# New England Section Newsletter

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Paul H. Carr & Laurence I. Gould, Co-Editors



## The Fall Joint Meeting of the APS and AAPT New England Sections "The Physics of Sports" October 13-14, 2006, College of the Holy Cross, Worcester, MA

The annual Fall joint meeting of the NES-APS/AAPT is scheduled for October 13-14, 2006 on the campus of the College of the Holy Cross in Worcester, Massachusetts. The technical program focuses on the physics of sports and athletics. We have invited speakers to address a spectrum of topics, from the dynamics and kinematics of baseballs, baseball bats, footballs and football players to that of dancers, the variability of sport records, and the effects of technology on sports. It looks to be an excellent program for researchers, teachers and students alike. The AAPT program is comprised of workshops, contributed speakers, and poster sessions, while the APS program includes contributed speakers and poster sessions in addition to the plenary sessions. There is also a possibility of a new teacher workshop sponsored by the Physics Teaching Assistant Forum (PTAF).

**Invited Speakers:**
Robert Adair, Yale University
Timothy Gay, University of Nebraska
Kenneth Laws, Dickinson College
Beate Schmittmann, Virginia Tech
James Sherwood, University of Massachusetts at Lowell

For updates and complete conference information, including lodging, go to
**www.holycross.edu/departments/physics/website/NES-APS-AAPT**

**Organizing Committee:**
Bob Allison, Bridgewater State
Matthew Koss, Holy Cross
Tom Narita, Holy Cross
Nick Nicastro, Wachusett Regional HS
Paul Oxley, Holy Cross

Timothy Roach, Holy Cross
De-Ping Yang, Holy Cross

## 2006 Joint Spring Meeting NES APS/AAPT
## Physics and Cosmology: at the Interface
## Boston University- March 31 - April 1, 2006

http://physics.bu.edu/nesaps/

The joint spring meeting of the New England sections of the APS and AAPT was held Friday, March 31 and Saturday, April 1, 2006 at Boston University. The theme for this meeting was Physics and Cosmology: at the Interface, with an invited session of prominent scientists discussing their research in talks aimed at a general physics audience. The meeting also featured a new teacher workshop, a graduate teaching fellow workshop, and a physics demo show. About 200 people attended.

The new teacher workshop was held on Friday morning and targeted at those new to teaching physics. This workshop focused on various aspects of teaching high school physics such as integrating new technologies and the challenges of implementing Physics First. The program included a new workshop for graduate teaching fellows on Saturday afternoon.

**Organizing Committee:**

Karl Ludwig, BU, Chairman (left)
Nick Nicastro, Wachusett Regional HS,
Andrew Cohen, BU, and
Davis Andrew Duffy, BU

1:00 Welcome from David Campbell, Provost of Boston University

1:05 Welcome from Bennett Goldberg, Chair, Department of Physics

**PHYSICS & COSMOLOGY: AT THE INTERFACE**
Boston University Photonics Center

1:10 Lawrence Krauss, Case Western Reserve
– “Einstein's Biggest Blunder: A Cosmic Mystery Story…”

2:00 Max Tegmark, MIT – “Measuring and Predicting Cosmological Parameters"

2:50 Chris Stubbs, Harvard – “The Accelerating Universe: Why You Should Worry”

4:00 Tony Tyson, University of California, Davis
– “Imaging Dark Matter: Multiple Probes of Dark Energy”

4:50 Tereasa Brainerd, Boston University
– “Satellite Galaxies and Cold Dark Matter Halos”

5:40 Poster Session and hors d’oeuvres: Public area outside PHO206

7:00 Banquet: Faculty & Staff Dining Room, 5th floor of George Sherman Union

Speaker: Lawrence Krauss "Science Under Attack?"

Saturday, April 1st

8:00-10:00 Parallel APS and AAPT Contributed Sessions

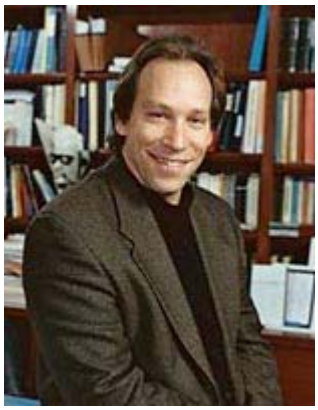
9:00-4:00 Workshop for Graduate Teaching Fellows

**Invited Session: Topics in Physics Education**
Chair: Andrew Duffy

Physics Education Research Talk I: Karen Cummings
– "Is Revolution Really Necessary for Course Improvement?"

