

# New England Section Newsletter

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## 2001 Fall Meeting of the New England Sections of the American Physical Society and the American Association of Physics Teachers Keene State College, Keene, New Hampshire, November 2-3, 2001

The Fall 2001 Joint Meeting of the New England Sections of the American Physical Society (NES/APS) and the American Association of Physics Teachers (NES/AAPT) will be held at Keene State College on Friday and Saturday, November 2-3, 2001. Keene State is in the beautiful Monadnock region of New Hampshire, a popular fall destination. Information on the conference appears on the website <http://wcb.keene.edu/?rharkay/meeting.cfm>. The local chairs are Dr. J. Russell Harkay ([rharkay@keene.edu](mailto:rharkay@keene.edu)) and Dr. Jerry Jasinski ([jjasinsk@keene.edu](mailto:jjasinsk@keene.edu)). The site of NES/APS is [http://www.physics.ccsu.edu/aps\\_nes/](http://www.physics.ccsu.edu/aps_nes/) and has been provided by Dr. Peter LeMaire of the Physics Department at Central Connecticut State University. The NES/AAPT has the site <http://webphysics.tec.nh.us/nesaapt/newsletters.html>.

The overall subject of the fall meeting is **The Convergence of Chemistry and Physics**. There will be topics in Condensed Matter, Applied and Physical Chemistry, Thin Films, Surface Science, and Cross-disciplinary Education. Registration and presentation of papers will be in Rhodes Hall. Arrival begins 1 pm Friday with a welcome and invited papers to begin at 2. A poster session and cash bar will be in the Art Gallery with dinner in the West Wing of Dining Commons, then dessert and speaker in the Mountain View Room. Contributed and poster papers at 8 am Saturday will precede invited papers and a roundtable discussion on issues faced by those trained in one field teaching in another, eg chemistry/physics.

Invited speakers who have accepted so far include:

- Susanne Yelin (Harvard) "Freezing" Light: Trapping and Storage of Light States in Atoms
- George Ewing (Indiana U) Physics and Chemistry of Ice
- Richard Staples (Harvard) Novel Applications of X-Ray

#### Crystallographic Techniques

- Peter Lindenfeld (Rutgers) What are Students Looking for? Tradition and Innovation at Rutgers
- Fredrick Stein (Director of Education and Outreach, APS National Office) Redesigning the Science Preparation of Future Teachers: the PhysTEC Project
- Alex Soldatov (Harvard) Fullerenes in the Polymeric State: Current Issues and Perspectives
- Randall Headrick (Cornell) Ion-Assisted Thin-Film Growth and Surface Patterning
- Joerg Appenzeller (IBM Watson Research Center, Nanometer Scale Science and Technology) Beyond Silicon Technology: Electrical Transport in Carbon Nanotubes
- David Weitz (Harvard) New Insights into Hard Problems with Soft Materials; Imaging Phase Transitions and
- Brian Holton (President, NJAAPT) topic TBA

Contributed and poster papers are welcome in all topics related to the subject of this meeting and will earn students free registration. **Any student may also petition, via APS/faculty sponsor, for subsidy/reimbursement for expenses up to \$100.** All other information, of travel, lodging, registration (forms, deadlines) and abstract submission are on the websites.

### **Spring 2001 Meeting at Middlebury College, March 30-31**

The Spring 2001 Meeting of the New England Sections of the American Physical Society and the American Association of Physics Teachers was held at Middlebury College in Vermont. Friday afternoon's program centered on the theme of chaos, complexity and self-organization, and featured talks on nonlinear dynamics and mixing dynamical systems. Thomas Moore of Pomona College was the banquet speaker, summarizing lessons he learned about reforming the introductory calculus-based physics course at his school. Along with topics in general physics, Saturday morning's program cast eyes on chaos, complexity and self-organization in the high school and college classroom. Two additional invited talks outlined six ideas that helped shape physics and applied chaos theory to ship dynamics and wave propagation. In a charming informal way, those in attendance wished Bob Romer much happiness on his VIB (very important birthday) and on his fine years at AJP (American Journal of Physics).

Attendees were treated to a beautiful phenomenon natural to the mountains of Vermont. Spring's last winter storm dropped up to two feet of snow in a 24 hour period. We were never in doubt that we would get to the meeting and they held the talks late to assist us. The local committee was very gallant and gave all of us a wonderful time. For future reference, there are two glorious inns on the green in the center of Middlebury.

