

Evolution education for K-12 teachers needs beefing up, says CU-Boulder professor

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A failure to grasp the fundamentals of biological systems may be leaving K-12 teachers and students vulnerable to claims by intelligent design creationists, new-age homeopaths and other "hucksters," according to a University of Colorado at Boulder biology professor.

On the 150th anniversary of Charles Darwin's classic book "The Origin of Species" that first described natural selection in detail, polls still show that only about one third of Americans believe evolution is supported by scientific evidence, said Professor Mike Klymkowsky of CU-Boulder's molecular, cellular and developmental biology department. "The questions we are asking ourselves as scientists and educators is what the problem is here, and what are the objections to evolution," he said.

Klymkowsky said the disconnect is due in part to the inability of students and the public to understand the evidence for and the mechanisms behind the evolutionary process. There is difficulty in grasping the idea that random biochemical events can produce novel and useful adaptations, he said, and an inability to understand how such random events take place at the molecular and cellular level to generate evolutionary change.

"We can't leave students with mysteries about how biochemical processes work, because that's when nonscientific information sneaks in," he said. Klymkowsky gave two presentations on innovative science education programs at the American Association for the Advancement of Science meeting held Feb. 12-15 in Chicago.

Klymkowsky and CU-Boulder Research Associate Kathy Garvin-Doxas co-developed the Biology Concept Inventory at CU-Boulder, which includes online surveys to measure undergraduate understanding of fundamental biological concepts. The inventory is especially useful when it is administered to students prior to course instruction to allow professors to better understand the needs of students in particular courses, he said.

The BCI effort also includes obtaining short essays from thousands of students regarding their understanding of evolution and natural selection, genes and traits, including the notion of dominant and recessive genes, he said. Such essays have helped to identify commonly held misconceptions of biochemical processes, he said. As part of BCI, Klymkowsky and his colleagues also surveyed campus science faculty in different disciplines to assess which key concepts and ideas in fundamental biology they felt should be covered.

Klymkowsky and Clemson University chemistry Professor Melanie Cooper were recently awarded a \$500,000 grant from the National Science Foundation for a three-year project titled Chemistry, Life, the Universe and Everything, or CLUE. The project includes developing a general chemistry curriculum using the emergence and evolution of life as a springboard to introduce and explain related chemistry concepts, Klymkowsky said.

Klymkowsky also is involved in the national Science Technology Engineering and Mathematics program at CU-Boulder, designed to improve introductory science and math courses and to recruit and train future K-12 science teachers. CU's STEM program includes CU-Teach, an undergraduate program found on the Web at <http://www.colorado.edu/cuteach> that leads to a math or science degree and a secondary education teaching license in four years.

"A staggering percentage of the American public, ranging from plumbers to presidential candidates, fail to accept, at least in part because they don't understand, the evidence for and mechanisms behind evolutionary processes," said Klymkowsky. "Understanding the nuts and bolts of biological systems is important for all students, and particularly critical for those planning to become biology teachers or general science teachers."

Source: University of Colorado at Boulder

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