

**Kansas Association  
of  
Biology Teachers**

Volume 40 Number 3 - September 1999

**Calendar & Activities**

Please mail, e-mail or phone meeting dates and other items of interest to biology teachers to John Wachholz, 2311 Applewood Lane, Salina, Kansas 67401-

**Date**

**Event**

September 17-18, 1999..	Kansas Wildflower Society annual meeting -Maxwell Refuge & Hesston College
September 18, 1999.....	Annual KABT Fall Meeting - Sternberg Museum and Wildcat Canyon – Hays
September 24-26, 1999.....	Charter organization meeting of the Central Plains Society of Mammalogists (formerly an informal annual meeting of Kansas mammalogists) .....Emporia State University
October 1-3, 1999 .....	Kansas Herpetological Society Fall Field Trip, Cherokee County, Kansas
October 6, 1999 .....	Stephen Jay Gould Lecture – University of Kansas
October 8-10.....	Kansas Ornithological Society Annual Fall Meeting – Fort Hays State University
October 27-30, 1999.....	NABT National Convention - Fort Worth, Texas
November 6-7, 1999.....	Kansas Herpetological Society Annual Meeting – Pratt Community College
November 13, 1999.....	Jonathan Kozol Lecture - University of Kansas (Place & Time In Next Newsletter)
March 31 – April 1, 2000 .....	Kansas Academy of Science Annual Meeting - Hutchinson Comm. College
September 16, 2000.....	Fall Meeting – Great Plains Nature Center, Wichita
May 12-14, 2000.....	Morton County Field Trip
Spring 2001 .....	Northeast KS Field Trip



Your membership **expiration date** can be found on your mailing label. All dues are now payable on September 1st of each year. The membership list was last updated on **September 1, 1999**. If you sent dues in after this date they were not recorded before the mailing list was printed. Pay you dues before September 30th and save \$5.00. Dues increase to \$15 after Septem-

**KABT Web Site**  
**<http://kabt.org>**

Made Available by KanCRN

<http://kancrn.org>

Send comments to:

[jwachholz@midkan.net](mailto:jwachholz@midkan.net)

**NABT Web Site**

**<http://www.nabt.org>**

## Publishing Dates For Newsletter

The newsletter is published during the months of September, November, February and April. Manuscripts must reach the editor by the 15th day of the previous month. The KABT Newsletter includes abbreviated minutes of the official meetings, announcements of future activities, brief news notes, and other brief items of interest to biology teachers. Send your contributions to John Wachholz, Editor, 2311 Applewood Lane, Salina, KS 67401 785-825-7742. You may send you information to [jwachholz@midkan.net](mailto:jwachholz@midkan.net).

## Newsletter & Journal Articles

Articles are needed for the newsletter and journal. Send them via e-mail to [jwachholz@midkan.net](mailto:jwachholz@midkan.net) or on a disk. If you send it on a disk, any format is acceptable. Your help is appreciated.

Articles for the Kansas Biology Teacher should be sent to John Richard Schrock, editor KBT, Division of Biological Sciences, Box 50, Emporia State University, Emporia, KS 66801-5087. E-mail: [ksnatur1@esumail.emporia.edu](mailto:ksnatur1@esumail.emporia.edu)

Please remember to keep your dues up to date so you will continue to receive KABT publications.

## Outstanding Biology Student Certificates

These are available for students who you feel have completed a biology course under you and have shown outstanding achievement. We have just updated our supply. Send your name and address to KABT Student Certificates, 2311 Applewood Lane, Salina, KS 67401-3707.

Please use these certificates as valuable awards for outstanding students.

## NABT Contact Information

**Address:** ..... 11250 Roger Bacon Drive #19  
Reston, VA 22090-5202

**Web Site:**..... <http://www.nabt.org>

**Phones:** ..... 703-471-1134; 800-406-0775

**Fax:** ..... 703-435-5582

**E-mail:** ..... [NABTer@aol.com](mailto:NABTer@aol.com)

## Dues Increase

Starting September 30th, 1999 the annual dues for KABT membership will increase from \$10 to \$15 per year. Life memberships will increase from \$200 to \$300.

Any membership dues received by the KABT treasurer and postmarked no later than September 30th, 1999 will be at the old rate. Those received after that date will be at the new rate.

Your cooperation concerning the above is appreciated.

## KABT Fall Meeting – Sternberg Museum – Hays

### KABT FALL CONFERENCE

#### AGENDA FOR September 18, 1999

Registration: Members-\$5 Non-Members \$10

If you bring family members and are a member of KABT their cost will be \$2.50/ person.

The KABT Fall Conference will be held at the Sternberg Museum in Hays, KS on Saturday, September 18, 1999. The Sternberg Museum is easy to locate just off of I-70. We will plan to

meet on the third floor classroom at 9:30 a.m. on Saturday. Please come prepared for a morning inside the Sternberg Museum, an open lunch hour, then followed by a road trip to Wildcat Canyon and Castle Rock in the afternoon. The agenda is as follows:

[http://www.fhsu.edu/sternberg/Sternberg Museum Website](http://www.fhsu.edu/sternberg/Sternberg%20Museum%20Website)

9:00 a.m. Registration Table will open.

9:30 a.m. Introduction of our guest speaker, Mr. Greg Liggett. Mr. Liggett, assistant director of the Sternberg Museum, will be speaking on Kansas Geology.

10:30 a.m. Tour of the Sternberg Museum

11:30 a.m. Fall KABT meeting. Updates on what is happening in KABT to our membership. Special speakers, addressing the state's new science standards and KABT's new website, are Steve Case, Dr. Richard Shrock, and Brad Williamson.

12:30 p.m. Open lunch; many restaurants are located along the main strip in Hays and are easy to access.

1:30 p.m. Road trip to Wildcat Canyon and Castle Rock. Be prepared to hunt for fossils in the chalk beds of western Kansas. We will car pool, so think about whether you can volunteer to take others in your vehicle. The roads are not too bad. This is quite an opportunity--be sure to plan to stay for the road trip. We should return about 5:30 p.m.

Come join us for an EXCITING day! Learn, have fun, exchange ideas--it sounds great!

Please e-mail Lisa Volland at [lvolland@topeka.k12.ks.us](mailto:lvolland@topeka.k12.ks.us) if you plan to attend. You may also phone 1-785-271-3500 and leave a message that you are attending with the secretary. By getting a count, this will help with the planning, etc. Thanks ahead of time.

You will be observing displays highlighting the Cretaceous era, including walk-through diorama featuring plants and animals from about 80 million years ago (as well as full-sized robotic dinosaurs and trees) and the giant reptiles and birds that lived at or in the Kansas sea.

Location: 3000 Sternberg Drive, Hays, KS

Telephone: 1-785-628-4286

## From the President

Hello to all and a big welcome back to the new school year! Hopefully the summer has renewed your spirit and you are eager to begin school. To help boost your spirits, try to do something for yourself early in the school year. A great idea is to attend our KABT Fall Conference, Saturday September 18, 1999 in Hays, Kansas (Sternberg Museum). The feeling of camaraderie with fellow biology teachers will leave you with a warm, fuzzy feeling (it's the only way I can describe it!), that will last you at least until the end of October. Then you can attend the NABT (National Association of Biology Teachers) conference, October 27 - 30, 1999 in Fort Worth, Texas to recharge your teaching battery once again! Take the time for yourself to learn more biology, and you'll find an incredible excitement added to each of your teaching days! If it isn't possible to attend the national conference, it is well worth your money to become a NABT member. With a membership fee of \$59, you will receive lots of purchasing benefits, such as discounted insurance, liability coverage for your classroom, etc. You also will receive \*The American Biology Teacher\* journal (8 copies per year) which is

an excellent source for both you and your classroom teaching (How-to-do-its are in every journal issue).