DM

## Broken Fearful Symmetry

We are all in awe of William Blake's *The Tyger*. After lines directly addressing the tiger, the poem consists entirely of questions. You know how successful you are in questioning an animal. It never answers you. Of the six stanzas, the first and last differ by one word. The four in the middle also break symmetry in that three are "what questions" and a lot of them, eg *In what distant deeps or skies Burnt the fire of thine eyes?*, and the fourth is "did questions" as *Did he who made the Lamb make thee?* Note that the almost identical stanzas are isomorphic to the childhood favorite *Twinkle, twinkle, little star*. The poem contains metaphors and Christian symbolism as well as psychological insights. Emeritus Professor Arnold Orza of the English Department at UConn gave me the ideas. And here are the first and sixth stanzas:

Tyger! Tyger! burning bright  
In the forests of the night,  
What immortal hand or eye  
Could frame thy fearful  
symmetry?

Tyger! Tyger! burning bright  
In the forests of the night,  
What immortal hand or eye  
Dare frame thy fearful  
symmetry?

Like much of the best literature, the poem presents a double universe, the exterior of objects and events and the interior of interpretation and expression. Do we have a double universe in science, the one patrolled by measuring equipment and the one performing feats of fancy mathematics? Ah, but are our papers poetry?

Why did Blake change one word from the first stanza to achieve the last one? Does that word suggest the answer to the question? Interestingly, the world's best poems and best musical compositions, where records exist (for Shakespeare, whoever impersonated him, or for Beethoven), were written many times before satisfaction. They showed a lot of care and no accidents. When you see or hear the final form, you can't imagine changing a word or a note. So why that one-word change? It is a fearful broken symmetry.

DM

## Some news from Keene State College

Keene State has undergone a decade of expansion. The building which will house the fall 2001 meeting of the New England Section is only two years old, as is the \$8,000,000 student center. They just added on to the library and to the main administration building. Now they are adding to the gymnasium. They are remodeling labs in the old science center and expect to start on the proposed new wing in about two years. KSC added three new "upscale" dorms and has a soccer facility which is used by a

New Hampshire pro team. Those who were here for the AAPT regional in the eighties won't recognize the place. Enrollment doubled over the past decade to the current 5500+.

Russ Harkay and Frederick Wolf (physics) and Sally Jean (chemistry) were awarded a two-year \$300,000 NSF grant (Adaptation/Implementation) to develop the inquiry-based capstone courses for KSC's new Elementary and Middle School General Science Major. The college graduates 400 teachers per year, a large clientele for this type of course sequence. In connection with earning this grant, they received state certification for the major and designed the major program. The college is contributing its support with a "Science Education Initiative." A portion of the expected Science Center renovation/addition is to be dedicated to housing the new major. Planning begins this fall.

### **Some news from the University of Connecticut**

There is a great deal of news at UConn, not all of it good. For example, our science "quadrangle" which for decades had three sides now has a fourth. But it is a very tall very broad abandoned eyesore, which I have dubbed "the ghostbuilding in the sky." And why? The builder went out of business and the prospective new builder will not stand behind (and certainly not stand on top of) the Stuntman's Special that currently offends the skyline. Several science departments were rubbing their hands expectantly for years, imagining moving-in day. Now they are rubbing their hands to maintain circulation.

But enough of that. The major piece of news is indeed a happy one. In a department with a number of notable research physicists, one of our long-time members has been duly noted. Professor Kurt Haller, who joined the Department in 1964, has been honored with a Festschrift published to pay tribute to his contributions to theoretical physics. The journal Foundations of Physics has performed the service on the occasion of Kurt's seventieth birthday. A fuller account written for a general readership appears in the April 30, 2001 issue of the UConn Advance, pg 8, a pleasing article with a nice photo of Kurt in his office. Publication website is <http://www.advance.uconn.edu>.

Several professors served as guest editors and gatherers of 28 articles for the journal. They include Munir Islam, Gerald Dunne and Philip Mannheim of UConn and Larry Horwitz of Tel Aviv University. The Standard Model of particle physics is an example of a gauge theory. Kurt Haller's biggest contributions to particle theory are his studies, including difficult detailed calculations, of gauge theories. As with theories through many ages in science, practitioners tackle problems that are interesting, with luck solvable, and connected to other theories and observations of the world. Haller pointed out to the interviewer of the Advance, "The most important outgrowths are those outcomes that are totally unforeseen and unforeseeable."

