APS Council Proposes Constitutional Amendments

At its November 1996 meeting, the APS Council began the Constitutional process to change the way the variable ‘X’ in the APS Constitution and Bylaws determines when a shrinking Division or Forum loses representation. These changes follow a report by the APS Committee on Constitution and Bylaws on how the X-system has worked, and recommendations by the Committee on appropriate adjustments. Taking into account members’ comments, which are hereby invited, a final decision on the X-system and the wording of the proposed Constitutional amendments will be made at the Council meeting in April. The proposed amendments will be submitted to the APS membership for a vote in the next general election mail ballot.

The parameter X% in the APS Constitution and Bylaws sets the percentage of APS members who must belong to a unit in order to entitle it to a representative on the APS Council: a voting Councillor for a Division or Forum and a non-voting Advisor for a Section. Topical Groups do not qualify for a Councillor. For all the ways X is used, see the APS Constitution and Bylaws on pages xliii in the 1996-97 Membership Directory, or on the APS home page at http://www.aps.org/exec/bylaws/bylaws.html

The value of X is stated in the Bylaws, and has been set at 3 since 1991, when the new Constitution and Bylaws were adopted. The Constitution specifies that the 3 is linearly, with the same X to acquire a first Councillor, or for large Divisions to get additional Councillors, and for the loss of a single Councillor when a Division decreases below X% in size. The Committee on Constitution and Bylaws reported that the X-system and the value 3 have worked very well in orderly creation of new Divisions and Forums with Councillors and providing proportional representation of the large Divisions. These major objectives of the new Constitution were clearly met. The only exception was a potential problem concerning the loss of the last Councillor at the same value of X, as is required to gain the first one. The Division of High Polymer Physics (DHPF), the section...
Corrections

In the article on the 1996 Nobel Prize Winners in Physics and Chemistry (December 1996, APS News), we incorrectly identified Dr. Robert F. Curl as "Richard." Our apologies to Dr. Curl for the error. In addition, we note that all three chemistry Nobel recipients (Carl, Kroto, and Smalley) won the 1992 APS New Materials Prize.
doctors in mathematics and computer science to foreign candidates was over 50 percent, and the number of foreign graduate students is now approaching 50 percent. However, our problem has not been too many foreign students, but too few American students. However, at the undergraduate level, we've only developed a nation that doesn't have standards for what constitutes a college education. Thus, we have seen institutions that provide education far beyond world standards in quality, and a very large number of students who are not prepared for graduate education. We thought that the average we were competitive with the rest of the world. However, in March 1996 the National Academy of Sciences, following a poll of our leading universities and found some very sobering statistics suggesting that we can't become complacent about the quality of college education in this country.

The precollege level is enormous important for the sciences, mathematics and engineering, because people in these areas make their career decisions typically in the middle grades, and if we've lost them at that point, we've lost them permanently. Thus, it is a problem that is critical in the case of women and minority group members. That is why I think the education summit in 1989 was so important in addressing the nation's need that exists in precollege education, and why the APs education programs are critically important. There is no problem facing the US that is more serious than bringing our overall educational system back to excellence. Money is not the problem — we spend around $700 billion a year on education, so how we spend it.

Is the influx of foreign graduate students likely to continue into the next century?

We're going to have to recognize early that if the faculty and the number of foreign students is going to decrease substantially in the future. One reason is that their home countries are increasingly recognizing that the US is benefiting from a brain drain, we are picking up the brightest people, and that's not going to be allowed to continue. These countries are realizing that they have to develop infrastructure at home that results in attractive career opportunities for these bright young people. Secondly, last summer the US immigration and Naturalization Service substantially tightened the restrictions on admission of foreign students and, I regret to say in part because of pressure from American students, didn't want the increased competition.

Is it true that there are no job opportunities, but there are not the same opportunities available for Ph.D. physicists, and they are increasingly required to be interdisciplinary and inventive in their career choices?

