

# nature structural & molecular biology

## What is science?

The battle over teaching evolution in the classroom is fought in courtrooms and on school boards across America, and recent developments could affect science education throughout the country. Eleven parents have filed a lawsuit against the school board of Dover, Pennsylvania, charging that the decision to require teaching intelligent design as an alternative hypothesis to evolution violates the US Constitution's ban on state promotion of religion. Both sides have now argued their case in front of a judge, and a ruling is expected in January 2006. But elections in early November have ousted eight board members who favored the intelligent design policy and replaced them with those against it. It seems likely that, irrespective of the outcome of the trial, the policy will be reversed.

Although this is a gain for science education, elsewhere in the country the very definition of science is being rewritten. On November 8, 2005, the Kansas Board of Education voted six to four to adopt new science standards that are critical of evolution. Even though the board contends that the standards do not mandate the teaching of intelligent design—nor do they prohibit it—the explicit criticisms listed in the standards adopt the same language used by proponents of intelligent design.

In the new Kansas science standards (<http://www.ksde.org/commiss/nov2005materials.pdf>), the board redefines science as “a systematic method of continuing investigation that uses observation, hypothesis testing, measurement, experimentation, logical argument and theory building to lead to more adequate explanations of natural phenomena.” This largely operational definition of science makes one crucial omission: the word “natural” has been removed from the phrase “natural explanations.” This definition thus serves as a standing invitation for including discussion of supernatural explanations for natural phenomena, such as the origin of life, in science classrooms.

Fortunately, the standards will not take effect until 2007 at the earliest, and with any luck the elections in 2006 may once again change the makeup of the school board and its direction. Thus, it is uncertain whether any Kansas students will actually be subjected to the new standards. Nevertheless, given that four other states—Minnesota, New Mexico, Ohio and Pennsylvania—have already called for critical analysis of evolution, the National Center for Science Education is sounding the alarm that the Kansas standards may set a precedent for other parts of the country.

As intelligent design will not withstand the rigor of science and as the fate of Kansas's new standards remains uncertain, why not let it run its course? The main reason is that teaching intelligent design as part

of any science curriculum does more than just provide a scientifically unsound alternative hypothesis (for the current discussion let's set aside the debate on whether intelligent design can be called a hypothesis); it replaces a process based on logical thinking and deduction with one based on belief. Our February 2005 editorial pointed out that one of the main criticisms of evolution raised by the proponents of intelligent design confuses scientific theory with facts. A scientific theory incorporates existing observations (facts) and makes predictions that can be experimentally tested. Consistent with this, evolution as a theory for speciation makes predictions that have been, and will continue to be, tested by scientists around the world. In contrast, intelligent design does not lead to testable ideas. The assertion that organisms are so complex that they must have been designed is dogmatic and leaves no room for experimentation. Teaching such a hypothesis in a science classroom will short-circuit the scientific process at the stage of formulating hypotheses and bypass the rest of the activities crucial for the progress of science, including designing experiments, objectively evaluating the experimental results, considering alternative hypotheses, making conclusions and communicating the results and their interpretations to one's peers so that they can judge the validity of the conclusions. Thus, it will damage the very foundation of scientific training.

The danger of teaching intelligent design as science is not limited to biology, as the rationale can easily be extended to explain any other complex natural phenomena. In physics, the Big Bang theory for the birth of the universe has already been challenged. But why stop there? Any theory explaining the movements of tectonic plates in geology or climate changes in atmosphere sciences could also be supplanted by the suggestion of control by an omnipotent being. Using this type of ‘reasoning,’ there will be no need for further research, and therefore no further progress will be made.

According to the Los Angeles Times, the Kansas Board of Education cited popular support in opinion polls as one reason for its action to change the science standards, but science is not decided by votes. The decision as to what should be taught in public schools is, however, and so we all have a responsibility to advocate for science education. We must actively engage everyone in our society—irrespective of educational level, social class, religious belief and ethnic or cultural background—explaining what science is, how the process works and how progress is made. Most importantly, we must continue to argue, without derision or condescension, why intelligent design must not be taught as science in school (or elsewhere, for that matter). ■