DM

## Speakers Give Advice to Graduates

I guess, like most of you, I have been to too many graduations in which the speakers, invited at great expense, appear to be reruns of the prior year's speakers. But in the campus newspaper the lead article of the "commencement issue", boasting the above headline, began "Much like snowflakes, no two commencement addresses are the same." The next sentence should have said: Also like snowflakes, it takes a microscope to tell them apart. To save everyone the trouble of attending next year's ceremonies I will print here what you would hear there: Dare to dream. Dare to act. Be yourself. Do for others. But don't forget to have fun.

## If Not The SAT, Then What?

This was the headline of a syndicated column by George Will that appeared this spring in the Hartford Courant. The column recognized that the United States is dedicated to having as many people as possible attend college and that the Scholastic Assessment Test has been central to the admission process at schools it is good to go to. Now, however, Richard Atkinson, president of the University of California, wants his university to drop the SAT. Thus, the admissions criteria will have a drastic change.

Will points out that regardless of the specific criteria used, some applicants will be accepted and others will be denied. The question is not whether there is inequality, but which of the unequals will prevail. At my own school most of the admittees are here because they are good at something, which might include a tendency towards scholarship. Others, after determinedly raising their grades, are allowed by the NCAA to excel at their sports.

My son gave me the book *The Big Test* (The secret history of the American meritocracy) by Nicholas Lemann; Farrar, Straus and Giroux, 1999. The meritocracy meant is academic, not athletic. The fifty-year-old system determining the course of American lives began as a utopian experiment of James Bryant Conant, president of Harvard, and Henry Chauncey, head of the Educational Testing Service or ETS. They used the techniques of intelligence testing to sort American students into levels worthy of the different levels of colleges (items into bins).

The politics, economics, and ethics of the half century of testing and its treatment of the vast diversity of potential students form the subject of this engrossing book. Now that the system is poised to change, it is worthwhile seeing where it has been. There are surprises in store for the reader, although to call the history "secret" may be going too far. Like anyone seeking to change a system that some in power wish to keep, the dynamic duo did not lay all of their cards on the table. They needed to be closer to holding the winning hand. Occasionally they bluffed but eventually they did win. We all know that in poker, life, and educating American students,

the winning streak lasts only so long. Now UCal's Atkinson is poised to find out whether his opponents know when to fold 'em, assuming he knows when to hold 'em.

**Suppose physicists had the "hearts" of lawyers** "The Capitol Steps" is a clever daring group of singing comedians. In one of their skits they joke that President Bush's energy conservation plan is to replace the electric chair with lethal injection. That set off my red light. This is a jurisdictional dispute. A physics job will be replaced by a chemistry job and my union will object. In an unrelated incident, retired editor John Richards of Boston, England, and his son, both of whom decry the abuse of the written mother tongue, have founded the Apostrophe Protection Society (the APS) to force sign painters to distinguish properly its and it's. My bell rang. Our manger (or is it harem?) of lawyers will claim loss of revenue and mental anguish to our APS.

### **Mismatches of the American Mind**

I finally got around to reading *The Closing of the American Mind* (How higher education has failed democracy and impoverished the souls of today's students) by Allan Bloom; Simon & Schuster, 1987. Professor Bloom has spent most of his life at University of Chicago, Ivy League bastions, and comparable schools around the world. His 370 pages of controlled rant are his strategic defense initiative against the likes of -- wait a minute -- us, you and me. Why read it now? Because what was bad in the eighties has gotten much worse.

I did not know that today's students have souls. They should make them more evident. Bloom bemoans many factors of soulless contemporary life. Nobody has love; they have relationships. Nobody has God; they have spirituality. Nobody has taste; you have your values, I have mine, and we agree that all values are equal. Nobody has culture; we have only society, and what is called culture is just some set of agreements. Hardly anybody has humanities; they have science, a poor actor that struts and frets on a stage called objectivity. Where have you gone, Aristotle? A nation turns its lonely eyes to you, woo woo woo. And passion? Fuhgeddabouddit.

