

We who honor the Declaration of Independence, which testifies to the endowment of certain inalienable rights by our Creator, must not suppress the scientific evidence for intelligent design and creationism, and should openly admit the scientific vacuum for evolutionism. Teachers in Minnesota covenant to not suppress knowledge from their students. Therefore, students should know and understand what many eminent scientists have understood.

The much-lauded father of evolution himself, Charles Darwin, in his, Origin of Species, wrote: "To suppose that the eye with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have been formed by natural selections, seems, I freely confess, absurd in the highest degree. Why then is not every geological formation and every stratum full of such intermediate links? Geology assuredly does not reveal any such finely graduated organic chain; and this, perhaps, is the most obvious and serious objection which can be urged against the theory. For I am well aware that scarcely a single point is discussed in this volume on which facts cannot be adduced, often apparently leading to conclusions directly opposite to those at which I arrived. There is a grandeur in this view of life, with its several powers, having been originally breathed by the Creator…"

Public Comment e-mailed to MDE: The amount of environmental education included in these standards is woefully inadequate. A vast majority of MN citizens believe that EE is important and support it in the science curriculum, yet you leave it out altogether. Students need to learn more about interdependence, human impacts on the environment and basic ecological principles. We need informed citizens. Your standards also gloss over human impacts on the environment and living systems. (both positive and negative impacts) You ought to Look at the Environmental Literacy Scope and Sequence for more specific detail when rewriting the standards. Environmentally literate citizens are those who have a basic level of understanding of a system. Without a deeper study of environmental education our students will not be able to make informed choices, nor will they be able to understand the science behind todays environmental issues and what it all means. Some of the comments posted here refute global climate change and other current ecological issues, but These issues are based on scientific study and there is a huge body of evidence to support them.
Your standards also seem too heavy on memorization of facts and don't leave enough room for "doing science"...also, it would be nice to see some benchmarks that involve service-learning. You might also include time for fieldwork using science to solve real problems or find real answers to questions the students have. Finally, please stop politicizing the evolution/creation debate. This is science. If our students are going to learn science they should learn the Theory of Evolution, as it is a commonly accepted theory in science. To leave this out is to allow our students to be uninformed in the language of science. Give our teachers a little credit. Most are fully capable of teaching about evolution in such a way as to not undermine anyone's religious beliefs. We are teaching science here, not trying to subvert anyone's faith. I know plenty of incredible teachers who also belive in Creation. It's insulting to our teachers --and our students---to imply that the two are mutually exclusive.

Public Comment e-mailed: Thank you once again for receiving my comments for the Standards Committee.

My wife and I have four children at home aged 8-13. We consider their education a high priority and so when I learned of the transformation of our schools under Goals 2000 and School to Work I began reading material from the then DCFL. I obtained two documents (The Minnesota Goals 2000 Initiative and The Minnesota School to Work Initiative). After looking thru these documents I realized how radically schools would be changed and be directed toward work force preparation systems and and less directed towards a broad based liberal arts education.

As a result of learning this I began to call my legislators to ask them to repeal the Profile of Learning. Thankfully, they did and it was a great start toward the directing education to a knowledge based academic system which you are doing via the Standards Committee and Commissioner Yecke. I want to thank you for the hard work of making genuine academics a priority again in the State of Minnesota. In regards to the Science Standards Committee

I think that teaching evolution as an exclusive explanation of the origins of life is dishonest and cannot stand up to criticism. It is intellectually dishonest to not allow a class to have an open discussion of the criticisms of evolution as the explanation of our origins and to discuss the other explanation of origins via an Intellegent Designer as some prefer to describe what most Americans refer to as the God of creation. I would like to leave you with a fact for your digestion.

When NASA sent Neil Armstsrong and company to the Moon they had calculated there would be a very thick layer of dust on the moon surface due to being millions of years old and no atmosphere to burn up particles hitting the surface. So NASA designed large bowl shaped pods for the feet of the lunar lander so that it would not sink too deeply into the surface. However, it turns out there is only a ½ inch to an inch of dust on the surface. Since there is still no atmosphere around the moon the other factor of age must then be reconsidered. That is that the moon is not millions of years old and perhaps the Earth as well. Finally, I have recently learned No Cild Left Behind has language in it (Santorum ammendment) that calls for allowing teachers to have open discussion in the classroom of the origins of life with alternative explanations disallowing evolution to become exclusively taught.

Public comment: Scientific Method and Worldview Critical to Our Businesses As a research scientist at 3M, I can think of no more valuable output of our public schools and contributions to our MN workforce than graduates who know how to critically think. It's straightforward to see the value of teaching the detailed content of science whether it be Newton's Laws, Molecular Orbital Theory, or whatever. But I see a "higher" need in our workplace beyond just the content: employees who know how to synthesize the details and use them to solve problems.

The scientific method is foundational to this ability and should be interwoven throughout the benchmarks. 3M and many other MN businesses depend critically on our workforce solving problems, inventing, and discovering. We don't necessarily need experts in the academia of science, although that's important. What we really need are individuals who can work independently to solve and discover in the areas of technology our businesses depend.

In that light, I particularly like the sections on "History and Nature of Science" in, and especially the subsections on " Scientific World View", "Scientific Inquiry" and "Scientific Enterprise". These would have been high on my "to do" list if I would have been on the committee, and I recommend to you that these stay AS WRITTEN. In fact, I think these particular benchmarks are so important, I would recommend this section on "History and Nature of Science" be replicated in every other strand in the standard. I seriously OBJECT to them simply being another module that is taught and move on to the next . It should be CENTRAL to the teaching of every section of detailed science—and re-emphasized at every turn. In other words, model this scientific world view by using it to teach each of the areas of science. By stressing its importance at every turn, students must develop this skill in approaching and evaluating science...and even other areas. As an aside, I see this "Scientific World View" as CENTRAL to one of 3M's key business processes called Six Sigma—a process that has truly revolutionized our businesses and made them more competitive in the global marketplace. Future employees would surely have an advantage—and give us an advantage—if they are superb problem solvers and practitioners of the scientific method.

Objection to Teaching Evolution Alone
I would point out two sections of the standards I oppose as written: Grade 9-12, Life Science, Strand B "Organisms" (benchmarks 4-5), and Strand E "Biological Populations Change Over Time". As to the question of "how biological populations change over time", I have no issue with teaching micro-evolution—it's observable via the scientific method. But as to the question of biological origins, I personally believe in theistic creation, not Macroevolution as proposed in your standard. HOWEVER, before you discount my opinion as "religious", note that I would NEVER (underlined!) expect the school to teach this worldview alone, or mandate it. So then what to teach? And what would I propose to remedy the flaws in your standard in this area?

If you hold to the tenets I described above as foundational—the use of the scientific method and reproducibility of data to evaluate hypothesis—the theory of MACROevolution doesn't rise to the level of foundational, as your standards propose they are. I don't object to it out of hand. Rather I propose that there is NOT ENOUGH TRULY FOUNDATIONAL EVIDENCE for it to be given exclusive treatment in our teaching of how "biological populations change over time". In the absence of a mass of evidence (yes, the true "reproducible" evidence for Macroevolution is an inch deep), you must do the prudent, consistent thing: teach a scientific method approach to origins. In the name

of scientific objectivity, I implore you to reconsider this section. Allow students to see and critique the evidence for Macroevolution, and expose students to other theories that may explain origins. Isn't this consistent with GOOD SCIENCE, exactly as I proposed above? What makes Macroevolution an exception to the standards we've set out for teaching science?

Also, I ask you to consider that if you do teach Macroevolution exclusively, you are UNDERMINING what I teach my children at home as to their origins—don't you dare! What makes the Naturalist worldview the one the State should impose on me and my family? Those of us like me are not ignorant of "scientific facts"—we just happen to believe that use of the scientific method applied to this area has not yielded a definitive answer, and therefore our view has equal likelihood as the others. At a later date, one of the theories, even Macroevolution, may have enough data and reproducible evidence to substantiate its exclusive teaching, but until then, I ask you to reject this dogmatic teaching of Macroevolution. Teach the controversy! It's the natural, liberal, democratic approach, right?
Thank you for considering my comments, and if I can be of any further assistance, please don't hesitate contacting me.

E-mailed comment:

ANALYSIS OF DRAFT MINNESOTA SCIENCE STANDARDS

Public hearings are now being held around the state of Minnesota for public comment on the first draft of the proposed 9-12 science standards. Minnesotans have an important opportunity to improve and enhance those standards through their comments and testimony. While there are a number of positive features of the draft standards (especially in the area of the "History and Nature of Science"), the proposed benchmarks dealing with the theory of evolution are incomplete, failing to introduce students to the full range of scientific views and evidence on this important topic. Below is an analysis of some positive benchmarks in the initial draft as well as proposals for additional benchmarks that would strengthen how the standards cover evolution.

POSITIVE BENCHMARKS IN THE EXISTING DRAFT

The "History and Nature of Science" section of the initial draft contains many benchmark standards concerning the nature of science that promote good science education. The "Scientific World View" subsection contains a particularly important benchmark:

> **Students will be able to explain how scientific innovations and new evidence can challenge accepted theories and models, including cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease, Big Bang theory.**

Another positive benchmark immediately follows the above cited provision:

> **Students will know that scientific explanations must meet certain criteria to be considered valid, including that they must be consistent with experimental and observational evidence about nature, logical, respect the rules of evidence, be open to criticism, and report methods and procedures.**

Inclusion of these two provisions is important so that students will learn that science is based on critical inquiry rather than dogmatism and that existing scientific theories should always be open to challenges from new evidence.

SUGGESTED BENCHMARK IMPROVEMENTS

Because the theory of evolution is such a central concept in the life sciences, students should be fully informed about it. They should learn not only the best evidence for the modern theory of evolution (known as "neo-Darwinism"), but also about current scientific criticisms of key tenets of the theory. Unfortunately, the draft benchmarks on evolution

in the “Life Science” section do not address any scientific weaknesses of modern evolutionary theory, nor do they acquaint students with the full range of scientific views about evolutionary theory. Following are three suggestions for improving the coverage of evolution:

1. Add the following five additional benchmarks to the “Life Science” section to improve the coverage of evolution:

a. Students will be able to distinguish the different meanings of the term evolution, as well as explain the different levels of evidentiary support for each meaning.

b. Students will be able to distinguish between microevolution and macroevolution and explore the controversy over whether microevolution can be extrapolated to explain macroevolution.

c. Students will be able to explain the limits of natural selection and random mutation to explain complexity.

d. Students will be able to critically analyze the evidence for universal common ancestry.

e. Students will be able to explain the controversy surrounding the origin of life.

2. To encourage full discussion and critical thinking relating to evolution, substitute the the phrase "analyze the theory that " for, respectively, "understand," "explain how," "be able to identify," and "describe how," in the following: (a) Sub Strand E in the Life Sciences for Grades 7 through 12; (b) Grade 8, IV Life Science, Strand E, Fifth Benchmark, (c) Grade 9-12, History and Nature of Science, Strand A, Fourth Benchmark; and (d) Grade 9-12, IV Life Science, Strand B, Fourth Benchmark

3. Add the following benchmark to History and Nature of Science, Stand B beginning at an appropriate grade level:

"Students will understand the methods used to test historical hypotheses that can not be confirmed by experiment."

Brief explanations concerning these suggestions:

1.a. Students will be able to distinguish the different meanings of the term evolution, as well as explain the different levels of evidentiary support for each meaning.

“Evolution” is a term that is employed at different times to mean everything from “change over time” to “microevolution” to “universal common ancestry” to the claim that natural selection acting on random mutations has been the primary cause of the major changes that have happened in the history of life. It is important that students learn about these different meanings of the term evolution and understand the difference between empirical support for change over time and microevolution—which can be directly observed—and empirical support for universal common ancestry and the mechanisms responsible for long-term evolutionary change—which cannot be directly observed.

1.b. Students will be able to distinguish between microevolution and macroevolution and explore the controversy over whether microevolution can be extrapolated to explain macroevolution.

Microevolution refers to small intergenerational changes within existing species or gene pools, such as the acquisition of antibiotic resistance in bacteria or a change in average beak size in birds. Macroevolution refers to the process that creates innovations occurring above the species level, such as new complex organs, new body parts, or new body plans.

Natural selection often oscillates with changing conditions from year to year, and it has never actually been observed to produce new species. Furthermore, the genetic mutations that supposedly provide raw materials for selection are almost always harmful, and the rare ones that are beneficial have only been observed to produce minor biochemical changes

rather than the major anatomical changes required by evolution. For these and other reasons, the simple extrapolation of microevolution to explain macroevolution is controversial, even among evolutionary biologists. Students should know why the controversy exists.

1.c. Students will be able to explain the limits of natural selection and random mutation to explain complexity.

In neo-Darwinian theory, natural selection improves the function of an existing system gradually, step by step, with no thought for its future utility. According to some biologists, however, "irreducibly complex" systems present a problem for neo-Darwinian theory. An irreducibly complex system is one that functions only when several well-matched parts, all working together, are present; some examples are the human blood clotting cascade, intracellular transport systems, and the bacterial flagellum. Since a partially assembled irreducibly complex system has no function at all, it cannot be improved by natural selection, and thus poses a problem for neo-Darwinian theory.

Students should know the evidence and scientific arguments for and against the sufficiency of neo-Darwinian theory. In particular, they should be encouraged to evaluate critically various claims about the power or limitations of natural selection and genetic mutation.

1.d. Students will be able to analyze critically the evidence for universal common ancestry.

The Darwinian view that living things in all the major kingdoms of life (such as bacteria, fungi, plants and animals) are modified descendants of a common ancestor has been challenged in recent years by a growing number of discrepancies in the molecular evidence previously thought to support that view. Students should know enough about that evidence to understand the controversy over this issue.

Evidence for the common ancestry of all animals has traditionally come from the fossil record, embryology, homology, and molecular studies. Yet the fossil record shows the major groups ("phyla") of animals appearing fully formed in a relatively short time (5-10 million years according to standard geologic dating), a phenomenon known as the "Cambrian explosion." Embryos which Darwin thought were almost identical in their early stages (thus pointing to their common ancestry) are now known to be very different. Neo-Darwinians once thought that homologous features (such as the bones in vertebrate limbs) were produced by similar genes inherited from a common ancestor, but it is now known that there is no simple correlation between genes and homology. Finally, molecular studies have not produced a consistent evolutionary tree for the animal phyla.

Students should understand that common ancestry may be true at some levels (such as the cat family), but may not be true at others (such as the major kingdoms of life). They should know enough about the evidence to be able to evaluate it critically, at least at some representative levels of the biological hierarchy.

1.e. Students will be able to explain the controversy surrounding the origin of life.

While Darwin's theory purported to explain how life could have grown gradually more complex starting from one or a few simple forms, it did not explain, nor did it attempt to explain, how life first originated.

Chemical evolutionary theory has in recent years encountered severe criticisms on many fronts. First, geochemists have failed to find evidence of the "primordial soup" required by the standard model. Second, the remains of single-celled organisms in the very oldest rocks testify that, however life may have emerged, it did so relatively quickly. Third, new geological and geochemical evidence suggests that prebiotic atmospheric conditions did not favor the production of amino acids and other essential building blocks of life. Fourth, molecular biology has revealed such great complexity in living cells that standard origin-of-life scenarios now look quite simplistic.

Even if it could be demonstrated that the building blocks of essential molecules could arise in realistic prebiotic conditions, the problem of assembling those building blocks into functioning proteins or DNA chains would remain. This problem of explaining the specific sequences—and thus the information—in biopolymers lies at the heart of the current controversy over the adequacy of materialistic explanations for the origin of life. Students should at least be aware of the controversy and why it has arisen.

2. To encourage full discussion and critical thinking relating to evolution, substitute the the phrase "analyze the theory that " for, respectively, "understand," "explain how," "be able to identify," and "describe how," in the following: (a) Sub Strand E in the Life Sciences for Grades 7 through 12; (b) Grade 8, IV Life Science, Strand E, Fifth Benchmark, (c) Grade 9-12, History and Nature of Science, Strand A, Fourth Benchmark; and (d) Grade 9-12, IV Life Science, Strand B, Fourth Benchmark

The referenced strands and benchmarks use language that suggests a close minded approach to evolution. The suggested change will encourage critical analysis that will open minds about a controversial subject.

3. Add the following benchmark to History and Nature of Science, Stand B beginning at an appropriate grade level:

"Students will understand the methods used to test historical hypotheses that can not be confirmed by experiment."

According to Ernst Mayr, a highly regarded evolutionary biologist, "Darwin introduced historicity into science. Evolutionary biology, in contrast with physics and chemistry, is a historical science – the evolutionist attempts to explain events and processes that have already taken place. Laws and experiments are inappropriate techniques for the explication of such events and processes. Instead one constructs a historical narrative, consisting of a tentative reconstruction of the particular scenario that led to the events one is trying to explain."[[Ernst Mayr, *"Darwin's Influence on Modern Thought,"* p. 80, (July 2000, Scientific American)]. Other historical sciences include certain aspects of geology, paleontology, anthropology, and archeology.

In the absence of experiment, historical scientists postulate multiple competing hypotheses about the cause of past events and seek to test a given historical hypothesis by collecting evidence that will not only rule in the hypothesis to be tested, but also rule out the reasonable competing hypotheses. [Carol Cleland, *Historical Science, Experimental Science and the Scientific Method,* Vol 29 No. 11, 987-990 (Geology, November 2001)]. According to Kenneth Miller, we "learn about the past by applying good, old-fashioned detective work to the clues that have been left behind." [Kenneth Miller, *Finding Darwin's God,* (Cliff Street Books, 1999), pp. 22-23.] Because the record of past unobserved events is often incomplete with many evidentiary gaps, historical sciences frequently yield only a "best current explanation." This benchmark would complement the second Benchmark in the same sub-strand which requires students to "give examples of how different domains of science use differing bodies of scientific knowledge and employ different methods to investigate questions."

Public Comment e-mailed:
Comments related to the proposed science standards.

General—

1) Suggest that the students should be able to relate some scientific concepts and breakthroughs to the scientists that developed them such as the following:
   a) Aristotle, Galen, Ptolemy
   b) Copernicus, Galileo, Kepler, and Newton
   c) Harvey, Pasteur, and other medical pioneers
   d) Alexander Graham Bell
   e) Max Planck, Niels Bohr (and his group), and Richard Feynman (Quantum physics)
   f) Charles Darwin
   g) Albert Einstein
   h) Sigmund Freud (and other psychologists, etc.)
   i) Frick & Watson (DNA), Gregor Mendel, and others in molecular Genetics
   j) Edmund Halley, Edwin Hubble, George Gamow (Big Bang theory)
   k) Ohm, Faraday, and other electro-magnetic pioneers

2) I failed to see any mention of human evolution (though I may have been reading too quickly). Evolution seemed to be limited to plants and other animals.
   a) On these lines, teachers should be instructed that Scientific Creationism and Intelligent Design are not allowed to be taught in the science curriculum (per the consistent input of the courts). Nor does their existence constitute a reason for keeping Evolution (selection via selective means) out of the science classroom).
3) There should be some coverage of Quantum Physics in the high school years. The reasons include:
   a) Almost all electronics and technology the students used and find interest are based on Quantum Physics. These include TV, computers, games, and so on.
   b) In addition, some small mention of Superstring theory should be made in the last year of high school. This seems to be the next kind of physics that might take hold in the years these standards will be in place
   c) I personally find it somewhat incomprehensible that they were not included in the first place. Think how long these standards will be in place and try to imagine what these students will have to know to keep even with the rest of the world during this time.
4) Something should be said about the difference between quantitative and qualitative descriptions and teaching of the science curriculum.
   a) Roger Jones, from the U of M and author of *Physics for the Rest of Us*,
   b) Has proposed and uses this distinction. I am convinced that more high school students should be taught qualitatively, so they do not get turned off by all the Math that some teachers think is vital to the teaching of science.
   c) Finally, there seems to be little mention of field trips. For example, enlist the help of amateur astronomers and have the students do their own astral observations. Take a trip to the woods, marshes, etc. to observe and chart environments.

Particular/Individual:

1. Grade 1 (I, B): Specify some examples of simple tools
2. Grade 1 (II, A): Change “materials” to “matter” here and elsewhere.
3. Grade 2 (I, A): There is a problem with the use of the word, “civilization” in that it was not until the 1600s that true science began to be practiced. SO……?? Repeated experiments may not always yield the same results in that circumstances may have changed something. Make this change throughout the standards.
4. Grade 3 (I, A): What does it mean to say that science should be used “responsibly?” Can you give some examples of responsible and irresponsible? Please stay away from “moral” and “immoral” that would be unknown to children of this age.
5. Grade 3 (II, C): In the fifth bullet under benchmarks, you state “light travels in a straight line.” It does **not**! Einstein’s theory of relativity states that light can be curved as it passes near large masses such as stars. This has been proved countless times during solar eclipses when the light of distant stars passes past the sun and we can see that light bends.
6. Grade 3 (IV, C): In the last bullet, give examples of how habitat changes can be beneficial or harmful and such changes may help the organism change and adapt.
7. Grade 4 (I, A): Now that you have added “inventions” you have a better opportunity to explain responsible uses. I’d suggest some medical inventions, since Minnesota is a center for such devices.
8. Grade 4 (I, B): In the third bullet, you mention “opinion.” I’d suggest making a strong argument about the use of the word opinion. In common lingo, it can mean, “Oh, that’s just your theory!” In scientific language, there is a huge difference between theory and opinion. This difference should be made clear to the sudent.
9. Grade 4 (II, C): In the first bullet, it might be better to use the word “closed” in place of “complete.”
10. Grade 4 (III, B): I think this might be the place to introduce the cycle of Ice Ages on the earth and the effect of Ice Ages on the earth’s climate. The climate has not always been this way, nor have the seas and oceans always been this high.
11. Grade 4 (IV, G): In the last bullet, one might better use the word, “expected” in the place of “usual”. When “challenged” children being mainstreamed, kids might start pointing and hurting other children emotionally by name-calling, etc.
12. Grade 5 (I, A): Science does help investigate and propose solutions. Unfortunately, those who do not know of or refuse to accept the data tend to refuse the proposed solutions. Witness the SUVs in the parking lot.
13. Grade 5 (III, A): In the first bullet, make a tie in with the next standard, in that fossils are very hard to come by and find without the rocks erode in which the fossils were trapped.
14. Grade 5 (IV, E): I think the standard should state, “all biological populations, including humans, have changed over time.” Moreover, it should be made clear that individuals evolve through adaptation and then propagate to pass on this adaptation. Populations then display this adaptive change in such a way that it becomes apparent to scientists or paleontologists. Another bullet should be added to make this point clear.

15. Grade 6 (I, A, B, B): There are some ideas which are not stated well on this page. For example, there is an assumption that all of science is based on experiment. Einstein's theories of Relativity all stem from thought experiments—not investigations. Planck's thoughts also led him to postulate Plank's Constant and that led to Quantum Physics. And most importantly, bias and personal reputation have and still lead to refusals to accept certain ideas and theories. For example, the Paleontologists (fossil diggers) are, at this time, quite reluctant to accept the input of biologists regarding the age of various organisms. The fact that humans are so closely related to chimpanzees is a matter of contention, mainly because this proven fact is difficult to correlate with commonly accepted evolutionary trees and clades.
16. Grade 6 (I, C): One needs to explain to the students that scientists most often communicate to each other via peer-reviewed journals.
17. Grade 6 (I, D): The use of the words "throughout history" appears here and elsewhere. These words seem to imply that science (as practiced today) has been with us since the beginnings of history. This simply is not so. There was a scientific revolution in the 17th century and, to imply anything different, begs the question. Is this a way of sneaking in Scientific Creationism? If so, get it out.
18. Grade 6 (II, B): "Substance" is a word that Aristotle and the Scholastics might have used. But, it is not suited to the subject of chemistry.
19. Grade 6 (III, A): There seems to be a misstatement here. The Earth itself is composed of an inner core, and outer core, etc. The words used here imply something else, since the earth itself is not composed of a stratosphere.
20. Grade 6 (III, C): The solar system is not located at the edge of the Milky Way. Rather, it is located in one spiral arm of the galaxy, about 2/3 out on that bar and some 26 million light years away from the center of the galaxy. Accessing Google on the Internet, selecting the "Images" tab and then typing in "Milky Way and/or Spiral Galaxies", may ideally make this point.
21. Grade 6(IV, D): This is an ideal place to introduce the concepts of Genes and their role in inheritance. It need not be a very deep discussion, but this is about the time the student should become aware of genes since the human genome has recently been mapped. They would probably have heard of it.
22. Grade 6 (IV, D): Clarity is lacking in the first bullet. It sounds more like Mendelian genetics, rather than evolution via common descent with alteration via change in a gene to cope with changes in the environment.
23. Grade 7 (I, A): See previous comments on "thought experiments."
24. Grade 7 (I, B): See the general comment on the use of math. It might be well to use math only in those classes for advanced students. While technology is sometimes important to use in experiments, it is not always used. Take a look at the Patent Office's awarding of patents. I'd mention some, but there too stupid to put in the standards. Experiments do not need to be repeated over and over. Most of the time, one or two tries suffice to validate an initial experiment, provided other persons and/or teams perform them.
25. Grade 7 (I, B): The standard seems to imply that science and technology are influenced by civilizations found around the world. That is preposterous! The civilizations of New Guinea, the Aborigines of Australia, the Innuit of Northern Canada, among others, have done little or nothing to influence today's science and technology. That is not to say they do not have their own technologies, such as stone age tool, bone spears, etc. But, not the ideas we mean in these standards.
26. Grade 7 (II, C): The standard (on Energy) seems to apply to the Entropy, the second law of Thermodynamics. Please advise the people who developed this standard, that there are two ways to consider Entropy: the way it occurs in a closed system, as opposed to an open system. Creationists conveniently forget this difference. Entropy only applies to a closed system. In an open system, such as Earth, evolution can occur. This appears to be a hidden back alley to allow opposition to evolution within the standards.
27. Grade 7 (II, C): The mention of "waves" in the bullets gets us into the conepts of waves and particles, that photons are particles and that light moves via both waves and particles. That's Quantum Physics! Is this too early? Perhaps! If they want to get all of it together, how about introducing wavelengths in ranges outside that of seeing and hearing, e.g. alpha, beta, etc.
28. Grade 7 (III, B): It's not the sedimentary layer/rock that allows us to date the earth and fossils. Rather, we use the potassium-argon dating systems (and other like it) to data the volcanic and other rock formation above and below the sedimentary layers.
29. Grade 7 (IV, C): Humans have altered the equilibrium of ecosystems already. It's now a matter of the speed by which we alter them, if we keep up our current patterns of destruction. Students should be made aware of the "life-carrying capacity of planet earth." I prefer to think of it as "spaceship earth" which has a limited carrying capacity.
30. Grade 7 (IV, D & E): The concepts of genetics and fossilization should be combined. One reflects on the other. We can date, via genetics, when various lines have split as backups and clarifications to the estimates of paleontologists. Several new and highly researched books on this very subject are now available. This comment also applies to Grade 8 (I, B).
31. Grade 8 (I, C): In the fourth bullet, there should be some examples of social, political, and economic changes caused by technological and scientific changes.

32. Grade 8 (II, A): This would be a great area within which the notion of sub-atomic particles could be introduced. Then, when the student gets to high school, they could be further introduced to the role of field theory along with these sub-atomic particles along with the technology that developed from these understandings.
33. Grade 8 (II, B): The issue of Entropy needs to be clarified here as well.
34. Grade 8 (III, D): The use of the word Doppler needs clarification here. It is not sound waves that are shifted; rather it is light waves that are shifted. Red shift equates with galaxies moving away from us and blue shifts indicate them moving toward us. Edwin Hubble figured this out in the 1920s. There is now evidence that, at the furthest reaches of the universe (further than 13.7 light years), the expansion is getting even faster. What does this means? Guess we'll have to wait and find out.
35. Grade 8 (IV, E): This whole standard needs to be rewritten. It should include the notion of punctuated equilibrium, as well a gradualism. The concept of time—immense amounts of time needs to be brought up. The commonly accepted definitions of evolution must be brought up and explained. The notion of common ancestry needs clarification—and that is not only "among some organisms." The whole notion of ecological disaster is missing (What happened to the dinosaurs? A huge meteoroid did them in. What about the Permian extinction?) The notion of behavior as it applies to past species is totally unknown to us and really doesn't belong in this discussion.
36. Grades 9-12 (II, A): Let's go the full way and introduce Quantum facts here. What are the particles? Why is the concept of fields so important? Why does Quantum theory place the Theory of relativity in doubt? What's the potential roles of Superstring Theory? (Also applies to II, C. More is needed than just the mention of photons here.)
37. Grades 9-12 (II, D): Funny that Newton is not mentioned here, when his three laws of motion are being explained.
38. Grades 9-12 (II, E): Something needs to be said about the combination of forces, the electroweak combination—but no way to get gravity in on a unified theory. That's part of the problem with Quantum Physics and Relativity.
39. Grades 9-12 (III, A): The notion of the earth remaining constant is false. Didn't anyone take into account at least the spreading of the plates under the oceans? You may not see it, but it is taking place. Also, Mt. Everest has been growing by several feet throughout my lifetime.
40. Grades 9-12 (III, D): The standards should mention the concepts of dark matter and dark energy. The visible mass of the universe doesn't come close to keeping the whole together.
41. Grades 9-12 (IV, B): Need to mention genetics and microbiology here. And I fail to see anything "probable" about evolutionary relationships and common ancestry.

Grades 9-12 (IV, D): Students need to know that there are only 30 thousand genes in the human genome. And also, there are 23 chromosome pairs (total 46), with a female having an XX chromosome and a male an XY chromosome. While Mendel's laws are important, I'm not so sure about the Punnett Square. It is more important to explain the difference between the phenotype and the genotype, however. The Mendelian laws probably would be best left to an advanced placement class.

Education organization, Public Comment:

Commissioner Yecke,

We are writing to communicate the position of the Minnesota Association of School Administrators(MASA) in regard to the proposed Science and Social Studies standards for the State of Minnesota. Youhave received a significant amount of feedback from the regional meetings and on the specifics of the
new proposed standards. Our comments are intended to be more general than specific.

General Comments:

1. The curriculum for elementary students is now very full with the requirements to have students be successful in reading, math and other curricular areas. The new Standards in Social Studies should provide an appropriate level of instruction for elementary students but not so much instruction that the study of social studies takes away substantially from the time students need to study reading, mathematics and science.

2. Standards should be developed for school levels as opposed to specific grade levels. If the Standards are too specific for each grade level it takes away from the flexibility of the faculty to design curriculum. It also reduces access of the faculty and students to textbooks that are appropriate. The Standards at a particular grade level may not fit with the available textbooks.

Comment regarding science standards:

1. The science curriculum in most of Minnesota's schools is already relatively strong. Minnesota students compete well in comparison to students in other states. Further, they compete well through the elementary and middle school levels in international comparisons.The refinement of the existing curriculum through application of rigorous standards is appropriate, but the newly developed standards should not substantially change the direction and focus of the science curriculums already in place. Groups ranking standards consistently identify Minnesota's existing science standards as strong and appropriate.

2. Enhancing the rigor and time commitment for the study of science at the high school level would be appropriate.

3. Keep 7th & 8th grade sciences as coherent courses that can be taught by highly qualified teachers. Do not change 7th & 8th science to a 'smattering' of life, earth and physical science.

4. There are too many benchmarks at the middle level (especially grade 6).

5. Recognize that most districts teach physical science at grade 9. To move it into the middle level may dilute the middle level science curriculum.
6. Include more opportunities for the study of Environmental science.

Thank you for this opportunity to provide our comments.

Comment From an email:

INTRODUCTION:
I want to begin by thanking and commending the committee for the work they have done. The vast majority of the standards and benchmarks are academic, knowledge-based and scientific, and they follow the law that says that the standards must be "be clear, concise, objective, measurable, and grade-level appropriate; (2) not require a specific teaching methodology or curriculum; and (3) be consistent with the constitutions of the United States and the state of Minnesota." These standards are an improvement over the process-oriented standards of the Profile of Learning. The following are examples of standards that are both positive and negative with regard to objectivity and measurability as required by the law:

OBJECTIVITYAND MEASURABILITY:

- Positive – While there are many, these benchmarks in particular meet the requirements of the law for objectivity and or measurability, and or they promote objectivity or measurability in science education and endeavor. They should be kept in the final standards.
- Students will distinguish between scientific evidence and personal opinion. (6.I.A.1.a)
- Students will know that observations and explanations can be affected by bias or strong beliefs about what should happen in particular circumstances. (6.I.B.1.c)
- Students will be able to explain how scientific innovations and new evidence can challenge accepted theories and models, including cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease, Big Bang theory. (9-12.I.A.1.b)

- Negative – These benchmarks do not meet the standard of objectivity or measurability for the reasons described below each one. They should be removed.
- Students will understand that science should be used responsibly. (3.I.A.1.a, 4.I.A.1.a, 5.I.A.2.b)
    - Responsible use of science is in the eyes of the beholder. This is neither objective nor measurable and should be eliminated.
- Students will cite examples of how the prevailing culture of a time influenced scientific and technologic advances.
    - This could also go under multiculturalism. It is impossible for this benchmark to be considered objective, as the law requires, because the views of a prevailing culture or groups within a culture are by nature subjective. This should be under social studies
- Students will recognize how traditions govern the conduct of science, including ethics, peer review, conflict, and consensus. (9-12. I.A.1.d)
    - Comment: Consensus is subjective and opinion based, and the word should be removed. Consensus comes from the Hegelian dialectic of thesis/antithesis resulting in synthesis. It is the opinion of the group that speaks the loudest or that controls the press or textbooks that wins out, not what is true or the most scientific.

There is a portion of the standards or benchmarks, however, that while not significant in number, are very significant for the impact they will have on the knowledge and actions of future Minnesota citizens. There are several themes that run through the draft standards as well as the *National Science Standards* on which the draft is largely based. These themes push political agendas that have little or nothing to do with science knowledge. If Minnesota adopts standards in line with those national political agendas, then the huge outpouring of opposition to and the tremendous effort to repeal the Profile of Learning will have been in vain.

Most of these problems with political themes and lack of objectivity would be solved by inclusion of the Santorum language as a preface to the standards. However, this alone would be meaningless unless the philosophy of this language is incorporated into the various controversial standards and benchmarks, because the tests are based on those them. The language says, "Where topics are taught that may generate controversy (such as biological evolution), the curriculum should help students to understand the full range of scientific views that exist, why such topics may generate controversy, and how scientific discoveries can profoundly affect society." This language is in the conference report to the No Child Left Behind Act, reflects congressional intent on the issue, and is going to be used by the US Department of Education to interpret the law and evaluate the standards that states submit.

I will group my comments about the standards by those themes.

UNBALANCED ENVIRONMENTALISM: Environmental science is taught in the national standards from the radical, political, crisis point of view that precludes a balanced discussion including fundamental American principles, such as private property and free market enterprise. Concepts, such as global warming, man's harm to the environment, finite resources, land use, population growth, and urban growth are mentioned prominently and frequently. In contrast, private property, good stewardship of natural resources, progress made on environmental issues and free market enterprise are never mentioned as positive concepts for the environment in the national content standards. This approach results in highly politicized content.

There is a similar lack of balance in the draft. Here are some examples:

- Students will understand that science is a tool that can help investigate solutions to environmental concerns/problems. (3.I.A.1.b, 4.I.A.1.b, 5.I.A.2.a.)
    - Comment: Most people agree with the above statement. However, science also addresses many other concerns and problems. For example, science ameliorates human and animal suffering, is used to create technology that protects humans and makes their lives better, increases crop yields, and the list goes on and on. Environmental concerns and problems should not be taught as the only or the pre-eminent use for science. Other uses should be added to the list.
- Students will give examples of ways humans can alter the equilibrium of ecosystems, including human population growth, technology, and consumption; human destruction of habitats (through direct harvesting, pollution and atmospheric changes). (7.IV.C.1.b.)
    - Comment: This benchmarks above speaks only to the negative side of human interaction with the environment and parts are just plain inaccurate. For example, expert Dennis Avery, said, "The environmental advocates do not like to be reminded that virtually all of the warming in the earth's recent temperature record occurred before 1940 – before the emission of much greenhouse gas from human activities." (Dennis Avery, Why Global Warming is Hot Again, American Outlook, Summer 2003) This benchmark should be changed to something like "Students will give ways that humans can both positively and negatively affect the equilibrium of ecosystems."
- Students will give examples of how environmental neglect or degradation can lead to potentially irreversible effects. (7.IV.C.1.c.)
    - Comment: This benchmark is just fear mongering. Every major environmental "disaster" has been rectified years, decades, or centuries before the Chicken Littles in the environmental movement said would happen, at least in countries where there are free markets and freedom of innovation. Examples include the Exxon Valdiz oil spill and the oil fires in Kuwait after the first Gulf War. The dire consequences of certain so-called "irreversible" and man-made "catastrophes" like global warming or ozone depletion have been wrongly assigned to human activity and have failed to materialize. This benchmark should be eliminated or changed to something like, "Compare the environmental conditions in republics and democracies that have freedom of innovation and totalitarian countries that do not."

