CHAPTER 17

PROFESSIONAL CONCERNS

Professors have a variety of professional concerns, from obtaining tenure to professional growth, which directly or indirectly affect their teaching. Matters of faculty development for a successful and enjoyable career confront them with responsibilities of professional ethics and the necessity that they be ethical professionals. The sections that follow will deal with these matters in turn.

17.1. PROMOTION AND TENURE

We will first consider the pros and cons of tenure and then discuss promotion procedures along with the widely perceived criteria for promotion. Finally, we'll consider appropriate actions for untenured professors desiring to be promoted.

17.1.1. Tenure

Tenure is essentially a lifetime guarantee of a job at a university as long as the university continues to teach the subject and as long as the professor is not found guilty of any heinous crime. Our discussion of tenure relies heavily on the well-researched article by Segal (1974). Tenure was invented to protect a faculty member's right to say things in her or his area of competence. This right is now called "academic freedom."

Prior to the development and widespread adoption of tenure it was not unusual for a professor to be "summarily dismissed" for saying something that the president or board of

trustees of the institution disliked. Clearly, the American Association of University Professors (AAUP) was reacting to abuses when its 1915 Declaration of Principles was adopted. Amended in 1940, this declaration advocates:

1 Bestowing tenure on all associate and full professors.
2 A probationary period with a maximum length of seven years.
3 Explanation of the grounds for dismissal.
4 Written notification and a hearing before a faculty committee prior to dismissal.

Most universities use the AAUP guidelines as the basis for their individual variations of tenure. A typical variation is the separation of promotion to associate professor from tenure which others closely link.

Tenure does have several advantages. It has proven to be the best protection for academic freedom. There are numerous instances of abuses by institutions, but sanctions established by the AAUP are embarrassing to the institution and do force most institutions to use due process for tenured professors, a protection not enjoyed by untenured professors.

For some professors the granting of tenure serves to unleash a latent creative ability which can lead to major scholarly advances. The newly tenured professor may feel free to try risky research or to attack the scholarly establishment. Although this flowering does not always occur, the possibility that it might occur is a strong argument in favor of tenure. One additional advantage is that tenure forces the institution to make a carefully considered decision at a defined point in time. Otherwise, many institutions, like many individuals, would procrastinate and not make hard decisions. When the department chair needs to fill out the teaching roster, it would be quite easy to keep someone barely adequate in place.

Like any structure invented in response to abuses, tenure can be abused. First, the process of granting tenure often does not follow the AAUP ideal of faculty control. Even if administrators do not vote or have a limited vote, their presence on committees certainly has an effect on tenure decisions. Of course, the AAUP is an advocacy group, and their ideal may not be in the best interests of all universities.

A second abuse of tenure is by professors. Perhaps the major charge against tenure is that it inbreeds mediocrity (Segal, 1974). Once mediocre professors become promoted they may promote other mediocre professors and the entire faculty rapidly becomes mediocre. As the faculty slides downhill, the truly excellent professors may decamp for greener pastures. The danger in the tenure decision is that it is a guess at a fairly early stage about what a professor will do for the next thirty or so years. If too fine a cut is made, some excellent people may be let go, and they may well bloom elsewhere. If the cut is too easy, mediocre or lazy individuals may be retained.

Tenure often places untenured professors under enormous pressure, while tenured professors are under almost no pressure. This pressure on assistant professors pushes them to do research that is rapidly publishable but not necessarily important. The untenured professor is told to focus and not become a broadly educated scholar. Changing one's research area from one's Ph.D. subject may be the kiss of death even if the now older and wiser professor can see more productive research areas. The push for tenure can also severely limit the time an

untenured professor spends on improving teaching (see Section 17.1.2).

The pressures of tenure also skew the institution's resources. Assistant professors are often given light or nonexistent teaching loads and committee assignments. This is done to let them devote time to research. In the best circumstances this strategy works well, although in the worst circumstances the assistant professor leaves before ever having produced anything. In addition, this procedure may reduce the teaching load below the critical mass necessary for the assistant professor to learn how to become an effective, efficient teacher.

