

# AMERICAN ENGINEER<sup>TM</sup>

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## Unrealistic Expectations Of Engineering Education

An article in ASEE *Prism* magazine (published by the American Society for Engineering Education) titled, "Educating Tomorrow's Engineers" (May/June 1995, p.11), gave the text of a panel discussion of four corporate executives and one National Science Foundation (NSF) assistant director. This discussion, which offered educators advice on educating future engineers, opened the dedication ceremonies of the William States Lee College of Engineering at the University of North Carolina at Charlotte (UNC Charlotte) on November 22, 1994. The discussion showed that the panelists had unrealistic expectations of what can be accomplished in only four years, the typical nominal length of engineering programs: "The panelists told UNC Charlotte educators that tomorrow's engineers must be people who can go beyond the numbers to understand the impact their projects are likely to make on society. They must be able to communicate, to solve problems in teams, to speak other languages and work with other cultures, to understand environmental impacts, and to resolve conflicts. An example of unrealistic expectations is the following statement by panelist Tommy Hodge, vice-president of corporate human resources at Milliken and Company in Spartanburg, South Carolina: "Some of the questions we ask about any graduating student we interview include: Is the student technically competent to hit the ground running and solve problems? Has the student any kind of project management experience? The Milliken engineers I surveyed felt that most students receive a lot of theory, that the majority we interview are technically competent, but that they could use more experiences in applying their technical skills and in actually managing projects." Those things are a lot to ask of a new graduate of a four-year engineering program.

Panelist Joe Bordogna, assistant director for engineering at the National Science Foundation, said, "we want engineering students to be together that first day. We want them to take full advantage of technology on the first day. We want them to be at workstations, using all of the software available to learn calculus and mathematics. We want them to interact with the Internet from day one. We want them to do projects. We want them to design and build projects from day one. We certainly want students to have what have been called the fundamentals: mathematics, physical science, and, increasingly, life sciences. These are the tools they need. But those are not the reasons for being engineers. We want them to do experiential things, the things of engineering, up front, not wait until the end. We want the undergraduate program to be holistic so that instead of students taking 30 or 40 courses that never connect, all courses connect to the

ones before. We have about 60 engineering schools involved in coalition teams of five to 10 schools, each team working to develop such an integrated undergraduate curriculum. These coalition teams are encouraged to be experimental because none of us really knows what to do yet." (*Editor's note: you can say that again.*) However, there is a very good reason why design courses are saved "until the end": design courses utilize and integrate all of the students' prior education, and therefore the end is when students derive maximum benefit from these courses. In a related statement, panelist George Heilmeier, president and chief executive officer of Bellcore in Livingston, New Jersey, said, "The power of computation has made the research and the work that we engineers do much different from what it was when I came out of school. But with all the computational power that we can bring on problems, we need people who can understand what's behind the numbers. I've seen some absurd conclusions from people who looked only at the numbers without using any other perspective to understand what those numbers meant or why those numbers made sense or didn't make sense." A professor of psychology once gave the following explanation as to why uneducated people tend to score poorly on intelligence tests: "you can't be a genius if you don't know anything." Similarly, under modern conditions, one cannot be an engineering genius unless one knows a lot of engineering. Two conclusions follow. 1. It makes sense to save the design courses for the end of the engineering curriculum. 2. The four-year curriculum is woefully inadequate to prepare engineers for careers in the '90's.

*Dissident Engineer*

## Editor's Column

### WHAT I'VE BEEN UP TO

Readers undoubtedly noticed that no issue of "American Engineer" reached their mail boxes during the month of April, whereas in the past, an issue came every two months. The last one was February '96. It happens that my apartment was renovated during March and April, and the material for the next issue was not to be found in the rubble. I have since unearthed some of it and am going to press with this issue, which may not be as extensive as prior issues, since lots of stuff was lost.

### ILLUSORY JOB ADS

This is a long-running column in AE, deservedly. Here's a job ad apparently slated for aliens. The wording, 'Must have proof of legal authority to work permanently in the U.S.' is a dead giveaway that an alien is the intended hire. Also where do they get off calling a field service technician an engineer, when all they require is a high school diploma? If you don't like this, write Secretary of Labor Robert Reich at the Labor

*(Continued)*

Department in Washington, DC, which is enough of an address to reach him. You can also apply for the job, which may embarrass the local Labor Office, if they haven't already hired some alien to fill the job.