To a significant extent, the problem has been that faculty members like myself have allowed the career horizons of our graduate students to be too subjective that students have the impression that if they don't choose their professors' laboratory lifestyles and careers, they are really second class citizens. This lack of understanding of the opportunities, challenges and rewards of career trajectories completely outside of academia is something that we must confront. Far too many faculty members also feel that their responsibility to students ends at commencement. That is clearly unacceptible. Having a senior faculty member work to assist a student in finding an attractive position can make a difference between five to ten years in their career pattern. We must educate ourselves about the importance of their responsibilities after their graduation, as well as giving an honest appreciation of the career situation at the very beginning of their relationship with students.

1996 DFD Meeting

(continued from page 1)

correctness and completeness of results, (2) the comprehending numerical results, using the example of the dynamics of a two-dimensional cylindrical wake flow.

Computational Aerodynamics

Computational aerodynamics (CAA) involves the numerical simulation of the development and radiation of sound by unsteady flows. Noise predictions prior to the advent of high performance computers were based on approximate relations, which are not readily applicable to problems with complex geometries. Initially the CAA technique was applied to the development of algorithms for three-dimensional boundary layer flows. More recently, scientists at Penn State University have attempted to apply CAA methodologies to more practical problems, reaching the stage where it is possible to adequately produce the three-dimensional unsteady simulations.

Purely Elastic Instabilities

Purely elastic instabilities in viscometric flows are instabilities that are present in the absence of yield stress, as a result of the comprehending numerical results, using the example of the dynamics of a two-dimensional cylindrical wake flow.

Flow-Induced Microstructures

Researchers at Cornell University have concluded that flow-induced microstructure has a strong influence on the rheology of suspensions of non-Newtonian fluids, in this case cellulose microfibers, and that microstructure properties of injection molded composite materials. Donald Koch and his colleagues applied slender-body theories and microstructure properties of injection molded composite materials. Donald Koch and his colleagues applied slender-body theories and simula- tion of two-dimensional internal disturbances by solving the Navier-Stokes equations, extending the finding to viscous, turbulent dynamics. According to Kerr, in order to describe the propagation of the internal disturbances, the nonlinear vortex interaction calculations which show singular behavior can be used to identify the three steps by which fully developed turbulence might form from the initial conditions. While admitting that take alone, none of the flows he cited as examples appear to be the right answer for convincing evidence, he noted that in each case he observed (1) formation of vortex sheets and suppression of single behavior, following (2) a strong increase in peak vorticity, and finally (3) a peak in enstrophy.

Fluid Dynamics in Physical Oceanography

On Monday afternoon, Jack Whitehead of the National Oceanic and Atmospheric Administration reviewed current research in the fluid dynamics of physical oceanography. The ocean is the most massive fluid body in contact with human kind, and understandably its behavior covers an immense range of length and time scales; he said, adding that the largest and longest time scales are linked to ideas about the ocean's evolution. While research indicates that scales governing temperature and salinity and heat transfer play a key role in climate issues, more work needs to be done in this area, as well as in research on eddy flux mechanisms, which are only partly understood.

According to Whitehead, much is known about the ocean's general circulation. Vertical, horizontal flows, and density driven currents are found all over the world oceans. However, the fluid dynamics of the Earth's atmosphere, which is the other half of the coupled atmosphere-ocean system, have only been studied recently. The coupled atmosphere-ocean system is still a mystery, with many questions left unanswered. However, the progress made in the past years has been significant, and there is hope that in the future we will be able to better understand and predict the behavior of the oceans.
Letters

Horgan’s Arguments Require Closer Examination

In John Horgan’s article, ‘Is Science a Victim of Its Own Success,’ he quotes Richard Feynman as saying, “The age in which we live is the age in which we are discovering the fundamental laws of nature, and that day will never come again.” However, in Feynman’s provocative essay, “The 7 Percen Solution,” he says, “Since then I never pay any attention to what John Horgan is saying, either.”