Physics Education Research Talk II: Michael Wittmann
– "Comparing Curricula to Study Student Learning"

11:45 Physics Demo Show, including three presenters



Lawrence Krauss,
Ambrose Swasey Professor of Physics,
Prof. of Astronomy, and
Director of the Center for Education and Research in Cosmology and Astrophysics,
Case Western Reserve.

Lawrence Krauss gave the keynote talk

**“Einstein's Biggest Blunder: A Cosmic Mystery Story…”**

and the banquet talk.

In 1905 Einstein published his theory of special relativity, in which the velocity of light was invariant in reference systems moving with a constant velocity and energy was related to matter. This was followed by his theory of general relativity in which gravity caused space and time to be curved or distorted. It was experimentally verified by observing the bending or curvature of light from a distant star as the light passed close the sun, with its large gravitational field.

Einstein, after completing his theory of general relativity, applied his new theory of gravity to the universe as a whole. In 1917, he found that it was impossible to construct a model of the universe that was static or unchanging. The gravitational attraction of the galaxies, stars, and planets would cause them be attracted towards each other and eventually collapse in a "big crunch." At that time, astronomers did not observe any motion of this type.

Unlike some theoreticians today, Einstein wanted his new theory to agree with observations and therefore inserted a "cosmological constant" into his equation to remove the attractive motion. In 1929 the astronomer Hubble discovered that the velocity of distant stars was proportional to their distance, that is, the universe is expanding. If one extrapolates this motion back to the

beginning of time, then all the heavenly bodies originated from the same center. When Einstein learned about this, he remarked that his "cosmological constant" was the greatest blunder of his career.

Recent Wilkinson Microwave Anisotropy Probe (Wilkinson, 2002) satellite data reveals that only 4% of the mass energy content of the universe consists of the atomic mater, so familiar on earth. This is also the building block of planets and stars. Luminous stars are only a small fraction of this 4%. Dark matter comprises 22% of the universe. This matter, different from atoms, does not emit or absorb light. It has only been detected indirectly by its gravity. It is evident in gravitation lensing, the bending and focusing of starlight expected from general relativity. The gravitation attraction of this dark matter is need to prevent the centrifugal force caused by the rotation of the galaxies from tearing them apart. The remaining 74% of the Universe is composed of “dark energy” that acts as a sort of an anti-gravity. This energy, distinct from dark matter, is responsible for the recent acceleration of the expansion of the universe. Explaining the nature of “dark energy” is a major challenge.

Reference: **http://map.gsfc.nasa.gov/**

Banquet Talk:
Science Under Attack?: From the White House to the Classroom: Public Policy, Science Education, and the Emperor's New Clothes
By Lawrence Krauss

The slides of his presentation can be downloaded from his web page
**http://www.phys.cwru.edu/~krauss/#gallery**

The text of his talk was similar to his article published in APS News, The Back Page, Vol. 15, No. 4. April 2006

## When Worldviews Collide: Science and Religion Face Off Again

By Lawrence M. Krauss

Religion and science are in collision again today, as they have been periodically in the past. In Afghanistan in 2001, the Taliban blew up the monumental Buddha statues at Bamiyan. They destroyed them because their religion forbade the reproduction of human faces and bodies. The Taliban had nothing specific against Buddhism; they wanted to destroy all statues. This was a clear example of religion attacking science–in this case, archaeology–inasmuch as these sculptures were amazing specimens of antiquity. What motivated this attack? In a word, fear.

Similar collisions between science and religion, based on fear, have taken place in the United States. Former House Majority Leader Tom DeLay–who has, amazingly, a degree in biology–once argued that the Columbine school shootings happened “because our school systems teach our children that they are nothing but glorified apes who have evolutionized out of some primordial mud.” That’s in the Congressional Record. Meanwhile, public policy regarding Intelligent Design (ID) has been defined by people like President George W. Bush. Talking about evolution versus ID, Bush recently declared that “Both sides ought to be properly taught so people can understand what the debate is about.” The sentence assumes that there are two “sides” and that there is a debate. There isn’t.

The ID conflict unfolds against a background of desperate problems in education. Our public schools are not teaching science effectively. As a society, we should be spending our time and energy trying to teach science better in the classrooms, not worse. The argument over evolution versus ID is a huge waste of time. Having to focus our energies on this attack on science keeps

us from finding better ways to teach how remarkable science is in illuminating various aspects of our universe.