The big bad news to me is that most students don't have science, not in their hearts anyway. They have business. They have the ambition to make a million by age thirty and many of them succeed. And the business of the University of Connecticut? Whoops, did I say business, Dr. Freud? Is it different at Harvard? G'wan. They achieve without breathing hard what puts us into oxygen deficit. All schools are not endowed equally.

Bloom, annoyed with people like us, says Sure they can figure out anything but do they truly appreciate it? There is no creativity in science because it's all out there awaiting discovery. Or else it isn't out there and we make it up, meaning science is a sham. The arts, on the other hand, are creative but have been betrayed. Seeing what passes for art nowadays, I would have to agree with that assessment.

What dismays me is on such a lower level than what Bloom bemoans, it's hard to see we live in the same world. I won't tell you where this trivial event occurred but it is an eatery next to the Storrs campus. They give you these booklets of coupons so you'll try their snacks. I said to myself, So their souls are impoverished (the students who work parttime in this place) but at least they will charge me the right amount. I handed over a coupon that said Omwich, 99 cents. Being a sport, I also ordered coffee at full price. The girl asked me for a sum obviously too high. Not obvious to her. Woody Allen should have burlesqued the scene.

She redid it. \$2.59 - .99 and there it is. We do all the coupons the same way, she insisted. Look in the book: \$1 off a dozen donuts, \$1 off a dunkaccino. But, I protested, this coupon says 99 cents regardless of the original price. It's a plus sign, not a minus sign. The manager arrived to assure me I was getting a good deal. The folks behind me chafed for their caffeine. It was definitely a Woody Allen moment. (Bloom's critique of Woody Allen: He parodies the loss of soul but has lost his soul in the process.) Souls? Who has a soul?

**What is your proposal of the cleverest twist on a physics expression?** I hope you will email me your ideas. Anyway here is mine. The New Yorker issue of February 5, 2001 has an article called "The Book Eater" about an obsessive collector of books and anything else of paper, cloth or cardboard that bears writing. The bibliophile Michael Zinman's theory of when a bunch of stuff becomes a collection is: You buy and buy as impulse hits you and finally you achieve critical mess.

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## **Report of the Section Representatives**

The APS Council met in April in Long Beach. Kannan Jagannathan is our Section Advisor but June Matthews attended the meeting in his place. This report is based on mailings to me from both. The most important item for all Sections of APS is the change in Sectional representation on the Council. **This entails an action item for all attendees of the next Section meeting.** There will now be by Constitutional Amendment of APS "two (voting) Councillors representing the Sections. Council shall establish a rotation list of existing Sections. When a Section's turn in the rotation occurs, it will elect a Councillor representing the Sections."

In a motion passed by the Council "the two Sectional Councillors will be chosen from the existing Sections in the following order (according to age): New England, Southeastern, New York, Ohio, Texas, Four Corners, Northwest. The New England Representative will serve for two years initially, the Southeastern for four years. Every two years the list will rotate with the top listing going to the bottom. If new Sections are formed, they will be added to the current list." As your Editor understands the new situation, members of the Section will have two duties at the next meeting: **We vote an Amendment to the NES Constitution saying the Councillor will be elected. If it passes, we elect our Councillor.** To

complicate matters, the first of several Announcements on page 7 of July 2001 APS News states determinedly that the APS Constitution and Bylaws Committee feels that voting on important matters at a meeting is unfair to members not at the meeting, and paper and/or electronic ballot for all members is fair.

Compared to that kettle of Schrodinger's fish or Catch 22 (Editor's metaphors), other items are of some but more straightforward interest. They are in APS News and on the APS website and will be ruthlessly summarized here.

1. President George Trilling's email messages to members expressed APS concern with reductions looming in proposed Federal Science budgets for physics research. APS members are asked to lobby our elected House Reps and Senators to argue the case of National interest in basic research and reverse the reductions.
2. National APS elections were to be held (and by now have been).
3. The APS Council passed a motion against blanket polygraph testing of personnel at weapons laboratories and urging elimination of restrictions on scientific interchange of unclassified information, including with foreign visitors or during travel of personnel.
4. Council supports the new APS Forum on Graduate Student Affairs.
5. Daniel Kleppner, Co-Chair of the APS Study Group on Nuclear Missile Defense Initiative, gave a progress report and expressed hope that the final report will affect Federal actions.
6. The Forum on the History of Physics proposed and the Council approved having an award to recognize outstanding work in that field.