Mr. Horgan seems to believe that much of the research being done in particle physics today, and particularly in string theory, can never be given a firm experimental standing. His thesis rests on the fact that physicists may never be able to do experiments at the Planckian energies needed to observe elementary string quanta. He says, “It is a myth that string theories or questions about the universe can ever be given a firm experimental standing. We can test hypotheses about how the universe cooled should have a certain temperature and power spectrum, and so on, even though we do not recreate the conditions of the big bang in the laboratory. We can test hypotheses about how dopants became extreme 60 million years ago even though we were not there. Similarly, we can test the existence of forces that only act over Planck scale distances because they might induce decay forbidden by the Standard Model of particle physics, such as proton decay or decays that violate conservation laws. It is also a test of such theories if they explain previously unexplained results, such as quark or lepton masses, or CP violation. Many more such possibilities could be given. There was no room for space, however, as it happens, an article by Feynman is speaking as an “expert,” whereas in the second, he is speaking as a practicing scientist, par excellence. The motif for practicing scientists is that they should not pay any attention to that first quotation, but pay close heed to the second quotation. A footnote, they should not pay any attention to what John Horgan is saying, either.

I would like to argue emphatically against the point of view advocated by John Horgan in his article. “Is Science a Victim of Its Own Success?” (APS News, December 1996). In fact, it is a myth that string theories or ideas formulated at the Planck scale can never be tested. We can test the big bang theory of the universe by quantitative study of its predictions that the universe is expanding, that certain abundances of nuclides should be observed throughout the universe, of the microwave background radiation left over as the universe cooled should have a certain temperature and power spectrum, and so on, even though we do not recreate the conditions of the big bang in the laboratory. We can test hypotheses about how dopants became extreme 60 million years ago even though we were not there. Similarly, we can test the existence of forces that only act over Planck scale distances because they might induce decay forbidden by the Standard Model of particle physics, such as proton decay or decays that violate conservation laws. It is also a test of such theories if they explain previously unexplained results, such as quark or lepton masses, or CP violation. Many more such possibilities could be given. There was no room for space, however, as it happens, an article by Feynman is speaking as an “expert,” whereas in the second, he is speaking as a practicing scientist, par excellence. The motif for practicing scientists is that they should not pay any attention to that first quotation, but pay close heed to the second quotation. A footnote, they should not pay any attention to what John Horgan is saying, either.
Recognizing the Importance of Undergraduate Science Education

by Robert C. Hilborn

T
tax any discussion of undergraduate science education to emphasize its connections with other levels of science education, as well as other aspects of the fourfold scientific enterprise encompassing science, mathematics, engineering and technology. In my thinking about the subject, there are four numbers that have dominated my considerations: 24 percent, 3 percent, 15 percent and 40 percent. Let me explain what these percentages represent.

Only 24 percent of high school students currently take some form of high school physics, compared to about 54 percent who take biology, and 19 percent who take algebra-based physics. Even with the most optimistic estimates, this means that fewer than half of the students entering college have any background in physics. The implications for all college science courses are ominous. Many of the students will be innocent of basic fundamental laws of Nature. And while there may be some eventual limit in our ability to prove or disprove, let alone teach, these laws, it is a mistake to think we have no reason to believe that we have already arrived at that final stop in our journey. Rather, I believe that all of the above will continue to feed back into the need to prepare potential majors with critical thinking and scientific literacy.

Critical Thinking & Science Literacy are not the Same Thing

I was pleased to see the article “An Alien Ate my Laundry: The Decline of Research in the Sciences” by James C. Garland (“The Back Page,” November 1996). It was a very interesting and thought provoking article. One thing I thought it lacked was a clear distinction between critical thinking and scientific literacy.