**The Real Target**

ID doesn't amount to much more than simply being opposed to evolution. But evolution is a straw man. What people are challenging is science itself, and the methods by which it investigates the universe. People who oppose evolution are really trying to take a stand against science and rationality as such. This is why I, a physicist, got involved in the public policy issue.

Years ago, my state of Ohio was one of the first to experience a concerted attack on science standards. A local group called Science Excellence for All Ohioans–associated with televangelist James Dobson–accused in its literature: "Science standards use a little-known rule to censor the evidence of design. The rule, which is usually unstated, is often referred to as methodological naturalism." We have a different name for it where I come from. It's called the scientific method.

Advocates of creationism and ID ultimately stand opposed to the scientific method, because the scientific method is based on the assumption that natural effects have natural causes and that human beings can try to understand those causes. That's incompatible with their particular theological view of reality–and that is the heart of the problem. (Of course, science is not inherently atheistic. The existence of God simply isn't a scientifically testable proposition.)

In 2002, the Ohio Board of Education was developing a new science curriculum, and there was a statewide controversy over whether to include ID. Stephen Meyer, a vice president of the pro-ID Discovery Institute, made a bold rhetorical move that turned out to be the first appearance of a clever new theme in ID's marketing campaign: teaching the controversy.

Everyone expected Meyer to get up and say, "We want ID to be taught in schools." Instead he declared, "You know what? We're not dogmatic. We want to compromise. Let's just teach the controversy." Meyer implied that there is a controversy, which there isn't, and that there are grounds for compromise, which is also not true.

When the Board of Education finished the new science standards, we saw how effective Meyer's teach-the-controversy strategy had been. Tacked on at the very end of the science standards was a phrase that required students to learn "how scientists continue to investigate and critically analyze aspects of evolutionary theory."

There's nothing inherently wrong with that statement, but it was in the wrong place. It should appear at the beginning of the science curriculum and say something like, "Students should learn how scientists are continuing to investigate and critically analyze all scientific theories." After all, that's the way science works. Putting the statement so late in the document, where it pertained only to the science standards concerning evolution, had the effect of making evolution seem suspect.

Not surprisingly, instead of producing a lesson plan that showed how students were critically analyzing evolutionary theory, it produced a lesson plan critical of evolutionary theory. It was so badly flawed that the president of the National Academy of Sciences protested, as did many other individuals and groups. The proposed curriculum passed.

**Dishonest and Unfair**

The marketing campaign for ID in this country has been well run and strategically ingenious. It's designed to exploit revered American values, including: open-mindedness ("We can't have this closed, dogmatic view of evolution."); honesty ("Let's talk about the fact that there are some people who don't believe in evolution."); and fairness ("We should just allow different people to express their views in classrooms.") It's not enough for defenders of evolution to talk about the science. I think the argument we have to present is that the ID strategy is in fact dishonest and unfair.

The dishonesty of ID lies in its proponents pointing to a controversy when there really is no controversy. A friend of mine did an informal survey of more than 10 million articles in major science journals during the past twelve years. Searching for the key word evolution pulled up 115,000 articles, most pertaining to biological evolution. Searching for Intelligent Design yielded 88 articles. All but 11 of those were in engineering journals, where, of course, we hope there is discussion of intelligent design. Of the 11, eight were critical of the scientific basis for ID theory and the remaining three turned out to be articles in conference proceedings, not peer-reviewed research journals.

The ID strategy is also unfair in a very particular way. Consider how real-world science gets done. Suppose you have a novel scientific claim. You do some research on it. You then submit an article to journals. The journals send it out to idiots called peer reviewers, and those idiots tell you why you're wrong, and then you have to fight with them and tell them why they're idiots, and it goes on and on. If you're lucky, you get published. What happens next? If your work is interesting, other people will begin to look at it and do follow-up research. If it's really interesting, you'll build a scientific consensus, which may take ten, 20, 30, or 40 years. Only then does your work get mentioned in high-school textbooks.

ID advocates want to skip all the intermediate steps. They want to take their theory straight into high school textbooks. And that's not fair. ID advocates are unwilling to play by the same rules as scientists. If they believe ID is a scientific theory, they should welcome the requirement that they go through all the steps that other scientists have to go through before their work makes it way into textbooks.