I wanted to take this opportunity to give a big thanks to all of the KABT members who have been diligently working on the science standards (the ones that weren't adopted--more on this at our fall conference!) this summer as well as those of us who tried to stay up with what was happening with the science standards and for representing KABT in a positive way. Several KABT members were quoted in newspapers, on television, and fielded phone calls and questions from big names in both the media and the scientific community. We really represented a positive group of biology teachers; it made me extremely proud to be leading and representing this organization. We will be discussing this issue and what additional work needs to be done to make sure that our message is heard at all of the local school boards. This discussion will take place at our fall conference--but also keep in touch with your e-mail from Steve Case; he is dedicating some of his efforts into dealing with the science standards issue in your local area. Thanks a lot Steve for your hard work!

Well, I hope this finds you having a great start to your school year. Tell a colleague about KABT and how to join!! We are always looking for new members and keeping all Kansas biology teachers informed on what's happening in biology.

### **KU Lectures**

**WEDNESDAY 8 September**

3:30 pm -- regular departmental seminar (open to public)

1005 Haworth Hall, KU

DR. EUGENIE SCOTT -- National Center for Science Education

"Creation and evolution: the national perspective"

**WEDNESDAY 8 September**

7:30 pm -- public lecture (\*everyone\* invited -- publicize widely, please)

Plymouth Congregational Church, 925 Vermont, Lawrence

DR. EUGENIE SCOTT

"Creation? Evolution? Both? Neither?"

**THURSDAY 9 September**

In the evening in Kansas City, Dr. Scott will present "Creation? Evolution? Both? Neither" at a place and time still being arranged

**WEDNESDAY 6 October**

8:00 pm -- public lecture, no tickets, no admission fee (doors open at 7:00)

Lied Center, 15th and Iowa, Lawrence

DR. STEPHEN JAY GOULD

title to be announced

**SUNDAY 25 October**

Public lecture, time and place still being arranged

DR. LAWRENCE KRAUSS, Chair, Physics and Astronomy, Case Western

Reserve University

"Science, non-science, and nonsense: from aliens to creationism"

**SATURDAY 13 November**

8:00 pm -- public lecture, no tickets, no admission fee (doors open at 7:00)

Lied Center, Lawrence

DR. JONATHAN KOZOL

title to be announced

### **Mike Everhart's Web Site**

Check out Mike Everhart's web site "Oceans of Kansas". He covers most of the fossil life of Kansas, including the birds Hesperornis, the Baptonithids and the Ictyornithids. Try:

<http://www.oceansofkansas.com/contents.html>

### **Stan Roth Retires**

Stan Roth has retired after teaching students about biology in Lawrence High Schools for 40 years. He and his wife Janet will remain in Lawrence. Current plans are to consult with the newly constructed Prairie Park Nature Center and pursue continuing study projects in association with the Kansas Biological Survey. He also plans to continue his interests in issues related to public school education and environmental awareness.

### **Check Out This Article!**

Check out Stephen Jay Gould's response to the Kansas Board of Education decision in the August 23, 1999 (I just picked it up tonight) Time issue on page 59. Also in that issue is the cover article entitled "Up From the Apes"

### **Washington Post Articles**

In last week's Washington Post Online Forum, Steve Case did a wonderful job defending evolution and science in schools. Earlier in the week Tom Willis of the CSAMA presented his views.

You can check them out at:

Case:

<http://www.washingtonpost.com/wp-srv/national/zforum/99/nat082799.htm>

Willis:

<http://www.washingtonpost.com/wp-srv/national/zforum/99/nat082399.htm>

In Sunday's (August 29, 1999) print version of the Post, in the Outlook section Brad Williamson has an article that he wrote about the history of the situation and its impact in my classroom. It's at:

<http://www.washingtonpost.com/wp-srv/WPlate/1999-08/29/1451-082999-idx.html>

### **Heading To NABT Convention?**

Anyone heading to Ft. Worth for the NABT convention who wants to ride with others in a van can contact Harry McDonald. We can hold 7 maybe 8 people plus luggage. We will depart Blue Valley High School at 8:00 A.M. on Wednesday, Oct. 27. We will journey down I-35 and can make arrangements to pick people up on the way. We will return on Sunday, Oct. 31. Space in the van will be on a first come-first served basis. Harry would be willing to share a room if anyone wishes. He has a room reserved at the Radisson. Contact Harry at: phone - 913-897-9630; or [biologyctrack@hotmail.com](mailto:biologyctrack@hotmail.com).

### **Citizens For Science Organization Formed**

As everyone knows, at it's August meeting, the KSBOE voted to adopt new "standards" for science education in Kansas. The board voted for a set of standards which removed all requirements for macroevolution, geologic time and the origin and history of the universe to be taught in Kansas. Additionally, they voted to redefine science in such a way as to allow creation to qualify as science. Numerous benchmarks and indicators were changed which introduced questionable if not inaccurate items into the standards.

This whole affair was railroaded through in such a hurry that the version adopted was in a shambles and the SDOE is even now trying to clean up the mess. Unfortunately, this will not include adopting the standards written by the science experts. In any case, the standards are not ready for publication. There is a serious question as to whether AAAS, NSTA, etc. will allow the direct use of passages from their documents. This use was approved for the writing committee but since their work was not accepted, we don't know if they will allow their work to be associated with such a poor set of standards. Don't expect to see anything out of Topeka any time soon. Hopefully, Brad and Steve can update everyone at the fall meeting in Hays.

The unfortunate side effects of the SBOE actions include: Local districts will not be required to teach any of the deleted material and in fact, a strict adherence to the "standards" will result in inaccurate and poor teaching of science.

Local districts and therefore local teachers will be subjected to increased demands to delete evolution and/or include creationism in local curricula.

A group of concerned individuals have recently announced the formation of a new organization, "Citizens for Science." This group will work for a return to quality science education in Kansas. The group will play a large public information roll in the state school board elections next year. In the meantime, CFS plans to organize support for local districts and teachers.

As soon as possible, printed and internet material will be available, including a list of individuals who could give support to local districts either in person or via the internet. The group has established a web site, <http://www.ksdfs.org>. The site should be up and running soon.

In the meantime, if you have questions, contact Harry McDonald, 913-897-9630 or [biologyctrack@hotmail.com](mailto:biologyctrack@hotmail.com).

## **While Serving On The State Science Standards Writing Committee**

**By Steve Case**

I hope you will indulge me while I go on a bit of a rant. About a year and a half ago I was asked to serve on the Science Standards writing committee. When I was asked to serve on the Science Standards writing committee, I jumped at the chance. Science provided an understanding of the natural world that empowered my students to make valuable contributions to society and to experience a great sense of personal fulfillment. I felt that my work on the science standards would allow me to contribute to establishing this kind of empowering education for all Kansas students. It was also an opportunity to be of service to the science teachers in Kansas.

The Science Standards writing committee is made up of 27 highly qualified scientists, university people, schoolteachers, administrators, parents, and professionals. The committee is

broadly representative of Kansas. We worked over a year and a half on the writing process. In the writing process we produced five versions as we refined our standards. The foundation of our State standards are the National Science Education Standards, which we worked with to make more specific to our students in Kansas. After completing our second version, we began state-wide public hearings. These hearings were well attended and all comments were carefully considered. In addition, we also received hundreds of written comments that were also carefully considered. Our focus remained on reflecting good science and the best possible science education. We sought the review of science researchers from across the State. We were grateful for their careful review and comments and included their suggestions. Finally, the standards had two outside reviews, completed by reviewers picked by the State Board of Education. The reviews indicated we had very strong standards.

This is the document produced by this process - Version 5 by the writing committee. Citizens for Science feel that this document reflects good science and best possible science education for Kansas students. Version 5 of the Standards will provide a solid foundation as students try to understand the natural world and it will help them acquire the reasoning tools to become life-long learners.