Students will be able to apply an integrated understanding of chemistry, physics, and biology to the analysis of global change issues, such as ozone depletion, greenhouse warming and overpopulation. (9-12.III.A.1.h)

- Comment: Here is more fear mongering. There is no way to assure that students will be taught that science has shown that none of these issues are problems at all. This benchmark should be removed
  - Climatologist, Dr. Fred Singer said, "Escalating the drum beat for CFC phaseout were stories about blind sheep and blind rabbits in Chile, plankton disappearance in the Antarctic, increases in cataracts, and damage to the immune system with the unspoken suggestion of an AIDS epidemic. All of those stories proved to be baseless" (http://www.cato.org/pubs/regulation/reg17n1-singer.html)
  - Climatologist, Dr. Patrick Michael said of global warming, "The effects of this warming have been benign or beneficial. The growing season has increased by about three days at US latitudes and a week or more at more northern locations…Streamflow records indicate decreased drought and no change in floods. And heat related deaths declined with effective temperature." (http://www.cato.org/pubs/regulation/regv23n3/michaels.pdf).
  - Finally, How can credible scientists speak about overpopulation as a problem when large parts of the population of African countries are dying of AIDS and European countries are not even replacing their populations?

Students will be able to use globally gathered data to describe how Earth systems interact to create our climate and ecosystems. (9-12.III.A.1.i)

- Comment: Will students be told how the scientists who wrote the "US National Assessment" on global warming used the two computer models that predicted the most extreme changes in temperature and rainfall over the United States and that those models could not beat a table of random numbers when it came to predicting US temperatures? (http://www.cato.org/dailys/08-05-02.html) The benchmark should be changed to read something like, "Students will be able to use globally gathered data to describe how Earth systems interact to create our climate and ecosystems, and understand the bias and flaws in this data and its use."

The student will understand the relationships between the global atmospheric processes driven by energy from the sun, the Earth's tilt, rotation, revolution, the influence of land and water, and the impact of human affairs. (9-12.III.B.1)

Students will discuss the impact of human activity and natural resource use on the Earth's climate. (9-12.III.B.1.f)

- Comment: Both the standard and accompanying benchmark imply that human activity is significant on the earth's climate, when that is simply not true. Both should be changed to say that human activity has a negligible effect on climate or references to human activity should be removed.
  - "The environmental advocates do not like to be reminded that virtually all of the warming in the earth's recent temperature record occurred before 1940 – before the emission of much greenhouse gas from human activities." (Dennis Avery, Why Global Warming is Hot Again, American Outlook, Summer 2003)
  - "It is noteworthy that in 1987 the scientific evidence presented in published, peer-reviewed research showed that *natural* sources, and not CFCs, dominated the amount of stratospheric chlorine." (http://www.cato.org/pubs/regulation/reg17n1-singer.html)

Students will predict and analyze how a change in an ecosystem, resulting from natural causes, changes in climate, human activity, or introduction of invasive species, can affect the number of organisms in a population and the biodiversity of species in the ecosystem. (9-12.IV.C.1.d)

- Comment: If the reference to human activity stays in this benchmark, then there should be another one that says something like, "The student will explain how the Endangered Species Act and other laws and international agreements have been used, sometimes incorrectly, to alter human economies and activity, including but not limited to saying the spotted owl, certain species of salmon, and the lynx were endangered when they really were not."

MULTICULTURALISM: Multiculturalism holds the politically correct view that all cultures and ideas are of equal validity, and that there is, therefore, no real or universal truth. Multiculturalism also emphasizes the accomplishment of people because they belong to various minority groups, not because of the scientific achievement itself.

Students will know that people of all backgrounds and with diverse interests, talents, qualities, and motivations engage in fields of science and engineering. (6.I.C.1.a)

- Comment: What is the point of this benchmark? Although true, what does it contribute to scientific knowledge? It is not very objective or measurable and should be removed.

Students will know that technological changes and scientific advances are often accompanied by social, political, and economic changes. (8.I.C.1.d)

- Comment: This is true, but is subjective, opinion based, not measurable, and should be removed.

Students will recognize that science and technology are influenced by social needs, attitudes, values, and limitations, and cultural backgrounds and beliefs. (8.I.C.1.e)

- Comment: The implication of this kind of statement is that science is not a matter of truth or reality, but rather an issue of cultural perspectives, also called "constructs." It is subjective, opinion based, not measurable, and should be removed. This is an issue for the social sciences.

Students will provide an example of a scientific advancement contributed by another civilization. (9-12.I.D.1.b)

- Comment: This set up a quota system for scientific achievement, making the civilization or ethnic group of the scientist more important than the achievement. It is not objective and should be removed.

Students will compare and contrast the differences between scientific theory and other bodies of knowledge, including cultural beliefs, and the importance of each in a science discussion. (9-12.I.D.1.c)

- Comment: This benchmark is using "cultural beliefs" as an excuse for everyone who brings up a scientific argument against the current evolutionary or environmental orthodoxy to be accused of injecting religion or culture into the argument. This benchmark should be removed.

ORIGINS OF THE UNIVERSE: This is another area that would be helped if the Santorum language were included in some sort of preamble to the standards, because it is so controversial. The origin of the universe is a mystery and theories or hypotheses about it should not be taught as fact.

Students will explain how Doppler evidence suggests that our universe is expanding, moving away from the Earth and indicates support for the Big Bang theory of the origin of the universe. (8.III.D.1.c)

- This benchmark is clearly biased toward one explanation of the origin of the universe to the exclusion of any other scientific theory or evidence and is in violation of another benchmark that says, "Students will know that observations and explanations can be affected by bias or strong beliefs about what should happen in particular circumstances (6.I.B.1.c)." It is also in violation of good science to discuss one theory or set of evidence to the exclusion of all others. It should be changed to something like, "Students will explain how Doppler evidence suggests that our universe is expanding, moving away from the Earth and indicates support for the Big Bang theory of the origin of the universe, but also list other evidence that contradicts the Big Bang Theory.

Students will be able to explain how the sun, earth, and solar system formed. (9-12.III.C.1.a)

Students will be able to describe the remotely sensed evidence from current technology that has been used to understand the early history of the solar system. (9-12.III.C.1.c)

Students will describe the evidence from current technologies that has been used to understand the early history of the universe. (9-12.III.D.1.e)

- In all three of the immediately above benchmarks, the words "the theory of" should be inserted after the words "explain" or "understand." No scientist was present at any of these events, so any explanation or understanding is only a theory.

EVOLUTION TAUGHT AS FACT: This area is a prominent reason that the Santorum language is needed. The evolution/common ancestry benchmarks teach the theory of evolution as an established fact and do not discuss the scientific disagreements with and flaws in evolutionary theory. Even the National Standards admit that the "data and understanding are incomplete" regarding evolution, but there is no evidence of that in the draft. That dogmatic discussion of evolution puts it in the realm of religion, and is a violation of the 1st amendment to the US Constitution, as it is currently interpreted. The science standards disregard any scientific evidence that conflicts with the theory of evolution by calling it non-science or the injection of religion into science. This is a completely unscientific approach to learning. The standards do not cover the multiple scientific flaws with Darwinism such as the ones that I have listed in an attached paper titles Summary of Evidence of Evolution and summarized under the relevant standards and benchmarks below:

Students will know that fossils document the appearance of many life forms. (7.IV.E.1.b)

- Comment: This is actually true, but it needs to be emphasized that many life forms appeared all at once in the fossil record as in the Cambrian explosion and this does not give evidence of evolution. It should be changed to say, "Students will know that fossils document the appearance of many life forms all at once."

The student will understand how evolution provides a scientific explanation for the fossil record of ancient life forms, as well as the striking similarities observed among the diverse species of living organisms. (7.IV.E.1)

Students will give examples how fossils record the diversification of many life forms. (7.IV.E.1.c)

The student will explain how evolution provides a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms. (9-12.IV.E.1)

Comment: The following apply to both the standard and the two benchmarks above. These should be changed as follows: "The student will understand how evolution fails to provide a scientific explanation for the fossil record of ancient life forms, as well as the striking similarities observed among the diverse species of living organisms." (7.IV.E.1) "Students will show that there are no transitional forms in the fossil record to explain the diversification of many life forms." (7.IV.E.1.c) "The student will explain how evolution fails to provide a scientific explanation for the fossil record of ancient life forms, and that molecular biology underscores the enormity of the gap among the diverse species of living organisms." (9-12.IV.E.1)

- There are no transitional forms in the fossil record to support the idea of common ancestry. That record shows complete animal groups appearing all at once and fully formed, such as in the Cambrian explosion. "…our more extensive labor has still failed to identify any creature that might serve as a plausible immediate ancestor for the Cambrian faunas [animals]" (Stephen Jay Gould, "A Short Way to Big Ends," *Natural History*, 95, January 1986:18 as quoted in James Perloff, The Case Against Darwin, Burlington, Massachusetts: Refuge Books, 2002, 39) "It is a mistake to believe that one fossil species or fossil 'group' can be demonstrated to be ancestral to another." (Gareth V. Nelson, Origin and Diversification of Teleostean Fishes, "*Annals of the New York Academy of Sciences* 67,1969: 22 as quoted in ibid.)
- Taxonomy also shows a lack of transitional forms between the major animal divisions. "If we are willing to accept the facts, we must believe that there never were such intermediates, or in other words, that these major groups have from the very first borne the same relation to each other that they bear today." (Austin H. Clark, The New Evolution: Zoogenesis, Baltimore: Williams and Wilkin, 1930, 189 as quoted in Perloff, 47)
- Molecular biology also shows no evidence for the evolutionary sequence. "Instead of revealing a multitude of transitional forms through which the evolution of a cell may have occurred, molecular biology has only served to emphasize the enormity of the gap…[N]o living system can be thought of as being primitive or ancestral with respect to any other system, nor is there the slightest empirical hint of an evolutionary sequence among all the incredibly diverse cells on earth." (Michael Denton, Evolution: A Theory in Crisis, Bethesda, Maryland: Adler and Adler, 1986, 249 – 250, as quoted in Perloff, 48)

- Students will recognize that a great amount of time, approximately 3. 5 billion years, is necessary to explain the variation of species that has produced the great diversity of life currently present on earth and found in the fossil record. (9-12.IV.E.1.e)
  - Besides the problems with the fossil record not supporting evolution as shown above, 3.5 billion years is a guess, not objective and should be removed.
- Students will explain how diversity of species can develop through gradual processes over generations. (8.IV.E.1.e)
  - Comment: This would be better stated by changing the words "of species" to the words "within species." There is little or no scientific argument that species change within themselves due to natural selection, so called microevolution. However, there is a lot of scientific argument about speciation and common ancestry, macroevolution.
- Students will understand that there is scientific evidence of common ancestry among some organisms. (8.IV.E.1.b)
  - Comment: There is a lot of scientific controversy about that evidence, which will be discussed below. This benchmark should be reworded to say something like, "Students will understand that there is scientific evidence both for and against the theory of common ancestry among some organisms."
- Students will be able to use scientific evidence, including the fossil record, homologous structures, embryological development, or biochemical similarities, to classify organisms showing probable evolutionary relationships and common ancestry. (9-12. IV.B.1.e)
  - Comment: This benchmark should be reworded something like, "Students will be able to use scientific evidence, including the fossil record, homologous structures, embryological development, or biochemical similarities, to classify organisms and to investigate whether or not there are evolutionary relationships and common ancestry," for the following reasons:
    - The problems with the fossil record as evidence for evolution have been explained above.
    - Biology textbooks define homology as the similarity of structures due to common ancestry. It is used in a circular argument as proof of common ancestry even by the NCSE when it said, "The same anatomical structure (such as a leg or an antenna) in two species may be similar because it was inherited from a common ancestor (homology)…" (http://www.iconsofevolution.com/embedJonsArticles.php3?id=1106).
    - There is no evidence of evolution from embryology. Modern biology textbooks are still using versions of Haeckel's drawings that were discredited over 100 years ago. "This is one of the worst cases of scientific fraud…What he [Haeckel] did was to take a human embryo and copy it, pretending that the salamander and the pig and all the others looked the same at the same stage of development. They don't…These are fakes." ("An Embryonic Liar," The Times (London), 11 August, 1997, 14 as quoted in Perloff, 55)

- "Three high-school textbooks, Biggs, Kapicka and Lundgren's Biology: The Dynamics of Life (1998), Schraer and Stoltze's Biology: The Study of Life (7th Edition, 1999), and Miller and Levine's Biology (5th Edition, 2000), contain stylized drawings that improve only slightly on Haeckel, and perpetuate Haeckel's misrepresentation of the midpoint of development as the first stage." ((http://www.iconsofevolution.com/embedJonsArticles.php3?id=1106)
- According to biochemist Dr. Michael Behe, biochemical evidence speaks much more of "irreducible complexity," such as blood clotting, and the immune system, that cannot have evolved, because all the parts of those must be present for the system to work. If these systems had evolved gradually over eons, creatures would have bled to death or died from infection before the system was perfected. (Michael Behe, Darwin's Black Box: The Biochemical Challenge to Evolution, New York: Free Press, 1996, 77-97)
- Sir Francis Crick, the Nobel laureate who co-discovered the structure of DNA, calculated that the probability of just one protein occurring by chance would be one in 10 to the 260th power, or 10 with 260 zeroes after it. Most mathematicians say that something is for all practical purposes impossible if the probability is 10 to the 50th power. (Francis Crick, Life Itself: It's Origins and Nature, New York: Simon and Schuster, 1981, 51-52 as paraphrased from Perloff, 29-30)

Students will be able to explain how adaptations of species and co- evolution with other species are related to success in an ecosystem. (9-12.IV.C.1.b)

- Comment: How will students be able to explain "co-evolution" when there are many flaws in the theory of evolution itself, which are not mentioned in the standards? The phrase "and co-evolution with other species" should be removed.

Students will be able to describe how genetic variation between populations is due to different selective pressures acting on each population, which can lead to speciation/ a new species. (9-12.IV.E.1.d)

- Comment: The genetic variation referred to here is selective pressure causing mutations that are seen as the building blocks of evolution. The only problem with that is that mutations have never been observed to result in higher order, more complex genetic information, so it is impossible for genetic variation to result from mutations and in new species. This should be changed to something like, "Students will be able to describe how genetic variation within populations is due to different selective pressures acting on that population, which can lead to microevolution, but not to new species/speciation."
  - "All point mutations that have been studied on the molecular level turn out to reduce the genetic information, and not increase it." (Lee Spetner, Not by Chance!: Shattering the Modern Theory of Evolution, Brooklyn, N.Y.: Judaica Press, 1997, 138 as quoted in Perloff, 23)

INTEGRATION OF OTHER FIELDS AND SUBJECTS WITH SCIENCE: The national *Science Standards* require that there be less emphasis on "treating science as a subject isolated from other school subjects" and more emphasis on "connecting science to other school subjects, such as mathematics and social studies" (p.224). While integration of academic content between subjects is a good idea, the promotion of political agendas across subject areas is a bad idea and falls under the heading of indoctrination, not education. It is not a good idea in the draft either and has been done in at least two areas:

ETHICS:

Students will know that science can sometimes be used to inform ethical decisions by identifying the likely consequences of particular actions. (8.I.A.1.b)

- This is true, but there is no discussion of how science has coarsened human and medical ethics by leading to a utilitarian, quality of life ethic, instead of a sanctity of human life ethic. Examples of this include abortion for the wrong sex, abortion for even the hint of a genetic defect, partial birth abortion, euthanasia as being practiced in Europe and now in the US with the Schiavo and Cruzan cases, etc. The benchmark should be changed to read, "Students will know that science can sometimes be used to inform ethical decisions, both positively and negatively, by identifying the likely consequences of particular actions.

INTEGRATION OF BEHAVIORAL BIOLOGY WITH SOCIAL SCIENCES:

Students will realize that behavioral biology has implications for humans since it provides links to psychology, sociology and anthropology. (9-12.IV.G.1.e)

- This benchmark should be removed, because psychology, sociology, and anthropology are social sciences anyway and the standards should deal with hard science. Also, there is no discussion of the evolutionary bent of behavioral biology that has led to Skinnerian and Pavlovian treatment in psychology and education where people are treated as mere animals or organisms that need to be trained by using or withdrawing the proper incentives/stimuli. And there is no discussion of how behavioral biology and the evolutionary views that underlie it have led to the "science" of eugenics and the millions of deaths that have resulted from it.

Comments from unsolicited national reviewers:

Dear Commissioner Yecke,

I have read Professor Macosko's letter and analysis of the science standards and would like to voice my strongest support for his arguments.
Regards,

Professor of Chemistry
University of Minnesota

The amount of environmental education included in these standards is woefully inadequate. A vast majority of MN citizens believe that EE is important and support it in the science curriculum, yet you leave it out altogether. Students need to learn more about interdependence, human impacts on the environment and basic ecological principles. We need informed citizens. Your standards also gloss over human impacts on the environment and living systems. (both positive and negative impacts) You ought to Look at the Environmental Literacy Scope and Sequence for more specific detail when rewriting the standards.Environmentally literate citizens are those who have a basic level of understanding of a system. Without a deeper study of environmental education our students will not be able to make informed choices, nor will they be able to understand the science behind todays environmental issues and what it all means. Some of the comments posted here refute global climate change and other current ecological issues, but These issues are based on scientific study and there is a huge body of evidence to support them.
Your standards also seem too heavy on memorization of facts and don't leave enough room for "doing science"...also, it would be nice to see some benchmarks that involve service-learning. You might also include time for fieldwork using science to solve real problems or find real answers to questions the students have. Finally, please stop politicizing the evolution/creation debate. This is science. If our students are going to learn science they should learn the Theory of Evolution, as it is a commonly accepted theory in science. To leave this out is to allow our students to be uninformed in the language of science. Give our teachers a little credit. Most are fully capable of teaching about evolution in such a way as to not undermine anyone's religious beliefs. We are teaching science here, not trying to subvert anyone's faith. I know plenty of incredible teachers who also belive in Creation. It's insulting to our teachers --and our students---to imply that the two are mutually exclusive.

Comments on Minnesota Science Standards, First Draft

General comments:

1. As can be seen from my comments below, the present draft is in a quite primitive state and is not really ready for submission to public comment. It needs careful detailed work at every level from organization through specific content, down to copy editing.
2. The term "different" is over- and misused often in the draft when what is meant is "various" or "many."
3. Many of the benchmarks and some of the standards omit the important little word "that." Examples: 3.IV.B.1, 3.IV.C.2&3, 4.IV.G.3, 5.IV.E, 6.IV.B, 9-12.I.A.
4. The kind of output expected from students in their meeting of the benchmarks is not often made clear. Is the student to submit reports, mathematical analyses, graphs, lab notebooks, examination results? More detail would be helpful.
5. Thermodynamics is poorly covered in the Physical Science sections, although specific laws of thermodynamics are referred to in the Earth And Space Science and Life Science strands.

Specific Comments

K.I.B ~~The student~~ Students will raise questions about the world around them, make careful observations, and seek answers to them. [This is merely a matter of using correct grammar; similar barbarisms exist throughout.]

General comment concerning consistency: The "Standard" column consistently refers to "The student" while the "Benchmarks" column consistently refers to "Students will…". There is no reason for this inconsistency which, in addition, leads to the bad grammar noted above.

1.II.E Students will observe and describe that objects can be affected by magnetism and gravity ~~can affect objects~~ without being touched. [As it stands, the statement does not carry the intended meaning.]

1.III.B Students will observe, record, and describe characteristics ~~in~~ of daily weather and seasonal cycles.

p. 2:

2.I.B.3 The period should be replaced by a semicolon to avoid a run-on sentence.

2.II.D Students will observe and describe how objects move in a straight line, zigzag, back- and- forth, round- and- round, and fast and slow. [This sentence is sloppily written. It should read something like "Students will observe and describe how object can move in straight lines, zigzag paths, back and forth, round and round and that they can move fast, slow, or not at all."]
Students will observe that a push, pull, and spin are forces that can make objects move. ["Spin" is not a force. Rather, a push or a pull can make an object spin as well as translate.]

2.II.C Students will observe that the sun and the moon are not always in the same place. [What does this mean? The sun and the moon are only rarely "in the same place."]

*2.IV.C The student will understand that organisms live in different environments that are suited to their
needs. Students will observe and describe some features that plants and animals have that allow them to live in specific environments. [The first sentence – the standard – is misleading because it seems to imply that the environment accommodates itself to the needs of its denizens. The second sentence – the benchmark – makes more sense; the standard should be rewritten along similar lines; e.g., "Students will understand that plants and animals have features that equip them to live in a wide variety of specific environments."]

p. 3:

*2.IV.F The student will understand some relationships among organisms. [This is unnecessarily vague. Perhaps "Students will understand that all organisms interact with other organisms in many ways."]

*2.IV.G The student will understand that people have needs. [This is too vague to be useful. Perhaps "Students will understand that humans, like other animals, must depend on the resources around them to sustain life." Here again, the benchmark is better than the standard.]

3.I.A The student will understand the relationship between science and the environment. [It doesn't make sense to talk about a relationship between an intellectual discipline and the natural world. Better: "Students will understand how science can be applied to help us understand and interact better with the environment."]

3.I.B.4 See 2.I.B.3

3.II.C.1 Students will explore the different sounds that are produced by changing vibrating objects. [I don't know what this means. Maybe "Students will explore the different sounds that are produced by different vibrating objects."]

3.II.C.5 There is a verb missing here. Better: "Students will know that light travels in a straight line until it strikes an object."

3.II.C.7 For "in" read "is"

3.III.A The benchmark is too general for use at Grade 3; it's more a standard than a benchmark. "Shared physical characteristics" should be narrowed and made more specific.

3.III.B For "temperatures" read "temperature". This is necessary for internal consistency.

p. 4:

3.III.C.1 Students will know that the earth is one of several planets that orbit the sun, and that the moon orbits ~~around~~ the earth.

3.III.C.3 Students will understand the difference between rotation and revolution and their connections to day and night and the ~~year~~ seasons.

3.III.C.4 For "movement" read "motions"

3.III.C.5 Students will know that the Earth~~'s gravity~~ pulls objects towards it without touching the objects by means of its gravitational attraction.

3.IV.B for "different structures" read "a wide variety of structures"

3.IV.B.2 Students will know that plants have ~~different~~ structures different from those of animals that …

3.IV.B.3 … structures that allow ~~them~~ those life forms to survive in that biome. [The proper antecedent for "them" is unclear in this long, complex sentence.]

3.IV.D The student will understand that many …

3.IV.F See 2.IV.F

4.I.A See 3.I.A

p. 5:

4.I.B.2 Students will understand that conditions must be kept the same in order to compare investigations. [This is not quite true. In comparing experiments, one often wishes to change one variable while keeping the others constant. Rewrite so as to express this point better.]

4.I.B.5 Run-on sentence should be fixed here as in earlier X.I.B standards. I will not repeat this point below.

4.II.A.1 Students will distinguish ~~between~~ among three states of matter.

4.II.A.2 Students will know that matter can change and exist in one or more states. [I have no idea what this means. What is intended beyond the preceding benchmark?]

4.II.A.3 Students will know that ~~heating and cooling~~changing the temperature of matter can cause a change ~~between~~ of state~~s~~.

4.II.A.4 Students will know that solids have ~~a~~ definite shapes and that liquids take the shape of their containers

4.II.C.4 Compared with the three preceding benchmarks, this one is very general and vague. It should be brought into consistency.

4.II.E for “relationships” read “relationship”

p. 6:

4.III.D For “movements” read “motions”. Symphonies and colons have movements; physical objects have motions.

4.III.D.2 Students will know that planets look a lot like stars but over time they appear to… [The point here is that a more than superficial observation reveals a number of naked-eye differences between planets and stars besides their wandering motions. Most notably, naked-eye planets are brighter than stars and they don’t twinkle.]

4.III.D.4 Students will know that telescopes magnify distant objects in the sky… [This is misleading to the young student, who can be led to expect that he will see stellar features through a telescope. In fact, telescopes do not magnify stars; they only make them more visible by collecting more of their light. Planets can be magnified, as can the sun, the moon, and some planetary satellites. This benchmark should be rewritten so as not to mislead.]

4.IV.A This sentence is a syntactical monstrosity. Rewrite in a language resembling English.

4.IV.A.3 Students will know that cells need food, water and air;… [Anaerobes don’t need air. Indeed, aerobic cells in general don’t use “air” but rather extract oxygen from a water solution or from some other carrier.]

p. 7:

5.II.C, all benchmarks. Students are prone to the misconception (which was universal among scientists until less than 200 years ago) that heat is a substance. It is a mistake to use “heat” as a noun because this only reinforces the misconception. “Heat” should be restricted to use as an adjective (as in “heat energy”) and a verb (as in “when we heat an object its temperature rises.”) Here and subsequently, substitute “heat energy” for “heat” in all appropriate places.

5.II.C.4 Students will know that things that absorb light collect heat and may become warmer. [I can think of no better way to confuse students than with this statement. What is the meaning of “…absorb light collect heat…”? My guess is that the writers of this nonsense intended something like “Students will know that when an object absorbs light energy it is converted into heat energy and the temperature of the object usually rises as a result.”]

5.II.D.1 Students will use the principle of a simple machine to describe the use of the lever~~s~~, inclined plane, and wheel and ~~axel~~axle. [There are many persons of Scandinavian descent in Minnesota, but the word is still “axle” and not “Axel.”]

5.III.A.2 Students will explain how ~~waves,~~ wind, water, and ice… [There is a lack of consistency here. Waves are one form in which water works geological changes.]

5.III.A.4 Students will recognize the different composition and properties of soils.

*5.IV.E.1 …in surviving and reproducing and thus passing those differences on to successive generations.

*5.IV.E.2 Students will know extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. [“adaptive characteristics” is too vague here. It could mean that the individual members of the species cannot adapt sufficiently to the environmental changes, or that the species cannot evolve fast enough to accommodate the changes over the requisite time span, or maybe both (which would be really confusing! This should be clarified.]

p. 8:

6.I.A.3 Students will know that scientists assume that nature ~~is the same~~operates according to the same laws everywhere…

6.I.B.1 Students will use appropriate tools and ~~Systems~~ Système International units…

6.I.B.5 Students will explain how ~~the student's~~ their scientific investigations relate to…

p. 9:

6.II.A.3 A comma is needed after "properties"

p. 10:

6.II.C "…energy is a property…" A property of what? I have never seen this statement before and I can't imagine what information it conveys. Just leave it out and go on to the much more important fact that it cannot be created or destroyed.]

6.II.C.1 Students will know that energy exists as heat energy, chemical energy, mechanical energy and electrical energy.

6.II.C.2 Students will recognize that most of what goes on in the universe from exploding stars and biological growth to the operation of machines and the motion of people involves some form of energy being transformed into another. [This is bizarre. Why are exploding stars and biological growth paired at one end of some imagines spectrum and operation of machines and motion of people at the other?]

6.II.C.3 Students will recognize that heat energy ~~in the form of heat~~ is ~~almost always~~often one of the products of energy transformation. [There are many important processes in which this is not so. Examples are electrical generation by electrochemical means or the Faraday effect and emission of light by atoms. Heat energy may be produced in subsequent processes, but not in the basic processes.]

6.II.C.6 Students will know that energy ~~in~~ can be stored in many ways.

6.II.D.3 Students will know the difference between average speed ~~versus~~ and instantaneous speed at a particular time.

6.II.E for "different" read "a variety of" [As it stands, the statement means that the structure of object are governed by one force and their motion is governed by another.]

6.II.E.4 Students will know that electric currents and magnets can exert ~~a~~ forces on certain objects and on each other.

6.II.E.5 Students will recognize that gravitational forces are weak compared to electric and magnetic forces.

6.III.A.1 Students will know that the Earth ~~is comprised of~~comprises [or is composed of] layers including the lithosphere, hydrosphere, and atmosphere.

6.III.B The student will understand how the atmosphere interacts ~~on~~ with other parts of the Earth. [An interaction has to be with something; one thing can act on but cannot interact on something else.]

p. 11:

6.III.C.1 Students will compare the characteristics and the motion of Earth with the characteristics and ~~movement patterns~~ motions of the other planets, their satellites, and other objects in our Solar System.

6.III.C.2 The solar system is not located “at the edge of” the Milky Way but roughly halfway out.

6.IV.B The random placement of commas in this jumbled sentence renders it incomprehensible.

6.IV.C This standard is so jumbled that it makes no sense. It should be rewritten from scratch.

p. 12:

7.I.B.3 Students will know that hypotheses ~~are~~ can be valuable even if they turn out not to be ~~true~~correct.

7.I.B.4 Students will know that an understanding of mathematics and the use of technology are essential in ~~determining how~~ conducting a scientific investigation ~~is conducted~~ and ~~the explanations that can be made~~understanding the results.

7.I.B.6 Students will know that systems have boundaries, components, resources, flow and feedback. This may be true, but it is a hodgepodge collection of properties and not helpful.

p. 13:

7.I.B.4 Students will use appropriate tools and ~~Systems~~ Système International units… [This seems to be a pervasive error. I won’t note it again.]

7.I.B.10 Students will explain how ~~the student’s~~their scientific investigations relate to…… [This seems to be a pervasive error. I won’t note it again.]

7.II.A.1 Students will distinguish between mass and volume. [This is very important but surely should be introduced well before Grade 7. Indeed, the concept of density (mass/volume) should be introduced as soon as the students have been introduced to division and fractions.]

7.II.A.3 Students will compare and contrast the mass, shape and volume of solids, liquids, and gases. [The concept is certainly a good one but it must be rephrased. What is the shape of a gas?]

p. 14:

7.II.C.1 Students will understand that adding ~~or taking away~~ heat energy to or removing it from a system with ~~a~~ constant mass will usually result in temperature change. [Not true, for instance, of melting ice.]

7.II.C.2 Students will recognize that heat energy flows ~~moves~~ in predictable ways, ~~moving~~ flowing from a warmer object~~s~~ to a cooler one~~s~~ until both reach the same temperature.

7.II.C.3 Students will give examples of the ~~movement~~ flow of heat energy by convection, conduction and radiation.

7.II.C.4 Students will know that energy can be transferred ~~through~~ by means of waves.

7.II.D.4 Students will know that acceleration is a change per unit time in speed or direction.

p. 15:

7.III.A.1 Students will explain how land forms are created through ~~forces~~ events [or actions] such as …

7.III.B.4 Students will explain how the tilt of the Earth's axis and the Earth's revolution around the Sun affect seasons and how, together with the Earth's rotation on its axis, they affect weather patterns.

7.III.B.1 shadows?

7.IV.A.1 Students will distinguish between single-cell and multi- cellular organisms.

7.IV.A.3 Students will know that cells repeatedly divide for growth and repair. [This is a bit confusing in the context of Benchmark 1. The statement is true of cells in multicellular organisms; single-cell organisms divide in order to reproduce (as to multicellular organisms, though not "repeatedly."]

7.IV.B.1 Students will explain the organization of whole organisms in a living system including populations, niche, and communities. [Not clear. Perhaps "in a living system" is supposed to mean "within an ecosystem."]

p. 16:

*7.IV.E This is the first explicit use of the important term "evolution." It should have been introduced at an earlier grade level – say about Grade 4 – even though a detailed exposition of the theory must be deferred to the middle-school level.

7.IV.F.1 Students will know all energy within ~~an~~ most ecosystems originates from the sun. [Not true of ecosystems based on some extremophiles.]

7.IV.F.2 Students will know that green plants use the energy in light to make sugars out of carbon dioxide and water.

7.IV.G.1 Students will give examples of ~~the effects of~~ how environmental factors can lead to diseases and other risks to human health.

p. 17:

8.I.B.3 See above.

p. 18:

8.I.B.12 for "cause effect" read "cause-effect".

8.I.C.2 Students will know that technological solutions have intended benefits and unintended consequences. [This is a bit misleading. The proposers and constructors of technological solutions are often aware of at least some of the negative consequences of the solution, if not all. All technological activities involve a balance of positive and negative effects.]

p. 19:

8.II.A.2,3 Students will describe the states of matter in terms of the space between atoms and molecules Students will give evidence that the space between atoms and/ or molecules is smallest in a solid, and greatest in a gas. [This pair of statements supports the misconception, common in K-12 science texts, that the distance between molecules is the main factor in distinguishing the three common states of matter. It is indeed the salient difference between gases on the one hand and solids and liquids on the other. But the intermolecular distance is not dramatically different in the solid and liquid states of the same substance. This can be seen in the fact that the liquid is usually a little less dense than

the solid, but only a little, and there are dramatic exceptions including water and bismuth. The main difference between solids and liquids is not the intermolecular spacing but the nature of the intermolecular bond.]

8.II.C [See note above concerning calling energy a "property".]

8.II.C.1 Students will understand that energy is a property of many substances. [I don't know what this means. If I take a piece of pure gold and elevate it, its energy changes in a manner that has nothing to do with the properties of gold (except, perhaps, its density.]

8.II.C.3 Students will know that potential energy is stored energy and ~~is~~ may be associated…

8.II.C.4 for "vise" read "vice"

8.II.3.5 Students will use the idea that matter is made of small particles to explain the ~~movement~~ flow of heat energy in conduction and convection.

8.III.B.1 Students will understand how radiation, conduction and convection of energy in, ~~and~~ out of, and within the atmosphere affects weather and climate.

8.III.B.2 This statement is correct but jarring. Uneven heating and gravitation result in ocean currents and winds in a direct way by producing convection, but layering of the atmosphere is the result of a different process. It would be well to place it in a separate benchmark.]

p. 20:

8.II.C.1 for "principle" read "principal"

8.II.C.2 This benchmark must be rewritten in a language resembling English.

p. 21:

*8.IV.B.1 This is the first statement of the important fact that humans are multicellular organisms and have systems similar to those of other animals. The point should have been made much earlier than Grade 8.

*8.IV.C.2 Students will be able to ~~taxonomically~~ group organisms taxonomically ~~to~~ within their ~~appropriate~~ proper kingdoms.

8.IV.C.4 This benchmark must be punctuated properly – a comma is missing and a semicolon should be a comma.

*8.IV.C.6 "amount of life" is a pretty fuzzy concept. Rephrase.

p. 22:

*8.IV.E.2 At this level students should do more than just demonstrate awareness that scientific evidence for evolution exists. They should be able to give some examples.

*8.IV.E.3 Rephrase. See above for a similar badly phrased benchmark.

*8.IV.E.4 Students will give examples of physical characteristics of an organism that
changes the organisms' chance of survival. [This doesn't make sense. Either the organism has the characteristic or it doesn't. How can its chance of survival change?]

8.IV.F.2 "usable" is the preferred spelling.

8.IV.F.3 for "matters" read "matter's" – but it's better not to use the possessive in such cases, so rephrase.

p. 23:

9-12.I.C.1 Students will be able to analyze an example of a way ~~you~~ they use the scientific method in ~~your~~ their daily ~~life~~lives.

9-12.I.C.3 Students will provide an example of a need/ problem explained by science and solved by engineering/ technology. [This is an odd formulation. It suggests that science somehow poses problems and technology solves them. I think I know what is intended here, but it needs to be rewritten clearly.]

p. 24:

9-12.II.A The student will understand the nature of matter including their forms, properties and interactions. [This makes no sense. What or who is "they"?]

9-12.II.A.1 This hodgepodge of words needs to be rewritten.

9-12.II.A.2 Students will be able to explain the relationship of an element's position on
the periodic table to its atomic number and mass. [What's intended here? The order of elements in the periodic table is determined by their atomic numbers, but that does not by itself determine the column in which an element is located. The atomic mass is not directly related to position in the periodic table.]

9-12.II.A.3&4 These benchmarks make no sense. They must be rewritten in clear language.

9-12.II.A.6 "…the four states of matter…" is misleading because there are not just four states. To solids, liquids, gases, and plasmas one may add Fermi fluids, the matter in neutron stars, and such more abstract phases as superfluids and superconductors. In any case, the "structure and magnitude of intermolecular forces" does not make much sense for plasmas. Just restrict this benchmark to "…the three familiar states of matter…"

9-12.II.B for "…leads to the ability to…" read "…makes it possible to…"

9-12.II.B.4 Students will differentiate between ~~complete~~ irreversible and reversible reactions.

p. 25:

9-12.II.C I have no idea what this standard means. Rewrite in a language resembling English.

9-12.II.C.1&2 See above.

9-12.II.C.5 Students will explain how ~~electricity travels~~electric current flows through circuits.

9-12.II.C.6 Students will know that ~~electricity in~~electric current is the ~~movement~~ flow of charged particles.