For example, the article implied that if the woman whose laundry was “eaten” scientifically literate she would not have come to that conclusion. I don’t think scientific literacy is entirely to blame for the widespread belief in paranormal phenomena. In this case, it isn’t necessary for the woman to know Newton’s laws or any other science facts. What she needs to know is how to come to a conclusion on her own. Separate holes in sheets are not evidence for the existence of extraterrestrials. It is critical thinking that is lacking.

Since critical thinking can be taught in any class, the popularity of paranormal beliefs is a failure of all parts of the educational system, not just science education. However, we physicists have a special role to play in educating the public since many paranormal claims directly contradict established laws of physics. It is up to us to teach not only science, but also critical thinking skills students need to apply physics facts to their daily lives.

The article gave the impression that there is little we can do to fix the problem and that we are doing our part. It said, “The problem will not be solved if it is only the educators and scientists who wave their arms in despair.” Is that what we’re doing? Can we do more? I think we can. First we need to educate ourselves about the common paranormal beliefs. I strongly recommend both the Skeptical Inquirer and Skeptic magazines. Then we need to explain why these beliefs are wrong. Professors can include these subjects in their lectures or even assign them as a new class (Physics and the Paranormal 101, perhaps). The rest of us can influence friends and relations, write to TV stations and newspapers, and research papers who encourage these beliefs, or teach classes for the local community education program. If we scientists don’t encourage “reason in the age of science” who will?

Bruce Behrens
Bhabha, New York

Two-Year Colleges and the APS

A recent letter here (M. Sawicki, APS News, November 1996) complains that two-year college (TYC) physics teachers are locked down upon by APS members, that TYC faculty are prevented from applying for DOE and NSF research grants, and that these conditions make TYC physics teachers drop out of the APS. The letter proposes that the APS form a topical group for TYC physics teachers.

I have taught at a two-year college for 26 years, and have been a member of the APS all that time, my last Physical Review publication was in 1991. My experience has been the opposite to Sawicki’s in every way. University researchers have always been friendly and hospitable. Three different DOE-funded facilities have generously supported summer visits. The NSF funded a summer Research Opportunity Award and is currently evaluating a research proposal of my own.

At least in the research area, people and organizations have always seemed to make an extra effort to help people from two-year colleges. Also, TYC teachers I know who dropped APS membership had simply lost interest in research. A support group for TYC physics teachers called “TYC21” has recently been founded by the American Association of Physics Teachers (AAPT) [http://www.aapt.org/programs/tyc.html]. TYC21 intends to alleviate the isolation expressed by Sawicki.

Young physicists may encounter a culture shock on first arriving at a TYC. If they stay, they may find that compared to teaching 18 to 22 year olds, it is a great pleasure to teach young adults living in the real world. TYC teachers can keep up research if they really want to. Theory is easiest, but a biology colleague of mine studies whales.

John H. Goodell
Springfield, Massachusetts

OPINION

Ph.D.’s type of position secured and field of employment in the winter following their degree, class of 1994-95. [4% unemployed]

Ph.D.'s type of position secured and field of employment in the winter following their degree, class of 1994-95. [4% unemployed]
end-oldest division in the APS, is about to be downgraded to divisional status, according to the issue was raised at the May 1996 Council meeting. DHPP Councillor Andrew Lovinger spoke on behalf of low-estimated year end divisional status and the inclusion of the Division of Life Science and Physical Sciences in total membership of the Society for two consecutive calendar years, it shall lose its Council advisor…

The third annual Science Museum Open

Education and Outreach

Laser Plasma Astrophysics

Recent radio and x-ray observations of su-

pernovae SN1987A provide evidence for the

impact of a supernova remnant on its dense

cosmic wind and the production of high

electron-positron plasmas, considered rel-

vant to astrophysical processes, as well

as to high-energy particles in the inter-

stellar medium. In this study, the physics of

electron-position plasmas is considered, re-

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ANNOUNCEMENTS

APS UNDERGRADUATE PHYSICS STUDENT COMPETITION

1997 APKER AWARDS

For Outstanding Undergraduate Student Research in Physics

Endorsed by Jean Dickey Apker, in memory of LeRoy Apker

DESCRIPTION
Two awards are normally made each year: One to a student attending an institution offering a Physics Ph.D. and one to a student attending an institution not offering a Physics Ph.D.