It is important to understand the normal process of Standards development in order to understand why I am so angry about what has happened. After Version 4 of the process, Steve Abrams, a State School Board member, went off on his own wrote his own set of standards with the help of several young earth creationists. These standards represent the view of a fringe group that has expressed their dislike for science, scientists and a good liberal arts education. This version was not a legitimate set of standards but they were clearly a political strategy. This version of standards by Dr. Abrams and company was clearly illegal to teach in a public school. It represented nothing more than the views of this fringe group. This document was introduced so that a defacto subcommittee of three board members could create their own document and claim it was some kind of middle ground. This document is clearly not any kind of middle ground and they are again, lying to the public. Let me be specific. The State Board charter does not allow the formation of a subcommittee. The members of the subcommittee were self-appointed and not authorized by the entire board. The members of the defacto subcommittee are not qualified to write science standards. The science standards they drafted seem to include copyright infringements that they have not addressed. The standards they drafted include an appendix that is the work of the same fringe group that wrote Dr. Abrams first set of standards. The three board members on the subcommittee assure us that "the documents are 95% the same". I am holding nine pages that summarize the changes and differences between the two documents. Let me emphasize that these documents are fundamentally different. In an attempt to mislead the public, some have tried to turn this into a debate about origins, evolution and creationism, but this is only a part of an assault on science and any knowledge gained by science. The subcommittee's document reflects an utter misunderstanding of the nature of science, with significant deletions from the earth sciences, significant changes in scientific understandings of physics and chemistry, and of course the deletion of evolution. Evolution is good example of

what they have done in that it is a unifying concept of the life sciences and yet it asks students to understand the life sciences without it. Evolution is only one example of these changes and you are welcome to a copy of all these changes. Many of the other deletions have the same impact on other disciplines and should not be ignored in the emotional debate on origins.

We are now hearing a lot about local choice. The Chairwomen of the State Board of Education, Linda Holloway, is fond of saying that they are leaving "it" to local boards to decide. This is such a misleading statement that it has to be addressed. I am not sure what choice they are allowing the local board to make. Creationism/intelligent design is illegal to present in the science classroom, even in a debate format. In *Epperson v. Arkansas* (1968), the U.S. Supreme Court struck down a 1928 Arkansas law prohibiting the teaching of evolution in state schools. In *McLean v. Arkansas* (1982), the federal district court invalidated a state statute requiring equal classroom time for evolution and creationism. *Edwards v. Aguillard* (1987) led to another Supreme Court ruling against so-called "balanced treatment" of creation science and evolution in public schools. In this landmark case, the Court called the Louisiana equal-time statute "facially invalid as violative of the Establishment Clause of the First Amendment, because it lacks a clear secular purpose." This decision-"the Edwards restriction"-is now the controlling legal position on attempts to mandate the teaching of creationism: the nation's highest court has said that such mandates are unconstitutional. Equal time is not an issue as it is clearly illegal.

The flaw with design creation is that it is not a theory and has not added anything to the understanding of nature or to the progress of understanding nature. Creation by a creator would be a miracle and therefore be a one time exception to nature. This is why science may appear to conflict with other ways of knowing about the universe, unfortunately leading some groups to see selected theories of science as a threat to their belief systems. This is not the case: science does not, in fact cannot, explain or judge nonscientific issues or supernatural belief systems. These attempts, which commonly result from a misunderstanding of the nature of science itself, have no place in science or in the science classroom or laboratory.

Science is not teleological: the accepted processes do not start with a conclusion, then refuse to change it, or acknowledge as valid only those data that support an unyielding conclusion. Science does not base theories on an untestable collection of dogmatic proposals. Theory is not a guess or an approximation but an extensive explanation developed from well-documented, reproducible sets of experimentally-derived data from repeated observations of natural processes. Theory built on this large body of existing evidence is then tested through the processes of science by asking questions, proposing hypotheses, and designing empirical models and conceptual frameworks for research. The models and the subsequent outcomes of a scientific theory are not decided in advance, but are modified and improved as new evidence is uncovered. Science is a constantly self-correcting endeavor to understand nature and natural phenomena.

Ignoring all of the other deletions and concentrating only on the evolution issue, the choice we are left with in Kansas is whether or not to teach good science. Kansas Biology Teachers have always worked hard to present the best possible science

education program to our students. We have developed programs that involve our students in meaningful scientific work. I have no doubt that this will continue in Kansas but KABT needs to remain very active in supporting teachers who will come under considerable community pressure. Our local boards and community members will be deciding on "good science" in our schools and we will have important education work to do.

Steven B. Case

Kansas Collaborative Research Network - KanCRN

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## Document Comparisons

I just received this summary of changes. Scott Hill (Board Member) is saying that the two documents are 95% the same. What follows are the changes from Science Standards Draft 5 to Board Sub-Committee Draft.

In Vision Statement, added the word creed.

In Tolerance Statement,

1. Deleted sentence beginning If a student should raise a question... and replaced it with No evidence or analysis of evidence that contradicts a current science theory will be censured.

2. Deleted last paragraph which sites statutes and regulations.

At the end of the section on Changing Emphases, deleted reference to appendix 3, which is appendix 4 in their document, but left reference to appendices 2 and 4, which were deleted.

Under Standards, changed the title of the Science and Technology standard to Technology.

Replaced the list of the seven standards with a description of each:

Added definitions of:

Physical Science

Life Science

Earth and Space Science

Technology (formerly Science and Technology)

Science in Personal and Environmental Perspectives:

Students should develop an appreciation and understanding of personal and community health, natural resources, natural and human induced hazards and improvements, and technological implications in quality of life. All students (K-12?) should be able to research and assess prevailing environmental and personal health issues and develop a rational understanding of mans relationship to the environment.

History and Nature of Science- the statement in Draft 5 on the Nature of Science says, in part:

the edited document says:

Understanding the history, nature of science and limitations of science is fundamental to scientific learning. Students will learn to distinguish between science and other forms of knowledge or beliefs such as philosophy and religion. Science uses observation, experimentation, induction and deduction, and experimental, observational and statistical verification strategies in formulating and testing the validity of explanations for the behavior of the world around us. These explanations ought to be testable, repeatable, falsifiable, open to criticism and not based upon authority. It is also important that students learn to distinguish be-

tween scientific information (data), scientific explanations (hypotheses, theories, laws, principles, etc.) and the scientific method (the process of arriving at and verifying scientific explanations). Students should learn the applications and limits of science and the inductive and deductive reasoning processes that underlie science.

Deleted the unifying concept entitled Patterns of Cumulative Change from the introduction and throughout the document.

Deleted the chart that provided an overview of the standards.

In the Second Grade Standards, deleted from assessment eight of the 13 indicators marked for assessment at fourth grade.

To Second Grade Standard 5, Benchmark 1, added Indicator 3 and examples:

3. Experience science through technology in the kitchen

Example: Explore simple machines, i.e., wedge, lever and wheel, and their combinations, ramp, screw, pulley, roller and axle from the common kitchen items, such as sausage grinder and rolling pins. Identify the simple machines and discover the way they make tasks easier to perform.

Example: try to find how many machines are build into kitchen device like a hand powered egg beater- a crank or level. (sic)

In Fourth Grade Standards, deleted from assessment 13 indicators marked for assessment.

In Fourth Grade Standards 4, Benchmark 1, changed Indicator 5 from:

Observe fossils and discuss how fossils provide evidence of plants and animals that lived long ago, to:

Observe fossils and discuss how fossils provide evidence of plants and animals that lived in the past.

Changed the example for this indicator from:

Observe a variety of fossils, to:

Provide a variety of fossils for observation. Discuss how fossils are formed; how long it takes an organism to decay or be scavenged; how long it takes for an organism to be fossilized; whether or not all fossilized organisms were dead at the time of burial (i.e. closed clam fossils).

Fourth Grade Standard 5, Benchmark 1, Example, changed wording from

Compare two types of string.. to

Compare and contrast two types of string...

Fourth Grade Standard 5, Benchmark 3, added Indicator 4:

Investigate the various systems that connect utilities to the students home: Electricity, Gas, Water, Sanitation, Telecommunication, etc. Find the source of entry of the system and point where the utility can be accessed. Find the places where the system is controlled. (sic)

Fourth Grade Standard 7, Benchmark 1: All students will develop an awareness that people practice science, is listed, but seemingly is to be replaced, as it is followed by

Benchmark 1: Students will perform testable and repeatable experiments.