9-12.II.C.7 Students will describe the ~~production~~generation, storage, and transmission of electricity.

9-12.II.C.9 Students will explain how the energy of the waves described the electromagnetic spectrum is used in research, medicine and industry. [What does this mean?]

9-12.II.C.10 Students will be able to use the Law of Conservation of Energy to explain changes in energy in physical and chemical changes. [Unclear. What is a change in energy?]

9-12.II.D.3 Students will know that if more than one force acts on an object ~~in~~ along a straight line, the forces will ~~reinforce or cancel one another~~add or subtract, depending on their direction and magnitude. [Cancellation will occur only if the forces are equal in magnitude and opposite in direction.]

p. 26:

9-12.II.E.1 for "gravity" read "gravitational"

9-12.II.E.2 Students will be able to recognize that the nuclear forces that hold the nucleus of an atom together are usually stronger than the electric forces that would make it fly apart. [This is a common misconception. Think a bit: If the nucleus is stable, the attractive and repulsive forces are balanced. The real point is that the strong force falls off more rapidly with distance than the EM force. That is why there is a stable configuration, but this point may not be important for elementary-physics students.]

9-12.III.A.2 This is pretty vague. What is actually required of the student here?

p. 27:

9-12.III.B This standard is an unacceptable hodgepodge. It should be dissected into several separate statements.

9-12.II.B.1 "…the transfer of energy…" [What transfer of energy?]

9-12.II.B.2 Students will be able to trace cyclical movement of an element through the lithosphere, hydrosphere, atmosphere, and biosphere. [Chemical element? If so, which one or ones?]

9-12.II.B The benchmarks seem ill-matched and ill-ordered. Some seem to subsume others, and as a whole they are not cogent.

9-12.III.C.3 Students will be able to describe the remotely sensed evidence from current technology that has been used to understand the early history of the solar system. [What does this mean?]

9-12.III.D.1 Students will recognize that stars, galaxies~~y~~, and the universe as a whole change over time.

9-12.III.D.4 Students will be able to identify ~~that~~ the processes in stars that lead to the formation of ~~other~~ the elements of the periodic table.

9-12.III.D.5 Students will describe the evidence~~, from~~ most of it gathered using ~~current~~ modern technologies, that has been used to understand the early history of the universe.

p. 28:

9-12.IV.B.1 This benchmark is garbled and must be rewritten to make sense.

*9-12.IV.B.5 Students will be able to use scientific evidence, including the fossil record, homologous structures, embryological development, ~~or~~ and biochemical similarities (e.g., amino acid sequences and gene sequences), to classify organisms showing probable evolutionary relationships and common ancestry.

p. 29:

*9-12.IV.C.1 … the carrying capacity ~~of~~ for a population.

*9-12.IV.C.4 Students will predict and analyze how a change in an ecosystem, resulting from ~~natural causes,~~ changes in climate, human activity, or introduction of invasive species, and other natural causes, can affect the number of organisms in a population and the biodiversity of species in the ecosystem.

*9-12.IV.D.4 Students will know that ~~different~~ every species of multicellular organism~~s~~ ~~have~~ has a characteristic diploid number of chromosomes, and that in typical humans there are 22 autosomal pairs and two sex chromosomes (XX for female and XY for male).

9-12.IV.D.6 for “a monohybrid crosses” read “a monohybrid cross”

p. 30:

*9-12.IV.E.4 Students will be able to describe how genetic variation between populations is due to different selective pressures acting on each population, which can lead to speciation/ a new species. [This should be rephrased to reflect the fact that difference in selective pressure is only one mechanism for speciation; genetic drift, for example, is another important factor.]

*9-12.IV.E.5 Students will recognize that a great amount of time, approximately 3.5 billion years, is necessary to explain the variation of species that has produced the great diversity of life currently present on earth and found in the fossil record. [This needs to be rephrased. It is certainly true that a great amount of time, of order billions of years, is necessary to explain the variation of species. However, the figure 3.5 billion years is not an *a priori* value; it is arrived at by more specific considerations.]

*9-12.IV.F.2 components.
Students will know that ~~all matter tends~~isolated systems tend to become more disorganized and that living systems require a continuous input and output of energy in order to maintain their chemical and physical organizations and prevent death. [This reference to the second law of thermodynamics is not sufficiently accurate without the additions I have provided here.]

9-12.IV.F.5 Students will describe how respiration releases chemical energy by the breakdown of molecules and store the energy. [What does this sentence mean?]

Conclusion

The Minnesota Science Standards draft may well end up as a very good document. At present, however, it is in a crude state and needs a lot of work at all levels. In particular, it should be carefully checked by practicing scientists for correctness, by experienced teachers for proper grade level and steady, orderly progress from grade to grade, and by a skilled copy editor for correct English.

Comment from email:

I have looked over the science standards and they look good. My job involves teaching chemistry at the college level. I have been in this position for 12 years and have seen a steady decrease in the mathematical and critical thinking skills of the students. There are still some students who do good work but they are fewer in number every year. Lack of motivation is part of the problem. It is difficult to get students to understand the value of an education. Somehow, we must stimulate interest and build skills starting in kindergarten. By the time students get to college, it is too late for remedial work. They must come with a good foundation already built. The use of calculators has resulted in erosion of math skills. People are pushing buttons instead of thinking with their heads. I would suggest that calculators not be permitted until the junior year of high school. Thanks for allowing me to have some input.

Comment from an email:

I am the director of Como Planetarium, a St. Paul Public Schools program. I have been involved with astronomy education for more than 25 years. I work primarily with elementary students.

After reviewing the area of astronomy for the proposed Minnesota science standards, I have some concerns and would like to offer some suggestions. It appears to me there are some gaps and lack of continuity across the elementary grades. I have put together a few ideas for changes and additions.

Because the sky is half of our outdoors environment, what we can see from our earth bound vantage point, should be held important and taught at all grade levels. You will notice my suggestions for additions and changes emphasize what students can observe first hand.

Here are my suggestions.

Kindergarten:
Sub-strand: Universe
Standard: The student will understand the sky is one half of our outside environment.
Benchmarks:

- Students will observe the sky and everything in it.
- Students will observe the sky extends from overhead to the horizon.

First Grade:
Sub-strand: Universe
Standard: The student will understand and describe the changes that occur to the sky in a 24-hour day.
Benchmarks:

- Students will observe and describe how shadows change throughout daytime.
- Students will observe and describe the changes that occur to the sky and the position of the sun in a 24-hour day.
- Students will observe and learn to distinguish which sky objects are close to and far away from the earth.

Second Grade:

The third grade standard deals with the solar system. A couple of the third grade benchmarks deal with the earth's rotation and revolution. It is my experience that introducing rotation and revolution at the same time can result in students confusing the two. Rotation could be presented in second grade and revolution could be added the following year. Also, it would be great if rotation were introduced with an outside observation experience whereby students watch and record shadows produced by the sun over the course of a school day.

In addition, second graders can learn how the directions, North, West, East and South, can be found by observing the sun as the earth rotates. The sun rises near East, sets near West and is highest when it is South.

In fourth grade, constellations are used to observe changes that occur to the nighttime sky. It would be appropriate to introduce constellations in second grade. It doesn't have to be more than locating the big and little dippers, and maybe Polaris the North Star. The North Star is also a connection with the directions mentioned above. Here are my suggestions for second grade:

Second Grade:
Sub-strand: Solar System
Standard: The student will understand the changes that occur in the sky relate to the rotation of the earth.
Benchmarks:

- Students will observe and describe how the sun and moon appear to move across the sky as the earth rotates.
- Students will observe and describe how the sun rises near East, sets near West, and is highest when it is South.

Sub-strand: Universe
Standard: The student will understand that stars are always found in definite patterns, fixed with respect to one another.
Benchmarks:

- Students will observe and learn to locate a few simple star patterns (big and little dipper) and Polaris the North Star.
- Polaris the North Star is always found in the direction North.

Third Grade:

The solar system is a popular topic both for teachers and students at all grade levels. It is a great topic for third graders. However, it is important to consider the reason for learning about planets. We want children to learn about the planets because our earth is one, and we can get a better understanding of our earth by comparing its characteristics with the others. Since there is very little we can observe about the planets first hand, a study of the planets should use information collected by astronomers. However, a study of the planets has to be more than memorizing a set of facts about each planet.

Here are my suggestions for third grade:

Sub-strand: Solar System

Standard: The student will understand the characteristics and relationships of objects in the Solar System. (This is as it is currently stated)

Benchmarks:

- Students will be able to make simple comparisons between the earth's characteristics and those of the other planets and their moons.
- Students will understand how the conditions on the planets relate to their distances from the sun.
- Students will observe and explain how and why the planets appear to move among the stars over time.
- Students will understand the sun is a star and the planets are much smaller bodies orbiting the sun.

- Students will be able to explain the physical differences between stars and planets.

4th Grade:

The night sky should be an important part of 4th grade. The benchmarks should encourage observation of stars' apparent motions. However, in order for students to be able to keep track of stars over a period of time, they must know a few of the prominent constellations that are visible from Minnesota. Even though learning constellations is a skill, it is an important step towards observing the effects of the earth's rotation on the night sky. Here are a few alterations and additions:

Sub-strand: Universe.

Standard: The student will know important seasonal constellations and understand the changes that occur in the nighttime sky relate to the motions of the earth.

Benchmarks:

- Students will be able to locate at least two or three constellations visible during each season.
- Students will be able to locate at least three circumpolar constellations.
- Students will be able to use a sky-map.
- Students will observe and be able to describe the motion of the stars due to the earth rotation and revolution.
- Students will understand the sun is a star and all the other stars are distant suns.
- Students will understand why stars vary in color and brightness.
- Students will understand how a telescope magnifies sky objects and increases the number of stars visible.

Fifth Grade:

As stated earlier, science learners must link their knowledge base to observations they can make in the real sky, rather than "learning about" something abstract. The moon is a celestial object that receives little attention in the current standards yet is easily observed. Why not include more details about the moon in 5th grade where there is currently no astronomy standard. Here are my suggestion for a 5th grade standard and benchmarks:

Sub-strand: Solar System
Standard: The student will understand how the movements of the earth and moon affect the appearance and position of the moon in the sky.

Benchmarks:

- Students will observe and describe how the moon changes its appearance as it revolves around the earth.
- Students will observe and describe how the moon can appear in both the daytime and nighttime sky.
- Students will observe and explain how the physical surface features of the moon are similar to and different from the earth's.
- Students will be able to explain why we only see one side of the moon.
- Students will be able to explain how tides are produced by the gravitational attraction of the moon.

Sixth Grade:

Here are the current 6th grade benchmarks:

- Students will compare the characteristics of Earth with the characteristics and movement patterns of the other planets, their satellites, and other objects in our Solar System.

- Students will know that the Sun is a medium-sized star and is the closest star to Earth. It is the central and largest body in the Solar System and is located at the edge of a galaxy.
- Students will explain the length of day, length of year, phases of the Moon, eclipses, tides and shadows through the regular and predictable motions of the Earth and Moon.

The current 6th grade standards look like the solar system revisited with some important 6th grade level concepts crammed in the last benchmark. What if the first two benchmarks listed, are moved to third grade and the last benchmark gets expanded to include some simple observations that help to develop an understanding of why we have seasons?

Seasons are such an important aspect of life here in Minnesota. We often get accused of having only two seasons, winter and road construction. If you think about it, because of our location on the surface of the earth, which is approximately half way between the earth's equator and the North Pole, we are blessed with four seasons.

Citizens must learn to not only accept them but to celebrate them. It is therefore essential for all Minnesota citizens to understand how the changes that occur in the sky give us those four beautiful seasons.

Also, please notice the approach to explaining seasons here is different from other attempts. Quite often explanations of seasons are presented from a space bound vantage point. The suggestions presented here emphasize earth bound observations:

Sub-strand: Solar System
Standard: The student will understand how the annual change in the sun's daily apparent path in the sky causes seasons.
Benchmarks:

- Students will observe and describe how the sun's rising and setting positions change throughout the year.
- Students will observe and describe how the sun's highest daily elevation changes throughout the year.
- Students will observe and describe how daytime and nighttime change throughout the year.
- Students will observe and describe how the nighttime sky changes throughout the year.
- Students will observe and describe how the angle of the sun's rays affect the rate at which the earth absorbs heat.

I hope my suggestions are helpful. As director of one of only three planetariums operated by school districts in Minnesota, I have worked closely with teachers in each grade level developing the ideas I have presented. Astronomy education is my passion.

I am please that I got a chance to talk with you this morning, and glad I have a chance to get my ideas heard. I may have given you more information than you needed. Thanks for your help.

The Evolution Debate

My understanding is that these standards are supposed to teach facts. My comment is a caution regarding the teaching of evolution. The fact is that the concept of evolution is a theory. A theory is not a fact. It may be important for people to understand evolution, but it is equally important to know that it is a theory. Proper science will not draw conclusions from theories.

I currently read that Evolution was a fact. This is incorrect. Evolution is mandated by law to be taught as fact because someone didn't like Creationism. It is a theory along with Intelligent Design and some others. Science should not be taught in a bubble. Disocveries were not made because someone was told to think a certain way, but they were challenged to think of many things and prove through experimentation there hypothesis. Please let's don't do this to our students. I believe they should be exposed to Evolution,Intelligent Design and Cosmic theories. They all are theories that take great faith to believe in. Let's honor family values and instead pushing our on values on students. Let's don't forget, the demographics of the US look way differnt than they did in the 50's.

I attended the hearing on the 22nd and have some comments on both the science standards themselves and the remarks of some of the speakers.
-First of all, I must voice my agreement with those who support the teaching of the theory of evolution as part of the life science standards. There is absolutely no debate within the scientific community concerning the fact of evolution, and the Neo-Darwinian theory represents the best current understanding of biological diversity. In fact, all of modern biology and medicine hinges on the viability of the theory. We live in an age that is seeing rapid advances in the field of biotechnology, and today's students need to be equipped with the theoretical underpinnings of such things as cloning, stem cell research, genetically modified organisms, gene therapy, overuse of antibiotics, and other issues in order to think clearly about their potential costs and benefits. They cannot do this without a coherent understanding of the theory of evolution. Thus I would ask that the committee members strongly resist any and all attempts by creationists to dilute the standards or introduce some notion of "intelligent design" into them. To do otherwise would be a disservice to the children of the state of Minnesota.

-Second, while the standards themselves are for the most part sound, I am concerned that there is not enough in them about the integration of scientific disciplines. Knowledge gained in one branch of science can often have implications for several other branches, but the draft standards do not appear to recognize this. While studying one branch in isolation has its uses, this must be balanced by showing how all the branches complement and enrich each other.

It is necessary for the science standards to include creationism. Why? Because evolutionism is a religion. It takes faith to believe in it. For many it is a religious belief, a way of believing and living that belief, just like Christians live their faith.

Read the quote of an evolutionist and see for yourself that evolution is a religion:

Evolutionist’s blind faith in atheism, regardless of how absurd it seems
Quotable Quote: Amazing Admission
Quoted in:
Creation Ex Nihilo 20(3):24
June–August 1998

Professor Richard Lewontin, a geneticist (and self-proclaimed Marxist), is a renowned champion of neo-Darwinism, and certainly one of the world’s leaders in evolutionary biology. He wrote this very revealing comment (the italics were in the original). It illustrates the implicit philosophical bias against Genesis creation—regardless of whether or not the facts support it.

‘We take the side of science in spite of the patent absurdity of some of its constructs, in spite of its failure to fulfill many of its extravagant promises of health and life, in spite of the tolerance of the scientific community for unsubstantiated just-so stories, because we have a prior commitment, a commitment to materialism. It is not that the methods and

institutions of science somehow compel us to accept a material explanation of the phenomenal world, but, on the contrary, that we are forced by our a priori adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counter-intuitive, no matter how mystifying to the uninitiated. Moreover, that materialism is an absolute, for we cannot allow a Divine Foot in the door.'

I am very disheartened that we are still debating evolution. Creationism and intellegent design are by definition not science. Scientific theories must be provable. Even if it takes a long time to prove it, that possibility must exist. Since creationism and intellegent design both rely on a premiss that is not provable, God or some other intellegence, the theory can never be proven and is not science. They are theories, just not scientific ones and therefore don't belong in the science standards. There are not any competing scientific theories for evolution, so no alternatives can be taught. As for emphasizing the fact that evolution is just a theory, all science is just a theory and our understanding of it may change as we learn more. There is no reason to emphasize that more for evolution than for any other theory or branch of science. To do so would be biased. Just teach what we know so far and the rest will follow as we discover it.

I am pleased that Minnesota teaches evolution as an excellent example of scientific theory - data supporting a hypothesis. Evolution is good science, and one of the most important scientific theories of our time.

I would also like to respond to comments made by other person(s) that the standards expect too much at various grade levels. I disagree. 3rd graders are capable of sophisticated scientific thought. Let's support our teachers with the tools they need to teach those 3rd graders, rather than dumbing down the curriculum.

You have recognized that effective treatment of science requires inclusion of evolution. You have adequately included it in middle school and high school levels. IT IS IMPERATIVE, however, that it be included in some way at the elementary level as well. Otherwise, you leave all those currently teaching prehistoric life, geologic time, human pre-history, etc., hanging out there with almost no support for teaching good science.
As early as 1992 or so, the state included an essential learner outcome in elementary that said, "cite evidence that life on earth has evolved in response to a changing environment."
Elementary teachers will not need to know evolutionary theory in any great detail to teach it at the level commensurate with student's ability to understand it.
The wording you now use-- presumably very carefully chosen words-- that evolution provides a scientific explanation-- that is what elementary teachers need to teach too. Evolution is a scientific conclusion; it is regarded as a fact. The debate in scientific circles is about the details regarding how evolution occurs and occurred.
If necessary, the larger committee and/or group leaders may need to prevail upon the grades 3-5 group to include the necessary content.
I submitted some documents and detailed suggestions in writing at the St. Paul hearing and will send another message citing these so that members of the group can ask to see them.

A second Benchmark is needed at grade 2 (or a revised first benchmark) under the Biological Populations Change Over Time sub-strand, and the standard that says that students will understand that idea.
The additional benchmark should read something like this: "Students will understand that our evidence for extinction comes from fossils, and some of the ways in which fossils are formed (e.g., burial in ocean or river deposits, volcanic ash, sandstorm)."

I would suggest this be done in 5th grade, but 4th might be OK.
Under Biological Populations Change Over Time, add a new standard, as follows:
"The student will be able to place humans and their ancestors within geologic time."
The benchmark associated with the standard should be something like this: "Students will understand that humans and their predecessor species are a fairly recent development in geologic time, and that humans and their ancestors seem to have arisen in Africa."
As a study unit, devising a map showing the sites and dates at which various early hominid (etc.) fossils have been found, and having the students fill in the country names and track the earliest fossils will lead to the discovery that both early near-humans and later originated in Africa. So you can combine geography and discover & human pre-history.
I know most of you don't actually have (m)any African-Americans in your schools, but we do in the big cities, and it seems terribly Eurocentric to me that they don't get to find out that humans originated in Africa until far too many of them have long since become disillusioned with science if not school in general.

Grade 7, III. Earth and Space Science, A. Earth Structure and Processes, the fifth "benchmark" states, "Students will interpret successive layers of sedimentary rocks and their fossils to document the age and history of the earth."

This should be clarified. I assume what is meant is that students will be taught to recite the evolutionary story of creation over billions of years. If that is what is meant it should be clearly stated. But if that is taught, please note the assumptions being made to arrive at the conclusions.

When using radioactive dating methods scientists assume 1) they know how much was there at the beginning; 2) this rate of change has not been disrupted through time; and 3) there's been no contamination It should be noted that these assumptions cannot be proven. The past is not open to the normal processes of experimental science, that is, repeatable experiments in the present. A scientist cannot do experiments on the past. Scientists do not measure the age of rocks, they measure the amounts of isotopes very accurately, but the age is calculated based on the assumptions noted above.

Concerning Grade 7, IV. Life Science, E:

Please define the term evolution (it has many definitions that seem to get used interchangably, that's not good science). The following are seven different and distinct types of evolution that should be clearly distinguished in the science standards:

1. Cosmic evolution – the “Big Bang” – origin of time, space, and matter.
2. Chemical evolution – origin of higher elements from hydrogen.
3. Stellar evolution – origin of stars.
4. Planetary evolution – origin of planets.
5. Organic evolution – the origin of life.
6. Macro biological evolution – origin of major “kinds” of life.
7. Micro biological evolution – variations within “kinds” of plants/animals (survival of the fittest, random mutations, natural selection).

Each of these different types of evolution involve distinctly different processes. All the above types of evolution, except micro biological evolution, cannot be proven by the scientific method since they are not repeatable events and they are not observable (no one has observed them to occur).

The fossil record is not "scientific" proof of anything other than particular life forms lived on earth and were buried in layers of soil and became fossilized.

The focus on the scientific method at all grade levels is very good. For instance at the Grade Level 9-12, I.A., states, “…scientific explanations…must be consistent with experimental and observational evidence about nature, logical, respect the rules of evidence, be open to criticism, and report methods and procedures.” I would like to add that: “the basic assumptions used should be clearly and completely stated”. Stating your foundational assumptions is important in all scientific endeavors, but is especially important in complicated and controversial issues (for instance environmental issues or evolution).

Any discussion of evolution, in intellectual honesty, should address the assumptions the theory is based on. For instance, the assumption that the universe is a closed system and that what we see in the natural world is all there is, all there was, and all there ever will be and nothing outside of natural forces act on the natural world. This prior assumption should be clearly pointed out, to be intellectually honest with the students. This foundational assumption of course leads to the theory of evolution since we have excluded any other possibility other than natural causes. With that basic assumption almost no other theory is conceivable. It is assumed everything came about by natural processes, so we are forced to come up with a theory of natural processes to create everything, any other possibility has already been excluded. So based on this assumption, there has to be some natural process to have created all of life and this presumed natural process was simply named “evolution”.

The standards state that: “scientific explanations … must be open to criticism”. This is nice in theory but in practice no other theory other than evolution is allowed in the debate because of the foundational assumption that only natural causes for the origin of things is allowed. It is clear from a number of the comments on the draft science standards that people do not want to allow criticism of evolution by their desire to censor any mention of intelligent design as a possible cause for the origin of things (intelligent design is the theory that blind natural processes cannot produce the complexity we see in living organisms, that intelligent causes exist for the creation of life, and that these causes can be empirically detected by principles of science). I hope that discussion of criticisms of scientific theories will be allowed and to especially focus on the validity of assumptions made in coming up with specific theories.

Please incorporate into the science standards the language of the federal Better Education for Students and Teachers Act of June 13, 2001 non-binding amendment sponsored by Senator Rick Santorum that passed the Senate by a 91 – 8 vote. It stated that “good science education should be able to distinguish between the data or testable theories of science from philosophical or religious claims that are made in the name of science, and that where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject”. This would go a long way in addressing the issues of making clear the assumptions theories are based on and allowing valid criticisms of theories to be presented.

It should be noted what the fossil record shows and what it does not show. The fossil record shows that many forms of life have lived, died, and were buried in such a way as to become fossilized in successive layers. But it must be acknowledged that the origin of species is not proved by evidence of dead things. We just know the order in which these things were buried. It is appropriate to discuss theories of how these life forms came to be, but the fossil record only indicates that they died.

The term evolution should be clearly defined. Seven distinct types of evolution that follow should be clearly distinguished:
1. Cosmic evolution–the “Big Bang”–origin of time, space, and matter
2. Chemical evolution–origin of higher elements from hydrogen
3. Stellar evolution–origin of stars
4. Planetary evolution–origin of planets
5. Organic evolution–the origin of life
6. Macro biological evolution–origin of major “kinds” of life
7. Micro biological evolution–variations within “kinds” of plants/animals

The word “evolution” is often used interchangeably when referring to any of these different evolutionary theories. All of these types of evolution are exclusive of each other, but yet referred to as if one unified theory. Each one requires a totally different process and mechanism to occur.

The first six types of evolution are not true science, in that they are not observable, repeatable, or falsifiable. They are in the realm of historical science. Concerning macro biological evolution and micro biological evolution, please make clear the distinction between the two. Micro biological evolution is observable, repeatable, and falsifiable, but macro biological evolution is not. Micro biological evolution is the natural selection that we see in nature, it is observed and repeated. On the other hand, scientists have never observed or repeated macro biological evolution, where one kind of life changes into some other kind over time. They have never even observed the formation of some usable new organ or system within a life form where it didn’t already exist. This is genetically impossible. Random mutations and genetic variation within a species are not capable of making this happen. The examples cited always show change within a particular kind of life: bacteria remains bacteria, fruit flies remain fruit flies, moths remain moths, finches remain finches, etc. No new life form has ever been observed to come forth, just variations within a particular kind.

I think it should be stressed that there are many theories about evolution/creation and that theories are not absolute fact. Encourage the kids to talk with parents about the subject. Overall Good Job! Compromise is vital in creating standards.

On the science standards, when it refers to evolution, it should say "Theory of Evolution"

We need to incorporate the Santorum language that has been approved by Congress. Students need to be able to distinguish between theories of science and religious or philosophical claims. When biological evolution is taught to the students, the curriculum needs to include a discussion of the controversy surrounding the theory. Recent scientific discoveries have unveiled the immense complexity of biological life. These discoveries raise serious questions about the explanation of biological evolution. The evidence rather points to an intelligent design. Students need to be taught to become informed participants in the ongoing discussion on this subject. We cannot teach just one theory at the expense of others. Censorship of evidence that does not support evolution is at odds with true science and violates the ideal of academic freedon in the classroom. This is AMERICA!!!
If students cannot learn to debate different viewpoints and to explore a range of theories in the classroom, what have we taught them? Don't we have a common goal of broadening their horizons - encouraging them to think for themselves?

All scientists do not agree that the evidence supports the theory of biological evolution. We CAN NOT teach evolution as the scientific theory for earth's history.

The new wording in the science standards draft is contradictory to the current evidence that the "Theory of Evolution" is just that- a THEORY. We need to teach all students in the state of Minnesota that there is much evidence that some of the "facts" of evolution have been artificially proven. A previous draft was much more acceptable because it basically stated that evolution was not a foregone conclusion, but was up for discussion and had not been proven. Please reword the science standard or go back to the draft that was much more skeptical of the theory of evolution. Thank you.

I was pleased to see that Creationism and "Intelligent Design" do not appear in the life science standards. Religion does not belong in a science classroom and to present religion as if it is science theory only confuses students about what science is. Anyone who understands the nature of science and its dependence on natural law realizes that anything involving the supernatural is not science, but our students may not see that distinction. I cannot imagine why any parent would want to try to dress up their faith as a scientific theory and force students to make a choice between the scientific evidence of evolution and their faith. Faith is believing in the absence of evidence. Why degrade your faith by trying to treat it like science?

The principle charge leveled at neo-Darwinism is that "it is only a theory" and thus can not be trusted; hence "intelligent design" must be accorded equal billing. A theory is an explanation of a set of related observations or events based upon PROVEN hypotheses and VERIFIED multiple times by independent groups of researchers. A theory is much more complex and dynamic than a law which only governs a single action while a theory explains a whole series of related phenomena. Currently accepted theories include : quantum, cell, atomic and gravity theories and, of course, THE THEORY OF EVOLUTION!! The "intelligent design" hypothesis was evaluated by examining the papers on this subject published in the principal scientific journals. George Gilchrist of the University of Washington, conducted a search of the primary literature,using 5 scientific and academic indexing databases, covering over 6 thousand journals and several years. Compared with several thousand papers on evolution, the searches produced only 37 citations containing the keyword, "intelligent design".ONLY 7 had anything to do with biology. Of these, 5 were discussions of the debate overusing the "intelligent design" book 'Pandas' by various school boards, and 2 were comments in a Christian magazine. Several hundred thousand scientific reports failed to produce A SINGLE INSTANCE of biological research using " intelligent design" theory to explain the diversity of life!! With this failure in mind then, I must ask why any serious, dedicated and competent teacher would be forced to expose their classes to such unfounded and religiously based claptrap as the "intelligent design" HYPOTHESIS ??? Please, please, do not permit the teaching of religion in our science classes by masquerading under the guise of "equal concepts

The topic that I am concerned about is the move to make evolution the only fact in science.
I don't think you should teach evolution as a fact, because you can't prove that evolution is a fact. The only way you could prove this is go out into space and try to recreate his so called "Big Bang". Therefore you would be lying to the children every time you would teach that subject. Don't the children need the truth??? There is no way that you can prove that everything in this world happened by chance! For example, look at our solar system, it is so orderly. Look at nature, seasons are in a cycle, you never hear about fall suddenly jumping into spring without any winter involved. Look at the Canadian goose, it always flys south during the fall and comes back in the spring, same thing with the robin. There is no way that this happened by chance. How could you do this to the children?! Don't you love the children??? Some of you always use that as an excuse as a way to get away with things. I am so sick of the liberal people, it makes me throw up!!!! I am an 8th grader, and I know you and your ways. I used to go to public schools but soon caught on to your liberal agenda.

"Critical thinking skills" are highly touted throughout schools and I believe they are important but, if kids are not given more than one option (evolution THEORY) how are they going to develop these skills in reference to Science curriculum?
I think kids deserve to hear the creation side as well as the evolution ideas so they can decide for themselves as to what makes the most sense.

Regarding Science and History; My vote is to teach creation and to teach the children the truth about our history. We were founded on Bible basics. Creation is a must, otherwise these kids will not know they are created for a purpose and are loved. If the schools go with evelution as the only one I will always homeschool and will never consider placing my child in a public school. Thank you

Grade 9-12, IV Life Science, B. Organisms:
Homologous structures are defined as similarity in structure due to common ancestry. So common ancestry cannot be proven by similar structures. That is circular reasoning and very poor science.

The embryological development evidence presented in textbooks to try to prove evolution is extremely misleading ahd has been based on exaggerated drawings of similarities in embryos. This "evidence" for evolution has been known to have been faked for over a century. Please do not keep passing this off as science.

Please see the book by Jonathan Wells, Phd. called, "Icons of Evolution - Science or Myth?" for a much more thorough discussion of the above comments. The book discusses ten common "proofs" of evolution commonly used in textbooks that are shown to be misrepresentations and exaggerations. Please correct these misrepresentations of the evidence for biological evolutionary theory in the science standards.

I have read the standards regarding the 9-12 Science curriculum and find them to be very rigorous and generally appropriate. I must comment that it is a lot to ask of students to meet all the the critera listed in all areas, and it may be that a bit less is better. It seems like every discipline has gotten its favorite topics included in some detail. That may be a bit much to expect for all students. On a side note, I am aware of certain pressures coming to bear regarding the inclusion of creationism in these standards. That would be a huge mistake, it is religion not science. It may be appropriate to have these discussions in a public classroom, but not as part of a scienc curriculum, creationism is not science in any way shape or form. Those who 'believe' otherwise do not understand the application of the scientific method, it is as simple as that.

I was gratified to read the life science standard. I was afraid that there might have been pressure to include so-called "creation science" in this standard but I see that it has not been included. This is as it should be. Creationsism is religion and not science. It is not even very good religion. The basic tenet of science is that it is based on a set of hypotheses which are testable and most importantly which can be negated if the evidence does not support them. Without this testability and the possibility of negation, science would not exist. The same cannot be said to be true for any form of creationism which is entirely a religious argument.

I would like to comment on the standards for evolutionary change. This is a very well thought out course to enlighten our children on how we as humans developed. While I am a Christian and believe in Creationism, I do not believe that belongs in a science classroom. I believe that is religion and should stay in that context. As I was growing up and learning the different ideas behind why we are here, I heard the two different arguments between creationism and evolutionism, and I believe that learning evolution has better shaped my thoughts and understanding of how humans came to be civilized. Thus, evolution is a necessary concept to discuss in schools, not only for our children to get a better understanding of why we are here, but it will also help them understand the origins of disease and why we cannot wipe out a bacteria or virus, because they are constantly evolving. That is necessary information for the world in which we exist! Great job on the inclusion of such essential concepts!

As the first draft of the science standards stands (10/2/2003) the treatment of evolution is in line with current scientific understanding. It is appropriate that there is no mention of the pseudo-theory of creationism.

We must keep the important focus on the concepts of evolutionary biology. Modern molecular biology rests on this foundation and if this is weakened in response to religious objections our students will not be able to understand modern biology and will be ill equipped to move forward in science.

I would like to see creationism presented along side evolution.

Discussion of the difference between the common language meaning of theory and the scientific use of theory must be reiterated at several levels. Students must understand that research scientists, like myself, work within theoretical frameworks (paradigms as defined by Thomas Kuhn). This includes such theories as Newtonian mechanics and evolutionary biology. These theories provide the framework for developing progress in research and are NECESSARY for progress. When blatant contradictions keep occurring in research results, as in the inadequacy of Newtonian mechanics to explain the wave particle duality, a new theory (wave mechanics in this case) can be developed to explain the contradictions. Students should also understand that although science deals strictly with the material world some scientists are deeply religious, and regard the material world they study as a reflection of the majesty of God. If fact, many scientists throughout history began their study of science as a quest to understand God’s creation.

As a nuclear physicist, I am concerned about the teaching of evolution. It is taught as the only explanation for the fossil record. This is utterly ridiculcous because the fossil record actually disproves evolution. In order for a fossil to form, the animal or plant must die and be covered over immediately before the elements break it down. This means that a large amount of mud had to cover all those animals in order for a fossil record to even extist. Evolution clearly ignores this simple fact.
Evolution voliates several universal laws of physics and statistics.
The very fact that we imply that people are getting better without any scientific data to back this up was upsetting to me in high school and it continues to concern me as a parent wanting my kids to know pure science rather than some made up fantasy. It is time to teach the problems with evolution and allow children to use their minds to come up with their own conclusions. The school system is teaching opinions as fact rather than supplying the objective evidence and letting kids use their mind to draw reasonable conclusions. This is why people think I am so smart as a physicist. It is not that I have more brains, I just learned the laws of logic and apply them to the things that I read. I never bought Carl Sagan movies about the big bang because it did not jibe with the world I can obeserve. The big bang is a fairy tale not science. It is not observable, repeatable or doable. If it is included,

other theories should be analysed as well and allow students to choose what makes the most sense to their mind.

To provide a good education you cannot stuff information into a kid without giving them the option of disagreeing with the opinions being taught! You end up with little robots no smarter than computers. They can only process that which they have heard before.

I have viewed the proposed standards with particular interest to the Change in Organisms Over Time. If adopted, Minnesota students would have a very sound understanding of the scientific evidence for the mechanisms and processes of evolution. I commend you on resisting the political pressure to include nonscientific topics/dogma in the science curriculum.

Evolution is a theory. It can't be proven as fact. If you are going to teach this theory, then you need to teach other theories on how the universe was formed. Whether our children go to public, private, or are home schooled, this standard affects everyone. These standards are supposed to be factual and verifiable. Evolution is not factual and not verifiable, therefore, if you're not going to include other theories, you can't teach this one either. It just doesn't fit the criteria that is mandated for the standards.

I see the following public comments has been made
"8th grade science, benchmark above: “Big Bang Theory” is still under debate – scientists are still debating the evidence. "
This comment is ridiculous. This person clearly does not understand the nature of science OR the big bang theory. The big bang theory as the best model of the origin of the universe is NOT being debated
"Regarding same standard, I believe in a different “origin” – please leave this out completely. It is too controversial—we should leave it out. It violates my faith. Why push parents out of the public school system? "
Evolution and natural selection are NOT controversial in the scientific community. I would not expect this to be taught in a religion class. Similarly I would not expect religion to be taught in a science class. Teaching science without evolution would be like teaching economics without the concept of money.

I would like to respond to the proposed standards pages 16 -IV-C, 22-IV-E and P.30-IV E and all other standards requiring the teaching of Evolution as a fact for grades 7-12 and any other grades that may be involved.

One of the driving principles behind education is the principle of intellectual honesty. These standards throw this principle out the window.
Evolution is a belief system, a religion if you will, it cannot be proven. If you take some time to look up the scientific method you will find that it cannot be a science. For it to be science it has to observable and measurable. No one has ever been able to come up with an experiment whereby the theory of evolution can be observed and measured. Fossils exist in the present not the past. Since evolution is a belief system, it is against the law for it to be taught. Shall we also teach Christianity, Buddhism, Islam, Wicca and other such belief systems. The law of separation of church and state requires that evolution not be taught in our public schools.

What is even more disturbing is that the state intends to force these standards on private schools and home schools. This is an unconstitutional invasion on the freedom of religion clause of our Constitution.

I sincerely hope that the state will recognize its duty to keep church and state separate by not teaching evolution as a fact. I sincerely hope that the state will uphold the religious rights of parents who choose to send their children to religious schools or to home school them.

The proposed standards are both intellectually dishonest and an infringement on consitutional rights of parents. They must not be adopted.