Finally, the very idea of academic freedom can be abused by some professors. Academic freedom is meant to protect professors in their areas of competence. There are professors who wander outside their areas of competence and still expect to be protected by academic freedom. It is also not unheard of for professors to convert a class from one topic to another discipline and then argue that it is their academic freedom to do so. Since our colleagues in areas such as philosophy, political science, and religion really do need the protection of tenure for academic freedom, we are in favor of retaining tenure.

17.1.2. Structure of the Promotion Process

Promotion and tenure systems have significant differences from institution to institution, but the general pattern of the process is similar. We will describe a representative pattern. Untenured professors should determine both the written and the unwritten rules for tenure at their university.

Typically, the promotion process starts in the fall. The promotion document is prepared by the candidate's department, usually with considerable input from the candidate. The departmental primary committee, consisting of the full and sometimes the associate professors in the department, receives a copy of the document. The candidate is fully discussed at the primary committee meeting and a vote, usually by secret ballot, is taken. Support from the candidate's department and chair is necessary, but not sufficient, for promotion.

If the candidate is successful at the departmental level, the nomination is sent to the next level which is often the school (such as the school of engineering) level. The department head or a representative makes a presentation to this committee, and another vote is taken. If successful, the nomination is sent to the university level where yet another committee discusses and votes on it. Finally, the nomination is sent to the board of trustees for approval. The board has the legal right to vote no, but fortunately most boards are wise enough to leave promotion decisions to the faculty. By now, it is spring and candidates who are naturally nervous are reduced to quivering jelly.

The details of exactly when this all occurs, who votes, how many votes are required to pass, and so forth, vary greatly. Often the only way to find out is to ask.

17.1.3. Criteria for Promotion and Tenure

The criteria for promotion also vary greatly. Although often not written down, time in grade is usually included. Many schools adhere to the AAUP guidelines with promotion being considered during the sixth year so that unsuccessful candidates can be given the seventh year to find another position. Many schools have an unwritten but firm minimum number of years (four or five) required before the candidate will be considered. Since schools have both written and unwritten criteria, an untenured professor is advised to develop a relationship with a mentor (Balachandran and Udoka, 1990; Engelken, 1986). The written criteria at most schools include research, teaching, and service. These requirements should certainly be read carefully since they contain some useful information and some nuggets of truth. At research universities the actual criterion for promotion to associate professor and for receiving tenure has been

RESEARCH / RESEARCH / RESEARCH

which is usually translated into

PUBLISH / PUBLISH / PUBLISH

(Sisson, 1982; Addy and Dutton, 1987; Boyer, 1990). Reporting on a 1989 Carnegie Foundation survey of faculty, Boyer (1990) found that 83 percent of faculty at research universities agreed with the statement "In my department it is difficult for a person to achieve tenure if he or she does not publish." This number is up from 44 percent in 1969. Among engineering professors 63 percent strongly agreed with this statement. See Table 17-1 for additional information from this survey. In particular, the responses to Q2 further support the importance of publications. Recently, some evidence has appeared that many schools have revised the unwritten promotion criterion to

PUBLISH / PUBLISH / MONEY / ADEQUATE TEACHING

The addition of two requirements corresponds to a general tightening of the tenure requirements at most universities.

The importance of bringing in money is shown in Q3 in Table 17-1. The argument for the need for sponsored research is that professors cannot continue to do excellent research without support, and the peer review process measures quality. A small amount of institutional self-interest may also enter the picture. The importance of teaching is shown in Q4 in Table 17-1. The results in Q4 probably understate the importance of teaching since the requirement for adequate teaching seems to operate as a minimum condition which must be surpassed but then is not considered further. Since bad teachers continually cause the department and particularly the chair a great deal of grief, the requirement for adequate teaching is clearly in the best interests of the department. Obviously, one can argue with the values that only adequate teaching is necessary; our purpose here is to report what *is*, not what could or should be.