We face a vast problem in the public understanding of science. Consider some depressing statistics. In a June 2005 Harris Poll, 54% of respondents said they disbelieved in evolution. Only 38% accepted it. Asked what they do believe about human origins, only 22% said human beings evolved from earlier species. In contrast, 64% said human beings were created directly by God, and 10% said they believed in ID. Asked what should be taught in public schools, a mere 12% of respondents said that only evolution should be taught. Twice as many, 23%, thought only creationism should be taught. Most of the rest, 55% in fact, thought creationism, evolution, and ID should be taught–on grounds of fairness, of course.

Conventional American intuitions about fairness are simply out of place in genuine scientific debate. Science itself is not fair–and that very fact may be science's greatest legacy. In science, not all ideas are treated equally. In most scientific controversies, one side is simply wrong. Science's power lies precisely in its ability to prove false things to be false. If certain contentions do not hold up with experiment, we can just stop talking about them.

Many people suggest that because the majority of adults in this country apparently don't believe in evolution, we should "teach the controversy". But the purpose of education is not to validate ignorance; it's to overcome it. If we're doing a crummy job of teaching science in America–and we are–then we need to do a better job in teaching many different kinds of science, including evolutionary biology. Far from watering it down or teaching a nonexistent controversy, we need

to teach it better.

In December, the effort to install ID in science classrooms received a major blow, as Judge John Jones III ruled that a short anti-evolution statement read by school administrators to students in Dover, Pennsylvania, accompanied by a recommendation to read a creationist text called "Pandas and People", was unconstitutional, violating the separation of church and state. Judge Jones's 139-page ruling, available on the internet, is a masterpiece of scholarship, examining not merely the legal aspects of the Dover case, but the history of ID and its precursors and the nature of science, including evolutionary biology. As Judge Jones stated:

"Both defendants and many of the leading proponents of ID make a bedrock assumption which is utterly false. Their presupposition is that evolutionary theory is antithetical to the existence of a supreme being and to religion in general. Repeatedly in this trial, Plaintiffs' scientific experts testified that the theory of evolution represents good science, is overwhelmingly accepted by the scientific community, and that it in no way conflicts with, nor does it deny, the existence of a divine creator… ID's backers have sought to avoid the scientific scrutiny which we have now determined that it cannot withstand by advocating that the controversy, but not ID itself, should be taught in science class. This tactic is at best disingenuous….the fact that a scientific theory cannot yet render an explanation on every point should not be used as a pretext to thrust an untestable alternative hypothesis grounded in religion into the science classroom or to misrepresent well-established scientific propositions…"

As a result of this decision, we were recently able to convince the Ohio State School Board to revise their science standards, and remove the offending lesson plan. This success, and others like it around the country, suggest the disingenuous effort to introduce ID as a scientific theory in schools may have peaked. However, if history is any guide, the efforts of those whose religious convictions are inconsistent with scientific knowledge will "evolve" once again.

Why should we care so much about textbook stickers, a few sentences read before class, or whatever the next ID initiative may turn out to be? For some, it's an issue of church/state separation, but that's not my bottom line. To me, the crucial point is that, whenever teachers are made to soft-pedal evolution or teach a controversy that isn't there, we are forcing teachers to lie. The minute we force teachers to lie in one place, we make it easier to force them to lie in others. I view lying and misinformation–not religion–as the greatest threat to our democracy.

The universe as it really is a profoundly remarkable place. Science education should awaken American students to that fact. We also need to get the point across that science is not a threat to a moral world. Quite the contrary, science has an ethos based on honesty, open-mindedness, creativity, egalitarianism, and full disclosure. If those things were realized as thoroughly in the rest of the world as they already are in science, the world would be a better place.

Lawrence Krauss is a theoretical physicist at Case Western Reserve University and a best-selling author and lecturer. His most recent book is Hiding in the Mirror: The Mysterious Allure of Extra Dimensions. The above was condensed and updated from a longer article in the April/May 2006 issue of Free Inquiry, the magazine of the Council for Secular Humanism, www.secularhumanism.org.



During the question period, co-editor Paul Carr, proposed the Complementary Beauty of Science and Spirit as a better term than Intelligent Design. This, he said, should be particularly attractive to physicists, as it builds on Niels Bohr's Complementarity Principle.

(See www.MirrorOfNature.org)

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[The Newsletter editor is a non-voting position on the Executive Committee]

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Greg Huber (At large Exec Comm.)
Leslie Brown (See Supp. List)
? Candidate Appointed by Judy Franz

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