Regarding IV life science strand, E. Biological Populations Change Over Time,Strand- The student will explain how evolution provides scientific explaination for the fossil record of ancient life forms, as well as for the striking similarities observed among the diverse species of living organisms. I am appalled that this standard assumes that evolution is a scientific fact rather than a theory. It leaves no opening for student critique regardin scientific evidence that is problematic to the theory of evolution. Where is the challenge for students to look at scientific evidence critically and come to their own conclusion?

Objectivity and constitutional neutrality are of paramount importance. Your committee is hearing from atheists, on the one side, that demand a violation of constitutional neutrality, and creationists on the other hand, who also ask for the exact same thing. I urge you to ignore all that nonsense. I am not a creationist, but I dont see anything wrong with a school deciding to state the position of the creationists and then showing evidence both for and against their position. That wouldnt be teaching religion - it would be just teaching facts

about what various groups believe. I would suggest that you look at the work of the National Association of Biology Teachers 2001 Illinois Biology Teacher of the Year, Terry Mundy, who has twice been unsuccessfully sued by the ACLU! He won in court because he doesnt violate constitutional neutrality, instead he just teaches what the various positions of various groups of scientists are and states evidence pro and con. He himself doesnt take a position or share his own views. I myself have never asked for schools to teach anything about creationism, even if done objectively. Neither would I ask for Intelligent Design to be taught. We need to first do a better job of teaching darwinism, which means teaching the strengths and weaknesses and evidences that challenge the current theories. This would include an evaluation of the types of evidences that would disprove current theory.
Tentativeness and falsifiability are part of science but irrebuttability is not. To fail to teach kids that science is about following the trail of evidence where ever it may lead would be criminal.

Having read the standard and the publics comments thus far, and with a background in Physics (Bachelor of Science) and Engineering (25 years in industry), I see that the topic of origin is froth with controversy on both sides. Each side has zealots wishing to lable the other with the term 'fanatic'. The Scientific method can easily be taught with no discussion on origins at all. Although it is a natural topic to explore, (who isn't facinated?}, it is hampered by political and religious intrigue from both sides. Since either side requires a leap of faith to accept, and unless both sides get an equal shake, please present neither side.

While it is legitimate to convey to students that the theory of evolution is a working theory subject to modification and not fact, it is inappropriate to require public school teachers to include alternate beliefs of a religious nature. I commend the standards committee for holding firm on this issue and encourage all members to continue doing so.

I see no reason to include life, earth, and physical sciences in all middle school grades. As written it is NOT integrated science. It is simply side-by-side science which seems extremely inefficient from a teaching standpoint and ineffective from a learning standpoint.

I see a lot of content in these standards but very little time for process. Many believe the profiles had too much emphasis on process. But must we swing the pendulum back to the other extreme? Here is an opportunity for us as a state to learn from past mistakes and take note of the most current research to craft a truly innovative set of standards. There is no research to indicate the "mile wide inch deep" approach best prepares our students for the real world. I would like to see a balance between content and process in these standards.

IV-E of Minnesota Academic Standards Science. The Evolution standard is not objective, but a biased viewpoint. It is not based upon fact and is not verifiable. It is not measurable because it is not based upon facts. The evolution standard does not meet legislative criteria and therefore must be removed. The fossibl record clearly disporoves evolution and supports Biblical creation. The fossil record shows that all life forms suddenly appeared and there was no transition of life forms. Please remove evolution as part of the standard. We don't want to teach our children lies. If evolution is to be taught so should Creation. Thank you.

As I reviewed these standards it alarmed me to see that the standards were requiring schools to teach evolution as fact. I am concerned that our schools are being forced to teach information that is not accurate. We are a state that is grounded in many Christian values and facts. There are two sides to every theory. I find it interesting that many private schools focus their teaching on creation but also teach about evolution. This helps students to be prepared to defend their beliefs because they know both sides of the theories. It is essential that the teaching of evolution as a fact be reconsidered. A possible solution is to exclude the origin of life from all standards and benchmarks and grant Minnesota schools the freedom to choose how to teach about the origin of life. Minnesota is heading down a path that will not sit well with many people and these standards needs serious reconsideration.

Part of science _requires_ repeatable experiments
and _Objective_ view point.

This REALLY needs to be emphasized. Showing the difference between fact/knowledge and a theory (which is simplistically a educated GUESS).
What I repeatably see being taught is NOT science and hear many non-science.

micro-evolution vs macro-evolution is a good example. micro-evolution is what we see and can repeat, it is minor changes within a cell or species (family) line.

macro-evolution - is not observed, but is a _GUESS_ or theory based on ONE biased view of the
data. If the data is looked at OBJECTIVELY, you
will KNOW that it cannot be KNOWN. However, it points to various different theories, and other theories have more consistancy, more logically coherent.

Functional genomics makes MUCH more sense, especially if you are knowledgable about the details in the genetics versus just observe overall media coverage. When you understand that 1% is a LOT of difference. When you see that DNA binding proteins have common characteristics and sequences whether they are the drosphila 74EF gene or a proto-oncogene in humans. Are they related, no proably not.. do the genes have the same function, of course.. If you want something to roll well, you use a wheel. So you expect to see similarities for simular functions.

So the point is anyway that tells you it is therefore creation or therefore evolution based on the evidence of biology, science or genetics is
clearly ignorant of science or is completely NOT objective, and it no longer belongs in a science classroom. It is philsophy and religion, yes BOTH creation and macro-evolution are religious beliefs (their _personal_ world views, not based on science, however, science can support both to a certain degree). However, neither are repeatable by any scientist.

I have real problems with macro-evolution being taught as a 'solution' for the cause of the fossil records or as even as the only theory of why we see simularities in organisms. The religious thought of atheism or naturalism is the major reason for this.

However, just looking at the data scientifically and objectively it is CLEAR that macro-evolution is only one way to view the data and it is FULL of holes. So alternate view points MUST be taught fairly and ojectively...
Specically:
- The Objective functional genomics theories
- And the intellegent design theory

If it is going to be a SCIENTIFIC classroom, it should be objective and look at the data at opposing and various viewpoints.

macro-evolution should be taught but only in light of the other theories and it is only one way to view the problem. And it is NOT a fact. It is a excellent opportunity to teach OBJECTIVITY and true SCIENCE (this is not repeatable hence only one of the educated guesses.. theories).

philosphy of evolution and big bang philosphy. Should either be taught objectively or it should be made clear that a theory is just a one way to guess what MAY have happened. And to share the alternate view points that are equally VALID THEORIES. The point is we want our children to be EDUCATED, not indoctrinated. They need to learn to see things OBJECTIVELY, not clouded by bias and the abuse of using science to force ones religious or philsophical beliefs.

Yes there was a bias on the other side at one point, however, now the pendullumn is on the other side.

The current teaching is a embarrassment to science and objectivity.

9-12 IV Life science B. Organisms.
Another entry in biased thought instead of objective science.
3.5 billion years is questionable data based on many assumptions about how dating is done.
life evolving from a single cell and making students point to important adaptions is extremely bias. And is one of the falsies of logic assuming the result. It betrays the student into thinking it is fact. Instead of a theory (one of the many educated guesses).

If you look at the adaptions thought to have happened. It needs to be clear that there is NO PROOF, that it is NOT REPEATABLE, that there are MANY adaptions that are seen as Imposible.. Moving from no eyes to a complex eye is one simple example. One of the major failures in macro-evolution is that missing the fact that organisms are systems.

Also the fact that you see HIGHLY divergent even in macro-evolutionary theories, having portions of genes that are nearly identical.. It is because, I personally believe since it better matches the evidence, that it is FUNCTIONAL basis of the genes not some thought up relationship based on saying the wheel in China is similar to the wheel in South America. It is a wheel because it WORKS we see this repeatedly in the world, where parallel thought happens independently.

Grade 9-12 IV Life Science E. Biological Populations change over time.
Again clarify between micro-evolution - scientific and observed experience. And macro-evolution - not observed, but ONE of the theories of how things MIGHT have happened

The wording in this makes it sound like a FACT versus ONE of the educated GUESSES (theory).

Again Functional genomics makes MUCH more sense of the data. Or intelligent design.

If this is a SCIENCE classroom it MUST be objective, again not indoctrination. Which is what appears to be what is being done.

I can point to MANY "unrelated" even in Darwins view, and show STRIKING simularities in both a view of the observed physical structures and the genetic perspective. Which actually fits better with a intelligent design and functional genomics and actually makes Macro-evolution doubtful since you see (if objectively looked at) both advancements and regression between species.

BE sure you are CLEAR that macro-evolution is just one theory, and that it full of questions that cannot be answered.

My daughter will NOT go to a school that indoctrinates her into a secular belief system. I can teach her to be objective and able to look and understand the various perspectives.

But then I studied both genetics and philosphy and published papers, in both fields. I will fight you and show that both you have been informed of the problems in this science standard and that it teaches non-objectively and is a disgrace to science teaching to indoctrinate versus teach objectivity and the FACTS and show how to reach multiple conclusions, and infact learn how to understand opposing points of view. To see the good parts and the problems in each. Since my concerns are in non-provable (non-repeatable) theories, the ONLY responsible thing to do is to entirely cut it or teach good reasoning and objectivity by teaching each view FAIRLY.

Please add comparisons and references to Creation Science, Creationism, and Intelligent Design. Let the students know that Evolution is just as much a 'religion' as it is based on faith with no scientific proof. It's all about choice and allowing the students to choose. Creationism should also not merely be mentioned as a side bar in sections (8/6/I/B; 17/8/I/C; 22/9-12/A; 23/9-12/I/B,D).

People "believe" in evolution; they do not know that it is true. While beliefs are certainly fine to have, it is not fair to force on the students in our public school system the teaching of one belief, at taxpayers' expense. It is my contention that evolutionism is a religious worldview that is not supported by science, Scripture, popular opinion, or common sense. The exclusive teaching of this dangerous, mind-altering philosophy in tax-supported schools, parks, museums, etc., is also a clear violation of the First Amendment.

I have a concern that the standard appears to mandate that evolution be taught as fact, not as a theory and as one of several explanations for the origins of life. To state it as absolute fact and truth when there is so much in fossil records, etc. that contradict evolutionary theory is irresponsible, and unfair to Minnesota school children.

Evolution is not a fact, it is a belief by people who think our life is a happenstance of evolutionary events. Many people hold this belief as true.
Creation is also a belief by those people who believe in God and that God created human-kind in his image. Many people hold this belief as true.
Government has no business dictating which belief is correct. U.S. Const, Amend. 1, applied to the states via the 14th Amendment.
I worked with many people from the former Eastern Bloc who get chills up their spine at such government imposed ideology. We should be a country that embraces diverse thought.

The "No Child Left Behind Act" contained the Santorum amendment; which passed 98-1. This amendment mandated that for controversial science topics, such as biological evolution, competing theories be presented and discussed. I am writing to ensure that competing scientific theories, in particular "Intelligen Design" be included in the new science standards.

As an educator, I find it extremely beneficial to present multiple theories of the origin of man in the classroom. This is an area of science in which not all scientists agree and we must respect these views. Teaching only evolution or evolution as fact is not consistent with all scientific evidence or the value systems of many Minnesota families. It is my recommendation that the Science Standards of Minnesota allow for this diversity and do not create standards that teach only one theory as fact to our children.

The Minnesota Department of Education has released the Minnesota Academic Standards for Science mandating that evolution be taught as fact in all public schools K-12. The evolution standard in not objective, it is a biased viewpoint. It is not based upon fact and is not verifiable. Fossil reocrds do not support the evolution theory. the standard is not measurable because it is not based upon facts. The standard does not meet legislative criteria (Profile Repeal Bill(HF 302) and Current Law(chapter 129) Section 3, Subdivision 2(5). Therefore, it must be removed. Evolution is a theory not a fact. Don't leave our children in the dark - Remove evolution from the standards.

There are currently two over-all theories regarding the origins of the universe being discussed amongst learned and open minded scientists from every branch of science all over the world: Evolution and and Intellegent Design. I would like MN students to be allowed to hear both theories in full, without teachers being afraid of losing their jobs. I believe we need a little more academic freedom in this area than has been allowed for the last 50 or more years. I think there is room in the classroom for such discussion and those teachers who personally hold to one view or the other could take a course in how to present both theories with equanimity. 'Here is what we know; here is what the evidence shows; here is the direction the evidence seems most likely to be pointing; here is what scientists on this side of the question think. I don't believe this is too difficult to accomplish. However, there would have to be some major updates made in the science textbooks because they have been showing outdated concepts and disproven assumptions which have only led to confusion and false conclusions. Perhaps some supplimentary booklets could be distributed that would correct these outdated concepts. I sincerely hope this is not too much to ask.

Grade 8 IV life science E.
True facts please. the evolution theory does not provide a true scienctific esplanation of the fossil record, to many gaps.

Grade 9-12 Hist. and Nature of Science BRAVO!! All benchmarks are great! Teach kids to test it all!!

Life Science 9-12 organisms page 34
bullet 4 please don't teach evolution as a fact. Why not allow kids to see the evidence for a young earth?

I am not opposed to teaching evolution, I am opposed to only teaching evolution and to teaching it as fact. Help teachers to chill when students bring facts to class that don't support it.

Please include the Santorum language in the science standards. Overall I like what I see. Content is important. Critical thinking skills emerge from accumulating facts!

Evolution Standard

We strongly disapprove and oppose the current mandate on evolution, and ask the comissioner of education to remove it.

I realize that our textbooks need to be changed constantly due to increased learning and understanding of our universe, but I do not feel that teaching evolution as fact in any way is consistant with the absolute facts that have been know or uncovered by man. We by faith accept many unknown ideas and will continue to do so as long as we live. None of us were around when this all started and the idea that I may have come from a monkey takes more faith then any type of truth I can imagine! I hope you will seriously reconsider your decision before it is too late to retract. Thank you for taking my comments.

Grade 9-12 history/nature of science, scientific world view, benchmark 2
"Students will be able to explain how scientific innovations and new evidence can challenge accepted theories and models, including cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease, Big Bang theory."

This benchmark is unclear and needs to changed. Specifically, it is unclear why particular theories were listed as examples. Can't all scientific theories be challenged by new evidence? It would be more useful to use historical examples of theories that previously were accepted, but now have been rejected by the science. By listing currently accepted theories you risk giving the false impression that these are theories that are more likely to be changed by new evidence.

To: Bill Walsh and Commissioner Yecke
Subject: Evolution as Fact
I am writing to you to protest strongly your(Yecke) plan to mandate that evolution be taught as the only fact to explain the origin of all life. WHAT ARE YOU THINKING? Many well known scientists are admitting today that there is no proof. So why are you pushing a lie? The truth is that evolution is a theory. That is it. "The evolution standard is not objective, but a biased VIEWPOINT. It is not based upon FACT and is NOT verifiable." The more they dig they find that the fossil record clearly disproves evolution. Why don't you just do the sensible thing and not teach the origin of life at all if you have to lie about it. Or at least let each school in the state of Minnesota be granted the freedom to choose what to teach regarding the origin of life and how to teach it. Your making this theory into law is completely unacceptable.

"Regarding the Science standards, the grades 9-12 Life Science standards point out that students will learn that it took about 3.5 billion years for life to evolve on Earth from its

earliest beginnings to the present day.

The Earth and Space Science standards do not include any specific mention of learning about the corresponding and consistent evidence for the age of the Earth and solar system, 4.6 billion years, but only mention 'radioactive dating'. It would not be difficult to be slightly more prescriptive about this. Could the standards be amended to specify the sorts of evidence for the Age of the Earth? Radioactive isotopes and dating of rocks and meteorites, analysis of the orbital changes in the Earth-Moon system, and physical modelling of the Sun's interior and energy-generation processes, are all examples of such clear evidence, and there are some others that may be beyond the high-school level.
The standards include: 'Students will be able to explain how scientific innovations and new evidence can challenge accepted theories and models, including cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease, Big Bang theory.' It is not clear if this means that these are to be taught as examples of theories that changed existing views (which would be an excellent lesson in science), or that these theories are to be subjected (how???) to challenge in the classroom. If the former, please amend the wording to make this absolutely clear. If the latter, I would appreciate an explanation of the (presumably bizarre) lesson plans involved.

"The new Science standards, which firmly state that evolution is certain are exactly why I've just pulled my 5th grader from public school. There are a lot of us 'out here' that absolutely believe in creation, and this is another thing causing us to make the decision to home school our children. The public schools cannot teach values, and more parents are discovering that public schools are doing just that. Once I discovered it, we decided to homeschool our son."

"The Minnesota Draft Science Standards contain the seeds of good science but do not always apply the principles that are introduced. For example, it is noted that distinction must be made between evidence and opinion and that even observations can be affected by bias or expectations (6 I. A.), that culture and prevailing ideas affect scientific progress (7 I. D.) and that scientific knowledge is subject to change (7 I. A.). Yet it is insisted that “Students will use accepted physical, conceptual and mathematical scientific models to explain natural phenomena.” (7 I. A.) Is the student allowed to point out that the fossil record is not necessarily a record of appearance of organisms but rather a record of their burial and that the large number of fossils buried in very homogenous layers suggests massive rapid burial, such as might occur in a huge flood? Would it also be permissible to point out that there are not tiny changes between fossil groups as predicted by gradualistic evolution. Will it be noted that the punctuated equilibrium model, proposed to solve this discrepancy passes insurmountable problems on to genetics. When called on to “identify significant adaptations that have allowed life to evolve from single-celled aquatic organisms to multicellular terrestrial organisms over a period of more than 3.5 billion years” (9-12 IV. B.) would it be allowable for a student to point out that there is no mechanism for significant adaptations to be added that were not present on the organism to begin with? Would a student or teacher be considered out of bounds to point out that mutations degrade information, do not create information. In summary, will science education be treated as the transmission of a set of fixed and unassailable facts – similar to arithmetic – or will it be treated as an active field of human endeavor in which the students may someday make revolutionary changes if they are give the tools of critical thinking and courage today?"

"On a separate note, I'd like to applaud the absence of 'intelligent design' in the life sciences category. It isn't science, and it shouldn't be there. Thank you."

"A small minority of people actually believe that the Bible is the Word of God. The Bible is biased by the people that wrote it. Creationism is not a science nor is intelligent design. We see evidence of randomness and unintelligence in the design of everything. It is funny how creationists attack carbon dating but when it verifies the age of religious objects(shroud of turin) they accept it. They are hypocrits. The Bible states that you cannot get divorced or do any work on the Sabbath. You break those Biblical commands. The Bible is made up of stories called allegories. Stories made up by people to explain things they did not understand. What threatens the literal interpretation people's faith is that when science starts to prove a part of the Bible is wrong their whole faith is shaken. A real Christian is not fearfull because we understand the Bible is not the word of God. The Earth is not the center of the solar system- the sun is. The Bible is wrong on many accounts and contradicts itself. Evolution is just a process of how organisms change over time. We cannot comprehend 100's of years let alone millions. Keep religion out of the Science Standards. I don't want teachers teaching religion- I want them teaching science. Religion is for families and our church.

"My Comments are on the evolution part of the standard. I disagree with the version the public will be seeing. I am for the version that contains the words may have, might have, possible, may provide, and may be in it instead of has, have, probable, provides and is.

In spite of what the public has been lead to believe there is no actual proof that these things are true. It is believed by many scientists that these are explanations of how the earth and

all things on it were formed. At this time there is no complete proof that would change their theories to Law.

As a teacher I think we need to be careful not to force absolute on our students. We need to leave open the possibility that there might be other explanations. Science is constantly changing and old explanations are being proved wrong all the time. It is not about accepting things at face value, it is in looking it the possibilities that our young people will learn the most."

"I would strongly suggest that our schools endorse the presentation of alternative theories for the origin of the universe, life, and mankind in the classroom. I believe that it is prudent to present that the universe was planned by intelligent design rather than happening by chance. I realise that evolutionists prefer that their worldview is presented in the classroom but it would violate the very objectivity of science itself to not present other alternative theories such as intelligent design. Thank you,"

"As a retired scienctist (microbiologist) I have examined the working draft of educational standards in science and find very little to criticize. I commend the committee for the work done so far. My request is that, when the standards come under attack by the 'creation scientists' (as they inevitably will), the committee stand firm and not allow religious belief to be injected into the science curriculum. I would like to comment at more length, if there is a way to email the committee. I will try to attend one of the public meetings, but expect to be shouted down by the group that I anticipate will be out in force."

"Creationism should not be taught as part of the science curriculum; it suggests that the Christian view of the origin of life is the only view. There are many religions represented in our public schools with many beliefs as to the origin of life (traditional Native American for example) so which which is the 'correct' one to teach. It would be impossible to cover all the religions traditions without offending someone. To teach only the Christian Bible 'theory' would open a can of worms so it should be left out to be taught outside the public schools by each belief tradition."
"I am very pleased that there is a sound basis in scientific theories and facts, rather than soft theories or speculations unsupported by physical evidence. Specifically, there should be NO teaching of 'Intelligent Design' theory or any other 'alternative' to evolution that is not based in physical evidence.

Additionally, I think there should be more emphasis on biology and biological systems, and specific biological processes such as respiration, photosynthesis, etc. Also there should be measureable, systemic tests such as learning the periodic table and elements. When they are done with science education, children should be prepared to enter college classrooms."

"I request that the part of the standard be the ability to discern between verifiable, repeatable scientific discoveries, and philosophical claims which are presented as science.

I also request that the alternatives to traditional evolution be presented, and that the evidence for these alternatives be studied and evaluated, so that students can participate intelligently in both scientific and philosophical debate.

This language exists in the current version of the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush. Thank you for your consideration. "

I feel it is vitally important that the Santorum language should the be incorporated into the standards.

Please incorporate the Santorum language in the standards for Science in MN public schools.

Thank you for your consideration and good work.

Thank you for taking the time to read my letter. This letter is in regard to the Science Standards in Minnesota Schools.

I believe that the Santorum language approved by Congress should be incorporated into the standards. It merely states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory.

Recent scientific discoveries show the immense complexity of biological life and raise serious questions about the efficacy of biological evolution as the explanation. An intelligent

design is pointed to by the scientific evidence. (Even top scientists and scholars disagree that there is enough evidence to support evolution.)

Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

Please allow our children to learn how to make decisions based on the facts presented to them. Let's not hide the idea of "intelligent design" - let's present it to the kids. Let THEM make the decision of which to believe.

Considering the debate in the scientific community about the theories of origins and the statistical improbability of macroevolution, why is it the only theory that students are exposed to in the classroom? Varying viewpoints such as the Intelligent Design theory should be welcome as part of the school experience.

Children ought to be taught to be critical thinkers. That cannot be done if all that is offered is evolution.

I am concerned when I read a recent poll in which people were asked if the theory of evolution should be taught in the public schools as science, and the response was strong that it should be. But then when asked if creationism should be taught in the schools as science, people responded that it should not, but it should be taught as a belief.

This tells me that the public has not been told the whole story. I think that most people do not know that science shows forth overwhelming evidences for creationism. Most people think that science only supports the theory of evolution, and not special creation.

I also believe this shows the need for creation science to be available and taught (and equally so) with evolution. But this has not been done. It's interesting to note that the Scopes Monkey Trial was to bring the teaching of the theory of evolution up along side of the teaching of special creation in our schools. But now it is only evolution that is being taught and not always factually so.

I stongly encourage you to pursue a public school curriculum that fairly addresses special creation right along side of evolution. There is so much scientific information available now, except in the public schools. It's a shame that this inequity exists, and that scientific information is being held back from our children and young people in the very arena of learning which exists for them- the public schools.

The public schools are for everybody and we all pay taxes to support them. Why then is there such a desparity between these two interpretations of scientific facts? Our children are filled with evolutionary thinking everyday and in every way- especially in our schools. Ask any of them and they can tell you of at least a few things they were taught about evolution, but ask them to tell you what they learned about special creation science in the classroom and you will be hard pressed to get even one piece of information (that they learned in school). Believe me, I have tried this many times already.

Again, I am asking you to do all that you can to bring this issue to light, and make sure that creation science is taught in the classroom as science! And frankly, why wouldn't it be?

The THEORY of evolution is extremely faith-based and should never be presented as the only theory of the earth's creation. With all of the holes and unproven components that make up evolution, it really should be a very small part of science curriculum. Naturalism/Creationism has many more scientifically proven components and should ALWAYS be included in the source of the earth's creation. All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth’s history. (See Science Working Draft treatment of evolution at Grades 7, 8, 9-12, IV. Life Science, E. Biological Populations Change Over Time. And Grades 9 –12, IV. Life Science, B. Organisms, Benchmarks.)

I am concerned regarding the new science standards currently being developed. My concerns are that it will continue to push the non-provable theory of evolution only. There is no proof for evolution and there are many so-called proofs that have been proven wrong or intentional lies many years ago that still remain in our children's textbooks. Most true science and evidence points, more and more, to intelligent design. I believe that more than just one theory should be taught along with the its weaknesses. We must not allow censorship of theories that do not support evolution any longer. This is not true science. It becomes a religion (i.e. the belief or faith in a theory which can not be proven). There has been a longstanding offer of $250,000 offered to any evolutionist who can provide empirical evidence proving the theory of evolution (see: www.drdino.com). For some reason

no one has taken it up. I think it is time we show all sides and more than one theory. I, therefore, support the wording in Senator Santorum's bill.

While putting together these new standards, it is in the best interest of the students that they be taught all theories of how the earth and life was created. There are several and points to prove each one. Let the evidence speak for itself after the student has had the opportunity to learn about each theory. They will be able to make an intelligent decision about which theory they will choose to follow. A random chance that life just happened or a by an order that only God could have made happen.

It is my belief that students should have a well-rounded education. This cannot take place if they only taught the theory of evolution and are not allowed to be exposed to the teaching of "intelligent design". The theory of evolution has many flaws (see www.drdino.com). It would be a shame to give students the impression that there are no logical alternatives to this view. Creation science teaches that an intelligent designer created us male and female. If evolution is true, and an organism crawled out of the swamp a billion years ago, who did it mate with? To teach only this theory is to teach our children that they are the result of an accident. No wonder so many of them take their own lives. Thank you for considering my comments.

I am unable to attend the town meetings you have set up on the subject of developing the science standards. However, I am very concerned about the proposed wording and content as it is now written.
We need to incorporate the Santorum language that has been approved by Congress. Students need to be able to distinguish between theories of science and religious or philosophical claims. When biological evolution is taught to the students, the curriculum needs to include a discussion of the controversy surrounding the theory. Recent scientific discoveries have unveiled the immense complexity of biological life. These discoveries raise serious questions about the explanation of biological evolution. The evidence rather points to an intelligent design. Students need to be taught to become informed participants in the ongoing discussion on this subject. We cannot teach just one theory at the expense of others. Censorship of evidence that does not support evolution is at odds with true science and violates the ideal of academic freedon in the classroom. This is AMERICA!!!
If students cannot learn to debate different viewpoints and to explore a range of theories in the classroom, what have we taught them? Don't we have a common goal of broadening their horizons - encouraging them to think for themselves?

All scientists do not agree that the evidence supports the theory of biological evolution. We CAN NOT teach evolution as the scientific theory for earth's history.

I look forward to seeing the wording in the new science standard changed to incorporate the above points.

We need to teach the students true science not story telling.

I am a parent who is in the fourth year of home-schooling his children. One of the reasons my wife and I do this is because public school does not give children a fair representation of the way the universe and life came into being. The fossil record that so many claim proves gradual evolution from microbes to man has actually disproved this theory. There is not a single piece of evidence in the fossil record (which is 100 times what it was in Darwin's time) to prove gradual evolution.

Also, many scientists now agree that there was not enough time between the time earth first was able to support life and when life first appeared for it to have happened by chance.

To deny these things doesn't add to science, it detracts from it. Creationism may not have any solid proof in it's favor (it's not supposed to) but it has no solid proof against it either. Evolution cannot make the same claim. Yet evolution is taught to our children as if it's a proven fact and there is no other way we could have appeared on earth.

You can close your eyes to this fact, like a child who covers their eyes believing they can make disappear the things they don't like, or you can allow the intelligent discussion of all possible paths to our existence - what good science is supposed to do in the first place.

I encourage you to not close your eyes like a frightened child, but to open them like a scientist interested in all the possibilities.

Thank you for the opportunity to give input to the new science standards.

When biological evolution is taught, the curriculum shoul include a discussion of the controversy surrounding the theory. We should not be teaching just one theory-evolution. A complete science curriculum must insure that students examine various scientific theories. Varying viewpoints should be welcome as part of the school experience. We must not

allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science.

Therefore under Grade level 9-12, Strand IV. Lifescience B. and Substrand E. these statement need to be changed because they presume macroevolution.

Evolution is therory not fact. All therories need to be covered. If we are to keep religion out of schools then we also need to keep the religon of atheism out as well which focuses on evolution.

I encourage you to adopt an inclusive rather than an exclusive position regarding the theory of evolution and the theory of creation as a part of the standards for science. Inclusiveness develops critical thinking skills and for too long the educational community has ignored this in the scientific area. Teaching both sides of this issue would satisfy the parent-taxpayer concern that the school is undermining their teachings outside of school.
Thank you for your support.

The theory of evolution as it pertains to the origin of life is a theory in crisis. Censorship of the important evidence that does not support evolution is creating an even greater crisis. In order for us to continue moving forward technologically and socially, we must be able to follow the evidence of our origin wherever that evidence may lead. To teach only one theory (evolution)and not to teach the controversy surrounding it or the evidence that supports intelligent design is to limit the minds of students from possibly discovering things that are truly amazing.

I urge you to consider support of the Santorum language approved by Congress which states that students should be able to distinguish between theories of science and philosophical or religious claims. Allow for the controversy to be explored. Be a champion for academic freedom instead of dogma.

Some of the intellectual youth are breaking loose from the bondage of the academic elite, in spite of the pervasive attempts by the educational establishment to foster their ongoing indoctrination. You may want to join the vanguard of those willing to acknowledge the obvious...intelligent design will supplant Darwin!

My husband and I would like to speak up on this important subject. We do not agree that evolution be the only way to explain our existance to our children. Please do not make this a law for the schools. Science is always changing their thoughts anyway- but the Bible does not change and should be considered in the schools for
Gods way of "creating" us in His image.

I am writing to encourage you to require the theory of "intelligent design" be taught in private and public schools, at all levels of education.
Thank you for your sincere consideration of this issue.

I want to add my voice to the discussion of scientific evolution as the only theory taught to school children. I believe to better facilitate the idea of education, the theory of scientific evolution should be taught with the ideas of the problems that have gone with it, and that the intelligent design theory also be taught. The Santorum language approved by Congress should be incorporated into the standards to give students a wider base to examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned dialogue about different scientific concepts. No one therory should be taught as the only reasonable one but a broader base of theories be presented with the positives and negatives of each.
Our children should not be a victim of political agendas or religious agendas, but should be informed as to the different theories that prevail so they can have a base to explore different approaches to the origin of life.
thank you for your time.

I am writing you to ask that you ensure that both major theories of the origin of life on earth be presented in our schools. It appears that the theory of evolution is being taught as the only rational and acceptable theory. Intelligent design is being neglected and even ridiculed in some cases.

This needs to change because it goes against basic scientific principles to treat something as an established fact when it has not been proven using accepted scintific methods. Evolution theory is full of holes and riddled with assumptions and speculation. For instance, the lack of transitional evolutionary forms between species is a huge red flag. Why is it being systematically ignored? I suspect an educational agenda vs an honest investigation of available data. Our kids should be exposed to all of the evidence and be familiarized with both concepts as being possible.
Is it that frightening to consider the possibility that there is an intelligent design to life's origins and a creator involved?

I urge you to support the Santorum language when setting science standards for our public schools. Since the theory of evolution has not been proven, it should not be taught as the only possibility for the beginning of life. Students need to learn to think critically and weigh all sides of different theories.

When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom. As Senator Robert Byrd (D-West Virginia), a proponent of the Santorum language, pointed out, “If students cannot learn to debate different viewpoints and to explore a range of theories in the classroom, what hope have we for civil discourse beyond the schoolhouse doors? … If education is truly a vehicle to broaden horizons and enhance thinking, varying viewpoints should be welcome as part of the school experience.”

I am a firm believer in a God created earth and all living things. I also believe there is just as much evidence to prove that as there is (so called) evidence supporting evolution. It is a disservice to our children to not only teach one view but also only to mention one view. Both views must be explored equally in the public school system.

I am writing to request that the new science standards NOT be biased in favor of teaching evolution as a fact, but rather that evolutionary theories be presented alongside intelligent design theories in a balanced way.

Specifically I would request that the language of Senator Santorum in the "Better Education For Students and Teachers Act" be included in the new science standards, allowing students to become fully informed on this subject.

Since our student should be told the truth in our classroom,I am encouraging you in incorporate the language in the bill introduced in the Senate June 13, 2001 and passed by the Senate and signed into law by the President into the curriculum on the teaching of biological evolution in our classrooms. This theory has many flaws and is just a theory, not scientific fact. We should present all theories so the students can use their logic to decide.

I strongly oppose the teaching of 'only'biological evolution being taught to my kids that attend public school!! We are a God fearing faith based family. It is because of Him that we are here, this is what we believe...I know others believe different and that is their choice and that is exactley my point...give the facts of both sides and let the children decide which one they want to. But please do not take that choice from our kids. Whether you believe in God or not is not the problem, the problem is our public schools, which we fund through alot of farm taxes, should be giving both sides, not just the one who someone in their infinite wisdom(?!!) decides is right. Thank you for hearing me.

Please give students the opportunity to investigate the scientific arguments for and against macroevolution. It is a theory, and as such, should be viewed with an open mind--one that is not predisposed to accept or reject. Thank you.

The Santorum language approved by Congress should be incorporated into the standards.

All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth’s history.

I've had an opportunity to review the first draft of science standards. I would like to see that the standards include a stronger statement regarding the THEORY of evolution.

The standard does currently state that "The student will understand how evolution provides a scientific explanation for the fossil record of ancient life forms..."

Since a large number of scientists hold that evolution is a THEORY, I think this needs to be outlined in a standard for science.

I remember learning about evolution and learning the components of it as a THEORY. Demonstrating knowledge about the THEORY allowed me to get an "A" in biology. The point being, I demonstrated the knowledge about evolution without being swayed in my belief that it is and always will be a THEORY.

Please do what you can to strengthen the language in this standard.

A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned

dialogue about different scientific concepts. The Santorum language approved by Congress should be incorporated into the standards. Students should be able to distinguish between theories of science and philosophical or religious claims.

Recent scientific discoveries show the immense complexity of biological life and raise serious questions about the efficacy of biological evolution as the explanation. An intelligent design is pointed to by the scientific evidence.

All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth's history. (See Science Working Draft treatment of evolution at Grades 7, 8, 9-12, IV. Life Science, E. Biological Populations Change Over Time. And Grades 9 –12, IV. Life Science, B. Organisms, Benchmarks.)

Santorum Amendment

On June 13, 2001 U.S. Senator Rick Santorum introduced an amendment to the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush. It says:

"(1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science;

(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject.
ONLY God can make the world, man did not nor ever will be able to duplicate. Students must be taught the truth and the truth is ONLY in the Bible.

I urge you to support a fair and balanced view to our children concerning the "theory" of evolution vs. creation. It takes far more faith to believe in evolution than it does in creation and evolution is clearly not a proven science, merely a theory based on a series of unproven hypothesis. True education helps students to think for themselves and to do this they must be presented with both sides of an issue as controversial as this. This is clearly not a religious issue; it is matter of two beliefs on the origins of our planet and existence. Real science looks at all data provided and produces an educated hypothesis based on ALL evidence...I certainly hope our young people are not denied this right!

I am concerned about the Theory of Evolution being taught as the only valid scientific theory of creation.
I am very interested in seeing the "Santorum language" being incorporated into the new standards.
Thanks for your kind consideration.

I support the language of Sen. Rick Santorum as approved by Congress being included in the science education standards. The theory of evolution is just that...a THEORY, and ALL sides of the issue need to be taught. True science examines all possibilities.

I would like you to support incorporating the Santorum language in the science standards for our nations high schools. I so clearly remember when this subject came up in my science class 20 years ago and the teacher basically just skimming over the subject because with only 1 theory to give and many students already realizing that it's only a theory it left him with little to talk about. It was truly a waste of time because he wasn't allowed to bring other ideas into the classroom.

I request that you incorporate the Santorum language in our education policies/laws so that we are not teaching only one evolution 'theory' of creation. There have been to many blind assumptions made about evolution - it's time to allow more debate on this issue

The Santorum language approved by Congress should be incorporated into the standards. Students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the

censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.
All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth's history. Recent scientific discoveries show the immense complexity of biological life and raise serious questions about the efficacy of biological evolution as the explanation. An intelligent design is pointed to by the scientific evidence. These statements need to be changed to recognize the differences of scientific opinion.