An untenured professor needs to know the details of what counts for how much in the various areas. This search will lead into many subjective areas (Watson, 1991). For instance, not all publications are equal. Ideally, the quality of all publications would be determined by careful scrutiny, but this is a difficult subjective judgment. Although attempts are made to determine quality, it is common to use other criteria as a substitute. For technical papers, refereed articles in a major journal are more important than refereed articles in a minor journal,

TABLE 17-1 TENURE QUESTIONS FROM 1989 NATIONAL SURVEY OF FACULTY (E.L. Boyer, *Scholarship Reconsidered: Priorities of the Professoriate*, (Princeton, NJ: The Carnegie Foundation for the Advancement of Teaching, 1990). © 1990 The Carnegie Foundation for the Advancement of Teaching. Reprinted with permission.)

Q1. In my department, it is difficult for a person to achieve tenure if he/she does not publish

	Strongly agree	Agree with reservation	Neutral	Disagree with reservation	Strongly disagree
Research Institution	83	12	1	3	2
Engineering	63	18	7	7	4

Q2. How important is the number of publications for granting tenure in your department?

	Very Important	Fairly Important	Fairly Unimp.	Very Unimp.	No Opinion
Research Institution	56	39	4	1	1
Engineering	43	40	10	5	3

Q3. How important are research grants received by the scholar for granting tenure in your department?

	Very Important	Fairly Important	Fairly Unimp.	Very Unimp.	No Opinion
Research Institution	40	36	16	6	2
Engineering	49	28	17	4	2

Q4. How important are student evaluations of couses taught for granting tenure in your department?

	Very Important	Fairly Important	Fairly Unimp.	Very Unimp.	No Opinion
Research Institution	10	41	30	16	12
Engineering	17	38	31	10	4

which are more important than referred notes, which are more important than articles in refereed proceedings, which are more important than nonrefereed articles. Nontechnical articles are less important than any of the above. Thus, the journal is used as a substitute for a direct measure of quality. Since there may be little difference in the time and energy required for publishing in prestigious journals, assistant professors are often advised to publish in these journals.

Presentations at conferences and universities also count, but in a different way. Many schools ask professors in the candidate's area to evaluate the candidate's research. It is easier for the professor to remember the candidate's research and to write a favorable letter if the professor knows the candidate. Excellent presentations and informal discussions at meetings

help one to develop these personal connections.

Who the candidate writes publications with is also scrutinized. Papers from the candidate's thesis are expected and count positively only if they are of exceptional quality or quantity. Since the thesis papers are expected but really do not count, it is important to finish them as soon as possible. This is one advantage of having a postdoctoral appointment. Under no circumstance should an assistant professor start a job before he or she has completed the requirements for a Ph.D. Once these papers have been completed, the candidate needs to sever the umbilical cord to the adviser. This is particularly important for professors who stay at the school where they earn their Ph.D. Besides papers from the thesis, the candidate should have a mix of papers written by her- or himself, with colleagues and with students. If all papers are written with colleagues, members of the promotion committees will wonder if the candidate is independent, and if all papers are solos, the question will be whether the candidate can work with others.

Support for research is necessary to continue doing quality research and to support graduate students. As is the case with publications, not all research support is counted equally. At many research universities grants from certain government agencies such as NSF, NIH, and NASA are more valued than other grants. External support is always more highly valued than internal university support. The most weight is given to grants with the candidate as the principal investigator (PI). Grants for which the candidate is a co-principal investigator or investigator also count but not as much.

Fortunately, most schools do not expect that assistant professors will have graduated Ph.D.'s within the six-year probationary period. Assistant professors are expected to have graduate students who are conducting research. At least some papers should be coauthored with these students. However, because of the six-year time constraint, assistant professors should not expect the research of their students to be sufficient for promotion and tenure.

A final comment on research: Many full professors want to see a big, long-term research plan. What will the candidate be doing five and ten years from now? Develop a research plan to help guide your activities and to help impress the full professors.