- Recipients receive a $3,000 award; finalists $1,000. They also receive an allowance for travel to the Award presentation.
- Recipients' and finalists' home institutions also receive $1,500 and $500, respectively, to support undergraduate research.
- Recipients, finalists and their home physics departments will be presented with plaques or certificates of achievement. The student's home institution is prominently featured on all awards and news stories of the competition.
- Each nominee will be granted a free APS Student Membership for one year upon receipt of their completed application.

QUALIFICATIONS
- Students who have been enrolled as undergraduates at colleges and universities in the United States at least one quarter/semester during the year preceding the 13 June 1997 deadline.
- Students who have an excellent academic record and have demonstrated exceptional potential for scientific research through an original contribution to physics.
- Only one candidate may be nominated per department.

APPLICATION PROCEDURE
The complete nomination package is due on or before 13 June 1997 and should include:
1. A letter of nomination from the head of the student's academic department.
2. An official copy of the student's academic transcript.
3. A description of the original contribution, written by the student such as a manuscript or reprint of a research publication or senior thesis (unbound).
4. A 1,000-word summary, written by the student, describing his or her research.
5. Two letters of recommendation from physicists who know the candidate's individual contribution to the work submitted.
6. The nominee's address and telephone number during the summer.

FURTHER INFORMATION
(See http://www.aps.org/praw/apker/descrip.html)

DEADLINE
Send name of proposed candidate and supporting information by 13 June 1997 to: Administrator, Apker Award Selection Committee, The American Physical Society, One Physics Ellipse, College Park, MD 20740-3844. Telephone: (301) 209-3221/email: ripin@aps.org

COMMITTEE ON APPLICTIONS OF PHYSICS:
Andrew Yam (Chair), David Aspey, Cynthia Cutter, Fred Dylla, Steve Garrett, Allen Goland, John Lowell, Stuart Parkin, Maza Prettiss, Roy Richter, Peter Rosenthal, John Rowell.

AUDIT COMMITTEE:
Gordon Dunn, John Schiffer (Chair and third member TBA)

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COMMITTEE ON MINORITIES:
Nicholas Samios (Chair), John Armstrong, Kevin Aylesworth, Ronald Davidson, Jerome Friedman, William Happer, Peter Hohenberg, William Gail Lineberger, Albert Narath, Robert Richardson, Andy Sessler, Alvin Tivelpiece, Robert M. White, Gerald Garvey, Millie Dresselhaus, TBA, TBA.

COMMITTEE ON THE STATUS OF WOMEN IN PHYSICS:
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1997 OPERATING AND BYLAWS COMMITTEES

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Physics has been one of the most exciting sciences of the 20th century. Many of the revolutions in science, technology, and modes of thought have been fueled by physics. It is common to find itself developing new modes and justification for science funding. It is clear that the knowledge provided by physics has influenced society and that research challenges are backed with a substantial base of government and industrial support. However, employ- ment patterns for Ph.D. scientists and engineers are changing. There are fewer opportunities for academic positions, and those that are available are documented growing needs for flexi- ble and broadly trained physicists in many areas of the world of high tech- nology and business.

There has been much written about the changing paradigms in science funding. My focus is on some of the myths surrounding the universities, physics majors and the employment of physicists.

Myth #1: The fact that there are very few undergraduate physics majors is not important since there are many other undergraduate disciplines — at most universities is a clear indication that physics departments fail to do their job.