Indicators: The students will:

1. (Marked for assessment) Ask a question that can be answered by scientific experiment and do an experiment that will answer the question. Then repeat the experiment to see if they can get the same results.

The example given for this indicator is the same example given for the original Indicator 1.

Replaced Benchmark 2 and Example with:

Benchmark 2: Determine the difference between data, explanations and the scientific method.

Indicator: The students will:

1. Gather data and develop an explanation about the results of an experiment. Tell what is data, what is the explanation and what was the method.

Examples: The amount of growth of a plant is the data. An explanation might be that more light and the nature of the plant caused more growth and the scientific method is doing the repeatable and testable experiment and developing the explanation.

Added Benchmark 3: Learn about people in science.

Indicators: The students will:

Learn about the contributions people have made to science.

Examples: Short stories, films, videos, and speakers

In Eighth Grade Standards, deleted from assessment 31 indicators marked for assessment.

Eighth Grade Standard 1, Benchmark 2, Indicator 3, added the bold in the following:

Identify faulty reasonings or conclusions that go beyond evidence and/or are not supported by data in a current scientific hypothesis or theory.

deleted example for Indicator 3:

Analyze evidence and data which support the theory of continental drift, and replaced it with:

Analyze hypotheses about characteristics of and extinction of dinosaurs. Identify the assumptions behind the hypothesis and show the weaknesses of the reasoning that led to the hypothesis.

Added Indicator 4:

Suggest alternative explanations to scientific hypotheses or theories.

Example: At least some stratified rocks may have been laid down quickly, such as Mount Etna in Italy or Mount St. Helens in Washington state.

Eighth Grade Standards 2, Benchmark 2, made the bold additions to the example:

Follow the path of a toy car down a ramp. The ramp is first covered with tile and then with sandpaper. Consider the total energy (kinetic and potential) at the top of the ramp then at the bottom of it. Note the conversion of potential to kinetic energy. Trace the force, direction and speed of a baseball, from leaving the pitchers hand and returning back to the pitcher through one of many possible paths. What is the source of force that causes a curve ball to move sideways in midflight?

Eighth Grade Standard 3, Benchmark 1, added bold:

Compare and contrast organisms composed of single cells with organisms that are multicellular.

Eighth Grade Standard 3, Benchmark 5 explanation in Draft 5 states:

...Biological evolution, gradual changes of characteristics of organisms over many generations, has brought variations in populations. Changed to:

...Over time, genetic variation acted upon by natural selection has brought variations in populations. This is termed microevolution.

Also, added the bold in the following:

A structural characteristic or behavior that helps an organism survive and reproduce in its environment is called an adaptation.

When the environment changes and the adaptive characteristics or behaviors are insufficient, the species becomes extinct.

Also, deleted: Students can compare similarities between organisms in different parts of the world, such as tigers in Asia and mountain lions in North America.

Also, deleted:

Students tend to think of all individuals in a population responding to change quickly rather than over a long period of time.

Added:

Natural selection can maintain or deplete genetic variation but does not add new information to the existing genetic code.

To the following added bold:

Using examples of microevolution such as Darwins finches... deleted over time at the end of the sentence.

Changed the following:

Providing students with fossil evidence and allowing them time to construct their own explanations is important in developing middle level students understanding of extinction as a natural process that has affected earth's species over time. to: Examining fossil evidence assists the students understanding of extinction as a natural process that has affected Earth's species.

Deleted reference to resource.

Replaced Indicator 1:

Conclude that millions of species of animals, plants, and microorganisms may look dissimilar on the outside but have similarities in internal structures, developmental characteristics and chemical processes with: Conclude that millions of species of animals, plants and microorganisms have similarities in internal structures, developmental characteristics and chemical processes.

Replaced Indicator 2:

Understand that adaptation of organisms- changes in structure, function, or behavior- contribute to biological diversity with: Understand that microevolution, the adaptation of organisms- by changes in structure, function, or behavior- favors beneficial genetic variations and contributes to biological diversity.

Added Indicator 4:

Understand that natural selection acts only on the existing genetic code and adds no new genetic information.

Added example:

Research hemophilia among the Royalty of the 17th - 19th century.

Added Indicator 5:

The effect of selection on genetic variation is a well-substantiated theoretical framework in biology.

Added example:

Selection (natural and artificial) provides the context in which to ask research questions and yields valuable applied answers, especially in agriculture and medicine.

Standard 4, Benchmark 1 changed Indicator 4:

Understand that earth's plate movements result in major geologic events and landform development to:

Based on the prevailing model, connect the layers of the lithosphere with earth's plate movement that results in major geologic events and landform development.

Standard 4, Benchmark 2 changed Indicator 1:

Understand the dynamics of earth's constructive and destruc-

tive forces over time to:

Examine the dynamics of earth's constructive and destructive forces over time.

Deleted Examples and replaced them with:

Discuss the destructive forces of volcanoes and the resultant rocks.

Discuss major river floods and resultant sedimentary rock depositions.

Deleted Indicator 2:

Model geologic time to scale and replaced it with:

Compare geologic evidence from different areas.

Deleted Example and replaced it with:

Locate the same rock layer in two different road cuts: give fossil and other evidence that the layer is the same in both exposures. Compare sedimentary deposits from other areas. Are all layers of the geologic column present? If not. Which ones are missing? (sic) Are the layers of the geologic column always found in the expected sequence?

Deleted Indicator 3:

Relate geologic evidence to a record of earth's history .

Standard 4, Indicator 5: changed:

Trace cultural, as well as scientific, influences on the study of astronomy to: Trace scientific influences on the study of astronomy.

Standard 5, Benchmark 2, Indicator 2, Example changed from:

Select a technology to evaluate using a graphic organizer to:

Select a technology to evaluate.

Added Example:

Show the development of compound and complex machines in today's technological culture, i.e., a simple hand twist drill encompasses wheel, gears, helix, wedge, lever. The power screwdriver/drill adds to the complexity. An electric motor, control switch, torque limitation, and power storage battery further enhances (sic) its ability.

Added Example:

Investigate the complexity of current consumer electronics devices, such as

a VCR, video cam-corder, or digital camera. Identify:

\* mechanical features,

\* optical features,

\* electronic features, and

\* Stylistic features.

\* Compare costs and features of competitive products.

Standard 6, Benchmark 2, Indicator 2, Example, replaced:

Evaluate the benefits of burning fossil fuels to meet energy needs against the risks of global warming with:

What temporary changes in the atmosphere are caused by the cars and trees in our community?

Deleted Standard 7, Benchmark 1, Indicator 3:

Display open-mindedness to new ideas and Example that talked about claims regarding global warming and dietary claims, and replaced with:

Learn about falsification.

Added Example:

What would we accept as proof that the theory that all cars are black is wrong? How many times would we have to prove the theory wrong to know that it is wrong? Answers: One car of any color but black and only one time. Not matter how much evidence seems to support a theory, it only takes one proof that it is

false to show it to be false. It should be recognized that in the real world it might take years to falsify a theory.

In Twelfth Grade Standards deleted from assessment 35 indicators marked for assessment.

Twelfth Grade Standards, Benchmark 3 (Physical Science) Indicator 7: Assess the interrelationship between the rate of chemical reactions and variables such as temperature, concentration, and reaction type, to which was added: Why body temperature (sic) remains constant? What about cold blooded animals?

Standard 3 (Life Science), Benchmark 2, added Indicator 7: That biologists recognize that the primary mechanisms of genotypic change are natural selection and random genetic drift.

Added Examples:

Natural selection includes the following concepts: 1) Heritable variation exists in every species; 2) some heritable traits are more advantageous to reproduction and/or survival than are others; 3) there is a finite supply of resources required for life; not all progeny survive; 4) individuals with advantageous traits generally survive; 5) The advantageous traits increase in the population through time.

Deleted Standard 3, Benchmark 3 Biological Evolution, with five Indicators and accompanying examples.

