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## *From the IEEE Vice-President, Educational Activities*

### **Pre-College Engineering Education Presents an Epic Challenge**

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Suddenly pre-college engineering education is all the rage. In the United States, the National Academy of Engineering devotes two detailed publications to the subject and new websites on pre-college engineering proliferate. These sites aim to change the image of engineering, promising to “make engineering cool”. ASEE now runs an engineering K-12 center, and ACM has launched the Computer Science Teachers Association (CSTA). In its latest meeting, the IEEE Board of Directors changed its 2005 plans to make room for a new initiative. The initiative’s title is “Launching our Children’s Path to Engineering”. Its goal is “to increase the propensity of young people worldwide to choose engineering as a career path.”

Why all the commotion? In part, it is a reaction to disappointing statistics collected in the world’s most developed countries. These statistics demonstrate a low level of interest among young people in the field of engineering, as well as declining mathematics and science scores. For example, the number of Bachelor of Science degrees in engineering in the United States dropped by 24% since 1985 (while the total number of B.S. degrees there rose by 27% during the same period). In Sweden the average mathematics scores of eighth grade students have dropped by 7.6% from 1995 to 2003. Numbers such as these point to a potential shortage of engineers in the near future, causing harm and stagnation of industry, reducing development and employment, and negatively affecting standards of living. In the United States we already are experiencing a scarcity of engineers in the traditional infrastructure areas (civil, architectural and electric power engineers). A recent Wall Street Journal article describes “a spurring demand for electrical engineers with experience working on electrical lines, substation design and building

schematics. Also, EEs are needed to design instrumentation and controls at plants or facilities that need back-up power generation in case of outages.”

The projections of the future workforce do not tell the whole story. There is a continuing lack of diversity among engineering professionals. Some racial and ethnic minorities are under-represented, as are women. In spite of numerous programs devised to close the gender gap in engineering education, the percentage of female students in academic engineering programs in the United States continues to be less than 20%. Women still earn less than 10% of the degrees in engineering in Korea, Japan, Austria, Italy, and Switzerland.

The picture is not uniform, however, and the differences between regions and countries (as well as between engineering and other disciplines) hold important clues about both problems and solutions. To professional engineering associations such as IEEE and ASEE this information should serve to guide our plans. We need to understand where we can get the best return on our pre-college education investments. We also need to recognize where we cannot make a difference – a process that is often difficult to manage in volunteer-based organizations such as ours.

In this context I would like to make five observations and proposals.

1. The standing of engineering in the public’s opinion is not in global decline. There are regions and countries (notably China and India) where the number of engineering schools and engineering students is growing rapidly, providing the best indicator that the status of engineering in these countries is on the ascent. In other areas (such as most of Western Europe) the status of engineering and engineers appears

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to be at a relatively high and constant level though in some countries there are early signs of decline.

Not surprisingly the tendency of young people to favor engineering is correlated with the economic prospects of engineers. When a widely circulated 2002 article attributed the declining status of engineering in the United States to hard and uninviting college curricula, hundreds of engineers contacted the author to complain about salary compression, layoffs, and age bias that peaked at the time . The lesson is that when engineering associations speak to young people about careers in engineering they should include the (overly positive) economics and the (overly favorable) work conditions that engineers experience – not only the dynamism and excitement of discovery, development, and problem solving which we always tend to emphasize. Work condition issues are likely to resonate especially well with girls and young women. There are several engineering disciplines that can offer flexible time and the ability to work part time and at home, and are in general more favorable to young mothers than other non-engineering professions.

Engineering associations may also want to re-examine their attitude toward registration and licensing. Many of the associations pay lip service to registration, but do little to encourage engineers to register, or to strengthen the enforcement and scope of registration laws. The prestige of engineering seems to be higher in countries that provide some legal protection to engineering practitioners through a formal process of licensure. The lower status of engineers in the United States, compared to that of lawyers and physicians, is attributable, at least in part, to the significant differences in registration requirements between these professionals and engineers.

2. Researchers who have studied children’s feelings toward engineering keep reminding us that teachers’ expectations and attitudes have strong influence on those of their students. Researchers also report a general lack of awareness among pre-college teachers of state-of-the-art technology and (even more) engineering. A recent meeting of several engineering professional associations (ASCE, ASME and IEEE) and guidance counselor associations (NACAC and ASCA) underscored the need to supply teachers and counselors with relevant materials about engineering, and to include an introduction to engineering in continued education curricula required for the renewal of teaching licenses. Engineering associations, with their many academia-based volunteers, are ideally suited to address these needs. Moreover, the associations will do better to shift some of their attention to working with teachers and counselors from their traditional focus on students. There is little evidence that decades of isolated, local activities of engineering associations directed at children (in scouting events, during e-week etc.) have had significant impact on the propensity of children to choose engineering as a career path
3. Curricula in engineering continue to pose a challenge, and are often cited as a major reason why many young people, especially girls and young women, are discouraged by engineering. Many engineering students “drop out because of the heavily math and science oriented curriculum – particularly the earlier years, where engineering content is often sparse.” Women in particular are “turned off by the ‘boot camp’ mentality that pervades traditional engineering programs.”