Teaching counts, but not enough (Addy and Dutton, 1987). Since no one benefits from bad teaching, most departments want proof that teaching is at least adequate. Although the lack of a large number of student complaints may be sufficient proof, it is better to obtain positive proof by regularly obtaining student evaluations of the class. Unfortunately, at most research universities excellent teaching helps only in borderline cases. For example, if the promotion case looks to be a little early on the basis of research alone, excellent teaching may make the difference. Excellent teaching can be proven with teaching evaluations and teaching awards. In Chapter 16 we noted that teaching evaluations need to be used with care in promotion decisions. A uniform procedure for administration should be followed for distributing and collecting the forms. Items which ask for overall ratings should be used since they correlate more highly with student learning. Adjustments should be made for extraneous factors such as class size, time of day, or unpopularity of classes (such as laboratory courses). Finally, since different personalities do better in different types of courses, ratings should be collected for a variety of courses. The National Science Foundation has begun giving grants for curriculum and course development. These grants are quite competitive and will obviously count toward promotion, but it is too early to tell how much.

For promotion to associate professor and for receiving tenure, service has very little clout at most universities. One cannot totally ignore service, since failure to do one's share of committee work and other types of departmental service will be a negative factor. However, once a reasonable share has been done, more will not help. Professional society activities are also expected, but moderation is again the key. Once a professor has tenure, service does count and is rewarded more than teaching but less than research (Sisson, 1982).

A final unwritten area is general conduct and personality. Promotion is not a case where "nice guys finish last." All things being equal, it is easier to promote a personable individual and easier not to promote a nasty person than vice versa. A talented nasty person will be promoted, but a mediocre nasty person probably will not. If you act in a collegial fashion, do your share willingly, get things done on time, and have a generally positive outlook on life, then you will benefit if your promotion is not clear-cut. Part of the tenure process involves the decision that the candidate fits in with the institution (Watson, 1991). This paragraph may seem unfair, but remember that in industry the ability to get along and work with a team is even more highly prized than in academia.

Universities do change and the criteria for promotion and tenure change. We believe that publishing and research support will continue to be important, but that universities will be able to redefine scholarship to some extent so that a broader range of activities is rewarded. This follows the main conclusion of the Carnegie report (Boyer, 1990). There is a clear swing toward increasing the importance of teaching, though such a nationwide trend may not be followed by a given university. As with the weather, it is often easier to talk about rewarding good teaching than to actually do anything about it. Some of the unhappiest people we know are professors who were hired to do one thing (teaching) and then had the university change and ask them to do something else (research). Professors need to watch the trends at their university.

17.1.4. Actions for Untenured Professors

Many professors want to argue with the values universities use to set priorities for promotion and tenure. Doing this can lead to many spirited discussions with the participants leaving feeling morally superior. However, a professor ignores the established reward system at his or her peril. Our observation is that universities do not punish professors for excellent teaching and for spending time with students. What universities punish professors for (by denying tenure or promotion) is not doing what the university asked for (research and money). To survive with your moral esteem intact, determine how to do both what you want and what the university wants. Since the norm for new faculty is a work week of about fifty-five hours (Beaufait and Harris, 1989), there is enough time to get everything done if you work efficiently.

What can you do as an untenured professor to increase the odds that you will be promoted and receive tenure? The first is to find out as clearly as possible what the target is, especially since the requirements for promotion and tenure represent a moving target that is not clearly defined. Thus, the opinions of several professors are important. Once the target has been

identified, develop a plan (see Chapter 2) that focuses first on activities and priorities and then on appropriate schedules and to-do lists. List those things which count for promotion at your school and list those that you want to do. Plan an effective way to combine teaching and research. This can be done by teaching classes in your research specialty. Discuss with your chair the teaching assignments for the next several years and see if you can get a commitment that you will teach one course several times in a row.

Develop a tentative schedule for doing and publishing research. This schedule needs to include plans for writing proposals, visiting funding agencies, training new graduate students, doing research, going to meetings, writing papers, and so forth. Since plans like these are usually overly optimistic, plan to get more done than will be needed to secure your promotion. Then if some of the plans are delayed, you will still have done enough.