Field Engineer for Office Equipment Sales and Service Company. Troubleshoot and repair in field office equipment including photocopying machines, document feeders, duplex control circuits, solenoid drive circuits and frequency counters. High School completed. Three years experience in job or as Field Service Technician required. 40 hours per week, 8:00 a.m. to 5:00 p.m. \$16.54 per hour. Must have proof of legal authority to work permanently in the U.S. Send two copies of both resume and cover letter to Illinois Department of Employment Security, 401 South State Street, 3 South, Chicago, Illinois 60605, Attention: Shella Linsey. Reference No. V-IL, 14397-L. An employer-paid ad. No Calls.

Here's another beauty:

**CONTROL SYSTEMS ENGINEER** - In Portland Oregon, qualified applicant must possess a Bachelor's degree in Electrical Engineering or equivalent. Must operate Microsoft Excel, Lotus 123, Quattro Pro, dBase, Autocad, and Instaplan. Must function within a computer network. Must operate hardware systems: System 600, Metasys System, American Automatrix System, Johnson Controls, Inc., Landis and GyV Power. Must have 9 months experience in the materials employed, their costs and labor costs, construction contracts and their negotiation. Applicant will be responsible for designing heating, ventilation, and air conditioning (HVAC) control system equipment and coordinating construction, Design and plan layout of wire facilities connecting

direct digital control (DDC) equipment comprising of a network to cover the changing conditions and requirements. Visit proposed construction sites and select best and shortest route to avoid interference with power lines, etc. Evaluate technical capabilities of wire facilities, according, to availability and arrange to obtain most effective method of communication. Direct preparation of, or prepare drawings and specific type of equipment and materials to be used in construction and equipment installation. Estimate labor, material construction and equipment costs. Observe operation of installation for conformance with operational standards. Inspect completed installation for conformance with design and equipment specifications and safety standards. Cover letter and resume must reflect experience. 40 hours per week. Salary: \$34,600 per year. By April 1, 1996 send resume to: Oregon Employment Department Attn: Job Order 5551047, 875 Union Street, NE, Room 201, Salem, OR 97311.

If the surplus of engineers is over, how can this firm hire anyone to do all that for that salary? Tell me how.

#### REPRINTS

This issue has more reprints than original material. One reason is that I haven't received as many letters or original articles from readers as in the past. Readers—are your jobs more remunerative or more secure than a year ago? Or is it that you're so preoccupied with survival that you don't have enough spare time to write? Talk to me.

*Robert Bruce, AE Editor*

## ... Internet The Natives Are Restless

*By Frank J. Burge, Associate Publisher*

While governments and corporations attempt to deal with a cyberspace community, a few fast-buck artists are exploiting the opportunities. According to a *New York Times* story, a German engineer with homes in Las Vegas and Hong Kong, was arrested, along with two others, for conspiracy, fraud, and international sales of illegal electronic equipment. The investigation began after AT&T complained that cellular phones, programmed with stolen numbers, and eavesdropping devices were being advertised through a World Wide Web site.

Federal agents monitored the ring-leader's account on CompuServe and posed as buyers for the illegal equipment. A secret service spokesman said the case is the first in which federal agents obtained court approval to monitor private electronic messages on the Internet.

Governments are finding it increasingly difficult to control the cyberspace tribe, which makes them nervous and paranoid. Recently, the German government demanded that CompuServe block access to more than 200 Internet discussion groups on sexually-related topics. This brought immediate response from CompuServe subscribers, and a sampling of those comments were reported in the *San Jose Mercury News*.

One subscriber opined: "Adjusting content is a time-honored practice in the free world. It's called editing ... Editing content is fundamental in providing an information service and it is perfectly legal. But what is forbidden by our constitution is government censorship of information providers. The providers may edit/censor anything they wish. And if you don't care for their editorial decisions, you take your business elsewhere."

Another user said: "Don't give us this balderdash of 'use another service...' CompuServe has unique services that I find useful. There are only so many services, and once the principal is established that any two-bit European or Asian fiefdom can dictate what I can access through CompuServe, will American Online or Microsoft Network be far behind?"

Meanwhile, the natives in the U.S. are losing trust in their institutions. Not surprising, since downsizing and the constant threat of job loss would shake one's confidence. And they become uneasy when our government sends 20,000 troops to Bosnia to secure the peace, yet is unable to curb the warfare waging in our cities. They are disturbed by politicians who caused a partial shutdown of government while they wrestled for political advantage. And they don't give a damn about how it has affected millions of hard-working people.