Deleted Standard 3, Benchmark 6 (new Benchmark 5), Indicator 3:

Like other aspects of an organisms biology, behaviors have evolved through natural selection, and deleted accompanying example.

Deleted Standard 4, Benchmark 3 (with five indicators):

Students should develop an understanding of the origin and evolution of the dynamic Earth system, and replaced it with:

3. Students shall understand the history of the Earth.  
Example: Research all published data on the fossils present in the layers of the Grand Canyon.

Example: Investigate how rocks and fossils are dated. Identify assumptions used in radioactive decay methods of dating. Compare and evaluate data obtained on ages from such places as Mount St. Helens and the meteorite names Allende.

Example: Examine recent sedimentology experiments. Students could design and conduct experiments that show how layers are formed.

Deleted Standard 4, Benchmark 4:

...Students should develop an understanding of the universe, its origins, and evolution, and replaced it with:

Students should develop an understanding of the universe. The origin of the universe remains one of the greatest questions in science. Studies of data regarding fossils, geologic tables, cosmological information are encouraged.

But standards regarding origin are not mandated.

Deleted Benchmark 4, Indicator 1:

Formation of the universe, and replaced it with:

1. The structure of the universe.

Deleted Example for Indicator 1, which discusses the big bang theory, and replaced it with:

Galaxies are found in clusters and the clusters of galaxies are grouped together into super clusters.

Standard 6, Benchmark 1, Indicator 5, changed:

Sexuality is basic to healthy human development, to:

Sexuality is a serious component of being human and it de-

mands strong personal reflection in light of the life-long personal effects on students.

Standard 6, Benchmark 2, Indicator 3, Example, deleted last part:

Natural resources limit the capacity of ecosystems to sustain populations.

Standard 6, Benchmark 3, Indicator 2, changed from:

The Earth does not have infinite resources to:

The earth's resources are finite.

Added Standard 6, Benchmark 4, Indicator 3:

Human activities can increase potential hazards as well as decrease them.

Standard 7, (History and Nature of Science), Benchmark 1, Indicator 5

deleted: Recognize societies role in supporting topics of research and determining institutions where research is conducted.

Standard 7, Benchmark 2, added Indicator 3:

Explain how science uses peer review, replication of methods, falsification and norms of honesty.

## APPENDICES

Glossary- changed the heading from Terms: Concepts of Standards to Terms concerning the Concepts of Standards

Changed heading Terms: Science Content of the Kansas Science Education Standards to Terms Concerning the Science Content of the Kansas Science Education Standards

Changed definition of Evolution- Biological to Evolution, and added the terms macro-evolution to long-term perspective and the term micro-evolution to the short-term perspective.

Deleted:

In the long term, evolution is the decent with modification of different lineages from common ancestors. In the short term, evolution is the on-going adaptation of organisms to environmental challenges and changes.

Deleted the term and definition for: Evolution- Cosmological.

Added the definition for:

Falsification: a method for determining the validity of a hypothesis, theory or law. To be falsifiable, a theory must be testable, by others, in such a way that, if it is false, the tests can show that it is false. (sic)

Added the term and definition:

Pollution: the resulting condition of something being made physically impure or unclean. In the biological world, one organisms waste is food for another. its when an ecological imbalance occurs that you have pollution. Plants, animals and humans can all contribute to the pollution of our world.

Changed the beginning of the definition of SCIENCE from:

The human activity of seeking natural explanations for what we observe... to

The Human activity of seeking logical explanations of what...

Changed the definition of THEORY from:

In science, a well-substantiated explanation of some aspect of the natural world... to:

In science, an explanation of some aspect of the natural world...

Deleted Appendix 2: Diagram Explanation for the Science Standards

Added Appendix 2: Falsification- just over two pages added.

Deleted Appendix 3: Scientific Thinking Processes

Changed Appendix 4 to Appendix 3.  
Deleted Appendix 5 (although it is referred to several times earlier in the document).

## Teach, Therefore I Worry, in Kansas

By Brad Williamson

Sunday, August 29, 1999; Page B01, Washington Post

OLATHE, Kan.—I started my 24th year of teaching high school biology last week with a feeling of uncertainty unlike any I have ever experienced. Not even greeting my first class in my first year of teaching compares. Why? I was born, raised, educated and have always taught in Kansas--something I've claimed with pride. Now I'm on the defensive, though. I'm making excuses for my state because of the Board of Education's recent decision to approve new science standards--over the objections of a 27-member statewide committee on which I served--that attempt to deny the critical importance of evolution to the understanding of biology.

Don't get me wrong. Despite the state board's efforts, my students and I will still be exploring the diversity and history of life on Earth, experimenting with plant breeding to understand natural selection, analyzing genetic data banks to propose evolutionary relationships and collaborating with researchers who are investigating the evolutionary biology of the monarch butterfly. I am certain about the place of evolution in biology education.

What I am more uncertain about is what will happen in the community as a result of the state board's actions. Many people in our community have different views from mine, based on their religious convictions. Students in my class have sometimes expressed disbelief--and have even become upset--when I discuss Darwin or the Big Bang theory. This difference of opinion about the origins of life is not new--it has been present in my classes every year of my teaching career.

I've always respected those views. Until now, though, I've been able to minimize possible conflict. I have encouraged my students to seek guidance at home or with clergy members whenever they have felt that their biology study is in conflict with their religious beliefs. Our committee's proposed standards specifically recognized the division, stating that an understanding of evolutionary principles is not the same as a "belief" in them. But now I worry that the state board's action risks polarizing the community by forcing people to take sides.

Sometimes I wonder how we arrived at this point. When my wife (also a science teacher) and I were appointed to the science standards panel last year by the state's commissioner of education, Andy Tompkins, we had no idea that our committee's efforts would lead to a fundamental reassessment of one of the basic principles of biological science. We were aware that social conservatives had mounted successful campaigns to win seats on the state Board of Education, and that the 10-member board was split evenly between its conservative and moderate members. We also knew that the conservative members were taking a much more activist role in curriculum issues. But in those early days, there was no public evidence that Kansas was about to become the next battleground for the debate over evolution that has taken place recently in Arizona, New Mexico and other states.

Our committee--made up of scientists, educators and citizens,

including some appointed by the Board of Education members--was asked to provide more specificity and depth of content to the state's science standards. In our state, curriculum standards are only suggested as guidelines to help local school districts establish their own specific curriculums. That's why I can carry on teaching evolution to my students. However, there's a catch. The state standards are also used to develop mandatory, grade-level assessments that are directly tied to school accreditation.

My brother says that mankind's most effective invention for wasting time is the committee meeting. So that our committee wouldn't fall into that trap, we selected the National Science Education Standards (NSES) as a framework for our proposed standards. The NSES, the result of three years of intense work by hundreds of educators and scientists from all over the country, were designed to help states develop their standards.

Like the NSES, our document included evolution as a major theme in science, uniting many disciplines including cosmology, geology and physics, as well as biology. Some committee members raised questions about the wording, and we spent more than a year addressing concerns from citizens and board members, modifying the document to present science while trying to minimize perceived conflict. John Staver, the writing team co-chair, my wife and I spent quite a bit of time working directly with three board members to find a resolution to our differences. In the end, it wasn't enough.

When the proposed standards went before the public at hearings around the state, evolution opponents came in large numbers to several meetings to voice their displeasure. For months, the newspapers carried stories about the debate and about how the board was "deadlocked" over the standards. Several of us--and I was right in there--were pessimistic about swaying the social conservatives, but we were equally convinced that standards designed to help students prepare for the future required an understanding of evolution. If you believe that the world is only 10,000 years old, how can you understand plate tectonics, or mineral exploration?

In May, one board member, Steve Abrams, sent Staver his own revision. The document, which Abrams said had been developed with the help of citizen groups, including evolution opponents, contained a definition of creation as "the idea that the design and complexity of the design of the cosmos requires an intelligent designer." Abrams's document was not passed by the board, but it did open the door to a major revision of our work. On Aug. 11, the Board of Education voted, 6 to 4, to adopt a revised set of the writing team's standards. (Three board members made these revisions, since those of us on the writing team refused to remove evolution.) The resulting document greatly reduced and misrepresented the concept of evolution and related science topics. It omitted all mention of geologic time, for example, and radically restructured cosmology.