Many reforms of the engineering curriculum were proposed, and in some countries and school systems major

restructuring efforts indeed took place. These have included: (1) shifts in the balance between engineering science and engineering practice; (2) development of parallel curricula with different tracks, in some cases differentiating between more "scientific" and more "practical" tracks; and (3) introduction of new educational objectives such as broad human, economic and environmental consequences of professional tasks; multidisciplinary courses and projects; the ability to communicate findings effectively; and teamwork.

The level of success of these transformation efforts varied widely. There were major reforms in France, Germany, India, and Japan, and they appear to have increased the popularity of engineering curricula there or at least arrested the decline. In the United States such reform attempts gained little success in spite of significant federal government investments in the 1990s and several large-scale NSF initiated programs.

Engineering associations have the opportunity, especially through their involvement in accreditation, to foster change and modernization of engineering curricula. Many of these curricula are structured today as they were in the 1970s and fail to take full advantage of the major changes introduced into the profession by information technology. One of the consequences is that first-degree programs are behind industry expectations more than ever, and training of engineering graduates by industry is longer and more expensive. The development of new model curricula by engineering associations may be one first step addressing this challenge. More effective communication with industry on changing needs and skills is another.

4. We are witnessing large-scale transnational bidding and competition over engineering work, a relatively new phenomenon. Many engineering design and manufacturing jobs have migrated, resulting in restructuring of the engineering labor market on both sides of the transaction, and the emergence of new division of labor between "local" and "remote" engineers.

The reaction of engineering associations to these trends often emphasizes threats to domestic jobs, and calls for apposite legislation and regulation. This response is understandable, but in the long term we need to prepare the next

generation of engineers to face the new, transnational nature of the profession. When we speak to young people we may do well to emphasize the opportunities that globalization offers – cooperation in engineering tasks across borders and nations, larger high-impact projects, international travel and broader personal experience, and more effective production and manufacturing through collaboration and specialization. The trans-nationalization of engineering offers opportunities, not just threats.

5. Finally, we need to think big and work together. The multiple small-scale programs that engineering associations tend to engage in (a party here, distribution of key-chain holders there) have done very little to provide the long term, sustained and effective influence that we seek. In order to be effective, the major engineering societies need to get together, and develop a **Center for Pre-College Engineering Education**. The Center would become the focal point for the teacher and counselor communities, the professional engineering associations, and industry. It will also be our vehicle to secure funds necessary for meaningful large-scale projects. The Center will allow engineering associations to exhibit a unified front to industry. At present industry faces a highly fractured scene, as it is badgered by multiple groups to assist with short-term projects of little consequence.

The Center will be able to develop effective information resources (most, if not all, available on line); coordinate and provide organizational and equipment support for "show and tell" hands-on programs (such as the Teacher-in-Service Program (TISP) and the Teaching Opportunities for Partners in Science (TOPS)); promote best practices; and develop long-term programs with success metrics and effective assessment of outcomes.

The growing concerns of industry and the imminent changes in the business climate present the engineering associations with a worthy task – active engagement with pre-college education to the benefit of our profession, our society and the public. We should overcome our disciplinary and organizational differences and rise to the challenge.

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## The Importance of Biology in Electrical and Computer Engineering Education

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Electrical and Computer Engineering Department Heads Association (ECEDHA)



Ken Jenkins



Stephen Goodnick

This year the annual ECEDHA meeting was held in New Orleans on March 18-22, 2005, featuring the theme of "The Future of Bio-Science and Bio-Technology in Electrical and

Computer Engineering." Many of the sessions and associated hallway discussions wrestled with the question of how much biology should be included in a required ECE curriculum?

It seems ironic that ECE educators are now faced with this question, when only yesterday we were on the verge of eliminating chemistry from the required ECE curriculum, and any notion of requiring biology was pretty far out of mind for most of us. ECE educators now face the reality that bio-science and biotechnology will be a driving force in most engineering disciplines of the twenty-first century. But how much time should an ECE curriculum devote to biology-related topics (Bio-X), and which of the more traditional subjects should be squeezed out in order to make room for "Bio-X" in the ECE curriculum?

The emergence of Bio-X in a traditional ECE curriculum has not been sudden, but rather has been a creeping development for the past 30 years. A bio-intrigued friend recently told us about his experience as a graduate student in the 1970's while taking a graduate course called "Systems Approach to Neurobiology." In that course students were introduced to the Bonhoeffer-Van der Pol neuron model, which is characterized by a simple set of second order nonlinear differential equations. Our friend was a Graduate Teaching Assistant at the time, in a laboratory course that covered analog computers. For his course project he took the nonlinear neuron model into the lab and programmed it on an analog computer. It was not long until he was experimenting with many fascinating aspects of nonlinear behavior that the Bonhoeffer-Van der Pol model captures. He was fascinated with his introduction to Bio-X, and for a time he thought about directing his graduate studies toward bioengineering. But at that time employment was not particularly lucrative for bio-engineers (or hospital engineers as they were sometimes called at that time), and many of the systems-oriented ECE students of that era were more inclined to pursue academic programs in the traditional areas of circuits, communications, computers, control, and signal processing. Our friend ended up pursuing a Ph.D. program in signal processing, and today he occasionally applies his signal processing expertise to Bio-X projects.