When the natives get restless, they find others who are fed up and bond together in tribes. And they have the Internet to help them organize to force change. This makes governments nervous. So expect more cybertaps and attempts at censorship. The furor is just beginning.

*E-mail: fburge@class.org*

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### Sample Copies Available

Members of the American Engineering Association are encouraged to submit names and addresses of friends and associates who they think would be interested in receiving a sample issue of the "American Engineer."

Names should be sent to: AEA, P.O. Box 820473, Fort Worth, TX 76182-0473.

## Washington notices

By Robert Bellinger

It took them a while, but the politicians in Washington have finally noticed: We Americans are worried about our jobs.

This is old, old news to the readers of *EE Times*, of course. So far in this decade, in response to our annual *EE Times* "Salary & Opinion Surveys," you've listed "job security/employment" each year as your No. 1 career issue.

Now, the presidential candidates have picked up on this. President Clinton and his labor secretary, Robert Reich, have been sounding the drums of "corporate responsibility" and reportedly are planning a White House-sponsored pow-wow over the issue of why corporations continue layoffs in the wake of record profits.

Conservative Republican candidate Pat Buchanan illustrates perfectly the "strange bedfellows" netherworld of politics by deriding the corporations for layoff policies, an AFL-CIO rallying cry if I ever heard one.

And Bob Dole poked his head out of the Washington clouds long enough to marvel that so many workers—professional and blue collar alike—are sweating out their financial existence. Talk about being isolated.

The irony is that all this is happening as the job market for engineers has burgeoned. If the market pendulum were a golf swing, we'd have fallen backward from the sheer extremity of it.

Now, Challenger, Gray & Christmas, the outplacement firm that tracks employment trends, wonders: "Is there evidence the CEOs are responding to the jawboning about layoffs by some presidential primary candidates?"

In the week of Feb. 21, layoff announcements dived to the second lowest weekly total since 1993. From Feb. 14 to Feb. 21, "only" 4,344 layoffs were revealed, or about 868 per business day, vs. 1,520 per day last February.

"There is no way to say with any certainty that the daily pounding about layoffs that was heard from New Hampshire ... did in fact stop companies from issuing layoff announcements," said James E. Challenger, president of the Chicago firm. "Such plans are usually not developed or stopped on the spur of the moment. However, the fact that the number of layoff announcements dropped off so dramatically makes one wonder if there is a cause and effect."

Frankly, we're skeptical about any long-term change of heart by employers. Remember that CEOs were telling their employees, "We can't guarantee you a job."

Right now, the engineering employment picture is excellent. But with a sagging book-to-bill ratio, a deflating stock market and some evidence that too many PC/communications manufacturers have crammed into the same corner of the marketplace, personnel shakeouts are inevitable, no matter what babble the politicians mutter.

We suspect even Buchanan would admit that the federal government can't force employers to keep their people on the job. That would create a European-style socialist marketplace.

The best we should hope for is to reintroduce CEOs to long-term planning.

Is it really smart to let your engineers go after one quarter of sluggish profits? How much money have you spent rebuilding your staffs? Looking back on it, had you kept your engineering team intact in 1992-93, would you be better off today?

We think so.

E-mail: [bbelling@eet.cmp.com](mailto:bbelling@eet.cmp.com)

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Reach Out to the active volunteers that are making this publication possible. Tell them what you like or what you dislike. Provide them with questions, answers and information or just a hand written note of appreciation. Believe me when I tell you that it is important to let your volunteers know that you care.

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## TRUDEL to form

*By John D. Trudel*

My last column discussed the three major templates for business in the U.S.—value creation, downsizing, and M&As. The leaders still do business the old fashioned way. They create value and grow their markets.

These are the Intels, the Microsofts, the Motorolas, and a myriad of new ventures. They are also the Wal-Marts and numerous other firms to prosaic industries who are renewing themselves through technology. You can recognize such firms by their uniquely valuable products of services.

For the most part—but with the above mentioned and many other notable exceptions—as we stand at the end of the Industrial Age and the dawning of the Information Age, most of these leaders are no longer U.S. firms. Increasingly, the Japanese dominate world markets with their technology-based products.

Right behind them are the new competitors of the Pacific

Rim. They have stable economies, supportive governments, low crime rates, well-educated workforces, and an Information Age-infrastructure. Places like Singapore are 100% wired with fiber, in contrast to the nineteenth century infrastructure in the U.S. The Pacific Basin has been flooded with capital, a net inflow of over \$151 billion in the 1990-93 period alone. There are some 70 firms making PCs in Taiwan alone.