It also brought national attention to education in our state. Ever since, the other writing team members and I have been inundated with requests for interviews by each of the major networks, the New York Times, The Washington Post, Time, U.S. News, and journals such as Nature and Science. I know that our state's reputation in education is seriously damaged, but given the continuing public response to the board's decision, I have every confidence that voters at next fall's election will reestablish appropriate and effective educational leadership of the Kan-

sas Board of Education. But even if that happens, I can't help wondering whether we have laid bare some deeply rooted issues that will continue to inflame this controversy.

Much has been written since mid-August about the nature of both science and religion by others more eloquent than I. For now, I am interested in how this conflict expresses itself in my community--between the so-called "creationists" and the "evolutionists"--as we find ourselves picking sides. It seems clear to me that instead of remaining a single community, we may be allowing the fallout from the vote to divide us starkly into "us" and "them." Count the letters to the editor in my local paper, the Kansas City Star, and you'll find about twice as many in favor of teaching evolution as against. In some central Kansas towns, the letters are running closer to 50-50.

In Kansas, you can assume that nearly everyone you meet believes in some form of divine creation. At the same time, these very folks have demonstrated throughout our state's history an enormous level of support and commitment to excellence in education. That includes science education. Just as in every other state, the citizens of Kansas want for their children the best possible future--and they see education as the answer. This is not a paradox. Although I know many parents of the kids I teach pursue very different beliefs in their homes and churches, the strength of their faith allows them to trust me to teach science in the classroom. As Kansas Gov. Bill Graves (R) recently said, "In my education experience, the focus of science was based on evolution. There was still always a healthy opportunity at home and through what we learned in our churches to understand the creation of the universe." For most Kansans, there really is no conflict between science and religion. Our churches have helped us search for spiritual truth, and our schools have helped us understand the natural world.

The board's action creates an entirely different educational environment, though, by legitimizing the notion that science and religion cannot coexist. By politicizing this issue and their own particular interpretation of Biblical scripture, religious activists (like some of the board members) have created confusion and division. They would erect a wall between "creationists" and "evolutionists" and demand that each citizen choose one or the other side. And I sense new anger and frustration in the Star's letters to the editor.

That's how I see things now; that's the source of my uncertainty at the start of this school year. I'm worried about that wall.

### What Was All the Fuss About?

Here's an excerpt on evolution from the proposal, based on National Science Education Standards, that the 27 members of the Kansas science curriculum committee put forth in January for the state board of education's approval.

The students will understand:

1. That biological evolution is the scientific theory that living things share common ancestry, and that through time changes have occurred in different lineages as they became adapted to different ways of life.

2. That biologists use evolution theory to explain the Earth's present-day biodiversity which developed over approximately 3.8 billion years.

3. That biologists recognize that the primary mechanisms of evolution are natural selection and random genetic drift.

4. The sources and value of variation.

5. That evolution by natural selection is a broad, unifying theoretical framework in biology.

Understand does not mandate "belief." While students may be required to understand some concepts that researchers use to conduct research and solve practical problems, they may accept or reject the scientific concepts presented. This applies particularly where students' and/or parents' religion is at odds with science.

In mid-August, the board of education approved standards that eliminated virtually all mention of evolution and related concepts, including natural selection, common ancestors and the origins of the universe.

Source: Kansas science education standards, third working draft

My students have been back for more than a week, and so far things are going well; class is much the way it always was, with plant breeding and monarch butterflies. So maybe my work with the Board of Education clouded my reasoning, making me worry that its actions reflected a change in the personality of my native state. Maybe I should have known better. Right now, I can only hope.

Brad Williamson was a member of the Kansas committee that worked on revising the state's science curriculum guidelines. He teaches at Olathe East High School.

### Creationism vote also creates a problem for hiring at KSU

Jennifer Detweiler

Staff Writer, Manhattan Mercury  
Kansas State University will have a hard time recruiting biology professors because of the State Board of Education's decision to weaken the emphasis on evolution in science classes, a KSU official said today.

Gary Conrad, a biology professor at K-State working on the department's yearly campaign to recruit professors, recently received a letter from Maxine Singer, president of the Carnegie Institute in Washington, D.C., saying that she "would not recommend anyone to take a position in biology in Kansas."

The letter continued, "The students who come to Kansas State University will not have had appropriate preparation in biology in high school to undertake se-

rious study."

Although the board's decision does not directly impact instruction at KSU, it will weaken science education in Kansas high schools and middle schools, Conrad said.

Although the new standards are meant to simply be the basis for state assessment tests - not a curriculum guide - many worry teachers will eventually stop teaching evolution since it won't be appearing on the assessments.

Singer's letter added that anyone who would move to Kansas to teach would also "have to be concerned about the sort of education their children would receive."

Singer also wrote that anyone taking a job in biology in Kansas "would likely have problems of various kinds that stem from the general attitude of the state."

Singer's letter came in response to a letter from Conrad asking her to recommend potential applicants for professorships at K-State.

The letter was one of 200 letters Conrad said he sent to science professionals across the nation as part of the recruitment cam-

paign.

Conrad sent his letters about a week before the state board delivered its new science standards, which have been nationally criticized. Conrad said before the decision was known, his office had received half a dozen responses from interested applicants; since the decision about two weeks ago, no applications have come in.

Conrad said he is convinced that while Singer's was the only letter he received vowing not to recommend K-State, there will be other science professionals who won't be sending potential professors this direction.

Many "must have said 'how can they be recruiting people in these fields... if they're not allowing students to be taught about evolution?'" Conrad said.

He said he suspects many professionals don't realize K-State will continue to teach extensively the principles of evolution - that the state board decision doesn't apply to the university system. (State universities are governed by the Board of Regents, an entirely separate, governor-appointed board.)

He said evolution is actually a major component of freshman biology at KSU, in which 800 students a semester enroll, he explained.

Not teaching evolution, as far as K-State's biology department is concerned, Conrad said, "would be like not teaching something like gravity."

But Conrad doesn't blame other scientists for falsely assuming that the state board ruling extends to the university level.

For them to assume that K-State will continue to teach evolution "takes a leap of faith on their part" that he is concerned no one is willing to make.

Conrad has sent letters to Kansas legislators, members of the State Board of Education and university officials telling them he is urging the Legislature to find a way to reverse the evolution decision.

For now, Conrad said, he fears "no one in their right mind would want to come here."

You can reach Jennifer Detweiler by phone at 776-2300, ext. 248, or by e-mail at [jdetweiler@themercury.com](mailto:jdetweiler@themercury.com)

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## **Biology Teachers Decry Kansas Decision on Evolution**

By Wayne W. Carley, Ph D, Executive Director NABT

The National Association of Biology Teachers is deeply concerned by the August 11th decision of the Kansas State Board of Education to adopt new curriculum standards that virtually remove evolution and related topics from the Kansas science curriculum. By eliminating the fundamental unifying theme of biology, Kansas has done a serious disservice to its young people and the educational system that serves them. According to Wayne W. Carley, Ph.D., Executive Director of the National Association of Biology Teachers, we fear that by learning only partial truths, Kansas students will be unprepared for college admission tests and college science courses. Ultimately, a whole generation of Kansas citizens will be ill-prepared to deal with the scientific and technological world around them.

Teaching evolution is important for two reasons. First, evolution is real. As clearly documented evidence shows, life existed on Earth for more than one billion years. During that time life

has changed and evolved through a succession of natural forces acting within accepted physical laws. As a theory, like other established scientific theories, such as the theory of the atom and of gravity, evolution provides a powerful framework for asking - and answering - questions about our natural, physical world.

Second, teaching about evolution develops in students powerful skills of analysis and evaluation. The rigorous scientific thinking and testing that have gone into our current understanding of evolution represent the triumph of the best in human knowledge. It is essential that we teach today's youth these same processes of critical scientific analysis and testing so they can solve tomorrow's problems.