But the Bio-X influence was developing within ECE, and it continued to exert its forces on ECE education and research during the 1980's and 1990's. Our bio-intrigued friend once again became involved with Bio-X while conducting research on synthetic aperture radar (SAR) signal processing. The signal processing behind spotlight mode SAR had a curious similarity to the signal processing used in CAT scanners, although a SAR viewed the target object through a very small look angle, while the CAT scanner had the luxury of a full 360 degree view of an object. Could it be that the coherence of the SAR compensated for the limited look angle, while the incoherence of X-ray tomography relied on a broad look angle to achieve high resolution? It wasn't long afterwards that the curious similarity of seemingly unrelated problems led to a cross fertilization of signal processing theory and signal processing algorithms between the radar imaging and the medical imaging communities. Rapid developments in magnetic resonance imaging (MRI) spurred further interest in medical and biological imaging among electrical engineers. Today the discipline known as functional MRI engages a

combination of electrical and computer engineers and medical scientists in discovering how various parts of the brain react to and respond to stimuli throughout the human body.

Today there are so many areas where biology and ECE interact that we have to resort to using the phrase Bio-X to avoid continually enumerating long lists of bio-related areas. Bio-X can stand for bio-imaging, bio-materials, bio-MEMS, bio-sensors, bio-inspired signal processing, bio-photonics, bio-acoustics, bio-informatics, bio-computing, etc. In some of these areas the biology is central to the work that is going on, whether it is research, development, or manufacturing. For example, bio-acoustics usually involves the use of ultrasound for noninvasive imaging of biological subjects, including humans. Many of us have undergone ultrasonic heart scans to see if the internal mechanics of the heart are working properly. In an area like ultrasound the ECE community is involved primarily to develop instrumentation, computer analysis methodologies, and software packages. But the practitioners who use the equipment on a regular basis are medical personnel or clinical biologists.

There are other Bio-X disciplines where the original concepts were biologically inspired, but where the biology itself long ago ceased to play a central role, and only the bio-inspiration continues to be important. An example is the discipline of neural networks. While it is true that the concepts and structures used in neural network design were inspired by biological systems, the original concepts have been mathematically abstracted and the discipline has taken on a life of its own that has little to do with biology in practice. Another example of this type of Bio-X area is the field of bio-inspired signal processing algorithms. For example while the genetic algorithm (GA) originated by mathematically modeling the laws of genetics and evolution, today it is used in practice by circuit designers, antenna designers, control system designers, and communication engineers who do not need to have a detailed knowledge behind the biology that drove the inspiration.

It may be obvious by now that we have not attempted to answer the question of how much biology should be included in a modern ECE curriculum, nor have we suggested what traditional areas of the curriculum should be shaved to make room for Bio-X material. These are questions that will have to be hammered out through many long hours of stressful meetings by Curriculum Committees throughout the entire ECEDHA kingdom. But we would like to leave you with two final thoughts. The first is that there will be increasing opportunities in the future for ECE students to find fulfilling careers in Bio-X areas of the ECE profession. As educators it is essential that we modify our ECE curricula to prepare our students to take full advantage of these opportunities. The second and final thought that we leave you with may sound a bit like "just in time engineering." It is not essential that we drop major portions of the traditional ECE curriculum and add blocks of material that will make our students into mini-biology students. But rather we should strive to integrate Bio-X material into existing courses and teach it within the context of ECE theory, design, and practice. This implies that more than likely ECE faculty will have to teach the Bio-X

material themselves. This is not a problem that can be fundamentally solved by asking biology departments to teach new service courses for ECE students. Many ECE professors will need to re-tool, and they will require the help and encouragement of their administrations to do so. No matter how ECE education evolves over the next thirty years, there seems to one point on which there is little debate. In the next thirty years we will see more Bio-X appearing in the typical ECE curriculum than we saw in the last thirty years,

and this change will provide a challenging and stimulating environment for all.

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## ***From the Chair of the IEEE Committee on Engineering Accreditation Activities***

### **Do We Need Program Criteria for Bio-X, etc.?**

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These are interesting times for Electrical and Computer Engineering education. At the risk of sounding foolish, I will predict that we are on the verge of change in the profession (and in education for the profession) as profound as that which happened when vacuum tubes were replaced by transistors. That solid state devices replaced “hollow state devices” was not in itself the most important change. However this new technology enabled an immense growth and broadening of the profession.

When we look at both nanotechnology and biotechnology we see similar possibilities for growth and broadening. But we may also see a danger of losing some of our profession – which brings me to education and accreditation issues. It also brings up issues surrounding professional societies.

Societies like IEEE, ASME, and others grew up around our tools: mechanics, thermodynamics, electricity, electronics, etc., as opposed to being centered on our goals, such as transportation or communications systems. New areas like nano-science and the biological sciences will produce new tools for the engineer. Should they also produce new professional societies and new educational programs? That is harder to say. Does IEEE have a legitimate claim to a significant part of these new areas? The answer from IEEE’s mission statement (“The IEEE promotes the engineering process of creating, developing, integrating, sharing, and applying knowledge about electro and information technologies and sciences for the benefit of humanity and the profession.”) is clearly “yes,” and the key is the word “information” more than “electro”!