The American Institute of Physics (AIP) has collected data indicating that there are approximately 810 colleges and universities offering undergraduate degrees in physics. The number of baccaulareate degrees awarded annually — an average of six per institution. Thus, most physics depart- ments across the nation have few physics majors. To within a 15% this has been the situation for over 30 years. While it would be worthwhile for physics departments to make their under- graduate curricula more attractive and broadly based, it seems unlikely that we can recover a national level, the numbers of physics majors could be increased significantly. Even a factor increase of two would lead physics with a small number of majors.

A much fairer yardstick for the size of the physics department faculty and nec- essary number of physics courses would be the recognized matrix of the following factors:

1. The enrollment in introductory non-science major courses. Consider- able evidence exists that high enrollments are linked with first-rate physics courses in astronomy, contemporary physics, topics, or such specialized topics as the physics of music, physics of sports, or the physics of how things work.

2. The physics service courses for engineering, math, and computer sci- ence majors, as well as the pre-med, pre-dental and nursing majors.

3. The number of graduate students and postdoctoral associates.

4. The number of externally funded grants and support it provides for undergraduate and graduate education, and the overall quality of the research on campus.

5. The efforts of the department in education reform, research and out- reach to local teachers and schools, as well as efforts to nurture and in- crease the numbers of physics majors who are women and minori- ties.

6. The involvement of the department in educational research and the impact it has on local, as well as national, economic development.

7. The level of national recognition of the physics department.

8. The number of physics majors.

If such a matrix were to be applied, most physics departments would fare quite well, in spite of the relatively low number of physics majors. However, it would be important for department leadership and their administrative staff to develop strate- gies to improve their standing in each of the eight categories listed above. Each department should develop a strategic plan, in cooperation with the local ad- ministration, focusing on a matrix approach to determine appropriate size and the degree of support needed.

Myth #2: Physics majors at all levels have poorer employer- ment opportunities than those majoring in other sciences, math, engineering or computer science.

This myth is a partial result of the ex- periment the data. As a result, potential employers will look to physics department leadership and the faculty to work with physics program leadership and administrators, and in some cases, are doing a disservice to students by not providing adequate upper- level courses. When physics majors make use of their physics degree when a physicist is “forced” to take a job in business or finance, for example, in- stead of traditional academia, the starting salary approaches $100,000 per year and involves no typing. [See Physics Today, January 1997, pg. 42-46]

Myth #4: Most public universities have a relatively large number of foreign graduate students, who don’t speak English well, don’t get good job offers, don’t remain em- ployed in the region or nation, and return in large numbers to their native country.

There is presently a strong xenopho- bic undercurrent in the U.S. There has not been such a large influx of ethnic minorities since before World War II, when many scientifically capable Jewish and European refugees fled Hitler and came to the U.S., with many making important contributions to such major projects as radar and the atomic bomb. Currently the U.S. is ben- efitting, from the largest number of the best students from China, India, the former So- viet Union and other nations around the world studying and contributing to science and engineering research and development.

Data indicates that foreign physics students admitted score high on the TOEFL exam for English proficiency and score very well on the GRE physics exam. The data on post- Ph.D. employment indicates that foreign graduate students get good jobs at attrac- tive salaries in both traditional and non-traditional employment sectors, and that few of them return to their country of origin.

Each of the myths discussed above has some slight “ring” of substance, but not of truth. They are not presented in context, nor are they informed with data to determine their reality. Yet these myths con- tinue to be propagated and believed by administrators, and in some cases, are having a deleterious effect on faculty mo- rale and on-campus support for physics. At many universities, the situation for main- taining the quality of physics programs is quite fragile. It would be worthwhile if all relevant parties would become informed and work with physics program leadership to develop a realistic strategic plan to maintain the excellence of physics depar- tments nationwide.

Brian R. Schwartz is a professor of physics at Brooklyn College of the City University of New York and former Assistant Secretary of Energy. He operates an NSF- supported program at CUNY to enhance the employment prospects for Ph.D. physicists. Professor Schwartz can be contacted via email at schwartz@icbc.org.