# from our READERS

## HOW TO APPLY TO GRADUATE SCHOOL

In the interest of improving communication between potential graduate students and the schools to which they apply, I would like to paraphrase the typical letter of inquiry, 'I am a student in chemical engineering at Flapdoodle University and would like to continue in graduate school at the University of Colorado. Please send me bulletins, admission forms, and information on financial assistance. Thank you. Cornelius Bucolic."

This is so typical of the letters which I assume many of us receive. The omissions are many: 1) Exactly when is the student going to complete his work and when does he wish to enter the University of Colorado? 2) What are his interests; why should Colorado be a good school for him? 3) How good a student is he; what is his grade point average? 4) What is his citizenship; should he prove to be a competent student, is he eligible for U.S. Government sponsored fellowships and traineeships?

I recommend that early in the fall every school ask a teacher of seniors to have a heart-to-heart father-and-son (or daughter, as the case may be) conversation with students who are planning to apply for graduate school, and ask them, **please**, to be specific in stating their qualifications and reasons for being interested. It will save many frustrations, lost time, and wasted dollars.

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# ChE book reviews

*Man's Impact on Environment*, Thomas R. Detwiler, McGraw Hill, (1971) 731 pp. $5.95.

On cursory examination, Thomas R. Detwiler's "Man's Impact on Environment" appears to be another rush job non-book to serve the current environment fad. Like such books it is a collection of papers previously printed elsewhere, and in some cases, published many times over. But Detwiler provides authorship as well as careful selection and organization. In addition to introductory and summary chapters, he provides a short but useful introduction to each of the 50 selections, giving related references which may be more current than the paper and prove most valuable to the reader.

The selections are grouped into 10 sections. These sections include a wide range of topics: thermal pollution, aquatic weeds, surface mining, world population, air pollution, defoliation in Viet Nam, pesticide effects, wildlife in danger, the possible biological effects of a Central American sea-level canal, and more. They give one an insight

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*them. They're eager to tackle tough problems, but they sometimes find that the greater task is to identify the problems that need to be solved, and rank them in order of importance. This is still as much of an art as a science. The engineer wants to model a new process so he can optimize key variables, but it often turns out that there isn't enough data to build a complete model. By the time he gets the data, he is asked to design a Mark II process, and frustration sets in all over again. He finds that nothing stays nailed down very long, and that very few important problems are subject to final solutions.*

**Along with a tolerance for ambiguity, the engineer needs flexibility. We cannot promise a man that he will always work in his first field of specialization.** If he has real talent he is likely to be offered a variety of assignments. Some of my colleagues took a look at the records of five engineers who have been with us an average of seven years. They have had from three to six assignments each, ranging from design to vibration analysis, instrumentation, and reaction kinetics.

A THIRD QUALITY VERY much in demand is the ability to put it all together. Let me clarify that. I'm not trying to revive the old argument about the specialist versus the generalist. I'm not suggesting that every engineer ought to have a little bit of training in everything, because that could easily produce engineers no good at anything.

We still need highly trained specialists and theoreticians, people who dig a mile deep but only an inch wide. But above all there is a need for engineers who know how to collaborate across the disciplinary lines, people who can meld the soft inputs and the hard ones, make allowances for the economic and human factors as well is the technical ones, and come out with a consolidated approach. We know this kind of talent often develops in younger and smaller high technology companies. One of our main goals is to develop more of it in our organization, because it's just as badly needed, and when it is operating for us it has enormous leverage.

*We are not sure where these three qualities fit into the educational picture — the tolerance for ambiguity, the personal flexibility, the ability to put it all together. Are they teachable talents and if so, are they related in some way to academic performance, or to the type of engineering curriculum a man goes through?*

**. . . there is a need for engineers who know how to collaborate across the disciplinary lines, people who can meld the soft inputs and the hard ones, make allowances for the economic and human factors . . . and come out with a consolidated approach.**

We don't see the correlations very clearly, but in any case we defer to you. If these qualities can be incorporated more into the educational process, we know you're likely to find the way to do it.

I'd like to close with some comments about industry's role in adapting to uncertainty. Primarily, it comes down to the way we work with our people.

We acknowledge the incentive problem, and as everybody knows, from a strictly financial point of view, the lines aren't as distinct as they used to be. The median salary for a B.S. engineer with 15 years of service in manufacturing is $17,000 a year. That is about what a man can earn as an able-bodied seaman in the merchant service, as a locomative engineer, or as a tractor-trailer driver on cross-country hauling. Obviously there are psychological fringe benefits that make an engineering career worthwhile, but we don't take them for granted. We make a serious effort to put technical people on projects

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## BOOK REVIEW **(Continued from page 152)**

into the problems of the environment that is more profound than he is likely to experience firsthand or from perusing a newspaper or periodical.

Despite the indomitable optimists like the editor of Look magazine who decries the forebodings of the ecological Chicken Littles and fills us with football pep-rally confidence in our ability to overcome all obstacles, the problems of the environment described in this book deserve serious study. The engineer might have preferred more attention to internal and external combustion engines, to methods for converting garbage and recycling paper, and to greater utilization of renewable, non-polluting sources of energy. The author (a geographer at the University of Michigan) advises that the course which uses this book was taught jointly with an associate who is an engineer. So, we discover, that the environment belongs to all of us, even engineers, and we share, alas, in its responsibilities as well.

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