What do we do with regard to undergraduate engineering programs to both facilitate their responsiveness to the exciting changes ahead, and to best position IEEE to take part? It seems appropriate for IEEE to encourage the growth of new, often interdisciplinary programs. But is it beneficial to create new program criteria at an early stage? Doing so simply so that IEEE can “stake out our turf” as lead society in a new

area does not seem appropriate. Rather, it seems better for the new programs to develop via a growth and maturation process in the universities, with no restrictions other than those imposed by the ABET General Engineering Criteria.

It is important to note that in general, program criteria do NOT define the named discipline or profession in a comprehensive way. Hence, an important aspect of program criteria is that they assign responsibility for programs in that discipline to a given society as lead society and possibly to other societies as cooperating societies. Today there is a rather striking correspondence between program criteria and the lead society for that program – often sharing the same name. I suspect that this nearly one-one correspondence will begin to break down. One interesting situation is that of Software Engineering, where the lead society is CSAB which is not a professional society in the usual sense.

Much of the future of engineering lies either at the interface between traditional engineering disciplines or at the interface between a traditional engineering discipline and an area of science, such as in the life sciences. A current example is “Mechatronics,” for which ASME has requested the establishment of program criteria with itself as lead society (see the Proposed Changes section of the 2005-06 ABET Engineering Criteria). IEEE is considering opposing the establishment of these program criteria, arguing that the number of such programs is still quite small, and that they can best be handled under the existing criteria. Further, IEEE argues that if such program criteria are created, IEEE should be a lead society. This is an example of the complications that are likely to arise in the future.

Another recent example is Biomedical Engineering, for which lead society status recently moved from IEEE to the Biomedical Engineering Society. This action follows the tradition of the pairing of like-named professional societies with “their” programs. But should IEEE have let Biomedical Engi-

neering go? I will not attempt to answer that question, but I will point out that it was difficult and many-sided. An upcoming example may well be Systems Engineering, about which informal discussions are going on among several societies (including IEEE) as possible lead society.

It may help to address the questions surrounding new program criteria if we step back and ask the question, "Why do we have program criteria?" The obvious answer is that we have them to give guidance as to what constitutes the given discipline, and what differentiates it from another discipline. With new disciplines, that "body of knowledge" is often very ill-defined, and creating program criteria without this definition may not be helpful.

Program criteria were one of the major topics at the CEAA meeting held in January in Scottsdale, AZ. In particular, criteria in Biomedical Engineering, other "Bio-X" areas, Systems Engineering, and Mechatronics were all intensively discussed. I would be pleased to hear comments from readers of *The Interface* as CEAA wrestles with the issues mentioned above. Please email your comments to [j.orr@ieee.org](mailto:j.orr@ieee.org).

Much of the January CEAA meeting was devoted to the core of CEAA's charter: selection of new program evaluators and review of the visits conducted over the fall of 2004. We continue to have a very well-qualified group of applicants from which to choose program evaluators. However, the number of applicants from industry and government is smaller than we would like, so please help us increase those numbers. Qualifications and application/nomination materials can be found on the IEEE web site by following the "education" link from the home page.

Overall results in terms of recommended accreditation actions from the recent accreditation visits are similar to past years. The recommended actions at the conclusion of the 87 visits overseen by CEAA were: Next General Review: 32; Visit Extended to Next General Review: 5; Interim Report: 37; Interim Visit: 7; Show Cause: 2; Not to Accredited: 4. It is important to note that during the due process phase many of these recommendations will change, generally reducing the number of less than NGR actions.

The most heartening finding of the recent visit cycle is the overwhelmingly positive reviews which our evaluators receive, both from their team chairs, and from the department heads of the programs visited. What is not quite so heartening is that after more than six years of experience with ABET's Engineering Criteria 2000, the number of problems which programs are having with their implementation does not seem to be falling very much. Related to this, CEAA passed the resolution that: "CEAA agrees that there is a need for feedback from universities regarding Engineering Criteria 2000. Input will be solicited via a survey sponsored by ECEDHA and conducted by the IEEE Research organization. After analysis of the institutional response, the value of industrial input solicited via ECEDHA through departmental industrial advisory committees will be determined." If you are involved with an accredited EE/ECE/CpE program, please provide input when that survey arrives, probably via your department chair or head.

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## Revised ABET EC 2000: Helping to Close the Environmental Literacy Gap and More

Frank G. Splitt



With reference to Part I of the Trilogy on Engineering Education Reform, "Environmentally Smart Engineering Education: A Brief on a Paradigm in Progress," *The Interface*, April 2003, I saw ABET EC 2000 as a mechanism that could drive engineering colleges and universities to incorporate sustainability into their curricula. My thinking at the time was that it was unlikely that strong motivation would come from elsewhere. In fact I thought the ABET criteria would be the only available impetus to lead engineering and technology programs towards sustainability

The likelihood of the revision to ABET EC 2000 as well as the "driving" Campaign for Systemic Engineering Education Reform (a.k.a. as the SEER Campaign) were discussed in, "Engineering Education Reform: Signs of Progress," IJEE, December 2004. Preprints of the paper were distributed at the Sustainability and Higher Education Conference, October 21-23, 2004 where Cal Poly's Linda Vanasupa presented our paper on curricula for a sustainable future. During the course

of the presentation, I advised attendees that ABET Board approval of the revisions discussed in the paper was imminent.