Your plans should be developed for the entire untenured period at a sustainable pace. If you can do some research that will come to fruition quickly and some that will take more time to mature, you will have a steady stream of papers coming out. Since this is a five- to six-year period, not a one-month orgy of work, you need to include time to relax. Take one day off every week. Schedule an extra day to relax by flying to meetings on a Saturday to get the cheaper airfares. Schedule a week of vacation every year. In the long run these breaks will increase your efficiency, and you will get more done.

Professors need to keep a running record of things that they do (Beaufait, 1990) to ensure that all pertinent information is included in the curriculum vita. This is important in order to avoid selling oneself short in the promotion and tenure document. For instance, if you give three or four seminars every year at different universities, at the end of five years you will have accumulated between fifteen and twenty visits. If these are not written down, it is very easy to forget one or more of them. It is convenient to keep a running vita either in a computer file or on paper. Get into the habit of recording things right after you have done them.

The world does not end when tenure is denied. Most engineers who are denied tenure go into industry (Watson, 1991). Their salary and job satisfaction are often higher than in academia. If teaching was a positive part of the academic experience, there are many part-time teaching opportunities available.

17.2. FACULTY ENVIRONMENT

There is widespread grumbling in the professorial ranks (Beaufait and Harris, 1989; Boyer, 1990; Eisenberg and Galanti, 1982; Friel, 1985; Mooney, 1991), yet in many ways professors like their jobs (Boyer, 1990; Mooney, 1991). The reasons for these mixed messages are worth exploring.

Perhaps the best sources of information on the attitudes of faculty are the extensive faculty surveys done by the Carnegie Foundation for the Advancement of Teaching (Boyer, 1990) and by the Higher Education Research Institute at the University of California at Los Angeles (see Mooney, 1991). The signs of dissatisfaction are widespread and are reported in Table 17-2. From the responses to question Q1 in Table 17-2, one can see that 50 percent of the engineering professors are more interested in teaching than research. There is an obvious difference

TABLE 17-2 FACULTY SATISFACTION QUESTIONS FROM 1989 NATIONAL SURVEY OF FACULTY (E.L. Boyer, *Scholarship Reconsidered: Priorities of the Professoriate*, (Princeton, NJ: The Carnegie Foundation for the Advancement of Teaching, 1990). © 1990 The Carnegie Foundation for the Advancement of Teaching. Reprinted with permission.)

Q1. Do your interests lie primarily in research or teaching?

	Research	Lean to research	Lean to teaching	Teaching
Research Institution	18	48	24	9
Engineering	7	43	23	27

Q2. The pressure to publish reduces the quality of teaching at my university.

	Strongly agree	Agree with reservation	Neutral	Disagree with reservation	Strongly disagree
Research Institution	24	29	10	23	15
Engineering	24	29	13	19	15

Q3. During the past two or three years, financial support for work in my discipline has become harder to obtain.

	Strongly agree	Agree with reservation	Neutral	Disagree with reservation	Strongly disagree
Research Institution	38	25	21	13	3
Engineering	29	23	34	12	2

Q4. I hardly ever get to give a piece of work the attention it deserves.

	Strongly agree	Agree with reservation	Neutral	Disagree with reservation	Strongly disagree
Research Institution	13	33	12	30	13
Engineering	22	29	15	24	9

Q5. My job is the source of considerable personal strain.

	Strongly agree	Agree with reservation	Neutral	Disagree with reservation	Strongly disagree
Research Institution	15	32	12	24	16
Engineering	16	33	18	20	12

TABLE 17-2 (CONT.)

Q6. If I had it to do over again, I would not become a college teacher.

	Strongly agree	Agree with reservation	Neutral	Disagree with reservation	Strongly disagree
Research Institution	6	7	11	25	51
Engineering	8	5	11	21	54

Q7. I feel trapped in a profession with limited opportunity for advancement.