I feel strongly that the Santorum language approved by Congress should be incorporated into the standards. It merely states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

Under Grade Level, 9-12, Strand IV. Life Science, Substrand, B. Organisms, Benchmark, the draft standards state "Students will be able to use scientific evidence, including the fossil record, homologous structures…. showing probable evolutionary relationships and common ancestry." And under Grade 9-12, Strand IV. Life Science, Substrand, E. Biological Populations Change Over Time), the draft standard states, "The student will explain how evolution provides a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms." These statements presume macroevolution, e.g. that man evolved from a common ancestor is the correct view. Recent scientific discoveries show the immense complexity of biological life and raise serious questions about the efficacy of biological evolution as the explanation. An intelligent design is pointed to by the scientific evidence. These statements need to be changed to recognize the differences of scientific opinion.

Thank you for your attention to this matter.

It is absolutely critical students understand and are presented with the facts regarding evolution. All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth's history. Please be fair and impartial in your decision to incorporate the Santorum Amendment in the language concerning life science. If you do not included this language then you are discriminating against religions that believe in another source of creation.

In developing standards for Science I would ask that you please consider the Santorum amendment, approved by Congress, which insures that a full, complete discussion of the issue and theory of evolution takes place in the classroom. This includes the possibility of creation by a higher power. Many scientists have concluded that creation has the most logic and evidence to support it's claims, including Darwin in his later years. A real science discussion would include and look at all claims and the evidence to support those claims.

The theory of evolution is one among several contested explainations for life forms. One of these is the theory of intelligent design. Evolution is explained as a creation process void of a particular standard or order. Adopting this explaination for the development of the earth implies that matters develop in a way without intelligence and that one idea is no better than another. This can lead to moral relativism which unhealthy for our culture. No doubt you are familiar with the Santorum Amendment. I urge you to have incorporated this language into our education standards. This would help students judge different theories and debate their merits and shortcomings. This would be a good thing to learn.

As an educator and pastor I am very much aware of the challenges confronting the educational community. May I graciously ask you that in the teaching of evolution, that it would be considered a theory rather than a fact. In many parts of the world, Europe, China and other areas, evolution is only a theory. When researching the pros and cons of evolution in detail, especially in the area of DNA, the theory has significant deficiencies. Under these conditions, it would be unfortunate to propigate a theory as fact. As a church leader, I don't object to theories so long as it's treateed as a theory and gets thourough examination. Unfortunately the theory of evolution has gotten a pass.

Please do not allow the new text books to communicate theory as a fact. Evolution is a theory, just like uniformitarianism, catistrophism and theories in astronomy.

The language in the Santorum Amendment should be incorporated
into the science standards for the State of Minnesota.
Evolution is just a theory and it is not supported by all scientists. Intelligent design should also be incorporated into the science standards as there is evidence for it and it would promote learning and discussion on differnet scientific opionions.

As a retired public school teacher, a present home school teacher, parent, and Christian, I feel that it is very necessary for the standards committee to incorporate the Santorum language in the Science Standards.

If you go back to what Darwin said at the time he was postulating his theories, he said at that time that he did not have all truth or knowledge on the subject and left open that his ideas could be refuted as he could not prove them. I have a degree in mathematics and physics and we do our children a great disservice if we do not teach "Intelligent Design" in parallel with Darwin's theories as that is what they are - theories.

On June 13, 2001 U.S. Senator Rick Santorum introduced an amendment to the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush. It says:

"(1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science;

(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

I fully support the following.

Santorum Amendment

On June 13, 2001 U.S. Senator Rick Santorum introduced an amendment to the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush. It says:

"(1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science;

(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

Our educational system needs to be extremely careful how information is disseminated to our youth regarding how creation came about. The theory of evolution is taught in many schools as the only process in creation. I am totally opposed to this concept. There are many scientists who do not agree with the theory of evolution. Students should be exposed to all the theories.

Intelligent Design should be a part of the students curriculum. Where evolution is the sole option taught, I believe additional information should be made available as stated in the Santorum amendment. The Evolution theory is on shaky ground at best. I personally don't believe in the evolution theory; but if it is to be included, let's include all options, ie. INTELLIGENT DESIGN.

Curriculum should include all options about this topic, not only the evolution theory.

Please include the following words from the Santorum Amendment in any laws that deal with, where there is some aspect of creation or evolution mentioned in students' text books.

" Santorum Amendment

On June 13, 2001 U.S. Senator Rick Santorum introduced an amendment to the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush. It says:

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(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."
"

Thank you for including this kind of text.

I support the Santorum Amendment and urge both you and the Science Standards Committee to incorporate the Santorum language in the Science Standards for Minnesota.

I believe that Minnesota students should get ALL of the information so as to be as informed as possible.

As a concerned citizen I ask that you ensure that the "Santorum Language" be included in the science standards. It would encourage the kind of valid study and debate that our schools should promote.

As a certified high school science teacher...and now licensed and board certified Medical Doctor...I ask that you be open minded and fair-thinking enough to support and allow the incorporation of the Santorum language regarding the theory of evolution into our educational system(s).

An honest and open-minded scientific thinker must address the potential lack of science behind the evolutionary theory commentary,....and must also address real life science findings found throughout "life" all around us, that support the notion of at least "equal time" for commentary about "intelligent design".

An educational system that is truly given to teaching students to carefully and truthfully examine, review, investigate, and test data ...so that they might then be more capable of intelligently drawing meaningful conclusions,....must openly recognize and support the need for students to able to thoroughly discuss BOTH "THE THEORY OF EVOLUTION" and "THE THEORY OF INTELLIGENT DESIGN". Anything less...is an educational pursuit that is woefully lacking in scientific ingetrity and honesty.

Thank you for your consideration of the above

I believe public education should remain neutral regarding teaching theories of evolution. If both naturalistic evolution and intelligent design are taught in the classroom, then students are able to examine both of these theories and come to their own conclusions.

I would like to express my opinion that the Santorum Language approved by Congress, be incorporated into the education standards in MN. When biological evolution is taught, the curriculum should include a
discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others.

Please do not endorse science standards that force evolution as a fact, not a theory. We have been very strongly committed to the MN public school system, until last year when we pulled our youngest out to Home School him. We strongly believe in Creationism, although WE would not press others to learn only it, without the information to discuss both pragmatically. I would expect the public school system to offer the same forum.

All scientists are not in agreement that the evidence supports the theory of biological evolution. Thus, we should not teach evolution as the scientific theory for earth's history

(See Science Working Draft treatment of evolution at Grades 7, 8, 9-12, IV. Life Science, E. Biological Populations Change Over Time. And Grades 9 –12, IV. Life Science, B. Organisms, Benchmarks.) In fact, a recent survey has shown that a majority of the world's scientists debating this issue are now favoring Creationism over Evolution.

We strongly disagree with only evolution being taught in our schools with no teaching of the intelligent design. There is no way in God's green earth that the way this universe is put together that it just happened through evolution. There is to much facts that prove that wrong. We support the teaching of intelligent design.

Because the Science Standards are now being written, I feel it is important that certain items be included in this standard. I believe that incorporating the Santorum language in science standards would be appropriate in order to include another side of creationism. Because of scientific discoveries I believe that only teaching evolution is not giving the students the whole picture. By including the Santorum language you would be utilizing another theory that would enhance the curriculum. This would isnrue a full and complete discussion of the issues.

I am concerned that the theory of biological evolution is being written into our public school science curriculum as the only scientific theory for the earth's history. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

Please incorporate the Santorum language in the science standards

Please be sure that science teachers are presenting to students all
the theories of how humans, animals, planets etc. came to be. Evolution is not an acceptable COVERALL answer! The Santorum language must be included in the curriculum and standards for high school science classes. Creationism is the true & only explanation - from my viewpoint & beliefs. Thank you!!

In a society that values open discussion and debate on all subjects, I entirely support the inclusion of the Santorum language into the standards. There is nothing that motivates learning more than a healthy debate. If students are told only one side of an issue, they become lazy mentally and see no reason to initiate their own research. However, giving them current, factual data from both sides would be the only fair way to address any issue. As a mom, I always tell my children they should not be afraid to ask questions and honestly search for truth. What anyone believes should have enough validity to withstand intense scrutiny. Some things can't be totally understood, and for those, leave the door open for debate.

It is my belief that students will be devoid of a complete view of the evolutionary theory if you leave out other possibilities. There are strong implications that humans did not just appear by chance or evolve from a cell. I ask that you please consider to include the theory of intelligent design, which new scientific discoveries point to.

Thank you for your time and I hope you consider ALL of the options, so students may be able to have a more broad view of nature through science.

Please incorporate the Santorum language into the science curriculum taught in the public schools. Thank you for your consideration.

Since evlolutoin is not a fact, but rather a theory, it important that it be taught as a theory, not a fact.

Please give this matter of teaching evolution in our schools considerable thought. It is so important that we do not only teach science, but that ALL forms of creation are taught. The students of this day , will one day be the leaders of our country. We have not gotten this far as a free country without teaching CREATION in our classrooms!

It is absolutely critical students understand and are presented with the facts regarding evolution. Neither evolution or intelligent design theories are science. Both must be accepted on faith and in that sense, they are religion. Neither can be seen in operation and the past can never be tested scientifically.

The fact that we can't test either theory scientifically doesn't mean that they can't be discussed scientifically. We can compare the two proposed models and see how each correlates and explains known scientific data. That way the student can arrive at their own conclusion as to which theory is the most reasonable.

Evolutionists try to intimidate the public with statments like "evolution has now been proved" and "no real scientists now deny evolution". It's easier to demagog the issue that to support it with scientific evidence. Evolution violates one of the most basic laws of physics; The Second Law of Thermodymamics (sometimes called the Law of Increasing Entropy). It has never been observed taking place either in the current world or the fossil record. Any changes that have taken place in life forms are either horizontal (e.g. different

colors or characteristics), or downward like mutations going to extinction. In the millions of fossils that have been examined since Darwins day, not one transitional fossil (one showing evidence of evolving from one specie to another) have been found. These are just 2 of many scientific issues evolutionist have yet to explain.

It is important in teaching science that students be taught to anaylze problems scientifically. The issue of life and where it came from presents an ideal forum to teach these principles. Please include both Intelligent Design and Evolution in the Minnesota Life Science Curriculum, and also teach students how to evaluate both theories using scientific principles.

The santorum language must be incorporated into Minnesota's standards. Do not allow censorship of information that does not support evolution.

It is very important that we not indoctrinate students in any certain interpretation of the scientific facts.

Those who insist that we only teach students that we are products of chance and natural laws are going far beyond the evidence available and into the realm of philosophical interpretation which is highly subjective. The controversy among scientists in this regard highlights that fact.

It is very important that our science education standards include the Santorum language so that our children are taught how to discern testable scientific facts from philosophical and religious claims, and so that they have an understanding of why even scientists do not agree on the interpretations of the available evidence.

The Santorum language approved by Congress should be incorporated into the standards. It states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

Please consider incorporating the Santorium language into the standards. We feel that the students should not be taught only one theory, but be able to examine all viewpoints and come to a place where they can choose what they believe from the evidences they explored. Not everyone believes in evolution.

We strongly encourage you to incorporate the Santorum language in the science standards. The Santorum amendment, approved by Congress, will insure that a full, complete discussion of the issue and theory of evolution takes place in the classroom.

The Santorum amendment, approved by Congress, will insure that a full, complete discussion of the issue and theory of evolution takes place in the classroom.

On June 13, 2001 U.S. Senator Rick Santorum introduced an amendment to the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush.

I believe that the Santorum language approved by Congress should be incorporated into the science standards for the State of Minnesota. It merely states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

Thank you for allowing me to share my opinion.

As a retired banker and the knowledge of all of the rules and regulations there are for banks to follow to allow consumers to be able to make informed decisions, I believe the Santorum language must be incorporated into the Science Standards. Why should students (many of them consumers) be considered any differently? Allow the students to make "informed" decisions!

I'm writing today to urge you to incorporate a balanced treatment of the various subjects dealing with the origin of the universe into the Minnesota Science curriculum. I am against allowing only one theory soley to be taught. Teaching only the theory of evolution is bad science, for it denies multitudes of evidence for other theories. I am a mechanical

engineer working for a large defense contractor. I use science every day in my job. We need to be setting the standards high for students in the area of science by teaching them to think logically and make decisions based on the evidence they are given, instead of stifling their creativity by spoon feeding them a theory as though it were fact.

Good science gives all evidence, not preconcieved guessing based on unproven science.

Over 30 years ago while attending several different colleges I had classes that presented or treated evolution as an established scientific fact without any critique or even mention of weak points or evidence that contradicts it. On my own while in college I did research and discovered that many problems exist and some clear scientific facts contradict evolutionary theory. That was over 30 years ago and I still RESENT being given "INDOCTRINATION" instead of real education. True science does not run away from or hide from the evidence. To truely understand a subject students must understand the strengths and weaknesses of it.

If things continue in our schools as they have -- I will NOT be sending my kids to some stupid public school that teaches them they the chance formation from some ameba -- and have no intrinsic value. This trash is what murders are made of -- do you want that blood on YOUR hands?

So, if you must have our teachers fill our kids with a bunch of lies and deception -- then you will find BLOOD on your hands when more of our children murder one another right on our school premises. I will not be part of that.

So, choose carefully this day who you will serve. It is a real simple, a black and white issue....and here it is.

(Josh 24:15 NIV) But if serving the LORD seems undesirable to you, then choose for yourselves this day whom you will serve, whether the gods your forefathers served beyond the River, or the gods of the Amorites, in whose land you are living. But as for me and my household, we will serve the LORD."

So -- What will you choose to serve?

As a concerned parent and physician, I urge you to include Santorum language in the science standards to be set here in the near future. As more and more reputable scientists begin to question the validity of the evolutionary theory, it is imperative that our schools remain places of open debate into the pros and cons of this and alternative theories such as intelligent design.

It is imperative that the Santorum ammendment be incorporated into the Science Standards. It is not acceptable to allow the censorship of evidence that does not support evolution theory.

Please incorporate the language of the Santorum amendment, approved by the U. S. Congress, in the science standards to insure that students in Minnesota will have a full, complete discussion on the issue of the unreasonable domination of what is merely a THEORY of evolution.

There is abundant evidence for "intelligent design".

We think students must be given information that evolution is just a theory and cannot be proven - in fact, current scientific evidence is mounting through study of vast fossil remains that there is no sign of animals or nature in a state of change from one species to another. Every animal is complete as it was created. Incorrect information must not be perpetuated in the classroom - students must be given the opportunity to view different views and think for themselves which view of science rings true in its objective presentation.

For many in the science community, the scientific theory of evolution has a strong philosophical perspective - that mankind is merely the result of an unguided, mindless, chance process, e.g. naturalism. This view of course denies the evidence for intelligent design, which new scientific discoveries point to.
That’s why it’s absolutely critical students understand and are presented with the facts regarding evolution. If you don’t act, biological evolution could be the approved theory taught to all Minnesota public school students.

Use the following Santorum Amendment as a guide for Minnesota Science Standards.
Santorum Amendment

On June 13, 2001 U.S. Senator Rick Santorum introduced an amendment to the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush. It says:

"(1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science;

(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

Aside from the premise that BOTH main theories of evolution (theistic and atheistic) should be taught in public schools allowing students to further investigate whichever they wish --- or both --- may I ask: What scientific data is there proving SOMETHING has ever evolved from NOTHING?

The Theory of Evolution is just that--a theory. It must not be taught as fact and competing theories must be given equal time. The purpose of education is to create thinking, reasoning people, not brainwashed, propagandized robots.

I think that the students should be allowed to view the facts about evolution as a theory, but also be allowed to view other facts about the way man has come to be on the earth. Only using one theory (evolution) is not a complete study of the human race. I think that the Santorum Ammendment should be considered and put into the process of deciding the cirriculum for the students K-12.

Evolution is not a fact, there is no proof. It is a theory and should be presented as such if it "must" be presented at all. Thank you.

You must consider Santorum language as part of the educational process. For the sake of broadening the students mind, they must hear all theories.

Taught by my Grandmother about the great world God made and later taught by my school teachers the wonders of science I believe it is very important to know the difference between evoltution and the creation of God. The Bible was made for us to learn how to live in harmony. It is good to learn about such things of the past but to put a decision in the minds of our children is the American right. Why is it so wrong to teach the values of the commandments from our ancient Bible but so right to teach how man "thinks" he evolved from an ape like form? Our God is past, present and future, He created the earth. Science has alot of knowledge to offer but give the children both views. Some don't have anyone to look up to for guidance besides our teachers. Wasn't America founded by trusting in God? Why are we changing our stand? Because so many of us put our Lord on hold and say, "Not now, we have something so much more important to do." I am for the debate of different view points among our science classes. Thank you for taking your time to hear me.

Please make a note that I am one more concerned citizen who wants to see that our states students have the full information and opportunity to study the whole picture of creation, not just the conjecture of evolutionism. All scientists are not in agreement to support evolution and our children deserve the complete information for their own analysis not just one view. I would appreciate your full support for the the curriculum to include a discussion of the controversy surrounding the theory evolution.

As a caring and concerned parent and citizen, I'm writing to seek your support of integration of the Santorum language into our State's teaching standards for Science. Considering that scientists, after decades of research, still cannot agree that the evidence supports the theory of biological evolution, it would be wrong and an injustice to our children to teach evolution as THE scientific theory for earth's history. As noted in Senator Santorum's June 2001 amendment, which was supported by the Senate in a 91-8 vote before being passed into law, "...good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science..."

Please ensure that our Minnesota students are taught with this approach in mind. Give them the option to learn and discern.

Thank you in advance for your prudent consideration and integration of this language.

Please include the Santorum language in the Science Standards. It's sad that parents need to request that all points of evolution need to be addressed. What other areas of curriculum are one sided? This is one of the reasons our family was forced out of the public schools into private ones that include a balanced, fair curriculum.

Please do not limit discussion of theories other than evolution in the classroom. Not all scientists agree on this topic, and the students need to know that. An open discussion of other theories, including intelligent design, should be encouraged.

I understand the Santorum language encourages students to distinguish between fact and theory. Additionally, it allows discussion of both sides of the evolution argument.

I object to the Department of Education dictating a closed discussion in the science classroom. Varying viewpoints should be welcomed, not discouraged.

Treatment of evolution in the proposed science standards should include evidence for intelligent design. Students need to be presented the facts regarding evolution. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

A complete science curriculum must insure that students examine various scientific theories on the basis of all the information that is available to them, and facilitate reasoned dialogue about different scientific concepts.

I support the inclusion of the Santorum Amendment information in the Science Standards for MN. With all the information coming out that is debunking evolution, other ideas need to be included including creation.

I am writing to urge you along with the Science Standards committee to include the Santorum language in the science standards for the Minnesota public schools. It's very important that our students are provided with both sides of an issue especially now since the evolution theory is being called into question. Thank you.

I strongly urge that language similar to that in the Santorum amendment in Congress be adopted in our state science standards regarding the teaching of evoution as a theory in our state schools' curricula. Thank you for your consideration of this request.

As a parent of 4 children and as a Christian it is extremely important to me that evolution is not the only theory taught in our schools. I would prefer only Creationism is taught but since that is not going to happen I would want both theories taught side by side so discussions can arise. Through student involved discussions differing opinions can be evaluated. Also, the teacher will not be able to push his personnal viewpoint alone. Science books should not even be considered if only one side of this issue is written about.

Dear Commissioner Yecke:

· The Santorum language approved by Congress should be incorporated into the standards. (See above.) It merely states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

· A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned dialogue about different scientific concepts. As Senator Robert Byrd (D-West Virginia), a proponent of the Santorum language, pointed out, “If students cannot learn to debate different viewpoints and to explore a range of theories in the classroom, what hope have we for civil discourse beyond the schoolhouse doors? … If education is truly a vehicle to broaden horizons and enhance thinking, varying viewpoints should be welcome as part of the school experience.”

· However, under Grade Level, 9-12, Strand IV. Life Science, Substrand, B. Organisms, Benchmark, the draft standards state “Students will be able to use scientific evidence, including the fossil record, homologous structures…. showing probable evolutionary relationships and common ancestry.” And under Grade 9-12, Strand IV. Life Science, Substrand, E. Biological Populations Change Over Time), the draft standard states, “The student will explain how evolution provides a scientific explanation for the fossil record of

ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms." These statements presume macroevolution, e.g. that man evolved from a common ancestor is the correct view. Recent scientific discoveries show the immense complexity of biological life and raise serious questions about the efficacy of biological evolution as the explanation. An intelligent design is pointed to by the scientific evidence. These statements need to be changed to recognize the differences of scientific opinion.

· All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth's history. (See Science Working Draft treatment of evolution at Grades 7, 8, 9-12, IV. Life Science, E. Biological Populations Change Over Time. And Grades 9 –12, IV. Life Science, B. Organisms, Benchmarks.)

Please incorporate the Santorum Amendment into the new standards for the teaching of science. The theory of evolution is just that, a theory. For students to receive a well-rounded education they need to know the cons as well as the pros of this theory and not be taught that evolution is an absolute fact. The evolution theory has many flaws in it. Students need to know this.

We are definitely in support of have Creationism taught as an alternative to the theory of Evolution. We feel it is only right that this is given as an "equal" "theory" to Evolution. Our children need to know that Evolution is NOT the only theory. Of course, we feel that Creation is more than a "theory".

As a caring and concerned parent and citizen, I'm writing to seek your support of integration of the Santorum language into our State's teaching standards for Science. Considering that scientists, after decades of research, still cannot agree that the evidence supports the theory of biological evolution, it would be wrong and an injustice to our children to teach evolution as THE scientific theory for earth's history. As noted in Senator Santorum's June 2001 amendment, which was supported by the Senate in a 91-8 vote before being passed into law, "...good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science..."

Please ensure that our Minnesota students are taught with this approach in mind. Give them the option to learn and discern.

Thank you in advance for your prudent consideration and integration of this language.

PLEASE READ THE WHOLE BIBLE AND STUDY EVERYTHING IN IT'S CONTACT'S,AND THEN PUT AS MUCH TIME INTO RESEARCHING THE BIBLE AS YOU HAVE INTO EVOLUTION AND YOU'LL FIND ALL THE DIFFERANCE BETWEEN EVOLUTION AND THE TRUTH. THANK YOU!

Please incorporate the Santorum language in the Science Standards.

I am a parent with a child in the Minneapolis school district. I am concerned what my child will be taught concerning the orgins of life. So often the theory of biological evolution is taught as fact - not as a theory. No discussion is entered into as to why some scientists do not believe the evidence supports this theory. Therefore, I want to urge you to adopt the Santorum amendment when drawing up our science curriculum standards.

I am against the schools in Minnesota teaching evolution as the basis for earth's history. I want Minnesota to adopt the Santorum Amendment, which has been approved by our US Congress.

· The Santorum language approved by Congress should be incorporated into the standards. It merely states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

· A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned

dialogue about different scientific concepts. As Senator Robert Byrd (D-West Virginia), a proponent of the Santorum language, pointed out, “If students cannot learn to debate different viewpoints and to explore a range of theories in the classroom, what hope have we for civil discourse beyond the schoolhouse doors? … If education is truly a vehicle to broaden horizons and enhance thinking, varying viewpoints should be welcome as part of the school experience.”

· However, under Grade Level, 9-12, Strand IV. Life Science, Substrand, B. Organisms, Benchmark, the draft standards state “Students will be able to use scientific evidence, including the fossil record, homologous structures…. showing probable evolutionary relationships and common ancestry.” And under Grade 9-12, Strand IV. Life Science, Substrand, E. Biological Populations Change Over Time), the draft standard states, “The student will explain how evolution provides a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms.” These statements presume macroevolution, e.g. that man evolved from a common ancestor is the correct view. Recent scientific discoveries show the immense complexity of biological life and raise serious questions about the efficacy of biological evolution as the explanation. An intelligent design is pointed to by the scientific evidence. These statements need to be changed to recognize the differences of scientific opinion.

· All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth’s history. (See Science Working Draft treatment of evolution at Grades 7, 8, 9-12, IV. Life Science, E. Biological Populations Change Over Time. And Grades 9 –12, IV. Life Science, B. Organisms, Benchmarks.)

I would like to express my feelings on the proposed Science Standards regarding the teaching of Creation. I believe that children need to be allowed to be taught both theories, or beliefs, of evolution. As a parent, it is important to me that my kids don't hear just the evolution theory. They need to also hear the about Creation from the biblical stand point. I know that church and state are suppose to be seperated, but the Bible is an important document of historical events; it should not be ignored!

Thank you for taking the time to read my opinion. I pray that our legislators take time to consider the impact of their decisions in what is being taught to the children that will one day run our country.

As I understand the debate regarding science standards, I want to encourage you to incorporate the language and approach offered by the Santorum Ammendment in the teaching of evolution as one scientific theory and not as a proven secular theology used as a litmus test for scientific "orthodoxy." I believe the recognition and teaching of the differences of scientific opinion will make for better science - and offer students a more realistic understanding of the universe we call home. Thank you for your consideration.

Please incorporate the Santorum language into the new science standards. To ensure students gain a well balanced understanding of science, they need to be informed about other theories such as intelligent design.

Thanks for hearing my viewpoint.

P.S. Dumb question for you? Did the corvette just happen to evolve from the '46 chevy or was it designed by an intellegent designer?

It is my hope that you would consider incorporating the language of Senator Rick Santorum's 6/13/01 amendment into the science standards for Minnesota public schools.

This amendment merely states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject.

I wholeheartedly believe that we should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom. If education is truly a vehicle to broaden horizons and enhance thinking, varying viewpoints should be welcome as part of the school experience.

It is important that we keep in mind that all scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth’s history. Again, teaching one theory (that is not fully supported) at the expense of others, does not make sense.

Thank you for your consideration and review of this important matter.

A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned dialogue about different scientific concepts. As Senator Robert Byrd (D-West Virginia), a proponent of the Santorum language, pointed out, “If students cannot learn to debate different viewpoints and to explore a range of theories in the classroom, what hope have we for civil discourse beyond the schoolhouse doors? … If education is truly a vehicle to broaden horizons and enhance thinking, varying viewpoints should be welcome as part of the school experience.”

Please maintain the science standards as science standards. Don't have faith theories presented as scientific theory. With the increasingly limited funding to public schools, they should not be put in the position of having to spend precious funds defending a blatant abuse of the separation of church and state. There are plenty of churches around which are fully capable of presenting faith theories. Students should be learning about any controversy between science and faith in their church or at home. I am a Christian and attend church regularly. That is where my faith is nurtured and strengthened. Public schools should not be in the faith instruction business.

It seems particularly ironic that the "Theory" of evolution is presented exclusively in our science classrooms. If this theory were provable and thus accepted as fact, I could understand its exclusive position. We all know that this theory is not provable. Why are other theories excluded? Is it to protect evolution from objective scrutiny? I think so. Now, however, is the time to change that. Let's open the debate and challenge the minds of our students to think objectively.

I am writing to encourage you to support the Santorum Ammendment which states that "good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science."

I do believe that when biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory and that we should not be teaching just one theory, evolution,at the expense of others. To do so is nothing but censorship. Such an approach to education violates the ideal of academic freedom in the classroom.

Please incorporate the Santorum language in the science standards in our state's public schools.

Freedom to discuss Creation and evolution in school is vital ....otherwise the state is not allowing free speech from my kids!

I am requesting that the current science standards that fallaciously presuppose macroevolution as fact rather than theory be changed. Macroevolution has not been proven, and scientists are not in agreement that the evidence supports it.

The Better Education For Students and Teachers Act states that "where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

In our state, however, our drafted science benchmarks (Life Science, Substrand, B. Organisms) state that "Students will be able to use scientific evidence, including the fossil record, homologous structures…. showing probable evolutionary relationships and common ancestry."

This benchmark is not supported by science or federal law and needs to be changed.

On June 13, 2001 U.S. Senator Rick Santorum introduced an amendment to the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush. It says:
"(1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science;

(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

The Santorum language approved by Congress should be incorporated into the standards. (See above.) It merely states that students should be able to distinguish between theories of

science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

Please incorporate the Santorum language in the science standards.

I believe it is wrong to only teach the theory of elvolution in the schools. Philosphical and religious veiws need to be given in order to recognize the differences of scientific opinion.

Senator Byrd's statement, "that if students cannot learn to debate different viewpoints and explore a range of theories in the classroom, what hope have we for civil discourse beyond the classroom doors?", is a very valid argument to include more than just the evolution theory.

It makes good sense to incorporate the Santorum amendment language into the science standards.

We'd like to enter three comments into the record regarding the proposed competency standards for the instruction of science in MN schools.

First, we uge you to incorporate in the standards the language of the Santorum amendment -- language with which we are sure you are familiar.

Secondly, we urge that the standards be so worded as to acknowledge (1) that there are various and in fact competing theories, plural, of evolution, not just one monolithic theory; and (2) that there are other non-evolutionary theories and beliefs of origins which are based on alternate but demonstrably valid, non-evolutionary interpretations of the fossil record and similar data. An unprejudiced, truly scientific mind, seeking the truth in any quarter where it may be found, will grant these theories a fair hearing along with the evolutionary viewpoint.

Lastly, and most importantly, we urge that the standards require that no child entering the classroom with incredulity regarding evolution shall be made to feel inferior for doubting a doubtful theory. Nor should he or she be penalized academically for refusing to parrot evolutionary propaganda!

As one who earned a B.S. degree in the biological field (Urban Forestry), I am well versed in Darwin's concept of biological evolution. But as I have continued my education from outside the walls of academia, my reliance on this concept has come into question. An equaling compelling theory/concept/viewpoint of "intellectual design" has just as much scientifical data to back up this theory as the current biological evolution concept. I would request that both theories, and any other viable concepts, be taught & debated by students (my 4 children) as a integral part of their science education. All my science training is based on examination of the data and the corresponding theory derived from such data. When the data can be interpreted from multiple viewpoints with no absolute imperical determination, it would seem best to teach both, or all sides, and let individuals chose for themselves what theory to follow/belief. To exclude a viable theory from discussion/debate, seems narrow and small minded.

I therefore endorse the Santorum Amendment to allow "students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science."

For many in the science community, the scientific theory of evolution has a strong philosophical perspective - that mankind is merely the result of an unguided, mindless, chance process, e.g. naturalism. This view of course denies the evidence for intelligent design, which new scientific discoveries point to.

The notion that there are no set standards or order to the universe has implications far beyond science. It’s reflected in relativism in the law when judges think they can make laws – examples are the Roe v. Wade abortion on demand decision, the recent Lawrence decision which will created a Constitutional right to homosexual behavior or the banning of voluntary school prayer. We see it in the moral relativism throughout society.

That’s why it’s absolutely critical students understand and are presented with the facts regarding evolution. If you don’t act, biological evolution could be the approved theory taught

to all Minnesota public school students.

· The Santorum language approved by Congress should be incorporated into the standards.

· A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned dialogue about different scientific concepts.

· However, under Grade Level, 9-12, Strand IV. Life Science, Substrand, B. Organisms, Benchmark, the draft standards state "Students will be able to use scientific evidence, including the fossil record, homologous structures…. showing probable evolutionary relationships and common ancestry." And under Grade 9-12, Strand IV. Life Science, Substrand, E. Biological Populations Change Over Time), the draft standard states, "The student will explain how evolution provides a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms." These statements presume macroevolution, e.g. that man evolved from a common ancestor is the correct view. Recent scientific discoveries show the immense complexity of biological life and raise serious questions about the efficacy of biological evolution as the explanation. An intelligent design is pointed to by the scientific evidence. These statements need to be changed to recognize the differences of scientific opinion.

· All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth's history.

Please include the Santorum language approved by Congress in the Science Standards for the State of Minnesota. Students should be taught all theories of the earth's beginning, not just the theory of evolution. It is only a theory, and therefore should not be taught exclusively.

Please incorporate the Santorum language in the science standards for all grade levels, all schools in Minnesota. It is crucial that all students are presented with the facts regarding evolution - that it is a THEORY. Question to ponder: If humans were evolved from apes, then why isn't that still happening today? Whey did that stop? Apes give birth to apes, birds give birth to birds, humans give birth to humans, etc. Please do not teach theory as fact in school. In fairness, give all sides to this issue. Thank you for your attention to this important issue.

I am writing to encourage you to incorporate the Santorum language of the federal Better Education for Students and Teachers Act into the MN Science Standards. It merely states that when biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion reguarding the subject. We should not be teaching one theory-evolution-at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of intellectual freedom in the classroom.
All scientists are NOT in agreement that evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the only scientific theory for earth's history.

I would request you and the Science standards committee would incorporate the Santorum language in the science standards in our schools. Science has it's definites, but our creation is not one of them. Teaching only evolution even as science theory, makes it the truth in many eyes.
Good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science.

Your position on this issue matters to the well-being and growth of the students who will someday run our country. As parents, we do not take this lightly, and presume you do not either.

We value the ideal of academic freedom in the classroom and hope you do, too.

As you create the Science Standards for the public schools please consider the Santorum language as a part of the standards. Though most teachers were taught otherwise recent scientific developments bring the Theory of Evolution into serious question. The Theory of Intellegent Design is being adopted by top scientists as an equally valid theory of origins.

Shouldn't our children be exposed to both theories and taught to eveluate the evidence. It can and should be done without the introduction of religion into the classroom.

Please do not allow the Science Curriculum to become a place for worldveiw indoctrination. It must be an exploratory process of evaluating and testing evidence. Using the Santorum language is simply the right and balanced approach to the Science Standards.

Please do everything in your power to see that the language proposed by Sen. Santorum are incorporated in our school science classes. We are a homeschooling family and one of the biggest reasons is that we don't want our kids being taught theories and opinions (like evolution) as facts. Some of our children would like to be in a traditional school, and we would consider it only when the schools are no longer contradicting our religious beliefs.

I believe that the science standards enacted for our schools should contain the Santorum Amendment. We should teach our children all the science theories we can, and let them decide their own conclusion. They only can form these conclusions if we give them good, accurate information. Presenting only one theory, Evolution, is a disservice to our children, and is censorship.

I urge you to put the Santorum Language in the Science standard for our schools.

Please support the inclusion of the Santorum language in the science standards. It is so imperative that our children and our children's children have ALL of the information put before them. Our country is one of open-mindedness and not closed-mindedness (brainwashing?). Please let me know how you stand on this.

The Santorum language approved by Congress should be incorporated into the standards. It merely states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

I urge you to infuse the language Senator Santorum promotes relative to the teaching of the evolution philosophy promoted at present in our public schools. I have long been interested in the debate of the singular focus (agenda)of teaching evolution in our public schools and have studied the subjects in lectures and books. I have been left with the impression that the public school system;

a) preaches open thinking and learning but advocates a closed system that is intolerant of advocates of the significant body of evidence that proposes evolution is a farce and is condemned by the facts that demand to be heard

b)teaches a theory of evolution as it were a fact and defies anyone to challenge the teaching or authority of the system (I believe a teacher in the Faribault school district was fired for letting his students in on the "secret" that there were big problems with evolution) and

c)creates an environment whereby children believe they are products of chance rather than beings of importance and purpose. The philosophical result of evolution is the creation of world view that has no moral root and no direction for the ability of the student to chose right from wrong, seting morality aside as no longer relevant.

You are our new hope Commissioner. There are a huge number of us that are thankful that Christine Jax is gone as Commissioner and we have you to advocate and champion a move to step back and fix things. Please help get our children back from the autocrats running our school system, denying parental involvement and witholding the facts from the classroom. Open our kids to the right way of teaching and debate.

Thank you for the job you are doing and the tough stances you are taking. It will be a battle to take our kids back from the public school systems that have become our nemesis.

So does it supprise us that if they teach young people that they decended from the monkeys- they will act like monkeys? Why do school shooting supprise us?

The present concept of life teaches no value or respect for life. Unfortunately anyone that believes in this concept of mindless, unguided, accidental production of life must answer, where did that first cell come from?

Good luck- but I think the public school system is in a severe decline and it will take more than a change in the concept of evolution to save it.

I would like to encourage you to do everything you can to include provisions for varying viewpoints on the subject of evolution in the Minnesota Department of Education's science standards. In the name of good science, and education itself, one cannot ignore the growing body of scientific evidence that is in conflict with currently taught theories. Examples of this are:

The lack of transitional fossils. A key component in Charles Darwin's Origin of Species is that these would have to exist in great amounts in order for the theory of evolution to have any validity. Nearly 150 years have passed and no evidence of transition has been found.

Lack of natural mechanism. Darwin proposed that species of plants and animals could have evolved from a simple cell organism. However, scientists have been able to determine that natural selection is not the kind of process in which complexity develops from simplicity. In addition, genetic mutations have only been observed to be harmful, downward mutations.