Lately, it has come to my attention that the ABET Board approval of the revised version of EC 2000 at the end of October 2004 does not appear to be well known — disturbing since it hints that the "good news" has not been promulgated.

Reference to the revised ABET EC 2000, Criterion 3. Program Outcomes and Assessment, criteria (c) and (h) below, will show the changes BOLD-fonted:

- (c) an ability to design a system, component, or process to meet desired needs **WITHIN REALISTIC CONSTRAINTS SUCH AS ECONOMIC, ENVIRONMENTAL, SOCIAL, POLITICAL, ETHICAL, HEALTH AND SAFETY, MANUFACTURABILITY, AND SUSTAINABILITY**
- (h) the broad education necessary to understand the impact of engineering solutions in a global, **ECONOMIC, ENVIRONMENTAL** and societal context

I believe the fact that ABET will now require outcomes in accordance with the above criteria on a systemic basis, i.e., across all engineering programs, is a high-impact breakthrough for UG engineering education — certainly worthy of widespread promulgation.

To my mind, the ABET revisions represent a significant response to the challenge in “Systemic Engineering Education Reform: A Grand Challenge,” THE BENT of Tau Beta Pi, Spring 2003. Yet to be recognized is the fact that the revision opens up a rich set of EngrEdu research possibilities, with outcome assessment in the proscribed areas being one of many.

The strong support of **Ted Bickart’s** Accreditation Policy Committee of the IEEE Educational Activities Board and *The Interface* Editor Bill Sayle was key to the success of a 3-year effort. ABET certainly deserves recognition for responding to the challenge — helping to close the environmental literacy gap and more.

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## Continuous Improvement

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The Committee on Technology Accreditation Activities (CTAA) is responsible for the IEEE’s participation in the accreditation activities of the Technology Accreditation Commission (TAC) of ABET. CTAA is responsible for the following disciplines:

- Computer Engineering Technology (CET)
- Electrical-Electronic Engineering Technology (EET)
- Electro-Mechanical Engineering Technology (EMT)
- Information Engineering Technology (IET)
- Laser – Optics Engineering Technology (LET)
- Telecommunications Engineering Technology (TET)

Program Evaluator (PEV) activities are a core CTAA function. The committee recruits, trains, nominates, and provides PEV mentoring; therefore, the CTAA places high importance on continuously improving our PEV’s activities. The CTAA’s continuous improvement processes have led to the formation of multiple strategic initiatives.

One strategic initiative for the 2003-04 accreditation cycle concerned PEV mentoring. A PEV mentoring program was developed and approved. Twenty-seven (27) new program evaluators were afforded the advantage of participating in the new mentoring program. The process includes providing mentoring before and after the accreditation visit. Mentors are also assigned to existing PEVs as a way of continuing the learning process to improve the quality of evaluations.

Three new strategic initiatives are in place for the 2005-06 accreditation cycle. The objectives are twofold: improve the quality of PEV training and attract more people from industry and government to become PEVs. The first strategic initiative is to develop an on-line assessment tool for newly trained program evaluators. This is a continuous improvement tool that enables PEVs to communicate needed improvements for future program evaluator training sessions. The second initiative concerns Web-based PEV training. We

expect it to benefit program evaluators who cannot attend training workshops due to time and cost restraints. We anticipate it will increase the pool of applicants from government and industry. Secondly, web-based training could enable us to improve our training process by giving the trainers and trainees more flexibility in terms of course design and learning assessment. The third initiative is to improve PEV recruitment. Our first steps are to improve awareness by giving an *introduction to accreditation presentation* at various IEEE section meetings. We anticipate these presentations will also increase our exposure to potential PEVs from industry and government. These presentations will enable face-to-face dialogs to discuss the opportunities for personal growth and to underscore the importance of PEVs to the profession. The presentations also will create an awareness of opportunities for industry sponsorship of PEV training. This gives a company an opportunity for employees to attend training at the company site thus saving time and travel costs. It also gives a company the opportunity to better the profession by demonstrating their commitment to accreditation.

E-mail me at [j.sammarco@ieee.org](mailto:j.sammarco@ieee.org) if you want to learn more about having an introduction to accreditation presentation given by one of our CTAA members or if your company is interested in sponsoring PEV training. I invite your comments and suggestions concerning strategic initiatives for continuous improvement as well.

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## *From the ASEE ECE Division*

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The 2005 ASEE Annual Conference in Portland, OR, USA, promises to include another excellent technical program from the electrical and computer engineering division. Sessions include: research and new directions, trends in ECE education, online courses/programs, laboratory development, accreditation and assessment, course/curriculum innovations, design courses and engineering practice, mathematics, brainstorming and open forum, teaching and learning with technology panel discussion, education society adcom, and business meetings.

