ChE views and opinions

GRADUATE SCHOOL - WHO SHOULD GO?

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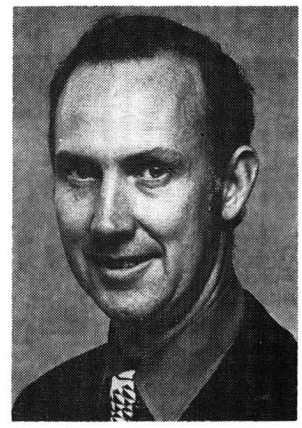

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AN ENGINEERING PROFESSOR is frequently confronted with the situation in which a student requests his opinion concerning whether or not he should go to graduate school. Due to the present difficulty of securing good graduate students and the press of time, it is very tempting to ask the student what his overall grade point average is—and if it is above 2.8 or so—encourage him to attend graduate school by stating that the future belongs to those who prepare for it. Most of us realize however, that grades are not the most important factor and that more important criteria should be used to determine whether or not a particular student should attend graduate school. The purpose of this article is to attempt to define some of the factors which the student should consider before making his decision.

PLANNING AN ACADEMIC CAREER

First of all, one can dispense with the cases which have an obvious solution due to the present climate in academia. Those students who have a high grade point ratio and are interested in a career in teaching must secure a Ph.D. to obtain a faculty position. It is probably better for such students to proceed directly to graduate school after obtaining a B.S. and to enroll directly within a Ph.D. program. This should be followed by approximately two to three years of industrial experience prior to a return to academic life. If the prospective academic stays any longer period in industry the industry will tend to increase his salary level above that normally associated with entry into academia. In addition, a longer period in industry will greatly narrow his technical interests and thereby reduce his effectiveness in academia because of the review that will be required. This review time will make it more difficult for him to establish a research program during the years in which he must prepare to be considered for tenure. At most universities, demonstrated research performance is absolutely essential to obtain tenure.

If the student chooses to obtain his industrial experience between his B.S. and his Ph.D. there will again be a significant review time requirement upon his entry into graduate school. In addition there is a considerable financial decompression which must be overcome when he compares the paychecks associated with industry and graduate school. Finally, the average student has an interest in starting a family ofter obtaining his B.S. and this imposes an additional financial constraint upon him when he considers returning to graduate school. Therefore, if he seriously wants to have the option of a career in academia open to him, the easiest path appears to lead directly to the doctoral upon completing the B.S.

INDUSTRIAL CAREER PLANS

For those students who plan a career in industry the answer concerning the desirability of graduate school is much more complex. In the initial phases of his industrial career, the engineer

can succeed by performing in two general areas. These areas are different in that one is basically people oriented while the other is problem oriented. A position in production or sales would be representative of the first area, while a position in development or process engineering would involve the second area. What is most important to the student is that the requirements for success in these two areas differ drastically.

The most important trait that an engineer can possess to be successful in a production position is the ability to communicate effectively. It is absolutely essential that he is able to easily communicate with his associates. This may require drinking coffee that tastes like mud in a dingy room off the control room or taking an occasional chew of tobacco. He must be prepared to do whatever is required to convince the operators that he is a "good ole boy" so that they will not hesitate to tell him all they know about problems with the process.

This trait must be combined with a considerable amount of political ability which will allow him to effectively implement and sustain the operating policies required to economically operate the plant. He must be the operator's friend but yet clearly their superior.

Finally, the engineer in production needs to have a reasonable grasp of technical matters. He does not have to have superior skills in this area because there is usually a pool of engineers in a technical division which he can call upon for support. Normally, he is so busy with day to day personnel and mechanical problems that he does not have time to consider the technical problems in-depth. His principal technological function is to identify the problems for others to solve.

Therefore, if the requirements for production engineer are listed in the order of decreasing importance, they would be a good communication skills, good political skills, and a reasonable technical ability. If the student's strengths are also in that order and he desires a career in production or sales, attending graduate school is not essential since the technical background provided by a B.S. will be adequate for success in his chosen career.

For those students who desire a career in development or process engineering the requirements for success are reversed since these positions are more problem than people oriented. That is, technical ability is the most desirable attribute followed by political skills, and then ability to communicate. Almost everyone who has had industrial

Any engineer who is in a problem-oriented rather than a people-oriented position should go to graduate school . . . consider in increasing importance the skills of communication, politics, and technical problems.

experience can cite an example of an engineer who lacks personnel skills but whose technical capabilities have made him a success in process engineering. Every organization needs a pool of real problem solvers who finish their careers as senior technologists. Many students intuitively realize that this order describes the actual order of their abilities. These students need at least an additional year and one half of training to be successful within the rigorous technical environment found in such technical groups. These students should go on to graduate school and obtain a Master's degree.

CHOOSING A GRADUATE SCHOOL

For some students the question then becomes where they should go to graduate school. Again, it is tempting to tell each of them to obtain admission at a school with a high academic standing in his area of interest. In my view, this is not the best answer, it again depends upon the career aspirations of the student. These aspirations are normally poorly defined by the student but it is better to make a judgment on the basis of his current prejudices than to decide on no basis at all. If the student feels confident that he desires only a Master's degree he must be very careful in his choice. Many departments secretly desire to produce only Ph.D.'s and the M.S. is reserved as a consolation prize. After the student enters the program, there is a strong pressure for him to remain until he gets his Ph.D. It is not uncommon for those who leave with a Master's degree from such schools to have difficulty in obtaining suitable employment. Therefore, if the student desires only an M.S., he should be certain that that degree is an important part of the graduate program at the school he plans to transfer to, and that it is not regarded as a second class degree. In addition, he does not want to attend a program which emphasizes research at the expense of work in the classroom. However, in order to obtain an appreciation of the problems involved with organiz-

ing a research problem, he should choose a program which requires a minor research effort for his M.S. This will help him later in his career when he is asked to translate research results into a process design.

GOLDEN HANDCUFFS

If the student is planning a career in industrial research, it probably is wise to proceed directly within a Ph.D. program. Normally, however, the student is not sufficiently sure of his objectives to know whether he really wants to obtain a doctorate. In those cases, he should obtain a Master's degree first. If he loses his enthusiasm for continuing on immediately, the student has the option of returning to obtain his Ph.D. at a later date.

Many students feel that they are tired of coursework and the economic pressures are so great that they must work for a while and obtain some money and then they will come back to graduate school. These are the "If I need it I'll come back!" group who never make it back but who always wish that they had. The reasons for this are many but the principal ones are babies and benefits. After a short time in industry it is natural for the young engineer to start a family and to participate in the benefits program. This program is frequently referred to as the golden handcuffs.

Engineering departments desperately need to improve their image among the mature engineers. It is not unusual for a rising manager to take time out of his career to attend business school to obtain an M.B.A., however it is very rare that a mature engineer would come back to get an M.S. I suspect that a part of this is due to the emphasis we place on research in the Master's program. In addition we in education need to dispel the notion that we can produce a finished lifetime product at the age of twenty-two or twenty-six. We need to instill in our students the idea that they should return periodically for retraining. This must be done during their bachelors program.

The entire engineering profession would greatly benefit by a program of periodic return for retraining. The young engineer would benefit greatly from the personal contact with the mature engineers, academic research would become more relevant to industrial problems, and the mature engineer would have the opportunity to upgrade his technical skills. □