Time constraints. If evolution was possible, most people agree that it would take an extremely long period of time. That being the case, many have placed the age of the earth at about 4.6 billion years. However, there are presently about five times as many indicators of a "young earth" than an "old earth." Some examples are: moon drift, earth rotation speed, magnetic field decay, erosion rates, chemical influx in the oceans and ocean salinity. Each of these factors are distinct from the other. Successfully challenging one of these would still leave the problems of the rest.

Unacceptable model of origin. The Big Bang is currently taught as the origin of life and matter in many schools. However, there are unanswered questions about this theory, including the very issue of where it all came from. A major explosion would certainly redistribute something that already existed, but could not cause something to exist from nothing.

Most, if not all, cultures of the world have theories of origins. These are usually based on cultural and religious traditions passed down from generation to generation rather than from a serious study of scientific evidence. Varying viewpoints are discouraged. Are we allowing our State to fall into the same trap?

I would urge you to incorporate the Santorum language in the science standards. Help our students to be educated learners, making their decisions from all information available, and with a full understanding of the controversy over biological evolution.

Since there have been recent scientific discoveries which have raised questions about the theory of biological evolution, I would hope that the Department of Education would be able to adapt their teaching of evolution. Good sicience education should prepare students for debate and being able to recognize differences of scientific opinion. Evolution has been debated for years without the evidence of intelligent design being taught or presented.

I'm writing you as a concerned citizen. I would urge you to incorporate in your science standards the Santorum Amendment, that has already been signed into law.
I believe our students and teachers need to have a complete carriculum that is taught concerning scientific theories. A theory should be taught as theory, not as fact. "All" theories should be taught, and the student allowed to decide for themselves, with the aid of their parents.
Thank you for making this a priority for our children.

The arguements of the Minnesota Family Council certainly are not representing MY family, or any family that doesn't represent their religious values. Religous fanatics should not be able to use public education to push their facist agenda. I certainly hope that my child will not be exposed to the rhetoric of the Christian Right while attending public school!

Please incorporate the Santorum language in the science standards.

Students in our great state of MN deserve to be allowed to use their mental abilities in Science Classes. The Santorum Amendment should definitely become a standard approved by the educational commission. The evolution theory cannot be proven, as cannot other scientific, philosophical, or religeous theories. Intelligent debate and discussion needs to become a means for our science students to use their past and present studies and research. The "real world" does not need an unproven dictatorical system in our public school science departments. Research is ever changing. Students must be able to have an "open mind" on theories that cannot be proven. To have students forced to assume that all educated scientists agree on the validity of the evolution is teaching them a falsehood. Becoming mechanical "robots" in their thinking is not how we want our future scientists to function as a result of their science courses. Lets not descend in the "dark ages". Lets prepare our students to creatively use their intellectual skills.

Dear Commissioner Yecke:

Students in our great state of MN deserve to be allowed to use their mental abilities in Science Classes. The Santorum Amendment should definitely become a standard approved by the educational commission. The evolution theory cannot be proven, as cannot other scientific, philosophical, or religeous theories. Intelligent debate and discussion needs to become a means for our science students to use their past and present studies and research. The "real world" does not need an unproven dictatorical system in our public school science departments. Research is ever changing. Students must be able to have an "open mind" on theories that cannot be proven. To have students forced to assume that all educated scientists agree on the validity of the evolution is teaching them a falsehood. Becoming mechanical "robots" in their thinking is not how we want our future scientists to function as a result of their science courses. Lets not descend in the "dark ages". Lets prepare our students to creatively use their intellectual skills.

I am writing to request you to support and incorporate the Santorum language into the science standards. Getting an education should not be limited to what a "few" people believe to be true, especially when it comes to theories.

The children of America should be given the best education possible. I believe that a discussion on the various types of beliefs and theories, along side the facts, is necessary for our children to have a well-rounded education. We want our children to think and reason for themselves and not just quote back what someone tells them.

The Santorum language should be incorporated into the proposed science standards.

I am deeply concerned about quality science education in our schools and ask that you support the concepts of the Santorum Amendment when implementing science curriculums. With scientists throughout the world realizing the immense problems with evolutionary concepts, it is only logical and scientific that this area of teaching be scrutinized appropriately.

Please strongly consider the impact of teaching by rote and memorization rather then through analysis and thought. Please support the concepts of the Santorum Amendment.

"Survival of the fittest" espoused by Darwinian evolutionists has much wider social implications than what color of butterfly might best survive in a forest. "Survival of the fittest" makes its way into all sorts of thinking: it makes policy decisions that ignore the poor, the frail elderly, and the defenseless unborn politically (but certainly not morally) defensible.

Please do adopt the the Santorum verbage because it truely represents the real world we live in.

I would support teaching creationism in schools as well as evolution. If one were to approach this from a statistical scientific point of view, the odds of such a variety of life evolving from some single cell is astronomical. So remote that if the same statistics would be applied to any scientific experient, the conclusion would be statistacally improbable of that event happening and you would have to reject the theory of evolution. In fact even the chance of having the perfect conditions to form that first one single cell would have to be taken to be statistically unlikely. If one were to assume all life did evolve from a single cell, why has no credible evidence been found to find the "intermediate" organisms that have evolved into the various species? To discredit evolution is to discredit our present scientific approach and therefore should be included in the science curriculum. Students could then take the two arguments and make their own decision.

Please consider including all possible theories of the world's beginnings in the science curriculum. It's a great chance for intellectual student discussion and opinion and facts to be discussed. Let the students figure out for themselves what they believe...not the teachers telling the students what to believe. Creation and evolution should both be taught.

Please do everything in your power to help Minnesota's parents leave a lasting and positive legacy in this world through their children by empowering them to insure that their children have the opportunity to be exposed to, learn aabout, and be able to distinguish between all of the scientific theories on the creation of life, as opposed to just one theory. If our children are to be meaningful participants in this world and life, they must be informed participants.

I am requesting that the Santorum language be incorporated in the Science Standards. The Santorum amendment, approved by Congress, will insure that a full and complete discussion of the issue and theory of evolution takes place in the classroom. I believe that Senator Robert Byrd (D-West Virginia), a proponent of the Santorum language, stated it best when he said, "If students cannot learn to debate different viewpoints and to explore a range of theories in the classroom, what hope have we for civil discourse beyond the schoolhouse doors? … If education is truly a vehicle to broaden horizons and enhance thinking, varying viewpoints should be welcome as part of the school experience."
A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them. This will facilitate reasoned dialogue about different scientific concepts. This attitude supports true science and the ideal of academic freedom in the classroom.
Therefore, I ask that the Santorum language be included in Minnesota's Science Standards.

Please be diligent to include the wording of the Santorum Ammendment into the new Science Standards. It is imparative that children are taught the WHOLE truth in all areas of education, and especially in the sciences.
When children are taught the Theory of Evolution, they should also be made aware of the controversy surrounding the Theory so they can learn to make sound scientific judgements. Teaching children that Evolution is absolute incontrovertable fact is just as bad as teaching only Biblical Creation was many years ago. There are MANY PhD's that have found some serious flaws in aspects of the Theory of Evolution. How can we insist on teaching something as absolute fact when almost a third of the most learned people in the world have seroius questions about the validity of the Theory? We just need to teach the whole truth and nothing but the truth. Our kids deserve nothing less.
Thank you for your time and attention to this.

According to the Santorum Amendment (see below), which has been passed, we should be allowing alternative Scientific theories into the classroom that have the appropriate evidence to back them up. Please allow this into the standards so that our children truly start to learn to think for themselves instead of being forced to learn only one theory. In effect, the other theories, namely the viable Intelligent Design Theory, have been censored and I know many Americans, and Minnesotans, would like to see this stopped.

Thank you for your consideration!

Santorum Amendment

On June 13, 2001 U.S. Senator Rick Santorum introduced an amendment to the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush. It says:

"(1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science;

(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

Please keep Santorum language in the science curriculum in public schools. I know I am not here by chance. Let the children learn both sides of the theories. Woe to those who hinder children from understanding ALL the possibilities.

I am writing to urge you to include the Santorum language that was approved by Congress into the new state standards for science education. Biological evolution is a theory and should be taught as such. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

Since all scientists are not in agreement that the evidence supports the theory of biological evolution, we should not teach evolution as the scientific theory for earth's history. The Santorum language approved by Congress should be incorporated into the standards. Senator Byrd (D-West Virginia) points out that, "If students cannot learn to debate different viewpoints and to explore a range of theories in the classroom, what hope have we for civil discourse beyond the school house doors?.... If education is truly a vehicle to broaden horizons and enhance thinking varying viewpoints should be welcome as part of the school experience."

Thank you for considering our view and doing your best to serve us.

I am writing as a concerned citizen in opposition to the proposed science standards for grades 9-12. The statement concerning evolution as providing a scientific explanation for the fossil record of ancient life forms etc. is not a true statement. The fossil record actually supports Biblical creation and Noah's flood. To only teach evolution as the standard is a great miscarriage of truth. If evolution is to be taught, creationism should also be taught. Let's be fair in our presentation of science.

Carl Sagan, a known atheist, attended a convocation of celestial and mathematical scientists in Russia shortly before he died. The materials from this conference was published by MIT in the late 90s, they concluded that the odds the earth (and universe) evolved by pure chance apart from intelligent design was between 1 in ten to the 600th to 900th power. They also concluded the chance that life as we know it could be found anywhere else in the universe was just as remote. We discovered in the physical scientific community's nomenclature anything smaller than a chance of 1 times 10 to the 50th power is classified as "absurd".

Based on these conclusions they stated that to hold a contrary position and to continue to adhere to dated theories of chance evolution was illogical and unprofitable. From what was called "a pessimistic report" Carl Sagan left these meetings in deep despair, evidently because he hoped their conclusions would be different. He died very shortly after that. His world view was demolished.

Can you imagine if your doctor told you the chance of your surviving without a certain operation was 1 times 10 to the 50th power? Commissioner Yecke, wouldn't you have the operation? Yet for whatever reason we've taken that one "absurd" chance and held on to it for dear life. The fact that we won't even teach an alternative position, let alone pointing out the fallacies of Darwinist evolution, is unimaginable.

The point is that for years the very best research, biological, and mathematical scientists at the highest levels have moved away from the a chance evolutionary position. Yet this is still taught to our publicly educated children as the only explanation of our existence. It has become the fundamental doctrine of grade school and high school. History will one day call our policy makers absurd, just as today we ridicule those who believed the world was flat.

As a concerned parent, I ask you to do whatever you can, based upon the authority you have been entrusted, to change the tide toward an enlightened policy on this subject.

True Science is not afraid to look at and examine all the theories. To teach evolution as the standard of origins is to exalt an unproved theory as fact. To ignore intelligent design is to disregard a whole body of scientific research because of a predetermined bias. Is not pure science supposed to explore and test data with the intent to find out truth? Only verifiable facts can be established as truth. To approve one theory to the exclusion of discussion of all others is dishonest and certainly not science. Science Standards to be legitamate need to be free to explore, and discuss all the data and apply them to multiple models of origins.

I'm contacting you because I would like to see the Minnesota Science Standards allow students to hear all scientific theories and not have scientific evidence censored due to religious & politicial biases. This can be done by adding the Santorum Amendment language to the Minnesota Standards.

I'm ok with students being taught the THEORY of evoltuion as long as both the positive and negative aspects of this theory are highlighted and discussed. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned dialogue about different scientific concepts. As Senator Robert Byrd (D-West Virginia), a proponent of the Santorum language, pointed out, “If students cannot learn to debate different viewpoints and to explore a range of theories in the classroom, what hope have we for civil discourse beyond the schoolhouse doors?

I'm expecting "Minnesota Public Education" to enhance the critical thinking and broaden the horizons of my two childre. To accomplish this, varying viewpoints need to be a

welcome part of the school experience.

The Santorum language approved by Congress should be incorporated into the standards. Varying view points should be welcomed in the classroom to give students the opportunity and experience to debate and explore. This will help broaden their horizons, enhance their thinking and help them develop critical problem solving skills.

Please incorporate the Santorum language in the science standards.

Santorum Amendment
On June 13, 2001 U.S. Senator Rick Santorum introduced an amendment to the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush. It says:

"(1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science;

(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

As you know true science involves the observation of reproducible phenomena. The history of creation is therefore outside the relm of true science. Theories of creation obviously are still of interest to scientists as so much rests on our view of creation. In reality without a creation that contains order,which can only occur by design, there could be no science.
I am writing to request that any standards contain acknowledgement that theories of creation are just that, theories, and not proven scientific fact and that there are at least two major theories; "evolution" or "intelligent design", and that both have support within the scientific community.We must present the data to young scientists and allow them to decide which they think is most compatable with the facts that are available. This is an essential exercise anyway for those who are being trained to be our future scientific thinkers!
Thank you for your work on this important issue.

I am writing to encourage you to incorporate the Santorum language passed by Congress into Minnesota's science standards. It is only right that students understand that evolution is one of several theories, and certainly not proven scientific fact.

I strongly urge you to promote that the Santorum language "(1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science;

(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

be reflected in the final science standards adopted for Minnesota schools.

Please consider this a vote in favor of including the words of the Santorum Amendment(as approved by Congress) into the Science Standards here in Minnesota.

I am writng to request that you and the Science standards committee incorporate the Santorum language in the science standards. I support both the idea that good science education prepares students to distinguish the data or testable theories of science from philosophical or religious claims made in the name of science and secondly, where bilogical evolution is taught, the curriculum should help students navigate the controversy and also assist the students in being informed participants in a public discussion regarding the subject.

A complete science curriculum must insure that students
examine various scientific theories on the basis of all
of the information that is available to them, and facilitate

reasoned dialogue about different scientific concepts. Intelligent design is one that needs to be discussed. Two more are Old Earth vs young earth creationism. Another is how Noah's flood and the sediments from it could be a cause of the various fossils scattered through the various layers of sediment in the fictional geologic column and not millions of years.

Kent Hovind of Pensacola, FL is a teacher and lecturer who currently speaks 700 times a year on the creation subject and who began Creation Science Evangelism in 1989. His web sight is www.drdino.com

We read about your meeting at Worthington High School and were very disappointed to read about the reactions of the faculty members there to the newly proposed standards. We are in the Windom School District and were not aware that your meeting in Worthington was taking place. I wish more parents had attended that meeting.

We support the newly proposed standards. They are just what the children in Minnesota need to raise the level of knowledge. Our kids can do it! Nothing mentioned in the newsapaper article was too challenging for Minnesota kids and teachers. PLEASE STICK TO THE DEVELOPMENT OF RIGOROUS STANDARDS IN ALL SUBJECT AREAS.

Also, please continue to include an open discussion of intelligent design in the science standards. The language of the Santorum amendment in Congress would bring much freedom into our public school science classrooms.

We are thankful that you are in Minnesota and that you have made needed changes in education in our state.

Please don't allow laws to be made mandating that only evolution be taught in school. Especially since the science books that are being used have been shown to be old and out dated in many areas not just Evolution.

We need a committee to check instead why the schools continue to use science books that are known to be incorrect. Our students are the best in the country and should not be taught things that are wrong.

How will my kids compete with other kids from say North Dakota if we continue to let the schools use incorrect material?

Please take to heart my concerns and let's raise the standards a little higher. If Evolution is taught then at the very very least it should be balanced out with Creationism.

It was encouraging to read about Senator Santorum's amendment to the Better Education for Teachers and Students Act, and in my opinion this language should be incorporated in the Minnesota standards, too. It's simply stated, and certainly addresses the concerns of a multitude of parents and educators.

The Santorum language approved by Congress should be incorporated into the standards. It merely states that students should be able to distinguish between theories of science and philosophical or religious claims. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned dialogue about different scientific concepts.

However, under Grade Level, 9-12, Strand IV. Life Science, Substrand, B. Organisms, Benchmark, the draft standards state “Students will be able to use scientific evidence, including the fossil record, homologous structures…. showing probable evolutionary relationships and common ancestry.” And under Grade 9-12, Strand IV. Life Science, Substrand, E. Biological Populations Change Over Time), the draft standard states, “The student will explain how evolution provides a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms.” These statements presume macroevolution, e.g. that man evolved from a common ancestor is the correct view. Recent scientific discoveries show the immense complexity of biological life and raise serious questions about the efficacy of biological evolution as the explanation. An intelligent design is pointed to by the scientific evidence. These statements need to be changed to recognize the differences of scientific opinion.

All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth’s history.

We are vehemently opposed to a curriculum that would teach one belief system as "fact" (evolution). The Theory of Evolution is just that - a theory - to mislead our children into believing that it is scientific truth is
unacceptable. Creation science should be presented along with evolution - let's not make learning politically correct just because a Creator is mentioned in the REAL truth of the matter.

I am the mother of a school-aged child. I would like to see the Santorum language included in the Science Standards. Evolution is one theory and it is not the only one to be considered, nor should it be treated as an undisputed fact if it is only a theory. I think our children should gain an understanding of why the subject of evolution is so controversial and be given the opportunity to openly discuss it along with creationism. Thank you for your consideration.

It appears the Evolution theory being taught in MN classrooms needs re-thinking. Senator Santorum has legislation which needs to be considered in the makeup of MN educators.
I really appreciate what you and Governor Pawlenty have been trying to do in education in Minnesota!
Thank you very much.

I have had the opportunity to attend lectures on the subject of darwinien evolution and intelligent design.
As my children reach high school age, I will teach them
intelligent design as the origin of life on earth. I also feel that evidence supports the young earth theory, the Earth was formed in a short period of time due to a series of catastrophies, not small changes over billions of years.
I feel that the origins material presented in school should include all possibilities, not just a loopsided, one theory approach.

I am a concerned parent requesting that the State of Minnesota adopt a science standard that includes the Santorum amendment. All scientists are NOT in agreement that the evidence supports the theory of biological evolution therefore we should not teach it as our earth's history.
Thank you.

We appreciate the opportunity for public input on this vital subject.

We strongly urge language of the Santorum Amendment(supported 91-8 by U.S.Senate) to the federal Better Education For Students and Teachers Act be incorporated into the science standards.

A complete science curriculum must guarentee that students have all researched information available. When biological evolutioin is taught they must understand that many true scientists have evidence that causes them to not agree that biological evolution has the answers to earth's beginnings.

Dr. Jed Macosko has his B.S. from MIT and doctorate from UC Berkley. He has done two years postdoctorate study at Berkley on DNA copying protein machines in the department of molecular and cell biology.

On 11/13/03 Dr. Macosko will speak in Minnetonka, showing how cells once thought to be blobs of jelly, are actually complex cities teeming with molecular machines. This reveals

orderly, intelligent design.

It flies in the face of true science to censor this kind of currently researched information from the curriculum of today's students!

We would like to see the Santorum language used in the science standards for schools in Minnesota. Our children need to be taught that theories are just that and to use the best information available to learn what is science and what is a theory being forced on them out of political correctness. Thank you for considering our point of view.

It is not reasonable or fair that you and your commission only include one Theory to explain how some think man "evolved", thus not giving our children all the facts. I believe that a very large percentage of scientists who have truly researched the subject do NOT agree with the THEORY OF EVOLUTION, and therefore our children should be advised that there is evidence that shows something different, as in the theory of Inteligent Design. I think our society would be better served if our children had ALL the facts, and not just those that a commission chose to put forward..

As Americans we are proud to have the right to teach our students to think, research and debate. True science allows for investigation into evolution as well as other theories of where we come from; there were at one time theories on gravity and shape of the earth which allowed for much discussion.

Please consider my comments and incorporate the Santorum language in the upcoming science standards.

Although I really have no problem with teaching about evolution I am always perplexed as to how it is presented as the factual explanation for why things/organisms exist the way they do. This is especially perplexing in light of the continuance of evidence from many of the scientific disciplines pointing to creative design elements. As a believer in a creator, I reject the claim that referring to a creator somehow mixes science and religion. It continues to be easier to find scientists who are willing to admit that many scientific questions make more sense from a creative design argument than from a natural argument.

With that in mind, why does the theory of macroevolution over 3.5 billion years (which is arguably still a relatively short time to arrive at life as we know it) continue to be pushed as the only possible explanation in public school science curriculae? It seems that students could only benefit from being presented with the major arguments, pointing out that well-respected individuals and evidence exist to support more than one way of thinking.

Although I believe strongly in creationism from a personal belief standpoint, talking about creationism does not have to walk hand-in-hand with a particular religious belief. Certainly it does infer that there would be a "God-figure," but I find it almost humorous how afraid of that concept people seem to be when spoken of in context of science. I am reminded of the driving force for many scientists in centuries past, i.e. because of their faith they desired to learn and understand the world more clearly.

I appreciate you reading my comments and taking them under consideration.

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(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

I would greatly appreciate your assistance to see that the principals of the above amendemnts are followed in our schools. I find that scientific discussions of evolution seldom are such. The actuall evidence, for and against, is not presented and our children are not educated in the true scientific method. As a laboratory supervisor I appreciate finding employees who can weight the evidence and come to a justifiable conclusion, rather than just jumping to conclusions based on insufficient evidence. We need to educate kids how to make desicions not just give them answers.

Please do not allow evolution to be taught as THE TRUTH! There are many of us that do not believe that it is the truth, therefore please let our kids be taught all the different theories, not just one.

I am all for true science being taught in public schools.
The evolution theory is a theory and the humanists want to teach it as fact.
Why is there such an agenda to push this (Darwinian Evolution) theory when there is so much evidence that support intellegent design?
The irreducible complexities found within a single cell should be enough evidence to end the debate.
This impossible theory that enerything came from nothing is really an attack on creationism.
Evolutionary scientist are baffled with the fossils found in the Cambrian layer and they know it completly defys their theory.
Evolution is a dying theory taking it's last breath. It should certainly not be supported by our public tax dollars.
Even if evolution were true (which it's not), but if it were true what good does it do to teach kids they are animals with no purpose?
Please refer to the United States vital statistics and you will see how teen suicide, divorse, teen pregnacy, violent crimes, etc. all rose significantly when evolution teaching went into high gear. This is right around the same time that prayer was removed from public schools. What kind of world are we trying to create. Let's get back to true science.
Please include US Senator Rick Santorum's language in the science standards. This will assure a full, complete discussion of the issue and theory of evolution in classrooms.
Thank you.

I am emailing you to encourage all that we must present our children with a balanced picture regarding evolution vs creationism. They must be taught the scientific basis and weaknesses. There is not a universally-accepted theory by scientists for the creation of our world and,as such, it is our duty as educators and parents to ensure that our children are truly informed and educated.

Dear Sir,
I encourage you to support the Santorum Amendment in our state education system. Please help our students to understand that true learning happens when all the information is gathered and biases are left out of the picture.
The theory of evolution is a theory... please help our students to understand this. I understand creationism to be a theory as well. Both need to be taught so students can make their own decisions.

On June 13, 2001 U.S. Senator Rick Santorum introduced an amendment to the federal Better Education For Students and Teachers Act, which was supported 91-8 by the entire Senate and eventually passed by Congress and signed into law by President Bush. It says:

"(1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science;

(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject."

I am writing because I believe the Santorum language approved by Congress should be incorporated into the standards. (See above.) It merely states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned dialogue about different scientific concepts. As Senator Robert Byrd (D-West Virginia), a proponent of the Santorum language, pointed out, "If students cannot learn to debate

different viewpoints and to explore a range of theories in the classroom, what hope have we for civil discourse beyond the schoolhouse doors? … If education is truly a vehicle to broaden horizons and enhance thinking, varying viewpoints should be welcome as part of the school experience."

However, under Grade Level, 9-12, Strand IV. Life Science, Substrand, B. Organisms, Benchmark, the draft standards state "Students will be able to use scientific evidence, including the fossil record, homologous structures…. showing probable evolutionary relationships and common ancestry." And under Grade 9-12, Strand IV. Life Science, Substrand, E. Biological Populations Change Over Time), the draft standard states, "The student will explain how evolution provides a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms." These statements presume macroevolution, e.g. that man evolved from a common ancestor is the correct view. Recent scientific discoveries show the immense complexity of biological life and raise serious questions about the efficacy of biological evolution as the explanation. An intelligent design is pointed to by the scientific evidence. These statements need to be changed to recognize the differences of scientific opinion.

All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth's history. (See Science Working Draft treatment of evolution at Grades 7, 8, 9-12, IV. Life Science, E. Biological Populations Change Over Time. And Grades 9 –12, IV. Life Science, B. Organisms, Benchmarks.)

Over the past decade or more I have grown increasingly concerned that our public schools may be conveying theory as fact where evolution is concerned. There does not seem to be any balance with competing theories, the main one being intelligent design. You are in a position to influence the standards that Minnesota public schools will use concerning curriculum. Such influence is sorely needed. When I served on a citizen curriculum review committee a majority of the citizens on that committee favored a balanced presentation of the two competing theories of origins. We were appalled when we discovered that our view was not even allowed in the committee's written report to the school board. We were forced to publish a report detailing our problems with the existing curriculum and distribute it to the board ourselves. Please take action to bring science back into the science classroom by setting standards that allow competing models to be studied and the strengths and weaknesses of each to be discussed openly.

It's absolutely critical students understand and are presented with the facts regarding evolution.
A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned dialogue about different scientific concepts.

The Santorum language approved by Congress should be incorporated into the science standards.

A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned dialogue about different scientific concepts.

All scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth's history.

I strongly urge you to make the education process thorough and complete with the teaching of evolution. The Santorum Amendment says, good science education should prepare student to distinguish the data. Please make sure the Santorum language is incorporated into the standards. Thank You.

As a parent of seven school-aged children, I am very concerned about the proposed science standards. Please adopt the Santorum language to these standards. It would be the only fair and sensible thing to do based on the fact that even the scientific community does not agree on this issue. My son's biology teacher had the freedom this year to state that very thing and I want it to stay that way.
Thank you for your time and attention to this matter.

ON OCTOBER 23RD, DR. PHILLIP JOHNSON, RETIRED BERKLEY LAW PROFESSOR, WILL BE SPEAKING AT THE SW MARRIOT ON THE PERTINENT AND TIMELY TOPIC OF CREATION VS. EVOLUTION. I WOULD INVITE YOUR ATTENDENCE.

I FEEL STRONGLY THAT THE TEACHING OF EVOLUTION AS FACT, IN OUR SCHOOLS OVER THE LAST DECADES HAS BROUGHT ON GREAT CONFUSION, AT BEST, AND DAMAGE TO OURSELVES AND OUR UNDERSTANDING OF THE WORLD AROUND US.

THIS THEORY, SERVED UP AS FACT FOR FAR TOO LONG, IS NOT EVEN A SOUND THEORY, AND RIDDLED WITH ERROR, AND WISHFUL THINKING BY ITS PROPONENTS.

I ASK THAT YOU LEVEL THE PLAYING FIELD.

The Santorum language approved by Congress should be incorporated into the standards. It merely states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum must, at the very least, include a discussion of the controversy surrounding the theory, and its weaknesses, as well as more global impact of such a theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

Having made you aware of my dissapointment that only the THEORY of Evolution was incorporated in the original draft of the Science Standards, I must also give you and your commission my thanks for how you've compiled the Social Studies Standards. For making our Founding Documents, Patriotisnm and Citizenship important, I thank you. For how our American History and the market Economy were included and given a place of importanc, I thank you. For raising the bar on expectations for my 5th child (who is still attenting District 196) to press on and achieve to the BEST of his ability, I also thank you. I would however, like to put in my vote for less 'environmentalism" and more good old Geography. Our children need to know more about where every other country is located, and that they are important in the grand scheme of things. Maybe then our children will grow up to be less snobbish and self important, and more understanding and compassionate. Speaking as someone who has lived a good portion of her life in a foreign country, it is important for American children to know that they are a PART of the whole, not THE whole.
Thank you for giving time to these concerns.

The Santorum language approved by Congress should be incorporated into the science standards.

Since it is only a theory, and since significant opinion exists about a competing theory of intelligent design, evolution should not be the only theory taught in schools.

Both theories, and perhaps any others that are scientifically significant (I'm unaware of any), should be taught simultaneously. It might also be good to teach what is being done or would be required to further validate either theory.

I strongly support teaching Evolution, not ID, because our children deserve to learn reality, not fiction, in their Science classrooms.

It is imperatiave that our students, the future of this great nation, study evolution only as a theory, not a fact, as this is precisely what it is: a theory. To treat it any other way would be a lie and also not give our students the opportunity to do some intuitive thinking.

Please support the inclusion of the Santorum language in the science standards. It is so imperative that our children and our children's children have ALL of the information put before them. Our country is one of open-mindedness and not closed-mindedness (brainwashing?). Please let me know how you stand on this.

Regarding proposed standards for teaching science, I recommend that the Santorum language approved by Congress should be incorporated into the standards. Such language states that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

Additionally, a complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate

reasoned dialogue about different scientific concepts. As Senator Robert Byrd (D-West Virginia), a proponent of the Santorum language, pointed out, “If students cannot learn to debate different viewpoints and to explore a range of theories in the classroom, what hope have we for civil discourse beyond the schoolhouse doors? … If education is truly a vehicle to broaden horizons and enhance thinking, varying viewpoints should be welcome as part of the school experience.”

I urge you to consider incorporating in some fashion, the language in the Santorum amendment in Congress regarding biological evolution. Senator Santorum's proposal ensures that the theory of evolution will be presented with some academic integrity highlighting the legitimate controveries surrounding it. Thank you for your hard work and consideration.

I urge you to use the Santorum Amendment standards when/if requiring that evolution be included in high school science standards and curricula. It is important that students recognize that evolution, while popular, remains an unproven theory. Students should be able to differentiate between a philosophical viewpoint and scientific theory. In addition to evolution theory, there are many other theories that are currently taught as fact, and should be balance with opposing theories (a good example is global warming, which was global cooling when I went to school). Since these are theories, and evolution theory has such marked philosophical implications, it is imperative that students are given a balance view of the existing theories so that they may understand and participate in public discussions of these theories.
Thank you.

Please include the Sanitorium langauage in our Minnesota science standards. This will prepare our students to understand both sides of the issues. Thank you for your attention to this issue!

It is my desire to express to you that it would be wise to consider using the language of the Santorum amendment, approved by Congress, when deciding science standards. The classroom should be a place where honest debate can take place regarding ideas such as the theory of evolution and the difficulties with that theory. In truth, the theory is on very shaky ground, yet that is a reality that is hardly discussed and is often dismissed due to the philosophical underpinnings of the debate in general. Students should understand that a theory is not fact, and that evolutionary theory is not testable. Students should learn that natural selection does not create information but only selects from material already present. Students should learn that mutations do things like put legs where antannae should go and virtually never provide for any advantage. The theory of evolution cannot account for the information creation required for organisms to evolve. Furthermore, such advancement contradicts the second law of thermodynamics. The fossil record is no help either as it shows that species suddenly appear time and again with no transitional forms. Please do students a favor and make healthy debate a part of the science curriculum. Thank you for your consideration.

I wish to voice my request that your committee include Senator Santorum's language in your final wording that establishes curriculum standards for the teaching of science in the State of Minnesota. It clearly states the need to allow our students to explore different theories or explanations for life on this planet, open discussion of the scientific evidence for each, and to come to an informed point of view. If we do not train students to examine the cons as well as the pros for positions taken, we will hardly produce a generation of young adults who can think for themselves, examine evidence, process information and make sound choices and recommendations; in other words, responsible citizens with something positive to offer.

Thank you for standing for what is right for the education of students. No one should be afraid of examining different points of view in order to arrive at an informed conclusion.

Please, please include the Santorum language when you are establishing the criteria for science subject matter. Students should be made aware that evolution is ONLY a theory and there are other options that people firmly believe in. Just as so much American history has been "edited" to be politically correct, I would be discouraged to see my grandchildren not receiving the entire truth about how others believe our earth and everything on it came to be. Give children the CHOICE to accept what they believe to be TRUTH.

As a concerned citizen, I want to express a concern that students be exposed to the creationism and not just evolution in the classroom.

I am very concerned that students today are being taught evolution,not as a theory, but as fact. We need to be teaching true science, where students are given the evidence and from that, debate and explore the various theories. The Santorum language needs to be incorporated into the standards so that schools will have the freedom to teach the varying viewpoints and let the students be free to have dialogue over the controversies presented. Our students need to learn to think critically, to orally defend what they see as truth, and to look at more than their own views. They can do this only as they are presented with more than one theory. We must not allow the censorship of ideas that do not support evolution. We must be more open to all the evidence, all the theories.
Thank you for considering my comments.

I am asking that you please include the Santorum language into the science curriculum standards. We need to allow students to know and understand the differing opinions and be

able to reason on their own. Why are we trying to tie up the minds of our future leaders? They need to be able to process different thoughts and make conclusions not be fed just one narrow field of thought.

My family and I strongly encourage you to support the Santorum Ammendment. There is an ever-increasing amount of evidence against evolution, so why teach that it is the probable origin of humanity? School is not a system to send our kids through just to "program" them into certain knowledge and beliefs. We need to teach them to take in all the information given, and from there make the best decision. Please support this ammendment that helps our kids, soon the people who run our country, to think for themselves, to learn to discern.

When evolution is taught curriculum should include discussion of the controversy surrounding the theory. We should not just teach one theory - evolution. We should not cencor evidence that does not support evolution.

Please note my concern that students receive a broad based understanding of the origins of our world and not be taugth that biological evolution is a proven fact rather than one theory. To that end I would like to see the Santorum language incorporated into the science standards.

Intelligent design needs to be taught also wherever there is evolution material.

I feel that as Minnesota is looked at highly for their standards of education, it would be a grave mistake to push to emphasize further biological evolutionism in our schools. When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. And all scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth's history. A complete science curriculum must insure that students examine various scientific theories on the basis of all of the information that is available to them, and facilitate reasoned dialogue about different scientific concepts. As a concerned parent of four children, I hope that you take this letter of interest seriously.

I am writing to urge you to positively consider the science standards adopted by the U.S. Congress and signed into law, as initiated by Senator Santorum. The language of the Santorum standards encourages a complete science curriculum that exposes students to all the various theories, based on information available. Each theory, since it is indeed THEORY, merits review of its strong and weak points. True education educates students to adopt critical thinking skills, viewing the evidence that validates or invalidates a premise. No one theory should be taught as the premier scientific theory for earth's history, when even the scientists themselves cannot agree on the evidence supporting evolution. In fact, it is more and more coming in to question.
This is not a request to do away with the teaching of evolution in order to soley teach creation. It is a request to teach ALL the theories along with their proofs and points of question.

Please consider the Santorum language in the adoption of the science standards for Minnesota schools. If the US Congress, representing the people, agrees why shouldn't Minnesota?

Dear Commissioner Yecke: I just wanted to write a quick note and encourage you as you prepare the science standards for our students. As the father of 5 children I appreciate the hard work that you do and as you work on these standards I hope you will include the Santorum language in the final standards. Our children deserve the very best and this language is very important for the final outcome. Thank you for your support.

When some scientists present Darwinian evolution dogmatically, as the mechanism whereby all life has arisen, they do a disservice to science. In other areas of study considered to be science, ideas and theories are allowed which are not always testable or falsifiable.

For a better understanding of this and an appreciation for Intelligent Design as a valid hypothesis, I encourage you to attend the Intelligent design conference to be held at the U. of Minn. (125/175 Willey Hall), West bank, on Saturday, Nov. 15 from 7:30 AM to 9:45 PM. This is sponsored by the MacLaurin Institute. There will be highly regarded scientists in attendence who will present the case for Intelligent design.

Thank-you for all you are doing. I wanted to add my comments about the Science Standards. I realize many things I was taught as truth in my science education was not factual. Many of the evolution theories were disproven one hundred years ago and are still taught as fact. This is a great diservice to our kids and does not give them the chance to make informed choices about what are facts and what are beliefs. Please help our kids by leading the charge in teaching our kids the truth about the information.

Please incorporate the Santorum language in the science standards.

The proposed science standards concern me. As you know, for something to be true science it must be observable, recordable, and repeatable. The origins of the universe and life fit none of these criteria. They come under the philosophical discipline of cosmology. In 2001 Congress passed the Better Education for Students and Teachers Act. It states in part: "...good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science." It further states. "...where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject." I would like to see this exact wording included in our state standards. It would open the door for the discussion of the theory of intelligent design and help ensure that academic freedom exists for both teachers and students.

I am a homeschool parent and have recently enrolled my children into public school part time. The reason for part time is that I do not feel I can trust the Minnesota public schools entirely with the minds of my formative aged children. The subjects of science, social studies, health, and even some english courses have me concerned. I have over the years had 8 children to put through an education. My oldest now 33years and a public school attendee. So I am very aware of the curriculum. The public school system continues to dub down our children's education. I see an ever increasing desire in textbooks to rewrite history so that it is no longer complete or accurate. I see evolution being taught as though it were fact. I myself took all the higher levels of science in public institutions and was taught at that time that evolution was truly a theory and only one of several. I was given the opportunity to make a well educated, unbiased decision as to what I chose to believe. Today that free thinking has been blocked for our students because the public schools have decided to narrow the options through curriculum that narrows the facts. I have never believed that I should force or impose my beliefs on others but I also believe that the government - public schools should not impose the beliefs of it's choice on my children or any other children. If evolution is in fact the correct choice than it should be able to stand on it's own. It should be able to stand even when matched against other theories. I find it interesting that the textbooks target the Biblical explaination to be deleted from it's books. I think if you would do more research on the subject, which I have, you would yourself have greater question to the validity of evolution and more understanding as to my concern. More and more scientific data has uncovered these past 30 years to support creation as a more valid theory.