Program details are available from ASEE and its Web site. In addition to technical sessions, we encourage all members to attend the ECE division business meeting on Monday morning and also the BSEE (BSECE) brainstorming session on Monday afternoon. There will be a panel discussion Tuesday morning on teaching/learning with technology. Any ideas and comments regarding the sessions may please be communicated to Satish Udpa, udpa@egr.msu.edu Also visit the ECE division's Web site: [www.eng.auburn.edu/ece/ASEE\\_ECE\\_Division](http://www.eng.auburn.edu/ece/ASEE_ECE_Division).

Another related and important activity we are involved in is the IEEE eit (Electro/Information Technology) conferences started in 2000 in Chicago. We are happy to report that eit 2005 will be hosted by the University of Nebraska-Lincoln, May 22-25. Please visit the conference Web site, [www.nuengr.unl.edu/eit2005](http://www.nuengr.unl.edu/eit2005), for the call for papers and other important information. The 2006 eit conference will be at Michigan State University and we will send out information about that conference shortly. The idea behind initiating these eit conferences was to have a forum for IEEE/ASEE members to exchange latest innovations and research topics in the growing area of information technologies as they relate to electrical/computer engineering disciplines.

At the regional-level, ASEE's North Central Section will be hosting its Spring Conference (April 7-8, 2005) at the Ohio Northern University. Information about papers and

technical sessions can be found at the Web site, [www.asee.onu.edu](http://www.asee.onu.edu). The North Central Section is planning to hold its 2006 Spring Conference jointly with the Illinois-Indiana Section. Please see future articles in The Interface regarding these and other conferences which might be of interest to you.

We want to take this opportunity to thank **Rob Reilly** of the IEEE Education Society for maintaining an excellent Web site for the society, [www.ieee.org/edsoc](http://www.ieee.org/edsoc). Rob has been hosting online speakers too. The web site has provided a useful forum for discussing issues important to membership.

Finally, regarding ABET related activities (our institutions have just gone through a visit and one will be upcoming) we like to again encourage members to attend the ASEE sessions in Portland that will focus on accreditation and related issues. It is important to keep in mind the importance of IEEE/ASEE (and other professional societies) activities when reviewing faculty workloads. While many schools do support faculty development and professional society involvement, there have been some concerns recently that these activities may be sidelined as universities "push" for increased productivity in the research domain. It is our strong belief that participation in ASEE/IEEE and other engineering/technology professional societies are of extreme importance and should be encouraged for all faculty members during their academic careers. This is especially true these days as we try to bring engineering education and its importance for the society to the public's attention.

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## **To Discover, To Understand, To Pass It On...**

Daniel Litynski  
President, IEEE Education Society

Those who had an opportunity to read my remarks in January's *News and Notes* on the Education Society website may remember this phrase. Education is a most fundamental

human activity that includes all these things. Education that involves innovation and creativity can be exciting and rewarding. Our profession and our passion for education are among





the reasons we have an IEEE Education Society.

Our Society constitution states that “the society shall strive for the advancement of the theory and practice of electrical and computer engineering and of the allied arts and sciences, and the maintenance of a high professional standing among its members and affiliates...” and that “The field of interest of the Society shall be Educational Methods, Educational Technology, Instructional Materials, History of Science and Technology, and Educational and Professional Development Programs within Electrical Engineering, Computer Engineering, and allied disciplines.”

Members of our Society have been, and are today, leaders at all levels of the profession. We include academic administrators, faculty members, students, government professionals, and private sector leaders who are active and interested in the field of science and engineering education. Our over 3,000 members from around the world comprise one of the 39 member societies and 3 technical councils of the IEEE. Approximately fifty three percent of our members live outside the United States. We now have 28 chapters in 23 countries and 38 potential chapters under development. Many of us (87%) are also members of different societies in the IEEE or other professional societies. We are at the center of professional innovators who are devoted to educating future generations of engineers and scientists in the broad spectrum of domains spanned by the IEEE.

The IEEE today has over 365,000 individual members in over 150 countries and almost 40 percent live outside the United States. It is the global leader of professional societies devoted to development and implementation of information, electrical, computer, and emerging bio-engineering technologies. These areas are fundamental and critical to the health, prosperity, and security of our world. The IEEE produces 30 percent of the world’s published literature in electrical engineering, computers and control technology, holds annually more than 300 major conferences and has nearly 900 active standards with 700 under development. There are more than 300 local sections, 1400 chapters, and over 1300 student branches that enable member networking and information sharing worldwide.

I am honored to be selected by the Society to serve as its President for the next year. I want to thank all of our volunteers who do such an outstanding job of administering our society, publications, conferences, awards, and other activities. We want to especially thank our now Junior Past President

**David Kerns** and our Administrative Committee for their excellent service and leadership over the past two years.

The IEEE Meeting Series including the Technical Activities Board (TAB) met in February this year. The TAB consists of the presidents of the technical societies and councils (42), the division directors (10), and the officers and standing committee chairs of the TAB (7). It meets three times annually to develop policy, review operations, and make recommendations to the IEEE Board of Directors. One of its activities is the periodic review of member societies on a 5 year cycle. After an extensive self study assessment, the society president and the editors in chief of the society publications meet with the IEEE TAB Society Review Committee and the TAB Periodicals Review Committee.