If you are a leader, you can make money anywhere. If not, the world is less kind. The "no-brainer" way to make money is to take U.S. technology and move it to low-wage nations. But the trick is that you need a well-educated workforce. Despite NAFTA; it is hard to imagine Mexico competing with Japan or the Pacific Rim at complex products.

Most countries are sensitive to where the value is added. They want to protect the high ground and keep the high-wage jobs for themselves. The U.S. is the exception. Wall Street cares about profits, not jobs or corporate survival. The U.S. government centers on problems, not opportunities. When it does worry about jobs, it protects the bottom, not the top, of the spectrum

Oregon is a good example. It recently won several coveted billion dollar semiconductor fabs. But it will get mostly low-wage assembly jobs, not high-wage professional and management jobs. The average wage in the state has declined from 110% of the U.S. average to about 90%, and it will continue to drop.

Because of such trends, many firms in the U.S. have given up on value creation. They are trying to make money by downsizing and M&As. They are cutting costs, slashing jobs, and selling assets, not creating value. Profits are up, but at what cost?

One cost is that silly situations like Ron Brown's patent sell out are tolerated. The value creators want better access to closed markets, like Japan, by pressuring Congress. The Japanese, who planned for this, have made sure that the top positions in our Commerce Department are staffed with former lobbyists like Brown. They trade trivial concessions for strategic gains, like opening our patent system.

The downsizers mostly welcome weakened patent protection. They think that if they can get free technology, they can compete based on "cheap." This doesn't worry the Japanese, but it does undercut the value creators in the U.S. Why invest in R&D if your competitors can legally steal it?

On the other hand, why not win? Why not create unique value and prosper? Since 1988, my consulting practice has been dedicated to this end. There are many success stories. Future columns will discuss some of them. I encourage you to send me your stories.

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## Reader's Voice

This column in the "American Engineer" is for readers to voice an opinion about issues that affect the professional life of an engineer or other technical professional. Readers are encouraged to write AEA with their professional concerns. Each submission should include the name, address and phone number of the writer. Except for short excerpts, we'll publish the writer's name, city and state (unless the writer requests anonymity). In that case, we'll publish initials, city and state. Let's hear from you.

From JL of Essington, PA. - I found your address from a recent article in *CE Weekly*. I'd like to get more information about your organization, as I might like to join. I believe you're set up to help Americans work in the U.S.A. (simply put). I try to keep up with the doings of our country in regard to jobs vs. technical talent from other countries. I've tried to do my part by following any suggestions that appear in *CEWKLY* and whatever else I can do on my own. I've enclosed a copy of a piece of paper that was tacked on the bulletin board in front of my boss's office a little over a month ago. The heading: Boeing Considers Hiring Fokker Engineers. I later heard it is a fact that Boeing hired Fokker engineers who are now working in WA. Boeing is supposed to have provided them

with apartments and cars, and they're here for about a year. When asked why they're doing this, Boeing was said to reply that there are not enough engineers in the U.S. of A. to fill the jobs. I know for a fact this is not true.

The notice follows:

### Boeing Considers Hiring Fokker Engineers

Boeing held an information meeting attended by 400 Fokker engineers last week in Amsterdam, with a view to hiring employees of the bankrupt Dutch aircraft manufacturer. The U.S. giant is considering offering short-term contracts to some 350 Fokker engineers for work starting as soon as mid-April.

Another U.S. company, Bell Helicopter Textron, is seeking to hire about 40 Dutch engineers, while de Havilland is considering recruiting 40 of them, a Dutch source said. The Fokker bankruptcy is affecting a total of 1100 aviation engineers.

*Editor: I call our readers' attention to "CE Weekly", an excellent publication dedicated to the interests of job shoppers and consultants.*

Robert Bruce, AE Editor  
Box 620726, Little Neck, NY 11362

## Overpaid?

By Robert Bellinger

There's been a real zinger in this month's *IEEE Spectrum* magazine. In the "Employment Roundtable," which features mostly non-engineers speculating about your futures, your jobs and your competitive stance, labor economist Howard Rosen is quoted as saying that the outsourcing and offshoring of engineering jobs are "pressures [that] suggest that U.S. engineers are being overpaid. I am reminded of the steel industry in the 1970s, when workers were making 20 percent more than the manufacturing average ... Maybe the engineering community needs to look at itself and take certain steps now to protect itself in the long run. Otherwise, engineers may end up being just like those steel workers."

To which a Penn State professor replies, "U.S. engineers are being overpaid in a globalized economy. There are no ifs, ands or buts about it."