Please include in the science standards the Santorum language passed by Congress. Simply stated "good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science;" and "where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject." This language will insure that science remains science and full and fair debate on the issue occurs.
Thanks for your consideration.

I am not a "young earth creationist", but I do believe that God created the universe and our planet with its sophisticated ecosystem and life-forms;
and I deeply believe that the so-called "natural selection" part of Darwin's
theory is totally absurd ("culling" weeds out bad, but does not create good). My training as a mechanical engineer and 20 years as a machine designer tells
me that sophisticated systems do no arise by themselves, and no one has ever witnessed this happening, nor
does fossil evidence imply this. Species may change over time (crocodiles have shrunk over 500 million years, people in sunny climes draw more melanin from the
existing DNA code and get darker skin through a link between mother and fetus),
but no one has yet proven that one species can evolve into another species (e.g. homo erectus to homo sapiens).
These are some of the reasons why I support the Santorum Language to be added to the MN science standards.
This will allow a balanced viewpoint to be taught to our children, rather than presenting highly unproven and
controversial theories as "fact".

Please incorporate the Santorum language approved by Congress into the standards. I agree that students should be able to distinguish between theories of science and philosophical or religious claims. When biological evolution is taught, the curriculum must include a complete discussion of the controversy surrounding the theory, not just supporting information. Moreover, we should not be teaching just one theory – evolution -- at the expense of others. We must allow and teach students to examine the evidence that does not support evolution. True science cannot ignore some evidence and present only supporting evidence. We must not violate the ideal of academic freedom in the classroom.

The Santorum amendment, approved by Congress, will insure that a full, complete discussion of the issue and theory of evolution takes place in the classroom. This is of utmost importance. Students must learn and understand why the subject of evolution generates so much continuing controversy. Science education should prepare students to distinguish

the data or testable theories of science from philosophical or religious claims that are made in the name of science

In order for students to scientifically examine the different theories as to how the earth was created, more than ONE theory actually needs to be presented. This is just good science! I am counting on you to incorporate the Santorum language (which has already been APPROVED by Congress) into the science standards.

I am writing in regards to the Minnesota Science standards. In order for students to actually apply the scientific method and explore all theories, I'm asking you to please include the Santorum amendment within the standards.

I wish to strongly urge you to incorporate the Santorum language into the science standards. I think that language would greatly improve the standards. Thank you for your consideration.

Please incorporate the Santorum Amendment within the standards also. If children are taking tests that only ask about evolutionary theory then that is what teachers are going to teach so that the children will get the correct answer. It does not seem right that our children are only taught one theory as fact.

I wish to strongly urge you to incorporate the Santorum language into the science standards. I think that language would greatly improve the standards. Thank you for your consideration.

I am writing to express my concern that as MN develops it's science standards that it give careful consideration to the opportunity teach students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science. This would be should be true in all areas. In the past the theory of biological evolution has not been taught this way. Students today should understand the scientific study and research on both sides of the theories of the origin of life. Thank you for your consideration of this matter.

In the final science standards, please include the Santorum amendment language that, "good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science," and "where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy and should prepare the students to be informed participants in public discussions regarding the subject."

The current tenth grade biology textbook at Eagan High School (ISD 196) contains 100 pages on the theory of biological evolution with one sentence pertaining to years ago when some people believed in "creation." Much scientific evidence points to intelligent design, yet students are currently taught only the theory of biological evolution. The door to discussion of "intelligent design" should be opened to ensure that academic freedom exists for both teachers and students.

Please include in the science standards the provision for academic freedom to allow evidence for intelligent design of the universe. This is provided for in the first ammendment of the United States constitution.

I am extremely concerned about the new science standards being proposed in relation to them requiring the theory of evolution be taught in Minnesota schools. I am strongly opposed to the standards as they are currently being proposed. If this theory is to be taught mandatorily, why not also require the theories of intelligent design and creationism?

When biological evolution is taught, the curriculum should include a discussion of the controversy surrounding the theory. Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others.

As a Christian, I don't like the idea of my children being forced to learn the theory of evolution when it is full of holes. All scientists do not agree with the theory of evolution.

The Santorum language approved by Congress should be incorporated into the standards. Again, I am strongly opposed to the standards as they are currently being proposed.

I am writing my response, from a Christian parent’s perspective, to the proposed state science standards. Though I personally do not believe in the theory of evolution, I remain sensitive to the fact that not all others agree with my belief in Creation. My concern is that if there is only one theory that is presented, then our children our not going to receive the

whole story. As Christian parents that have chosen to send our children to the public schools, we want to be able to come along side of their education. When it comes to matters such as evolution, this will not be possible. Instead, this will force us to "un-teach" the principles that are being taught in the classroom. Basically at that time, the school system will be "un-teaching" the fundamental teaching that our children will have learned from us. Please don't put us into the position of having to stand against the school system on the issue of evolution. This will only cause confusion and turmoil for our children at a very critical time in their development. Think of what this will do to unity between family and school! If the family is affected, society will be affected.

Also, if our children are only presented with one theory and tested on their understanding of one theory only, what is that really telling us about their critical thinking skills? It will merely tell us that they are able to assimilate and reiterate what they have learned. However, if our children are presented with varying views, and then tested on those views, they will show us that they are able to process multiple views and form a conclusion. It takes far more critical thinking skills to be able to sort through differing theories in an effort to reach a personal conclusion of their belief. Let our children choose the theory that they believe, it is not the job of the school system to make that choice for them!

Finally, there are many flaws in the theory of evolution. In presenting this theory, the school system is presenting a scientific theory that has not been proven. It should not be presented as "the answer" to our origin, but rather it should be presented as "one theory" of our origin. Creation should be fully presented as another theory of our origin. Please don't teach "half-truths" in our classrooms!

I understand you desire input as to our feelings regarding the standards for teaching evolution of man as opposed to creationism.

I strongly fell that there should be a balance and that both possibilities should be presented in the textbooks. Although it is true that neither has really been proven as a scientific fact, there is more evidence pointing to man being creatred by a higher being that there is to biological evolution. When we consider how intricate and uniguely man is made and so marvelously desiigned it causes me to believe that it simply could not happen through evolution.

Until there is absolute proof of either theory both must be fully explained in the textbooks and by the teachers. To do otherwise would be deceiving the students and denying them the right to learn the true facts and let them decidie for themselves which they wish to believe.

I think the support of the Santorum Amendment is crucial to the credibility of education in Minnesota. If the Theory of Evolution is the only explanation presented to our children then we are doing them a great disservice. As the title claims, it is only a theory, which should be presented in conjuntion with other explanations for the origins of our world, such as intelligent design. I also believe that when any theories are discussed, the controversy around those theories should also be addressed (there are MANY unexplained problems in the Theory of Evolution).
I find a large number of families leave the public school system, not because the academics are inferior, but because important issues are being taught in a very one-sided way, not only in science, but in history by having crucial facts about the origins of our country deleted. All these changes seem to come about because of a very small minority that has a very powerful voice. I hope that you will take the needs and the concerns of the majority of parents into consideration when you decide on the final standards for our children.

We would like to see the science curriculum include all theories of the earth's history, allowing students to look at all viewpoints and to discuss the controversies surrounding them. All scientists are not in agreement on the subject of biological evolution, and we would like our children to have the academic freedom to explore the evidence on all sides.

I am writing to you concerning the treatment of evolution in the proposed science standards.

My son is in the PSEO program and attending Hennepin Technical college. He is currently taking a Plant Biology class where he was taught that evolution is how life was created, although the theories of Intelligent Design and Creation by God according to Genesis were also mentioned. He was able to present an argument in favor of Creation, but the class consensus was that evolution was the correct answer.

Interestingly enough, later in that same textbook, he was told that life can never come from something not alive and that things don't go from simple to complex in the natural order of things--a complete contradiction to the evolutionary theory they just taught the class a few lessons prior.

I'm concerned that if the students are not given all theories to explore they cannot make intelligent decisions regarding this all-important issue. A lot of kids in school believe everything they read in a textbook as fact. If evolution is stated as "fact" and "the accepted scientific theory" (both false statements) then they will never have the opportunity to engage in thoughtful discussion on the subject.

As you are probably aware, all scientists are NOT in agreement that the evidence supports the theory of biological evolution. Thus, we should NOT teach evolution as the scientific theory for earth's history.

Students should be taught to become informed participants in the ongoing discussion regarding the subject. We should not be teaching just one theory – evolution -- at the expense of others. We must not allow the censorship of evidence that does not support evolution. Such an attitude is at odds with true science and violates the ideal of academic freedom in the classroom.

Recent scientific discoveries show the immense complexity of biological life and raise serious questions about the efficacy of biological evolution as the explanation. An intelligent design is pointed to by the scientific evidence. We need to recognize the differences of scientific opinion.

Please don't let our youth down. Support the Santorum language as approved by Congress being incorporated into the standards so we don't raise a generation incapable of "Intelligent Discussion" on this very important matter.

If evolution is to be taught to our youngsters, then equal time should also be given to the teaching of a more proven theory: Creation. It is not illegal to teach Creation in public schools, it never has been. If it IS wrong to teach religion in school, then teaching evolution is not to be taught as it is a belief, not a fact.

The benchmark on page 22 says that "students will be able to explain how new evidence can challenge the theory" of evolution. I would prefer if teachers presented evidence that challenges the theory of evolution. I cannot for see much of this challenging evidence being presented to students if we rely on the students to come forth with this as an addition to what the teacher presents. I just don't see it happening. But I could be wrong. Enlighten me if you think students will do this on any substantial scale. Santorum states "where controversy exists cirriculum should help students understand the full range of scientific views that exist." I like this in that the range of theories is to be presented by the teachers not left to the students with a wing and a prayer. (Not that I have anything against
prayer!)

Please make sure that evolution is revealed as it is theory. I am a christian and feel that the christian view needs to be expressed, it is over looked all to often in this so called informed society we live in. All views need to be expressed in truth and totality. Thank you for this consideration.

We have four children in the public school system. We are excited that the State is rewriting the education standards and getting rid of the Profile of Learning. However, we noted that the committee stripped the science standards of any mention of anything except the "theory of evolution." As parents we would like the standards to include the Santorum language which broadens and in our opinion strengths the value of our childrens education. Thank you for this consideration.

Please include the language from the Santorum Amendament in the new science standards. Evolution needs to be taught for what it is -- a theory. The science standards need to encourage science teachers to present other ideas concerning the formation of the earth and the life on it and the controversy surrounding the evolutionary theory. Science is ever changing as new discoveries are made. We need to teach science in that context.

Our students need to learn to debate different viewpoints and to explore a range of theories. The language of the standards needs to support the exploration of all theories as plausible. Recent scientific discoveries point to an intelligent design, not chance. All scientists are NOT in agrement tht the evidence supports the theory for earth's history.

I would like the wording for evolution to be changed back to could be and maybe due to the fact that evolution is still an unproven theory. I would also like creationism and other theorys added to the curriculum so we are not cheating our students with only one theory when many exist.

I am a community college science educator and am very happy to see that the scientific theory of evolution is included at several points in the standard. The standard must remain this way! Creationism, intelligent design or whatever the new flavor, are all attempts by the Christian right to impose their views of origins on our students. These views are not, however, scientifically based, no matter how hard they try to make them so. Teach the history of science, the methods of science, the major theories of science (gravitation, plate tectonics, evolution, atomic, etc...), but you MUST leave religious-based ideas out of the science standards. Evolution is a theory, but in science, a theory is backed by mountains of evidence, observation, and has predictive value. Comments which consider evolution "just a theory" show a lack of understanding about science, what it is and how it works. Religion, in all of its manifistations,is a vital part of being human. It just has no place in the science classroom! The commissioner of education should stop fueling this fire by her comments suggesting that local school boards should decide whether to allow the teaching of religious-based ideas into the science classroom. The commissioner must fight her

urges and foster the best possible SCIENCE EDUCATION for our students.

Using only the theory of evolution to teach about the origin of life is to teach our children to be ignorant. Darwin himself regected his theory long before he died saying that it was not good science and had far too many flaws, yet scientists today continue to cling to this theory and push it on unsuspecting naive individuals. If true scientific method is applied, all the evidence supports creation. The fossil record has long challenged evolutionists as it clearly disproves the theory, yet you want to teach our children that it proves the theory? This is a boldfaced lie! Teaching on the origin of life should not be mandated by the state, but left up to individual school districts where individuals can get personally involved. This is a clear attempt to teach religion in the schools, as evolution can be classified only as a religion. It does not have scientific evidence to uphold it, only a strongly vocal group of blind followers who try to cram it down people's throats as science. What a crock! Creation is far more scientific, but at least those of us who adhere to it have the decency to admit that it is a religious belief as well.

I commend the committee for drafting an academically rigorous set of standards. Please do not give in to pressure to add intelligent design or so-called creation science to these standards. The science curriculum should be limited to knowledge we acquire through empirical scientific method. What we learn, or think we learn, from divine revelation belongs elsewhere.

I have recently read an artical stating that Minnesota DOE wants to mandate the teaching as evalution as FACT. I do not feel that this is correct and it needs to be tought a theary. The theary of Creation also needs to be tought and each home can teach the children what that household can teach what they believe. I do not beleive that one beleive should be tought over another.

On pages 22 and 30 under Section IV item E I have the impression that evolution is the only answer to life's origin. I believe it is important for students to also know the weaknesses in the evolutionary THEORY. It also must be presented as a theory that has certain kinds of evidence.

I am very concerned about the MN Department of Education issuing the opinion that evolution is a fact. The very tools and tests used to prove evolution actually end up proving Biblical creation. I think our children would be better served if they were exposed to the different creation possibilites and were allowed to pursue these matters with their families. To teach one possiblity as fact is to actually teach entollerance to other possibilites or beliefs. We need to teach our children that many things are possible and that we should treat others with respect and acceptance to their differing opinions. There is no conclusive proof to say evolution is a fact!

I oppose using evolution for the standard method of explaining the origin of the universe. The fossel record does more to support Intelligent Design than evolution. I feel that this is not education but indoctrination of our children. Darwin himself, toward the end of his life, noted that science did not support his theory. That is just the point, evolution is an unproven THEORY. Science first does experiments and then develops a theory from the results. Evolution is the opposite, the theory was developed and people have been trying for 100 years to prove it, and failed. Using evolution to explain the origin of the universe is equal to saying 2+2=5.

I don't want the Big Bang theory and Evolution to be taught to my four children as FACT. These are theories and should be taught as theories. Creation as a theory should also be explored in our curriculum.

Substrand A, Benchmark 2: This is an important and misunderstood aspect of science. I trust that intelligent design is not what you have in mind. I.D. has virtually no support among scientists -- let alone any kind of consensus.

May comments concern keeping Creationism and Intelligent Design out of the standards. What are they afraid of???

We request that evolution be removed from all Minnesota State Science Standards and all standards' benchmarks. Thank you.

I am requesting that evolution be removed from all MN State Science Standards and all standards' benchmarks. Evolution is not objective, but a biased viewpoint. It is not based on facts and is not verifiable. It is not measureable because it is not based on facts. Therefore, this standard does not meet legislative criteria and therefore must be removed. I also believe that every school in the state of Minnesota should be granted the freedom to choose what to teach regarding the origin of life and how to teach it. Thank you.

I wish to comment on the proposed science standard that is to be put into the law. Evolution is to be taught as a fact not an idea or theory . This change will make it impossible for a teacher in the public sector to present the idea that God created the world in six days. This is the fact not evolution. Scientists can testify that this is true. Evolution can not be proved. It would force a christian student to be taught something they know to be false. They would be forced to pass this standard to graduate. This is wrong and I strongly object to this proposed mandate in the new science standards being proposed.

General Comment: To the Science Standards, do not add references to Creation Science, Creationism, Intelligent Design, or other cultural/religious postulates and beliefs. The only time they should be mentioned is as alternative cultural/religious views or opinions. They are not science and should not be taught as such. Evolution is not "just a theory". It can be demonstrated to be fact. The otherviews cited above cannot and should not be taught in a science course.

EVOLUTION STANDARD:While I can't seem to get a download to actually view specific language/wording... I am referring to the government wanting to mandate that evolution is taught as the only fact to explain the origin of all life. This is would be a lie and I strongly oppose it!!!

I am concerned that the new standards require that only evolution be taught. This is not the truth and should not be taught as such. I just found out today that this was going on. Why is the general public not aware of this change and why are we not given enough time to take action? I only know of 2 people that are aware of this change & they are the ones that contacted me. Something this important needs to be communicated to the larger public. This country was founded on Christian principals and as we are pulling away from these principals the morals of this country are going steadily downhill. Please leave it open for teachers to teach evolution as a theory, not fact, and able to present other theories to consider.

Darwin's "Therory" is nothing more than that. And it never should have been presented all these years as "Fact". Darwin himself refered to his OWN therory as the "Bablings of a young man" There is far more factual evidence that totally disprove his theory than anything that might even remotely support it. If it has to be taught at all in our schools it should only be a aprt of a total package of ALL different viewpoints. It has been a total misrepresentation to it's presentation as the FACT.

Standards on Evolution: I have reviewed the standards on evolution and believe them to be very reasonable and in accordance with overwhelming scientific evidence. I support the adoption of these standards.

I would prefer to see the teaching of the origin of life be excluded from all standards and benchmarks.

Re: evolution, pp 16-IV-C, 22-IV-E and 30-IV-E
The draft standard nmandates the teaching of evolution as fact rather than allowing it to be offered as a theory alongside others such as creationism.Establishing evolution as fact rather than theory violates the criteria established for MN academic standards, that they be "clear, concise, measureable, objective and grade-level appropriate." The evolution standard is not objective, but a biased viewpoint. It is not verifiable or measureable because it is not fact-based.Fossil record clearly disproves evolution. The fossil record shows that all life forms suddenly appeared and there was no transition of life forms as described by evolutionists. The same evolution standard mandates that the fossil record be used to teach evolution. This creates a significant inconsistency in the standard.I suggest that the teaching of the origin o9f life be excluded from the standards and benchmarks. Further, each school in the state should have the freedom to choose what to teach about the origin of life and how to teach it.

Retain the language used in various Earth/Space Science and Life Science sections (2/2/IV/E; 4/3/IV/D; 5/4/I/B; 7/5/IV/E; 11/6/IV/D-E; 20/8/III/A,D; 22/8/IV/E; 26/9-12/III/A; 27/9-12/III/D; 28/9-12/IV/B; 29/9-12/IV/C-D; 30/9-12/IV/E-F)re standards in geological history and origins, and in Evolution and other biological processes. Do not include any material on Creationism or Intelligent Design as science.

Grade Level 9-12
Strand I. History and Nature of Science
Sub-Strand: A. Scientific World View
Standard: The student will understand the nature of scientific ways of thinking and that scientific knowledge changes and accumulates over time, some scientific ideas are incomplete, and opportunity exists in these areas for new advances.
Benchmark: "Students will be able to explain how scientific innovations and new evidence can challenge accepted theories and models, including cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease, Big Bang theory."

COMMENT: In order to understand how new evidence can change scientific theories, students should take examples only from the HISTORY of science (such as the revolution in physics from Newton to Einstein), because only professional scientists in the relevant fields have the technical expertise necessary to challenge the scientific consensus on CURRENT theories.

Evolution is accepted by the scientific community. Its presentation should not allow to be "watered down" by inclusion of other explanations by local districts.

I do not agree with the 9-12 IV Life Science Section E - It infringes on what we know to be true: that our world and the people within it are inteligent beings created FOR A SPECIFIC PURPOSE. I quote the bible as being my source.

I would like this viewpoint included in the curriculum.

As late as of the l980's this viewpoint was taught in the schools.

Why have we changed history?

I believe the theory of evolution should not be mandatedand left just as it is, a theory.

while there are many theories such as the theory of gravity that have obvious supporting evidence, evolution has no such supporting evidence. The theory known as evolution requires six different stages:
1.Cosmic evolution- the origin of space, time, and matter
2.Chemical evolution- the origin of higher elements from hydrogen
3.Stellar and Planetary evolution- the origin of stars and planets
4.Organic evolution- the origin of life
5.Macro-evolution- the origin of major kinds
6. Micro-evolution- the variation within the kinds
The first five stages fall short of the scientific criteria: they are not observsble, testable,or demonstratable.
Unfortunately, many students are duped into believing evolution as a whole under the prepense that the evidence for micro-evolution, better called variation, confirms the entire theory although the first five stages exist solely in the IMAGINATION.
Note please that there is a three-fold test before something can be considered scientific- it must be observable, testable, and demonstratable.
Herein lies the problem- only number six is science; therefore first five evolutions are a religion. Some people chose to BELIEVE the theory of evolution, we choose to believe in God's creation. Why should we pay our tax dollars for you to inforse on our children the religion of evolution?! People shoud hve a right of choise of what to believe!

Related to sub-strand language: "Students will be able to identify significant adaptations that have allowed
life to evolve from single-celled aquatic organisms to multicellular
terrestrial organisms over a period of more than 3.5 billion years.
Students will be able to use scientific evidence, including the fossil record,
homologous structures, embryological development, or biochemical
similarities, to classify organisms showing probable evolutionary
relationships and common ancestry."
Evolution is a THEORY. This language seems to indicate it as fact. I would like see inclusion of other 'theories' as part of all children's scientific inquiry - such as creation! Our population of Christian students shouldn't be ignored for the sake of a theory.

The Minnesota Science Teachers' Association is right on in their recommendations. We parents are wholeheartedly behind them on this:
- Do not make evolution provision. It is as solid a theory as germ theory.
- Reduce the number of standards at the Middle School level. (You've got too many factoids in the standards altogether.)
- Put environmental science back in as a separate area.
Thank you.

Keep the evolution the way it is stated. Some of the benchmarks should be for advanced classes only. That means they can not be included in the test. There are too many benchmarks!!!!!!!!!!!!!!!!

I strongly believe that evolution should be taught as one of many theories about the creation of the planet and man. I read the news regularly and have not seen an announcement

that evolution of creation has been proved scientifically.

Regarding Science Standards(p.30-IV-E of Mn Academic Standards of Science. We feel that the teaching of the orgin of life be excluded from all standards and all benchmarks. A futher recommendation is that each school in the state of MN be granted the freedom to choose what to teach regarding the orgin of life and how to teach it.

We are very concerned about the fact that you are considering teaching Evolution as fact. I have no problem that it is taught as theory regardless of the fact that we don't believe this theory. I want my children to be presented with all of the theories and they can make an intellegent decision based on all of the information.

I would like to comment on the single-answer version of the question dealing with the diversity of species over time, as described in standards Gd 7 IV-E, Grade 8 IV-E, and Grades 9-12 IV-E. The standard describes evolution as providing A (single) scientific explanation for changes in life forms. In the grade 9-12 version it attempts to set up a timeline as 3.5 billion years, implying that the theory of evolution is sufficient to cover the entire question of the origin of life. I personally believe that evolution provides a reasonable explanation for the changes in species over time but it certainly is not the only defensible theory for the beginning of life. I believe that creationism is a far more likely reality for the initial explanation of life, while evolution, operating under the laws set in place by a divine creator, provides a reasonable explanation for on-going changes. I find the standards to be lacking in the presentation of creationism as another viable explanation for the origins of life and believe that it is short-sighted, and inaccurate, to leave out half the picture.

Evolution and creation should be taught as theories for grades 7-12

I am shocked (but not surprised) that the State would consider teaching as FACT the THEORY of evolution. Children should not be taught that this flawed theory is the only explanation of LIFE. One day every knee will bow and tongue will confess the true explanation for life, Creation by a LOVING GOD! This only helps to affirm our decision to send our children to private school. Shame on you!

This is in reguards to adopting evolution as the excepted means as to how life began.
How dare you tell parents what they are to believe and force us to teach your beliefs to our impressionable children. How many parochial schools are out there? I do not know the exact number, but I do know that Catholic and Lutheran Schools alike do not teach or believe that evolution is the basis for our creation and existance. You are stepping into religous ground here. You have no right to tell my children what to believe. Schools are a place for teaching the three R's. You are not there to teach my children that they evolved from monkeys. I have no problem with schools teaching or having the choice to teach possible theory's. However, you have no right to teach my children that this is what everyone believes to be true, especially when it comes to Science. Evolution is not a proven fact. There is no positive reforcement or documented proof as to it's credibility. I thought that all standards adopted need to be based on fact. Where is the fact in evolution? This is apalling. Do not force parents into home school. There are more pressing items to consider. For instance, why are state standard test scores so low in public schools vs. the private schools? Force our children to believe in fairy tales when they can't do simple factual math problems or read them for that matter. Where is the sense????
Wake up people.

I attended the debate at the Forest Lake High School last night. I have read enough to know that all of our children deserve to be taught truth. Although theory challenges a mind to think outside the box, when only one theory is taught, such as evolution, they have nothing to compare that theory with. They need to be taught creation also. They need to be able to decide for themselves which is right for them. The schools cannot teach one without the other. If creation cannot be taught, neither can evolution. If there is going to be standard of my children knowing evolution. That is one standard I will gladly see them take a failing grade on because ultimately the only truth there is, is God. Evolution will not get them into eternity, our Lord and Savior will. The more God is removed from our society, the more evil will take over. There will come a day that our kids may not even be able to walk into a school when they are not taught "Thou shall not murder".

Teaching Evolution as Fact:
I cannot believe that the state of Minnesota would even consider mandating this teaching. First of all, it is only a theory, and cannot be proven. Therefore, it does not meet legislative criteria. Each school must be granted the freedom to choose what to teach regarding the origin of life and how to teach it.

I write in opposition to the proposed new science standard mandating that evolution be taught as scientific fact. That Minnesota teachers should be forced by law to deny their own conscience and teach as factual that which cannot be proved or varified is outrageous and apalling. This new standard will be enacted to the outrage of tens of thousands of Minnesotans who know the difference between fact and fiction.

Dear Commissioner Yecke:

I am very concerned about the integrity of the Draft Academic Standards for Science, specifically their treatment of the topic of evolution. I sincerely hope that the final standards will reflect what truly is science, not a warped interpretation influenced by nonscientific preconceptions.
I am a recently-retired professor of geology, having taught at the University of Minnesota for 42 years. Most of my research over these years has been on the geology and geologic history of northeastern Minnesota, including radiometric age determination. I have long been interested also in biology, including one of its interfaces with geology (paleontology and evolution).
In several areas in the United States (though rarely abroad), such topics as organic evolution and the age and history of the Earth have been singled out from other scientific fields as suspect and open to alternative interpretations. It is clear that these approaches to these topics, commonly referred to as creationism and "intelligent design", are inspired by religious traditions going back many centuries. These ways of looking at these aspects of the natural world attempt to deny the applicability of the scientific method, and thus have no place in our science education system. It is not a matter of "fairness" or open-mindedness for equal time, etc. - these "alternatives" simply do not represent science.
The September 4, 2003 Working Draft of Minnesota's Science Standards, which I have examined, do preent in general a laudable set of standards for teaching science to Minnesota's youth. The Committee that developed this draft is to be commended, and I hope that the finalized Standards will retain the thrust and language of this Draft, with a few exceptions to be noted in Specific comments below.
One suggestion: more attention and instruction should be alloted to geologic time and radiometric dating.

We believe that you have developed a quality set of standards that examine the topics of Evolution by Natural Selection. The benchmarks involving evolution are written appropriately, as science. Specifically, the 9-12 Life Science Standard IV: Sub Strand B, C, D and E accurately articulate the unifying role evolution plays in cell biology, genetics, ecology and the history of life on this planet. The standards placed in these sub-strands are consistent with those found in both the National Standards and the Advanced Placement Biology Curriculum. We implore you to maintain the integrity of these standards, as they do accurately represent the current scientific paradigm for life on earth and the process of doing science.

Page 16, Grade Level 7, Strand IV Life Science, Sub-Strand Biological Populations Change Over Time,Students will know that fossils document the appearance of many life forms.

Students will give examples how fossils record the diversification of many life forms.

The underlined words are too active in tense, and imply evolution on a grader scale than can be shown. I suggest replacing appearance with presence and diversification with diversity.

I have serious concerns about evolution-only science curriculum! The majority of people in this country are Christian (see the census data!) and believe in creation. We MUST include creation in the curriculum of our children!

Pertaining to 7th grade (IV.) Life Science Standard. The fossil record shows that all life forms suddenly appeared and there was no transition of life forms as advocated by evolutionists.

Referring to 8th grade Life Science standard. The fossil record clearly disproves evolution and supports Biblical creation. The fossil record shows that all life forms suddenly appeared and there was no transition of life forms as advocated by evolutionists.

Referring to grades 9-12 IV. Life Science standard
The fossil record shows that all life forms suddenly appeared and there was no transition of life forms as advocated by evolutionists. Hence, the fossil record has long troubled evolutionists. This state standard mandating that the fossil record be used to teach evolution to all students is a lie.

I am a concerned parent who represents many when I say that we don't agree that evolution ALONE should be taught to our childern. According to the standards, it appears that evolution will be taught as fact, rather than the theory. Evolution is one theory, creation is another. If we truly live in a free society , all theories need to be presented to our children. There would be a huge public outcry if public schools decided to teach only the theory of creation. If enough parents were informed that evolution may be the only theory presented to their children, they too would be voicing their strong opinion. I was fortunate enough to have this brought to my attention. This proposed mandate also deserves considerable discussion and thought, as the many teachers who do not agree that evolution is the true way that we all came to be will be forced to present a one-sided theory. I urge you to strongly consider rewriting the grade 9-12 Life Science standard to include the teaching of creation as another theory. Just as it is not justified to simply present all children with the theory of creation, it is not justifiable that all of our children only be taught the theory of evolution.

The state should not put in the standards that evolution is the source of life.
Please remove evolution from the standards.
Thanks

I am totally opposed to the government mandating that evolution be taught as the only fact to explain the origin of all life!!!! I do not get on many "bandwagons" but this really goes against my beliefs and my entire being. I am now teaching for my 32nd year in a parochial school. If this were to pass, I feel it would be very harmful to our school. PLEASE, do not let this pass to the legislature! Thank you.

Do not support exclusion of creationism interpretation

I believe that students deserve to be taught science based on facts. They also deserve to be taught both evolution and creationism factually, so they can decide for themselves what they believe.

Evolution:
Many people question evolution on religious grounds and claim that it is "bad science" because biologists to not agree on the mechanism of evolution. The analogy would be for someone to hear 2 people arguing about whether an office in the Empire State building is on the 51st and 52nd floor and for the observer to conclude that since the debaters cannot agree that the office does not exist. There is more empirical evidence for evolution than there is for gravity and relativity yet these are not argued so vehemently!! Nobody says that gravity is "JUST A THEORY" Why??? Not because gravity is bad science but because gravity does not conflict with their religious ideals. That issue should not even be considered!!! No person's religious beliefs should not hold science hostage. Will we also teach in science that some northwest American Indians believe that man can from women's snot? That the Vikings believe in the world tree Ygdrassil? These are topics for a course in Comparative Religion, not the Science class!!! If you try to teach creation as science, you must teach all creation myths as science and in the end you will not have time for science!!!! In the end, it will come down to the law. If a single public school in Minnesota tries to teach creationism as science, I can guarantee that the lawyers will step in.

Evolution can not give to teacher freadonw to teach as the only theory and the only through. We Cristians, belive in Gods criation, and we are payng taxes to send our kids to learn, and the evution can be teach as theory not the only thruogh.

Standard: IV. Life Science E. Biological Populations Change Over Time

Evolution should be presented as one scientific theory rather than the single scientific explanation. The fossil record does not show how one species changed into another. It should also be made clear to the students that science is useful but not necessarlly the truth.

Science once told us that the sun moved around the earth. This was useful but not true.

We have no evidence that species change over time. And to say that it took 3.5 billion years is also just a guess. It is important to teach the technique used to determine this theory and present possible problems with the technique. We don't have anything that we know is 1 million years old to test our techniques on. And many of our techniques fail if the item being testing has been under water for a period of time.

Science needs to be honest about what it doesn't know. And distinguish between theory and fact. Facts are what we can observe and demonstrate with experiments and theory is our best guess to predict or understand things we cannot.

Perhaps an additional standard should be added so students will know how science has changed over time and it is not absolute.

Regarding the state standards for grades 7-12 on the topic of evolution: You should remove evolution from the standards. The evolution standard is not objective, but a biased viewpoint. It is not based upon fact and is not verifiable. It is not measurable because it is not based upon facts. Having evolution as a standard does not meet legislative criteria and must be removed!!
I suggest that the teaching of the origin of life be excluded from all standards and all benchmarks. I further recommend that each school in the state of Minnesota be granted the

freedom to choose what to teach regarding the origin of life and how to teach it.

My concerns are in the area of the theory of evolution, the absence of creation science, and the age of the earth. These areas do not seem to be addressed fully or accurately. Evolution needs to be taught with a clear distinction made between microevolution and macroevolution. Microevolution means change within a species. This is noncontroversial and there is scientific proof. This is very different then macroevolution which teaches that all species evolved from a single cell millions or billions of years ago. Macroevolution is an atheistic, philosopical theory that is not science by definition, there is no proof, and this theory goes against other proven scientific laws such as the second law of thermodynamics and the law of entropy, the law of biogenesis, and the law of probabilitity. Indeed, the lies, deceptions, and fraud involved in tinkering with fossils to perpetuate this myth should be taught. So should the scientific evidence to indicate that macroevolution never happened: the fossil record, and the study of cells and genetics.

The problem of dating methods also needs to be taught. If many living things known to be decades old are dated as billions of years old,it is obvious that things are dated billions of years off. Students need to be taught the many scientific facts that indicate the earth is around 6000 years old and that much longer is impossible such as the documented earth's magnetic field, the inside of the earth's documented net heat loss, the sun's documented shrinking,and the accumulation of dust on the moon discovered by NASA at the time of the moon landing. There are several other evidences for a young earth such as the documented history until recently dating the earth around 6000 years and the study of the earth's population and its growth rate.

Public schools and science class need to teach facts and not ignore facts and alternative theories in favor of some pet theory.

I want to voice my opinion that the standards under consideration include a particular requirement that is unacceptable.

EVOLUTION IS NOT A FACT. It is merely one theory (and a poor one I might add) that attempts to explain the creation of life. Therefore, it is completely INAPPROPRIATE for the state of Minnesota to mandate that EVOLUTION be taught as factual information.

It would only be appropriate to teach evolution ALONG WITH other theories of the creation of life, but only as one of several theories, not excluding the "theory" described in Biblical documentation (which, by the way, has been proven to be completely accurate in all other subjects that it describes).

You also cannot teach EVOLUTION as a fact simply because scientists themselves have proven that this theory has major flaws and therefore cannot even be considered a viable explanation.

In other words, wake up and educate yourselves on what it theory and what is fact before you begin mandating that false information be taught as fact to our state's children.

With respect to benchmark item 2, it should be made clear that "innovations and evidence" must themselves have scientific credibility; that is, challenges to the theories listed are not acceptable based on "creationist" faith. A science curriculum has no room for any off-the-street beliefs.

The standard that mandates that evolution be taught as fact to explain the origin of life should be changed. Evolution is a theory only, not based on facts, and is not objective. The law passed by the legislature mandates that the standards must be clear, concise, objective and measurable. The theory of evolution does not meet this mandate and this standard should be removed. The origin of life should be excluded from all standards allowing each school to choose how to teach about the origin of life.

Asking students to accept such theories as Big Bang and evolution as the source of the world and life is a significantly greater "leap of faith" than Creationism. Science has yet to prove (and duplicate) anything akin to the "random acts" required to create life. Evolution is nothing more than a belief and should be taught as such. To discount the beliefs of millions of people exhibits a level of hubris that should not exist in PUBLIC education.

E. Biological...
Remove the concept of evolution from the standards. IF evolution is included, creationism should also be included.

Remove evolution from the standards. Including this as a requirment will leave many families with no option but to home school their children or send their children to a private high school.

Current law (Chapter 129) Chapter 3, subdivision 2(5) mandates criteria for Minnesota academic standards “The standards must be clear, concise, objective, measurable and grade-level appropriate.”

Evolution is not measurable. It most certainly is not objective and it is definitely not based on fact (i.e. it cannot be proven to be true or false). That said, none of the other theories of the origin of life (creationism, intelligent design) are measurable or objective or based on fact either. Given that NONE of these theories can be proven fact, ALL of them should be presented equally -- allowing the students to formulate their own decisions about which theory to believe. Give them the tools to make their own decision about the origin of life.