**Department of hmmm** Doubleday Publishing mailed previews of seven "surprising novels" to be out soon. Included is Jenny McPhee's *The Center of Things*. The center is love, even love at the edge. Doubleday says: "But under these neurotic waters lurks something special. Marie is smart. Ever since her high school physics teacher quoted Groucho Marx, 'Time flies like the wind, fruit flies like a banana,' she has been secretly obsessed with science. While pursuing what she considers to be the tragic flaw that destines her to old-maidhood, she stumbles across Marco Trentadue, 'freelance intellectual,' who bears a startling yet not entirely unpleasant resemblance to Peter Lorre. Will Marie's lustful attraction to Rex Mars, aging pop star and Nora's ex, cloud her romantic judgment? Will her ability to grasp string theory make her a spinster?..." In this era in which probably more women author scientific papers than romantic novels, is this imagined opposition of the brain and the heart at all valid?

DM

## **New England Section Executive Committee Membership 2001**

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**THE LAST BANG or It's inexplicable, like love.**

I usually find a lot to carp about in this column, what with notorious stupidstitions both organized and individual. But this month I'm gripe-poor. It's not that I'm a disbeliever in things I can't see. But I do require evidence for them, on some level like the visible, the audible or the olfactory. Someone's word is not the last word on the subject. It's also the case that, contrary to public perceptions of scientific thought, most questions are satisfactorily decided superficially and even via stereotypes. Why is there killing in the Middle East, Northern Ireland, lots of places close to India, and the former (name a used-to- be country here)? They just don't like each other, that's why. But factor in hallowed or historic ground and you have more than enough reason. The Ebbets Field of yore was hallowed and worth dying for but not worth killing for. Otherwise, the worst human concept of all time is hallowed ground. Note that I do have faith in abstractions, such as the Cheshire cat and Schrodinger's cat. So that's not the problem.

With enormous pleasure, I opened my Hartford Courant of Monday, July 23, 2001. The top headline read "Bush, Putin Agree To Cut Arsenals." Below it and filling about half of page 1 was "Time Travel With Light," a profile of Ronald Mallett of the UConn Physics Department in Storrs and a description of his theory combining general relativity with light and atomic properties. There was no picture of Bush or Putin but there was of Ron thinking for the camera. It's a beauty. I hope everyone gets to see it.

The idea is for the future to affect the past, a desire of science fiction writers for centuries. Ron was motivated at an early age by events in his family to try to turn fiction into fact. Personally there are many things I would redo, of my own or others' actions, but I would settle for silencing the bat of Bobby Thomson and the gun of Lee Harvey Oswald. Those acts of infamy are in the record books so we need to start with the part of the future that will become the past. When a scientist dreams up an unusual theory, the interviewers wish to know whether he believes in it. Ron is quoted as saying "I believe this is real. I believe that this will be the beginning." Most quotes in the paper are fluff but this one is not a cliché. (By contrast in the "AT WORK" section, we find over a large photo of a career exploration specialist "When you're really true to yourself, you discover your choice." See my commencement addresses, top of newsletter page 4.)

What is it that Ron says is real? It is the past and future coinciding in space, the situation made possible through the magic of general relativity. To see this effect experimentally one needs to have it act upon something of material or energy. Ron is working on that and expects it to come some day. Others take a wait-and-see attitude. The first idea is to use equal and opposite circles of laser light slowed to snail's pace by procedures pioneered and perfected at Harvard, for example by Lene Hau. The gravitational influence on light is supposed to be inverse to the speed of the rays. After the hoped-for success of this attempt, one would presumably try it with atoms. ("Oh, and I suppose then you will do it with me." -- Schrodinger's cat.) Not knowing the math or the experimental likelihood, all I can say is, Good luck.

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### **News of the New England Section**

In closing, I want to make everyone aware of two benefits offered to you by your Section. The homepage of your department can be linked to the homepage of the Section, by courtesy of Peter LeMaire (CCSU). See page 1 for web address. The Section will help sponsor, through publicity and financing, a physics meeting that is in New England and open to all of us in New England. It has already done so for Statistical Mechanics that was held at Brandeis. Convey your proposal to an officer of the Section.

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