The Education Society was reviewed at the February meeting. I would like to thank all of the Administrative Committee members and others who helped with preparation of the approximately seventy-page reports that we submitted for review. Special thanks to **Dave Conner**, the Editor in Chief of the Transactions on Education and Bill Sayle, the Editor in Chief of *The Interface* who joined me in presenting the status and outstanding achievements of our society to the IEEE review committees. We received excellent immediate feedback, and the review procedures will continue over the next few months until the TAB approves the final report in about six months.

In the next few months, we will build on this review and our current strategic plans to examine who we are, where we are going, and how we plan to get there. Our previous strategic plans plotted an excellent course for several years, but it is time to reexamine our vision, mission, goals, and plans in the light of changing challenges and opportunities. One of the great strengths of our society is our diversity, and we hope to include input from all of our constituencies during the process. The society leadership team looks forward to working with all of you as we seek to integrate the broad issues and challenges in engineering and science education with the goals and needs of our global society membership. Our vision is to be a global leader in educational innovation, pedagogy, and research.

Best wishes,

*Dan Litynski*  
President, IEEE Education Society  
[d.litynski@ieee.org](mailto:d.litynski@ieee.org)

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## Biography of Daniel M. Litynski

*DANIEL M. LITYNSKI*  
Professor of Electrical and Computer Engineering  
Western Michigan University  
Kalamazoo, MI 49008

Dan Litynski is currently serving with the National Science Foundation as Program Director for Science, Technology, Engineering, and Mathematics (STEM) under the provisions of the Intergovernmental Personnel Act (IPA). Professor Litynski recently completed five years of distinguished serv-

ice as Dean of Engineering and Applied Sciences, Provost and Vice President for Academic Affairs, and Interim President at Western Michigan University (WMU). WMU is a national Doctoral Research Extensive University with almost 30,000 students and over 270 programs spanning eight sites across Western Michigan. Major initiatives included strategic planning, implementation, and reorganization at university and college level, and the planning and implementation of a new 270 acre, over \$100 million, engineering campus collocated with a Business Technology and Research Park.

Brigadier General (retired) Dan Litynski served in the US Army for over thirty years and completed nine years as Head of Electrical Engineering and Computer Science at West Point before joining WMU in July 1999. Teaching, research, and educational innovations in physics, optics, electrical engineering and computer science are included in numerous publications, awards, and a patent. Education includes Ph.D. and B.S. in Physics (Rensselaer Polytechnic Institute) and M.S. in Optics (University of Rochester) degrees. National service education includes the Army Command and General Staff College, and the Industrial College of the Armed Forces

of the National Defense University in Washington, D.C. Military awards and decorations include the Distinguished Service Medal and Bronze Star. Has been appointed to six honor societies, is a member of seven professional societies, and has several professional honors and awards. Senior member of the Institute of Electrical and Electronics Engineers (IEEE). Service to IEEE Education Society includes President, Vice President, Awards Committee Chair, Administrative Committee Member, Membership Committee Chair, Conference co-chair FIE 2001, and Program Committee Co-Chair IGIP/IEEE-ES/ASEE 2004.

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## *New Revisions to the IEEE Education Society Bylaws*

*Burks Oakley, Chair  
IEEE Education Society Constitution and Bylaws Committee  
b.oakley@ieee.org*



At the meeting of the Administrative Committee of the IEEE Education Society in Savannah, Georgia, on 22 October 2004, a number of changes in the Society's bylaws were approved. Please note that the Society's bylaws are available online at:

<http://www.ewh.ieee.org/soc/es/constitution.html>

Section 4 of the bylaws deals with nomination and election of the Administrative Committee. Section 4.1 was modified, as detailed below:

4.1 A slate of nominees for members-at-large vacancies of the Administrative Committee shall be prepared by the Nominating Committee. Recommendations for such nominees shall be solicited by a letter and/or e-mail sent to the Chairs of all Sub-Societies and Standing Committees by August 1st. In addition, the Chair of the Nominating Committee shall publish a call for nominations and distribute it to the entire Society membership by August 1st; such distribution shall be done electronically (e-mail distribution list and Society web site) and/or in print (Society newsletter). A nominating petition carrying a minimum of 25 names of Society members, excluding students, shall automatically place a nominee on the slate to be presented to the Administrative Committee. Recommendations and petitions are to be submitted to Nominating Committee by September 15th.

Section 9 of the bylaws deals with meetings of the Administrative Committee. Section 9.1 was modified, as detailed below:

9.1 No Administrative Committee meetings shall be held for the purpose of transacting business unless each member shall have been sent notice of the time and place of such meeting 20 days prior to the scheduled date of the meeting. Provided, however, that if less than a quorum attend a duly called meeting, tentative actions may be taken which will become effective upon subsequent ratification, either at a meeting or by mail and/or e-mail, by a sufficient number of members as to constitute a majority. Minutes of such meetings shall be mailed or sent by appropriate electronic means by the Secretary to each Committee member, who shall register his/her disapproval of any actions taken at such meetings within 10 days after receiving said minutes or he/she shall be deemed to have ratified.