	Strongly agree	Agree with reservation	Neutral	Disagree with reservation	Strongly disagree
Research Institution	5	9	10	19	56
Engineering	6	10	13	16	56

Q8. This is a poor time for any young person to begin an academic career.

	Strongly agree	Agree with reservation	Neutral	Disagree with reservation	Strongly disagree
Research Institution	7	15	16	38	24
Engineering	11	17	15	32	25

Q9. Please indicate the degree to which your academic discipline is important to you.

	Very important	Fairly important	Fairly unimportant	Not at all important
Research Institution	77	21	2	0
Engineering	75	23	2	0

Q10. Please indicate the degree to which your department is important to you.

	Very important	Fairly important	Fairly unimportant	Not at all important
Research Institution	48	39	11	2
Engineering	52	42	6	0

Q11. Please indicate the degree to which your college or university is important to you.

	Very important	Fairly important	Fairly unimportant	Not at all important
Research Institution	30	50	17	4
Engineering	41	43	16	1

between this and the perceived requirements for tenure that are reported in Table 17-1. Another source of dissatisfaction is the perception that publication pressures reduce teaching quality (see Q2 in Table 17-2). More than half of the professors at research institutions and more than half of the engineering professors agree with this statement. The interaction of teaching and research will be discussed in more detail later. There is also substantial agreement that it has become more difficult to obtain financial support (Q3, Table 17-2). Professors also report that it is difficult to put sufficient time into any project (Q4, Table 17-2).

These sources of dissatisfaction add up to considerable strain on faculty (Q5, Table 17-2). Approximately half of faculty members report considerable strain. The Higher Education Research Institute survey (Mooney, 1991) reported that the following were major sources of stress:

1 Time pressures (reported by 83.5 percent of professors surveyed).
2 Lack of personal time (79.8 percent).
3 Teaching load (65 percent).
4 Managing household responsibilities (63.7 percent).
5 Committee work (57.5 percent).
6 Colleagues (54.2 percent).
7 Students (50.4 percent).
8 Research or publishing demands (50.4 percent).
9 Faculty meetings (49.6 percent).

Boyer (1990) reports that when the data are looked at on the basis of age, the youngest faculty members report considerably more strain than any other age group. Clearly, there is a price to pay for trying to earn promotion and tenure. This is strongly supported by anecdotal evidence (e.g., Howard, 1980).

Table 17-2 also lists several questions which show that in some ways college professors are satisfied with their jobs. Q6 shows that most professors would become college professors again despite everything they now know. In addition, Q7 shows that most professors do not feel trapped, and Q8 shows that most think that now is a good time to start an academic career. Clearly, there is something satisfying about being a professor when it is compared to the alternatives. Q9 to Q11 show that the academic discipline, department, and university are all-important to professors but that the discipline has the highest level of allegiance.

What does all this mean? There appear to be some major satisfactions to being a college professor. But there are some demotivating factors at work, some of which have increased in recent years. These factors include pressure on faculty, red tape, too many administrative responsibilities, too many courses to teach, inadequate staff support, lack of modern equipment, excessive workload, lack of influence, tenure requirements, lack of collegiality, a poor administration, and the low value placed on teaching (Beaufait and Harris, 1989; Boyer, 1990; Eisenberg and Galanti, 1982; Engelken, 1986; Friel, 1985; Mooney, 1991; Yao and Michael, 1987). Interestingly, salary and fringe benefits are no longer the major problems they once were.

It is easy to complain and not present possible solutions. In the remainder of this section and in the next section on faculty development, we will discuss what can be done to improve

the environment for college professors. Obviously, more money would help but is probably not forthcoming. What can be done with no or modest amounts of money? Boyer (1990) strongly urges universities to find new ways to define scholarship and to develop new methods for the evaluation of teaching. Both of these actions would reduce some of the demotivating stress and ease the strain, particularly on untenured faculty.