The political forces that try to eliminate evolution from science classrooms impose a narrow, sectarian doctrine on our educational systems. This imposition represents an affront not only to the constitutional separation of church and state but also to the moral and intellectual integrity embedded in that constitution. It also clouds and weakens both the intellectual strength of science and the moral strength of the religion. The National Association of Biology Teachers urges all biology educators to teach modern scientific evolution; it is imperative that all local, state and national politicians and educational leaders support that effort. If we are to compete academically on an international level, we must insist on only the best, intellectually rigorous education for our youth. The National Association of Biology Teachers, established in 1938, is the only national organization dedicated to serving the needs of all biology educators. It is comprised of some 8,000 science educators, science supervisors, administrators, scientists, business and industry representatives, and others involved in science education.

### **NABT Statement on Teaching of Evolution**

As stated in *The American Biology Teacher* by the eminent scientist Theodosius Dobzhansky (1973), "Nothing in biology makes sense except in the light of evolution." This often-quoted assertion accurately illuminates the central, unifying role of evolution in nature, and therefore in biology. Teaching biology in an effective and scientifically-honest manner requires classroom discussions and laboratory experiences on evolution.

Modern biologists constantly study, ponder and deliberate the patterns, mechanisms and pace of evolution, but they do not debate evolution's occurrence. The fossil record and the diversity of extant organisms, combined with modern techniques of molecular biology, taxonomy and geology, provide exhaustive examples and powerful evidence for genetic variation, natural selection, speciation, extinction and other well-established components of current evolutionary theory. Scientific deliberations and modifications of these components clearly demonstrate the vitality and scientific integrity of evolution and the theory that explains it.

This same examination, pondering and possible revision have firmly established evolution as an important natural process explained by valid scientific principles, and clearly differentiate and separate science from various kinds of nonscientific ways of knowing, including those with a supernatural basis such as creationism. Whether called "creation science," "scientific creationism," "intelligent-design theory," "young-earth theory" or some other synonym, creation beliefs have no place in the science classroom. Explanations employing nonnaturalistic or super-

natural events, whether or not explicit reference is made to a supernatural being, are outside the realm of science and not part of a valid science curriculum. Evolutionary theory, indeed all of science, is necessarily silent on religion and neither refutes nor supports the existence of a deity or deities.

Accordingly, the National Association of Biology Teachers, an organization of science teachers, endorses the following tenets of science, evolution and biology education:

- The diversity of life on earth is the outcome of evolution: an unpredictable and natural process of temporal descent with genetic modification that is affected by natural selection, chance, historical contingencies and changing environments.

- Evolutionary theory is significant in biology, among other reasons, for its unifying properties and predictive features, the clear empirical testability of its integral models and the richness of new scientific research it fosters.

- The fossil record, which includes abundant transitional forms in diverse taxonomic groups, establishes extensive and comprehensive evidence for organic evolution.

- Natural selection, the primary mechanism for evolutionary changes, can be demonstrated with numerous, convincing examples, both extant and extinct.

- Natural selection—a differential, greater survival and reproduction of some genetic variants within a population under an existing environmental state—has no specific direction or goal, including survival of a species.

- Adaptations do not always provide an obvious selective advantage. Furthermore, there is no indication that adaptations—molecular to organismal—must be perfect: adaptations providing a selective advantage must simply be good enough for survival and increased reproductive fitness.

- The model of punctuated equilibrium provides another account of the tempo of speciation in the fossil record of many lineages: it does not refute or overturn evolutionary theory, but instead adds to its scientific richness.

- Evolution does not violate the second law of thermodynamics: producing order from disorder is possible with the addition of energy, such as from the sun.

- Although comprehending deep time is difficult, the earth is about 4.5 billion years old. *Homo sapiens* has occupied only a minuscule moment of that immense duration of time.

- When compared with earlier periods, the Cambrian explosion evident in the fossil record reflects at least three phenomena: the evolution of animals with readily-fossilized hard body parts; Cambrian environment (sedimentary rock) more conducive to preserving fossils; and the evolution from pre-Cambrian forms of an increased diversity of body patterns in animals.

- Radiometric and other dating techniques, when used properly, are highly accurate means of establishing dates in the history of the planet and in the history of life.

- In science, a theory is not a guess or an approximation but an extensive explanation developed from well-documented, reproducible sets of experimentally-derived data from repeated observations of natural processes.

- The models and the subsequent outcomes of a scientific theory are not decided in advance, but can be, and often are, modified and improved as new empirical evidence is uncovered. Thus, science is a constantly self-correcting endeavor to understand nature and natural phenomena.

- Science is not teleological: the accepted processes do not start with a conclusion, then refuse to change it, or acknowledge as valid only those data that support an unyielding conclusion. Science does not base theories on an untestable collection of dogmatic proposals. Instead, the processes of science are characterized by asking questions, proposing hypotheses, and designing empirical models and conceptual frameworks for research about natural events.

- Providing a rational, coherent and scientific account of the taxonomic history and diversity of organisms requires inclusion of the mechanisms and principles of evolution.

- Similarly, effective teaching of cellular and molecular biology requires inclusion of evolution.

- Specific textbook chapters on evolution should be included in biology curricula, and evolution should be a recurrent theme throughout biology textbooks and courses.

- Students can maintain their religious beliefs and learn the scientific foundations of evolution.

- Teachers should respect diverse beliefs, but contrasting science with religion, such as belief in creationism, is not a role of science. Science teachers can, and often do, hold devout religious beliefs, accept evolution as a valid scientific theory, and teach the theory's mechanisms and principles.

- Science and religion differ in significant ways that make it inappropriate to teach any of the different religious beliefs in the science classroom. Opposition to teaching evolution reflects confusion about the nature and processes of science. Teachers can, and should, stand firm and teach good science with the acknowledged support of the courts. In *Epperson v. Arkansas* (1968), the U.S. Supreme Court struck down a 1928 Arkansas law prohibiting the teaching of evolution in state schools. In *McLean v. Arkansas* (1982), the federal district court invalidated a state statute requiring equal classroom time for evolution and creationism. *Edwards v. Aguillard* (1987) led to another Supreme Court ruling against so-called "balanced treatment" of creation science and evolution in public schools. In this landmark case, the Court called the Louisiana equal-time statute "facially invalid as violative of the Establishment Clause of the First Amendment, because it lacks a clear secular purpose." This decision—"the Edwards restriction"—is now the controlling legal position on attempts to mandate the teaching of creationism: the nation's highest court has said that such mandates are unconstitutional. Subsequent district court decisions in Illinois and California have applied "the Edwards restriction" to teachers who advocate creation science, and to the right of a district to prohibit an individual teacher from promoting creation science, in the classroom. Courts have thus restricted school districts from requiring creation science in the science curriculum and have restricted individual instructors from teaching it. All teachers and administrators should be mindful of these court cases, remembering that the law, science and NABT support them as they appropriately include the teaching of evolution in the science curriculum.

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### **KABT BOARD Endorses NABT STATEMENT on EVOLUTION – October 11, 1997**

The Kansas Association of Biology Teachers Board endorses the NABT Statement on Teaching Evolution as approved at the October 11, 1997 NABT Board meeting. Having taken no action on the previous draft, this is the only version endorsed by the KABT Board. While this policy does not include the terms “impersonal”: and “unsupervised,” this statement in no way states, or infers by omission, that biological evolution involves creationist or non-natural processes. The KABT Board regrets that the NABT action to remove the two terms from their previous policy has resulted in the mistaken impression that NABT was acknowledging the possibility that supernatural powers could be involved in evolution. The KABT Board further points out that the 1987 Supreme Court decision in *Edwards v. Aguillard* does not allow “equal time” for creationism in the science classroom.