That sounds outrageous, especially coming from a Washington bureaucrat and an academician. But we must grit our teeth here, take a deep breath and count to ten—digitally. There is an itsy-bitsy grain of truth here. You are not, of course, "overpaid" relative to American professionals—especially compared with bureaucrats and professors. Engineers' real income is behind what it was 20 years ago, panelist Jack Doyle points out in the *Spectrum* article.

But when stacked against Indian and Chinese programmers and EEs, there's a hopeless disparity in salaries. As *Spectrum* notes, you can hire two Chinese engineers for the price of one American.

So, what does this mean? That you should take a pay cut? Get real. That you become more productive? Perhaps, but that's a management issue. That you stay one step ahead technically? Yes, but American engineers have no lock on innovation. You face stiff competition, technically.

The best reason to hire \$70,000 American engineers is ... they're Americans. The U.S. business environment encourages risk, innovation and reward. The Constitution protects free speech and rights. China's political environment poses a threat to businesses: India grapples with entrenched restrictive business practices and an immature internal market.

You are not overpaid. But as the steelworkers found out, nor are you invulnerable.

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# Old-Line Societies Still Obsessed With Women's Problems In The Engineering Profession

With all the problems plaguing the engineering profession (unemployment, underemployment, underutilization, undercompensation, age discrimination, salary compression and inversion, heavy unpaid overtime, the shortage myth, inadequate retirement funds, low professional status, tyrannization of the old-line engineering societies by academics and corporate executives, etc.), any special problems that women have in the profession—above and beyond the problems of engineers in general—should be the subject of benign neglect. Instead, the old-line engineering societies continue to be obsessed with women's special problems in the profession; examples of such obsession are the NSPE's recently published "Glass Ceiling" report and the lengthy main article titled, "The Uphill Struggle—No rose garden for women in engineering," which appeared in the May 1995 issue of IEEE's *Spectrum* magazine. The NSPE's newspaper *Engineering Times*, to its credit, carries many major articles on other career issues, whereas IEEE's *Spectrum* rarely does (a major exception is a recent *Spectrum* main article about layoffs); the IEEE may depend on its other publications to cover career issues, but more coverage of career issues should be in this magazine, IEEE's flagship publication.

This obsessive concern about women—and minorities—in engineering is partially the result of a myth that there is now a "shortage" of non-Hispanic white-male workforce entrants, the "traditional" source of engineers; the truth is that workforce entrants in the period 1990-2005, and the total non-Hispanic white-male workforce is actually expected to grow—not shrink—in this period.

The *Spectrum* magazine article mentioned above is a transcript of a panel discussion by eight prominent women working in engineering and closely related areas. Naturally, the panelists selfishly concentrated on the special problems of female engineers. Some of the comments in the discussion are rather interesting:

(1) "The signal we're sending is that it's tough for a woman to get into engineering. She has to be very good, but any old guy can be an engineer."

(2) "A basic problem is that engineers have an absolutely lousy image. They don't have a professional image. We've so splintered ourselves into separate disciplines that nobody speaks for the profession of engineering." (Comment: there again is that "splintering" or "fragmentation" argument that the old-line engineering societies have used for so long as a phony excuse for their failure to properly represent typical working engineers).

(3) "Maybe women in engineering find it so tough because male engineers have very low self-esteem, so somebody has to be even lower. That's different in other disciplines. I'm learning from the IEEE what a low self-esteem our practicing engineer has."

(4) "Is it (i.e., the low self-esteem) because they are the first generation to be educated as compared with most other fields? If you have parents who are college educated, majoring in literature or thinking of law school makes sense. But if you have a blue collar background, engineering is almost the first boot-strap kind of profession." (Comment: engineering is also a dead-end kind of profession, which helps explain why students with college-educated parents—particularly parents who are engineers—often do not choose engineering as a major.

(5) "More than that, it's the image of the engineer in society. You don't tell people you're an engineer, even when you're successful." (Comment: though the engineering profession is plagued with problems and should be giving engineers more to be proud of, probably most engineers are not ashamed to admit that they are engineers).

(6) "Women do this classic thing to themselves. I've read about it and see it all the time with our students. If a man messes up an exam, he says, 'The professor is unfair, what a lousy exam, he didn't prepare us for it.' But if a woman does badly, she eats herself up with, 'I didn't study enough, I knew I shouldn't have gone out this weekend.'" (Comment: that is an overly broad generalization if ever there was one.)

*Disillusioned Engineer*

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