Section 11 of the bylaws deals with standing committees. Section 11.1 was modified, as detailed below:

11.1 Awards Committee: The Vice President shall serve as the Chair of the Awards Committee. At least one-half of the members of the Awards Committee shall hold Fellow grade. This Committee shall be responsible for recommending various forms of recognition for noteworthy contributions to the fields of interest to the Society. It shall see that deserving members are nominated for awards and prizes administered by the IEEE and other relevant organizations. This Committee shall be responsible for administering the Society's awards programs. The Committee Chair may appoint sub-committees for individual Society Awards, as well as representatives to committees involved in the selection of other awards in which

the Society participates. Nominations for Society Awards shall be considered annually, although awards need not be made annually. The Committee's decisions are final and need not be ratified by the AdCom. The Committee shall review the Society's awards from time-to-time, and may propose modifications to existing Society Awards, as well as additional Society Awards, subject to approval by the AdCom and the IEEE TAB. The Committee Chair shall prepare an annual report

covering all of the awards activities.

Article IX, Section 2, of the Society's constitution states that changes in the bylaws cannot go into effect until they are published in the Society's newsletter. Please consider the above as the required publication in the newsletter.

Respectfully submitted,

*Burks Oakley*  
*b.oakley@ieee.org*

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## *For your Information*

### Online Forum

Currently there are 389 people subscribed to the IEEE Education Society online forum

- Defining and Teaching Engineering Ethics, October 2004 by Billy V. Koen, The University of Texas Austin USA
- Ever Think About Becoming a Book Author? June 2004 by David Fogel, Natural Selection, Inc.; IEEE Press Board Member
- Getting Published in the *IEEE Transactions on Education*,

May 2004 by Ted Batchman, University of Nevada Reno USA

Located at: <http://www.ewh.ieee.org/soc/es/esnews.html>

Excerpted from Rob Reilly's report to the IEEE Education Society Administrative Committee in October 2004 at the 2004 Frontiers in Education Conference, Savannah, GA, USA.

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## *Letters to the Editor*

Howdy Bill:

Enjoyed the piece by Dr. David Kerns in the 11/04 issue of *The Interface*. He brought out the impact of China, India, etc., on outsourcing.

Excellent points made, but only natural that a large number of overseas science and technology (S&T) folks, trained in the US, would go back home and try to replicate our past work in manufacturing ('tho many stayed here.) We should not be astounded at this development but only recognize it as a natural step of progress for the developing world.

What could be our response in manufacturing? Automation has certainly not been advanced as far as it could be. The auto industry seems to do a good job there but those "line" techniques seem not to have migrated to textiles, food, housing, etc. My son is with NASA who has been pushing to use robot-

ry to repair orbiting defects in space. I hope they set an example on the space telescope.

Major shifts towards robotics in US plants could reduce manufacturing costs to a competitive level to match the labor advantages of India, China, etc....

It's been a half-century since high school (HS) math was jerked upward, accepting calculus back in the Sputnik era as a challenge. The half-century of stagnation compares to two major earlier upgrades -- those of the late Reconstruction period and those of the Dewey cohort, in a similar half-century epoch. Obviously, post-calculus is a current challenge.

Thanks for your help on our project over the years...

*George Rodgers*  
*giorgio47@cox.net*



## From your Editor

Bill Sayle  
wsayle@georgiatech.metz.fr



As I have stated before, it's a real pleasure to edit *The Interface*. Not only do I get to read all of the articles in advance of publication, I get to have related conversations about some of the articles with the authors.

One such recent conversation was with **Frank Splitt**, the author of the Trilogy that appeared in the three issues of *The Interface* in 2003. One of the major points of the trilogy was reforming engineering education to focus on major world issues, like sustainability. In our recent conversation, Frank and I discussed the increased emphasis on sustainability in the revised ABET Engineering Criteria. These criteria will be effective for visits occurring this fall. (See related article in this issue of *The Interface*.)

My conversation with Frank Splitt also involved a discussion about Frank's efforts to help place the proper emphasis on collegiate athletics. He is very involved in the Knight Foundation Commission on Intercollegiate Athletics. With recent scandals at some of our prestigious USA universities involving collegiate athletes, the work of the Knight Commission takes on even greater importance. You might ask what business is it of electrical and computer engineers to worry about collegiate athletics? I would reply that it is most certainly our business to ensure the athletes are students first and ath-

letes second. We should also be very concerned about the financial drain collegiate athletics programs have on our universities. Donors to academic programs are being solicited by athletics programs for contributions that enable the purchase of season tickets to football and basketball games. The trend appears to be worsening. If we do not get involved, we only have ourselves to blame.

I also call to your attention the article by **Moshe Kam**, IEEE Vice-President for Educational Activities. Moshe has several excellent suggestions for building pre-college efforts in engineering education. One idea that really appeals to me is the pooling of resources by all of the engineering professional societies so pre-college teachers, administrators, and students can obtain information and resources at one central site.

And, of course, the continuing major issue of bio-X and its role in electrical and computer engineering education is prominently discussed in two articles (ECEDHA and IEEE CEAA). As the ECEDHA authors mentioned, it was only a decade or so ago we were discussing eliminating chemistry as a requirement for ECE education. Now, we are discussing requiring, or at least encouraging, biology as an integral part of the education of every CmpE and EE student. How to accomplish this outcome will continue to be the subject of discussion.

I hope Springtime in the Northern Hemisphere and Autumn in the Southern Hemisphere is a good time for all.

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