The standard and all benchmarks requiring the teaching of evolution as fact need to be removed!! Each school in the state of Minnesota should be granted the freedom to choose what to teach regarding the origin of life and how to teach it.

I have a university major in biology and minor in chemistry and respect opinion but know facts should be taught as truth. Students should understand the truth that lifeforms can marvelously adapt but cannot change their inherited genetic code. Fossils do document that other life forms existed in the past and extinction occurs. Science proves intelligent design. Please teach truth and stick to the facts, present all theories and let the students create a few new ideas of their own. It should be outlawed in school to omit truth, in this great country of ours.

There are 2 statements that imply a theory to be fact:
"Students will be able to identify significant adaptations that have allowed life to evolve from single-celled aquatic organisms to multicellular terrestrial organisms over a period of more than 3.5 million years”; and
"Students will be able to use scientific evidence, including.... to classify organisms showing probable evolutionary relationships and common ancestry.

A statement that would be more neutral would be something like this:
“Students will be able to identify the physiological adaptations many species have had to accommodate to themselves to a changing long term environmental changes”; and
Student will be able to recite different physical evidence and logic that support and counter the various theories of the origin of life.

I would like to express my feelings on the MN Science Standards Mandate Teaching Evolution as Fact. I would like to see that the teaching of the origin of life be excluded from all standards and all benchmarks. I would like to see each school in the state of MN be granted the freedom to choose what to teach regarding the origin of life and how they wish to teach it.

Thank you.

As a PhD molecular biologist, I wanted to express my outrage over the propaganda being disseminated by the "National Center for Science Education, Inc.". If this group had been intellectually honest, they would have named themselves "Evolutionary Fanatics Society for the Enforcement of Opinion". They fully understand the fraud they are engaged in, and the inability of educated scientists, such as myself, to publicly protest for fear of reprisal. Surely my position at the University of Minnesota would be jeopardized if I openly supported the teaching of Creationism, though I do support it wholeheartedly. I hope the MN Dept. of Education is aware of the unwritten gag order placed on all scientists by virtue of Minnesota's (and national) intolerant evolutionary social clubs. There was a NCSE letter posted on the walls of the University biology buildings recently, exhorting "supporters of quality science education" to oppose Dr. Cheri Pierson Yecke. This is very offensive to those fair-minded individuals at the UofM and elsewhere who realize the falacies of the macro-evolutionary argument. Having sat in a number of scientific seminars where evolutionary research was found lacking so the conversation turned to hiding this information from "the creationists", I must raise my voice in protest. I hope the Dept. of Education is listening to these voices that are being drowned out.

I find it alarming that with all of the scientific evidence that has discredited evolution, that this is still the only theory being presented to our children as fact. Carbon dating has been challenged by many scientists as well as many of the so-called fossilized bones, which turn out to be nothing more than dog bones! Please present ALL theories about the origin of our species - not just what we have been indoctrinated with in the past. It's time we wake up and get ALL the scientific facts and not just those that support one theory!

Creationism cannot be taught as Science. It is a religious myth. We have a diverse culture in Minnesota. Are you going to teach the creation myth associated with each different religion? This is an issue to be discussed as part of a high school social studies class. The church has been wrong-very wrong- about science in the past. We don't need to make those mistakes again. This generation of students should be taught and allowed to think freely in their pursuit of knowledge of the universe.

With all the talk about creationism vs. evolution it seems that the other areas of science are getting lost. While I am a believer of personal choice in the matter or creationism or evolution I believe that evolutionism should be taught as it is currently the accepted theory among scientists. I am also concerned as to how well the Minnesota standards align with National Science Stanadards or Benchmarks. These standards were designed to assure that our students have a solid understanding of science and the ability to critically think about science. It seems to me that the draft Minnesota is coming up with fall short of the mark.

I am very concerned with regard to the proposed science standards for public education in Minnesota. Specifically I am very disappointed at the possibility that a belief in creationism could be taught in our public science classes alongside fact and logic based theories.

As a manager at a variety of technical companies since the 1980's, I have become dismayed at the lack of quality critical thinking skills in much of our employee population. From working with many such individuals, it appears to me that such a lack of reasoning skills directly correlates to a lack of adequate teaching in the sciences, the scientific method, and logic. I routinely see poor or lazy reasoning, including an inability to understand the difference between facts and beliefs and a lack of understanding of causality, cost our businesses time and effort and reducing their viability as employers and taxpayers.

Now I see a proposal for a science standard that would propagate this problem by teaching creationism in the same classes and on a par with evolution and other accepted scientific facts and theories. Categorizing personal beliefs held without reference to facts as educationally equivalent to the best available factual data and currently accepted scientific theory is an example of exactly the type of lazy reasoning that we should be trying to teach our children to avoid!

I realize that this change is likely due to the efforts of certain pressure groups, but dumbing down our science standards and exhibiting faulty logic in those very standards is exactly the kind of change our entire society needs to avoid with critical thinking skills at such a premium as today. Please do everything in your power to see that this change in our standards is disallowed, and that we maintain high standards both within and about our state science standards.

Respectfully,

Overall I'm pleased with the standards.
I agree that there should be flexibility in lower/middle grades in the teaching sequence (not require covering all strands in each year).
I think high school standards are very ambitious, but students will be well rounded if they meet all the benchmarks.
On the politically charged issue of evolution; evolution is a demonstrated phenomenon in (change/adaptation of) current life forms. It is also the most widely accepted theory for how life progressed from single cell organisms to the diverse set of advanced life forms of the present; but is is still only a theory. However, the origins of life (first cellular organisms) on earth are still a great scientific mystery and I think it is appropriate to teach that. "Creationism" is a theory of the origins of life and is usually presented as an alternate theory (to evolution)for the presence and diversity of advanced life forms. However, from the few presentations I have seen, it is clear why this work is not widely respected or accepted by mainstream science. I don't think creationism should be covered in a science curricum except in the context of how culture/religion/politics affect attitudes & acceptance of science. A key point here: new scientific theories often displace older theories, but it must be done on the strength of the data, not on the basis of political/religious arguements or influences.

I cannot believe that Minnesota is going to shove the evolution theory down student's throats! Why can we refuse religion/prayer/Pledge of Allegience in schools? Because it might offend people? I think the evolution theory offends alot of people, too! It amazes me that a country that was founded by forefathers who believed in God continues to leave Him out of schools and government. The Bible is the #1 selling book of all time so most people are familiar with the book of Genesis. The majority of the country say they believe there is a God, but yet we continue to disown Him! Why does is say "In God we trust"on U.S. money? It's about time we show Him that we do trust Him!
No scientist has ever claimed evolution as a fact, but only a theory. So why does Minnesota want to teach this as a fact? The fossil records show that life suddenly appeared, there was no transition of life. The missing link has never been found.
This teaching has proven very destructive against God and His work. It is a powerful tool of the devil and a form of false propheting.
Therefore , I am standing up for the truth and I think our state and country should wake up and do the same. Thank you.

I am concerned with the wording at several points of the standard, including, but not limited to:

Gr 7, III, A - "sedimentary rock & fossils to document the age and history of the earth." I don't believe that the age of the earth is a finite thing (in the scientific community) - every

few years evolutionary dates change. A few years ago we were talking "millions", now the consensus is "billions". If the number keeps changing, why do we want to include it as a standard in our schools?

Gr 8 IV E - same situation

Gr 9-12 III, C - "explain how the sun, earth, and solar system formed." How did the sun, earth, and solar system form? Do you know someone that was there? The scientific community has theories about such things, and if that's what you're talking about, then say "explain how the scientific community descibes how the sun, earth, and solar system formed." I myself have seen very little evidence to convince me of the "Big Bang theory" - if that's the theory you intend on using for your explanation of the origin of the sun, earth, and solar system.

Gr 9-12 IV B - "adaptaions... over a period of 3.5 billion years." This is assuming that evolution is THE explanation of the origins of the earth. This is not a scientific consensus, as far as I am concerned. I personally do not believe in evolution as a plausible explanation of the origin of the earth.

Overall, the wording which indicates that evolution will be presented to our young people as "the standard" is disconcerting to me. There is certainly evidence that seems to lend credence to the evolution argument, but alternative explanations can be devised which support other theories. Go ahead and present evolution as ONE explanation, but do NOT demand that it be taught as THE explanation.

Summary of Evidence Against Evolution

1) Mutations, which are supposed to be the building block of evolution, have never been observed to result in higher order, more complex genetic information.[i]

   - "All point mutations that have been studied on the molecular level turn out to reduce the genetic information, and not increase it."[ii]
   - "To postulate that the development and survival of the fittest is entirely a consequence of chance mutation, or even that nature carries our experiments by trial and error through mutations in order to create living systems better fitted to survive, seems to me a hypothesis based on no evidence and irreconcilable with the facts."[iii]

2) Cells are far too complex to have arisen from a chance arrangement of chemicals. Each cell needs thousands of proteins, a genetic code to order the proteins, and a way to translate that genetic code. Sir Francis Crick, the Nobel laureate who co-discovered the structure of DNA, calculated that the probability of just one protein occurring by chance would be one in 10 to the 260th power, or 10 with 260 zeroes after it. Most mathematicians say that something is for all practical purposes impossible if the probability is 10 to the 50th power.[iv]

3) The human body has features that are "irreducibly complex," such as blood clotting, and the immune system, that cannot have evolved, because all the parts of those must be present for the system to work. If these systems had evolved gradually over eons, creatures would have bled to death or died from infection before the system was perfected.[v]

4) There are no transitional forms in the fossil record to support the idea of common ancestry. That record shows complete animal forms, such as in the Cambrian explosion.

   - "…our more extensive labor has still failed to identify any creature that might serve as a plausible immediate ancestor for the Cambrian faunas [animals]"[vi]
   - "It is a mistake to believe that one fossil species or fossil 'group' can be demonstrated to be ancestral to another."[vii]

   - *My Question: DARWIN'S TREE OF LIFE. Why don't textbooks discuss the "Cambrian explosion," in which all major animal groups appear together in the fossil record fully formed instead of branching from a common ancestor--thus contradicting the evolutionary tree of life?*[viii]

NCSE's Answer: Wells is wrong: fish, amphibians, reptiles, birds, and mammals all are post-Cambrian--aren't these "major groups"? We would recognize very few of the Cambrian organisms as "modern"; they are in fact at the roots of the tree of life, showing the earliest appearances of some key features of groups of animals--but not all features and not all groups. Researchers are linking these Cambrian groups using not only fossils but also data from developmental biology.[ix]

My Response in Outline:
(a) The NCSE is wrong: Fish DID make their first appearance in the Cambrian explosion.
(b) The "major groups" to which my question refers are the animal phyla. Fish, amphibians, reptiles, birds and mammals are sub-groups (classes) of a single phylum. The NCSE is using semantics to give the illusion that the Cambrian explosion never happened.
(c) It is through assumption and extrapolation, not "fossils" and "data from developmental biology," that Darwinists are supposedly "linking" the Cambrian groups.[x]

5) Taxonomy also shows a lack of transitional forms between the major animal divisions.

- "The general tendency to eliminate, by means of unverifiable speculations, the limits of the categories nature presents to us, is the inheritance of biology from the *Origin of Species*. To establish the continuity required by the theory, historical arguments are invoked, even though historical evidence is lacking. Thus are engendered those fragile towers of hypotheses based on hypotheses, where fact and fiction intermingle in an inextricable confusion."[xi]
- "If we are willing to accept the facts, we must believe that there never were such intermediates, or in other words, that these major groups have from the very first borne the same relation to each other that they bear today."[xii]

6) Molecular biology shows no evidence for the evolutionary sequence.

- "Instead of revealing a multitude of transitional forms through which the evolution of a cell may have occurred, molecular biology has only served to emphasize the enormity of the gap…[N]o living system can be thought of as being primitive or ancestral with respect to any other system, nor is there the slightest empirical hint of an evolutionary sequence among all the incredibly diverse cells on earth."[xiii]

7) The embryological drawings by Ernst Haeckel purporting to show that human embryos develop nearly identically with animal embryos were faked. These drawings are still used in a number of high school and college biology textbooks.

- "This is one of the worst cases of scientific fraud…What he [Haeckel] did was to take a human embryo and copy it, pretending that the salamander and the pig and all the others looked the same at the same stage of development. They don't…These are fakes."[xiv]

- *My Question: VERTEBRATE EMBRYOS. Why do textbooks use drawings of similarities in vertebrate embryos as evidence for their common ancestry--even though biologists have known for over a century that vertebrate embryos are not most similar in their early stages, and the drawings are faked?*[xv]

NCSE's Answer: Twentieth-century and current embryological research confirms that early stages (if not the earliest) of vertebrate embryos are more similar than later ones; the more recently species shared a common ancestor, the more similar their embryological development. Thus cows and rabbits--mammals--are more similar in their embryological development than either is to alligators. Cows and antelopes are more similar in their embryology than either is to rabbits, and so on. The union of evolution and developmental biology--"evo-devo"--is one of the most rapidly growing biological fields. "Faked" drawings are not relied upon: there has been plenty of research in developmental biology since Haeckel--and in fact, hardly any textbooks feature Haeckel's drawings, as claimed.[xvi]

My Response in Outline:
(a) Far from confirming the NCSE's claim that the early stages of vertebrate embryos are more similar than later ones, embryological research confirms that the claim is false.
(b) The NCSE's claim that "the more recently species shared a common ancestor, the more similar their embryological development" is also false.
(c) Textbooks claim that the various CLASSES of vertebrates resemble each other in their early stages. By focusing on taxonomic levels below classes, the NCSE is attempting to evade the issue.
(d) Although the NCSE claims that "faked" drawings "are not relied upon," a simple examination of biology textbooks shows that the NCSE is wrong.[xvii]

8) Biology textbooks define homology as the similarity of structures due to common ancestry. It is used in a circular argument as proof of common ancestry.

Homology - *My Question: HOMOLOGY. Why do textbooks define homology as similarity due to common ancestry, then claim that it is evidence for common ancestry--a circular argument masquerading as scientific evidence?*[xviii]

NCSE's Answer: The same anatomical structure (such as a leg or an antenna) in two species may be similar because it was inherited from a common ancestor (homology) or because of similar adaptive pressure (convergence). Homology of structures across species is not assumed, but tested by the repeated comparison of numerous features that do or do not sort into successive clusters. Homology is used to test hypotheses of degrees of relatedness. Homology is not "evidence" for common ancestry: common ancestry is inferred based on many sources of information, and reinforced by the patterns of similarity and dissimilarity of anatomical structures.[xix]

My Response in Outline:
(a) I thank the NCSE for conceding my main point: Homology (defined by modern Darwinists as similarity due to common ancestry) is not evidence of common ancestry.
(b) Yet many biology textbooks tell students that it is. When the NCSE launches its campaign to correct textbooks that treat the origin of life as part of evolution, it should also correct textbooks that treat homology as evidence for common ancestry.
(c) At the level of the animal phyla, common ancestry is not inferred from "sources of information" such as fossils, molecules or embryos; instead, it is assumed on theoretical grounds.[xx]

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[i] This list was based on one compiled in James Perloff's book, *The Case Against Darwin*, (Burlington, Massachusetts: Refuge Books, 2002), 51.
[ii] Lee Spetner, *Not by Chance!: Shattering the Modern Theory of Evolution* (Brooklyn, N.Y.: Judaica Press, 1997), 138 as quoted in Perloff, 23
[iii] Ernst Chain, *Responsibility and the Scientist in Modern Western Society* (London: Council of Christians and Jews, 1970), 25 as quoted in Perloff, 27
[iv] Francis Crick, *Life Itself: It's Origins and Nature* (New York: Simon and Schuster, 1981), 51-52 as paraphrased from Perloff, 29-30
[v] Michael Behe, *Darwin's Black Box: The Biochemical Challenge to Evolution* (New York: Free Press, 1996), 77-97
[vi] Stephen Jay Gould, "A Short Way to Big Ends," *Natural History* 95 (January 1986:18 as quoted in Perloff, 39

[vii] Gareth V. Nelson, Origin and Diversification of Teleostean Fishes, " *Annals of the New York Academy of Sciences* 67 (1969): 22 as quoted in ibid.
[viii] Jonathan Wells, Ten Questions To Ask Your Biology Teacher About Evolution, (January 2001) at http://www.iconsofevolution.com/tools/questions.php3
[ix] National Center for Science Education, Response to Jonathan Wells, (November 28, 2002) at http://www.ncseweb.org/resources/articles/7719_responses_to_jonathan_wells3_11_28_2001.asp.
[x] Jonathan Wells, , Inherit The Spin: Darwinists Answer "Ten Questions" with Evasions and Falsehoods (January 15, 2002) at http://www.iconsofevolution.com/embedJonsArticles.php3?id=1106
[xi] W.R. Thomson, introduction to *The Origin of Species*, by Charles Darwin (reprint, New York: Dutton, Everyman's Library, 1956) quoted in Henry M. Morris and John D. Morris, *Science and Creation* (Green Forrest, Arkansas: Master Books, 19960 29, as quoted in Perloff, 46
[xii] Austin H. Clark, *The New Evolution: Zoogenesis* (Baltimore: Williams and Wilkin, 1930) , 189 as quoted in Perloff, 47
[xiii] Michael Denton, Evolution: A Theory in Crisis (Bethesda, Maryland: Adler and Adler, 1986), 249,250 as quoted in Perloff, 48
[xiv] "An Embryonic Liar," The Times (London), 11 August, 1997, 14. as quoted in Perloff, 55. This was an interview with Dr. Michael Richardson, an embryologist at St. George's Medical School, London, who photographed the development of 39 different species.
[xv] Wells, Ten Questions
[xvi] NCSE,
[xvii] Wells, Inherit the Spin
[xviii] Wells, Ten Questions
[xix] NCSE
[xx] Wells, Inherit the Spin

Comments from an email:

November 3, 2003

Dear Minnesota Science Standards Committee Members:

Greetings once again. I sent each of you a box of origins-related resources back on the 18th of October. I've heard from several of you that you received this mailing and that you appreciated the effort and were going to consider what has been sent. I hope that all of you that I did not hear from will please take the time to review what has been sent. Because of the absolute seriousness of what your committee has been given to do, I am compelled to communicate with all of you this one last time prior to your meeting on November 8th. I attended the October 22nd public forum meeting held in the Albert Lea High School auditorium with State of Minnesota Education Commissioner, Dr. Cheri Pierson Yecke, presiding. There are several things that came up in that meeting, along with a few other points, that I must address to you now.

1. Never read about creation proof in scientific journals:

One man testified at the Albert Lea meeting that he has been reading scientific journals for over 30 years and had never seen evidence for creation presented. Therefore, he has concluded that evolution must be true because that's all that is ever presented. If creation were true or warranted consideration, it would be published about in the scientific journals. MY RESPONSE: I nudged my wife sitting next to me and whispered, "Of course he hasn't seen any articles in his secular scientific journals, they suppress any creationist authors from being published." It's like arguing that salvation in Christ can't be the truth because you've never seen it presented in a Satanist bible. Of course you're not going to see that there. The secular scientific journals are inherently biased towards a naturalistic/atheistic/humanistic philosophy of origins and, therefore, are not objective in the search for truth. They have hardened their hearts towards any evidence that shows a young earth, or the hand of a Creator, or that astronomical complexity, purpose in design, beauty and purpose could not have come about by chance, time, and out of chaos. This man's statement was totally illogical, groundless, and misguided. There are thousands of young earth creationist scientists. Many have published outstanding articles which have been carried in Creation Magazine, Creation Ex Nihilo Technical Journal, Creation Research Society Quarterly, and in hundreds of books that I am aware of and have a list of if any one cares to investigate further.

2. False claim that creation and evolution can co-exist:

Jamie Crannell, one of your committee members, stood up at the end of the
Albert Lea meeting and said that he was the son of a Presbyterian minister

and that he saw no conflict between believing in both creation and evolution -
* that they could peacefully co-exist. MY RESPONSE: Some Christians have tragically undermined the truth of the Bible by acquiescing to evolutionary scientists or compromising theologians and have tried to be syncretistic, melding the two worldviews together. This is illegitimate, unwarranted, apostate, heretical and wrong. The Bible clearly historically states in Genesis 1:1 that In the Beginning God created the heavens and the earth. This is followed by six literal 24-hour days of creative activity (with evening and morning). Everything that God calls into being by the power of His Word arrives fully formed and functioning, ready to reproduce after its kind. It is confirmed later in Exodus 20:11 that "…for in six days the Lord created the heavens and the earth, the sea and all that is therein…" On day six, man is created in God's image. Tracing the Biblical genealogies, there is no more than a little over 6,000 years since the creation of all things as far as time is concerned. Evolution calls for millions of years of things changing from one thing to another. Where did all the information come from? Evolution means there would have had to have been millions of years of death. Death did not come about until Adam and Eve sinned in the Garden of Eden, so that disqualifies compromise with evolution right there. I have included various articles that also address this unpermittable compromise.

3. The appeal for evolution to be taught in the science curriculum at all:
MY RESPONSE: Evolution cannot be classified as science. It is not observable, repeatable, or testable. No one was there purported billions or even millions of years ago to witness what has been classified as a fact of science. How then can it be taught as science? It is a philosophy, a worldview, and a religion. It must be taken on faith. It is a bias. It is true also then that creation is religious in that it is embraced and believed by faith since we were not there either. But we know Someone who was there! Our Lord Jesus Christ. The question then comes down to, what bias is the best bias to be biased with?! It is certainly more reasonable to believe in an omniscient, omnipotent Creator purposely designing and creating all things that what Dr. Duane Gish has been quoted as saying, "Isn't it unbelievable what the unbeliever has to believe in order to be an unbeliever?! It's simply unbelievable!"
4. Teachers are under tremendous responsibility for what they teach:
What if those of you who want to teach evolution as a fact, or even at all are wrong? You have the tremendous responsibility of imparting teaching to impressionable young people who are actively forming a worldview and philosophy of life. If there truly is a Creator (which I contend there is only one true and living Creator), do you not know that teaching that evolution is a fact then would be an incredible affront to the Creator. Are you aware that He shares His glory with no one! Are you aware that the Bible says that it would be better for a millstone to be hung around your neck and you be drown in the depths of the sea than to lead one of His little ones astray?! Teaching children evolution is leading children astray from Biblical historical truth and the one true and living Creator. Are you aware that the fear of the Lord is the beginning of wisdom? How then can anyone have true wisdom without fearing the Lord? Are you aware that in the book of Hebrews it says that without faith it is not possible to please God because those who would come to Him must believe that He exists! Teaching evolution is teaching impressionable young people that there is no God, we are not created in His image, we are here by a chance explosion, and that we are here as a result eventually from goo to you over millions of years of chance processes. Therefore, I would tremble if I were one who taught evolution as the correct view of how we came to be. We had the inventor of the MRI machine, Dr. Raymond Damadian, speak at the Albert Lea Senior High School on October 22nd, 1995, and the title of his presentation was, "We Dare Not Affront the Creator."
5. Evolution is presented as a fact.
MY RESPONSE: Many of the "facts" of evolution have changed over the years. How can a fact change? Almost all of the "scientific facts" presented for evolution in the Scopes trial of 1925 have been clearly shown to have been misinformation, incorrect, outdated, or outright fraud. This is verifiable. In an article about Charles Alexander that appeared in TIME magazine, March 14, 1994, we read: 'In the years before he got into journalism, senior editor Charles Alexander taught science at two high schools in Tennessee. He told his students about early man and the origins of life and touched on the dinosaurs, "And just about everything I taught them," he says, "was wrong"'… the material has since proved almost totally obsolete…". At the Smithsonian Natural History Museum in 1996, a sign on the origin-of-man display stated: 'A lot has happened since this exhibit opened in 1974. The science of human evolution is a fast-changing field. Much of the material here is now out of date. We're developing a new exhibit based on the latest findings.' There are many many other examples of outright fraudulent information and conspiracies to present evolution as a fact. If these things have been shown or admitted to being wrong, how then were they a fact in the first place? The evolutionary timetable for the beginning of the universe has been changed many times. Facts don't change. There is objective truth. This truth of origins is found only in the Holy Bible. An editorial in the Nov/Dec 1996 issue of Teacher Magazine by Ronald A. Wolk stated, "Science is arrogant. And it has had to eat its own theories more than a few times. But it is the accumulation of observation, analysis, and experimentation moving ever closer to something we might call "truth."' Well, evolution will never arrive at the truth, because it contains no element of truth. Therefore, it should not be taught to our children.
6. Sheer artistic license is taken in drawing scenes from supposed millions of years ago or of evolutionary intermediates. A 9-14-2003 article in the Pioneer Press on page 5A under the Science section entitled, "Painting to please" states: "The eye-popping hues in the photos from the Hubble Space Telescope are largely the creation of artists jazzing

up black-and-white images. So why do they do it?" …"…their breathtaking colors are, in most cases, exaggerated. They are the product of a team of NASA astronomers, computer artists and public-relations folk who touch up and color Hubble's photographs, massaging each one…It's a merger of science, art - and marketing." The same could be said for evolution in textbooks. How is it that complete scenes can be drawn out from one or two fossil bones found? Tremendous, shameful artistic license is taken to present the bias of the evolutionist. See the enclosed article about medical illustrator Ronald J. Ervin who was asked to illustrate ancient humans and 'prehistoric' animals - and to make them fit the evolutionary view. The article is entitled, "Filling in the blanks." Impressionable young people see these pictures and scenes in their textbooks and are indoctrinated into believing someone was there to witness the scene and record it as such. This is a devious scheme to undermine the truth. How can this be in a science book. These things belong in art class or creative drawing class. It is unconscionable to me that textbook companies allow this, and that teachers teach from this.

7. A host of renowned scientists of the past were and present are Bible believing, young earth creationists. Among those of the present whom I am personal friends with are Dr. Raymond Damadian of Woodbury, NY (inventor of the MRI machine); Jules Poirier of San Diego, CA who was instrumental in developing the navigational capabilities of the lunar landing module to get on the moon; Harold "Bud" Froehlich of Minneapolis who designed the Alvin submarine which filmed the Titanic on the bottom of the ocean; and many many more. The Creation Research Society alone has over 700 members with Ph.D.'s and degrees in science. It is not intellectual suicide to believe in creation. Two other friends of mine who have lectured on creation in Albert Lea were both voted Professors of The Year at their Universities - Dr. David Menton, Ph.D., Professor of Anatomy at Washington University in St. Louis, MO and Dr. David Kaufmann, Ph.D., Professor of Exercise Science at the University of Florida-Gainesville. "The fear of the Lord is the beginning of wisdom." Some of the great scientists of the past included Joseph Lister-Antiseptic Surgery; Louis Pasteur-Bacteriology; Robert Boyle-Chemistry; Georges Cuvier-Comparative Anatomy; Charles Babbage-Computer Science; Lord Rayleigh-Dimensional Analysis; James Clerk Maxwell-Electrodynamics; Michael Faraday-Electromagnetics; Ambrose Fleming-Electronics; Gregor Mendel-Genetics; Matthew Maury-Hydrography; and many many more. But even if there were no earthly man remaining who believed in their Creator, it would not nullify the truth of God's Holy Word. But fortunately, there remain many that embrace the truth and seek to help get others to stop and think about the ramifications of what they believe.

8. Circular reasoning is employed in the dating of rocks and fossils. The rocks are dated by the fossils they contain. The fossils are dated according to the rocks they are found in. This is absurd and dishonest.

9. Radiometric dating methods are ill-conceived, illegitimate, based on presumptions/bias, and are dishonest. Read the book, Radioisotopes and the Age of the Earth - a definitive resource on radioactive dating. It examines radioisotope theory, exposes its plaguing problems, and offers a better alternative. True dating and honest research shows an earth and universe to be just over 6,000 years old.

10. Evolution does not play on a level playing field. In a 2001 article out of Washington State entitled "Teacher Barred from Questioning Darwin" by correspondent Dave Clark, it is stated, "A flare-up in Washington State is showing, once again, that many evolution supporters really aren't interested in getting at the truth about the origin of life. At first, Roger DeHart was told that discussion of "intelligent design" was out of bounds with his students. Now, this man who has taught high school biology for 14 years in Burlington, Washington, has been ordered not to even question or criticize the theory of evolution."…"Now they have told me, basically, just to teach the textbook, and not to verbally bring up any information different than what our text has," DeHart said. "DeHart's textbook teaches Darwinian evolution uncritically. "That's not education, that's indoctrination," he added." In our own state of Minnesota, in Faribault, resides science teacher Rod LeVake. He has had similar experiences.

11. Incredible claim from Smithsonian Magazine about our supposed rodentlike ancestor:

Enclosed is a copy of p.14 of the Nov '03 Smithsonian entitled "New Hall on the Mall" and is written by Lawrence M. Small, the Secretary of the Smithsonian. Read his last paragraph! Here it strongly infers that Mozart is the great ancestor of a 210 million-year-old rodentlike creature. This is followed by the actual article on p. 44 called "The Mother of All Mammals." Notice that this is stated as a fact. What did they find in the ground, but a few fossilized bones?! Read how artistic license was used in the constructing of this evolutionary idol. Notice the words used in the article, such as "no complete skeletons…partially reconstructed… assorted odd teeth… time traveled… imagined… probably sported a fur coat… took shape in his mind… make the head a bit bigger… recommended enlarge Morgie's eyes… probably was nocturnal… add hair to the tail… more back and forth… model finally satisfied both artist and scientist…" and yet it is all presented as a fact. Then, the paragraph of all paragraphs-the last one-"Once the new hall opens this month, visitors will be able to reach out and touch their oldest ancestor." This is an abhorrent affront to the one true living Creator - this is an abominable, insidious lie. The truth is, we are created in the image of God, not evolved from a rat. This is the most outrageous, unfounded, despicable pseudo-scientific myth possibly ever concocted, apart from the supposed Big Bang and molecules-to-man macroevolution. Can you committee members really and truly agree with this, that you have come about through a totally chance process whereby your great descendants are slime molds and rodents and eventually apes and then here you are today. Do you really and truly believe this? This is inconceivable to me.

There are so many more things which could be said or sent to you, as I have been collecting books, videos, articles, news reports, magazines, fliers, brochures, etc. etc. for over 10 years and have literally boxes and file cabinets full of information. I do not say this to impress any of you, but rather to show that I've really just touched the tip of the iceberg here in this letter and enclosures and with the books and videos I've previously sent you.
I beseech you, I implore you-please do the honorable and just and right thing for the children of this state and their parents - do not subject them any longer to the false teaching of evolution. Break with the status quo and the party line of the evolutionists. Recent clashes in Texas, Kansas, West Virginia, Michigan, and Ohio need not discourage you Minnesotans in a position of power from having the resolve to teach the truth of creation.
Thank you for your time.

Comments from an email:

Dear Commissioner Yecke:

Your efforts and attention to the Minnesota Science Standards revisions are greatly appreciated. As our knowledge of science and technology continues to expand at an accelerated rate, it is important that we ensure that our educational standards reflect these advances. The impact of education on our young individuals and our society as a whole cannot be overstated. With four children at various stages in their education, I am acutely interested in this subject.

I have recently become aware of the controversy surrounding the biology Science Standards regarding origins of life. Although this controversy has existed for many years, there are significant discoveries in this arena, most of which are not reflected in the current Minnesota curriculum. As a product of our state's public education system (with subsequent undergraduate and medical degrees from the University of Minnesota), I am surprised to see the same material in biological sciences that I was exposed to many years ago, despite numerous advances in the interim. The Darwinian theory (now "neo-Darwinism") of evolution, and the chemical origin of life, is still presented as irrefutable fact, despite a number of discoveries that would prompt Darwin himself to question his original hypothesis. As a practitioner and lecturer in the field of neuroscience, I am constantly exposed to the rapidly expanding knowledge base in the fields of cellular biology, physiology, biochemistry and genetics. The purpose of this communication is not to refute any single body of knowledge or theory, but to inspire the Committee to produce standards that facilitate an honest, scientific approach to the study of all disciplines in science. This should include the emotionally charged arena of the origin of life.

Current biology texts used in schools typically champion the theory that all species have evolved from a single cell after a chance event occurring in primordial soup. The bulk of evidence cited to support this theory is based on the writings of Charles Darwin, who based his theories on observations such as the environmental impact on beak size of finches on the Galapagos Islands. However, even if the observed changes in beak size and other characteristics in the birds were true evolutionary changes (they have subsequently been proven to be transient adaptations to environmental conditions), the modification of features within a single species does not represent evidence that trans-species evolution occurs. The gross extrapolation from microevolution (within the species) to macroevolution (the development of new species) based on chance mutations requires a leap of faith, which has to date been unsubstantiated. Neither the controversy surrounding this important subject, nor alternate theories, are presented in the current text utilized in our high school ("Inquiry into Life", 7th edition by Sylvia Mader, William C. Brown Publishers, 1994). I am not making an appeal to the Standards Committee, science teachers, or students to agree with any particular theory. However, if benchmarks are presented as evidence for an educational standard, they should be logical, consistent with current scientific knowledge to date, relatively complete and unbiased.

For example, the Life Science Strand regarding "biological populations change over time" (Sub-Strand E. page 30, working draft: September 4, 2003) calls for the student to explain how evolution may provide a scientific explanation for the fossil record of ancient life forms, etc. One of the benchmarks requires that the students recognize that up to 3.5 billion years may be necessary to explain the variation of species that has produced the great diversity of a life on earth and in the fossil record. The gradual accumulation of small mutations that result in this diversity and change over the billions of years is not based on knowledge that is available today. Darwin was likely unaware of the Cambrian Explosion which refers to the drastic increase in the number of species on earth that occurred during a relatively short time frame relative to the earth's history. A balanced view of the implications of this rapid increase in the variety and number of species should be called for in this standard. Likewise, in the analysis of evidence regarding organisms (Sub-strand B, page 28, working draft: September 4, 2003) should also be presented with a balanced view. The same evidence used as evidence for evolution can be applied as evidence

for intelligent design (homologous structures, embryological development and biochemical similarities). All of these observations can be viewed as more consistent with a single intelligent designer than with a series of unrelated and random mutation events.

I have become familiar with the Santorum Language, which was a component of the conference report of the *No Child Left Behind Act* of 2001. This does not have to be introduced as a new guideline, as our Congress has already adopted it. I fully agree with its intent and implications. You are probably familiar with the passage:

> *The Conferees recognize that a quality science education should prepare students to distinguish the data and testable theories of science from religious or philosophical claims that are made in the name of science. Where topics are taught that may generate controversy (such as biological evolution), the curriculum should help students to understand the full range of scientific views that exist, why such topics may generate controversy, and how scientific discoveries can profoundly affect society.*

This statement was included in HR107-334, which was approved by Congress in December of 2001. It is interesting to note that the critics of intelligent design are quick to dismiss the concept as religious-based and non-scientific, even though scientific evidence exists to support it. Further, proponents of Darwinism as the sole explanation for the origin of species are, in fact, often more adamant about expressing their religion (atheism) than are all other religions when it comes to this topic. Science teachers should not teach religion, and I would include atheism in that statement. On the other hand, I fully support education regarding the scientific evidence available to date, the controversies that exist, and testable scientific theories, so that students can become educated regarding current scientific knowledge, and, more importantly to learn the critical thinking skills of a scientist.

The *History and Nature of Science Strand* (working draft: September 4, 2003, page 22) is an excellent step in that direction. The benchmarks cited in the *Scientific World View Substrand* encourage the development of the scientific process and critical thinking. The final bullet point in that list of benchmarks, however, is contradictory to the spirit of the preceding goals. To emphasize that science is conducted on the basis of consensus is to reduce it to a political process. The advancement of science is often dependent on breaking away from the consensus in order to advance our body of knowledge. This should not be viewed as confrontational, but in the interest of scientific advancements and education. Historically, had we adhered to the consensus, we would still operate from the premise that our flat earth was the center of the solar system, that the smallest unit in nature is the atom, and several other theories and hypotheses that have been disproven. Science is the discipline that allows us to challenge the consensus in order to garner more knowledge from the investigational process. We should instill these values in our students.

In developing these standards, we should keep the goal of the educational system in mind. Our goals should be to develop students to have an interest in lifelong learning, to develop critical and inquisitive minds, and to obtain a body of knowledge that includes the discoveries that have been made in the distant and recent past. The use of textbooks that contain out-dated material, and the adherence to standards that present a one-sided and incomplete view of scientific knowledge, is to do a great disservice to our students and ultimately, our nation. Further, by failing to present current scientific knowledge and controversies to our students, we fail to motivate them to play a role in future discoveries. If theories such as biological evolution as the origin of life are presented as irrefutable fact, what incentive do our students have to contribute to future scientific efforts in these areas? Please use this opportunity in the revision of our educational standards to strengthen the program and develop the student's ability to critically analyze all scientific data.

Respectfully submitted,