#### **From the ACLU Dated - 9/1/99**

In 1925, the American Civil Liberties Union defended biology teacher John Scopes in the famous Tennessee “monkey trial” against the charge that he had broken a state statute that banned the teaching of evolution. In 1968, the ACLU participated in *Edwards v. Aguillard*, the landmark Supreme Court case which held that states could not prohibit the teaching of evolution in public schools. For nearly 75 years, the ACLU has defended religious freedom and challenged attempts by sectarians to impose their religious beliefs and practices on others through government sponsorship. The ACLU will continue its vigilance in Kansas and in other states as this new anti-evolution movement begins to spread throughout the country. We are currently researching the legal issues surrounding the recent actions of the

Kansas Board of Education, but we need assistance in monitoring schools and school districts throughout the state.

The ACLU asks that teachers, students, and all members of the public be on the look out for the following situations: (1) schools or school districts which either prohibit the teaching of evolution or no longer require the teaching of evolution as part of its curricula, (2) changes in textbook content which omit theories of evolution, and (3) the introduction of religious based theories in science courses by schools, school districts, or teachers. You may contact our office in Kansas City at (816) 756-3113 if you become aware of any of these situations.

Today, as in 1925, the ACLU remains committed to the principles of separation of church and state within our public schools. With your help, we can continue to maintain the high standards of science education that Kansas schools, and other school districts nationally, have long maintained.

#### **Why I Support.....**

Recently there has been a great deal of impetus on teaching topics that are not really science in our science curriculum. This was brought out with the hearings on the new state standards. I have looked to KABT and the members for support in this area and have definitely received it. I thought that it was necessary to move beyond the state and look to the other areas of support. NABT offers excellent support and has for a long time. Still looking for more support I went to the National Center For Science Education. I have received so much support that I decided to make a monthly contribution to assist them with their work. This is just one reason why I joined all three organizations. It sure helps me in the classroom. The web address for National Center For Science Education is <http://www.natcensci.org>.

J.B.S. Haldane and C. H. Waddington once argued that there are four complementary perspectives in biology: biochemical, physiological, developmental, and evolutionary. In order to lay claim to understanding any aspect of biology, the biologist must be conversant with all four of these perspectives and how they can be brought to bear on the understanding the phenomena we can observe.

John Wachholz

#### **Scientific Integrity A Position Paper From NABT**

The ongoing procedures and processes of science are well-defined within each scientific discipline, including biology. The principles and theories of science have been established through repeated experimentation and observation and have been refereed through peer review before general acceptance by the scientific community. Acceptance does not imply rigidity or constraint, or denote dogma. Instead, as new data become available, previous scientific explanations are revised and improved, or rejected and replaced. Materials, methods and explanations that fail to meet these ongoing tests of science are not legitimate components of the discipline and therefore must not be part of a science curriculum.

Science may appear to conflict with other ways of knowing about the universe, unfortunately leading some groups to see selected theories of science as a threat to their belief systems. This is not the case: science does not, in fact cannot, explain or judge nonscientific issues or supernatural belief systems.

Science is but one way of making sense of the world, with internally-consistent methods and principles that are well de-

scribed. Among these principles is the notion that proposed causes and explanations must be naturalistic. Any attempt to mix or contrast supernatural beliefs and naturalistic theories within science misrepresents the scientific enterprise and debases other, nonscientific, ways of knowing. These attempts, which commonly result from a misunderstanding of the nature of science itself, have no place in science or in the science classroom or laboratory.

The credibility and utility of science, and therefore biology, depend on maintaining its integrity. NABT has a special obligation to promote this integrity in life science education. The data, concepts and theories of science presented to students must meet the accepted standards of the discipline. To this end, NABT will not support efforts to include in the science classroom materials or theories derived outside of the scientific processes. Nonscientific notions such as geocentrism, flat earth, creationism, young earth, astrology, psychic healing and vitalistic theory, therefore, cannot be legitimately taught, promoted or condoned as science in the classroom.

### **The Monarch Watch**

**<http://www.monarchwatch.org>**

Check the website out, order your tags and be part of The Monarch Watch. Visiting this website and getting involved will only generate enthusiasm in your students!

**From KANCRN – <http://kancrn.org>**

The Kansas Winter Bird Feeder Survey is a cooperative effort between the Kansas Department of Wildlife and Parks and the Kansas Ornithological Society, to census birds at feeders throughout Kansas. Hundreds of volunteers, who watch their feeders and count birds on two, of four designated days on their backyards or school feeders, in January of each year. The survey started in January of 1988. The data are gathered by hundreds of volunteers at home and from OWLS sites across the State. <http://kancrn.org/winterbird/index.cfm>

### **Apologies**

The KABT Website has not been updated properly lately. It is no ones fault but my own. I have some help at school so we should get it updated and improved shortly. Sorry!

<http://kabt.org>

Please send us your suggestions to [jwachholz@midkan.net](mailto:jwachholz@midkan.net).

### **Apologies**

This newsletter is full of information with no frills. Just printed information that seems to me to be very pertinent. Have a good school year. As Rachel Carson said, "Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts." J. Wachholz

- Rachel Carson

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KABT Regions



## KABT Listserv

The listserv for KABT is now up and running. We also have it mirroring in a web discussion area. We will subscribe all member for which we have e-mail addresses. If you do not want to be on the listserv, you will get information to unsubscribe when you get the first information page. You may also use the simple box on the web site (<http://kabt.org>) that will allow you to enter your e-mail address and get you subscribed as a participant of the KABT listserv. Wait a few days to make sure you are not automatically subscribed. You should receive your information message by then if we have your correct e-mail address. So you will be automatically subscribed if we have your information or you can subscribe via the web site. It should be really helpful to get the biology teachers online before the next State Board meeting on the standards. KABT listserve - biology teachers communicating information.

## Great Story

His name was Fleming, and he was a poor Scottish farmer. One day, while trying to make a living for his family, he heard a cry for help coming from a nearby bog. He dropped his tools and ran to the bog. There, mired to his waist in black muck, was a terrified boy, screaming and struggling to free himself. Farmer Fleming saved the lad from what could have been a slow and terrifying death.

The next day, a fancy carriage pulled up to the Scotsman's sparse surroundings. An elegantly dressed nobleman stepped out and introduced himself as the father of the boy Farmer Fleming had saved. "I want to repay you," said the nobleman. "You saved my son's life." "No, I can't accept payment for what I did," the Scottish farmer replied, waving off the offer.

At that moment, the farmer's own son came to the door of the family hovel. "Is that your son?" the nobleman asked. "Yes," the farmer replied proudly. The nobleman said "I'll make you a deal. Let me take him and give him a good education. If the lad is anything like his father, he'll grow to a man you can be proud of."

And that he did. In time, Farmer Fleming's son graduated from St. Mary's Hospital Medical School in London, and went on to become known throughout the world as the noted Sir Alexander Fleming, the discoverer of Penicillin.

Years afterward, the nobleman's son was stricken with pneumonia. What saved him? Penicillin. The name of the nobleman? Lord Randolph Churchill. His son's name? Sir Winston Churchill.

Someone once said: What goes around comes around. Work like you don't need the money. Love like you've never been hurt. Dance like nobody's



### KABT Membership Application - Renewal - Form (Dues Increase After 9/30/99!)

Name: \_\_\_\_\_  
(Mr.-Mrs.-Ms.-Dr.-Miss) First Name Last Name

Mailing Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_ Zip: \_\_\_\_\_ - \_\_\_\_\_

School/Institution: \_\_\_\_\_

Position: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_ Zip: \_\_\_\_\_ - \_\_\_\_\_

Phone: Work (\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_ Home: (\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_

FAX: (\_\_\_\_) \_\_\_\_ - \_\_\_\_\_ Internet Address: \_\_\_\_\_@\_\_\_\_\_

Enclosed Dues For KABT \$10.00 / Year Before 9/30/99 - After this date, Dues For KABT \$15 / Year  
Life Membership Available For \$200 Before 9/30/99 - After this date, Life Membership \$300  
National Association of Biology Teacher Dues: \$59.00 / Year

Yearly Due Date is September 1st - Make Check Payable To KABT - Tax ID #: 48-0945206

Send Dues & Information To:

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