Collegiality is a caring about one's colleagues. It involves both informal and formal sharing of the load required for an excellent department. It involves cooperation instead of competition. In a collegial atmosphere everyone is glad when one professor wins an award since the whole department has won. Working and playing together lead to collegiality. In a collegial atmosphere everyone works within the system and tries to change things without being disruptive. Like good will, collegiality is a fragile resource easily lost and difficult to regain. Unfortunately, the competitive atmosphere of research universities causes collegiality to suffer (Astin, 1985). Malacious gossip, vendettas, paranoia and false accusations, temper tantrums, pettiness, and bickering all lead to a poisonous atmosphere. One way to start to regain collegiality is to reinstitute TGIF with other faculty and graduate students. Another start is the development of ad hoc faculty groups to learn about new developments in mathematics, science, or engineering. Since young faculty members in particular complain about a lack of collegiality (Boice, 1991), an organized luncheon series to discuss teaching methods can be very helpful.

As noted in Q2 in Table 17-2, there is widespread belief that research can decrease the quality of teaching. This belief is only partially supported by the data on teaching evaluations. From a review of the literature, Canelos and Elliott (1985), Eble (1988), Feldman (1987), and McKeachie (1986) state that studies show little correlation between effective research and effective teaching, but these studies were not confined to engineering. On the other hand, Kuriger (1978) found that the teaching ratings of engineering professors who did no research were considerably lower than those of professors who did research. The ratings of professors doing a moderate amount of research were slightly better than those of faculty with a large amount of research. If only elective courses were considered, then teachers doing a large amount of research did slightly better than those doing a moderate amount. Bresler's (1968) study of scientists and engineers at Tufts University agreed with Kuriger's study, except that Bresler found that professors who did extensive research received higher ratings in all courses.

The disagreement between studies is an indication that the relationship between teaching and research is complex. Murray et al. (1990) found that few teachers are either good or poor in all courses. Professors who are ambitious, competent, hardworking, and confident tend to receive high student ratings in methodology courses which are very work-oriented. These same personality traits are highly correlated with research productivity. Thus, for this one type of course one might expect a correlation between student ratings and research. However, correlation does not imply causation. There is also a possibility that the pressure to do research, obtain funding, and publish has become worse, and that research interferes more with teaching than it did in 1968 or 1978.

The widespread belief that research interferes with teaching probably comes from ancedotal evidence and the self-knowledge that one could do better if more time were available. In addition, as Rugarcia (1991) argues, the direct link between engineering research and the teaching of undergraduates is rather weak. Ideally, research or other scholarly activity

reinforces teaching and both the teaching and the research improve. In engineering this is most likely to happen in elective courses since the professor has more freedom to discuss research. The advantages of doing research include developing faculty who are vital and enthusiastic (Roberds, 1988), and the faculty in some sense remain learners themselves. Research may also harm teaching if fewer faculty are teaching, the students are neglected, curriculum development is neglected, or the uncertainty of being on "soft" money lowers faculty morale (Roberds, 1988; Cavin and O'Neal, 1991). A balance of research and teaching is required for each individual faculty member (Turns, 1991; Cavin and O'Neal, 1991) and for the faculty as a group (Rugarcia, 1991).

One problem which may adversely affect the faculty environment in the future is a shortage of engineering teachers. Although this may drive salaries up, a shortage would also increase workloads and the sense that there is never enough time to do anything right. Such a shortage might also cause salary compression and competition for professors, so that the easiest way to obtain a large raise would be to change jobs. The competition for new professors would also probably drive up start-up costs and reduce the money available in the department for other projects.

The data on doctoral recipients are not encouraging. In 1989, there were 4536 Ph.D. degrees awarded in engineering and only 40.9 percent of them were to U.S. citizens (Anonymous, 1991). Only 8.2 percent of the degrees were awarded to women, 1.4 percent to Blacks, and 2.1 percent to Hispanics. After receiving the degree, only 23.1 percent of the recipients planned employment in an educational institution.

There are several possible solutions to the impending shortage of qualified faculty. One could increase the pool by increasing the number of B.S. engineers and by increasing the percentage that go on to graduate school. It would be particularly advantageous to increase the number and percentages of women and minorities in engineering. This requires action from grade school through high school up to the undergraduate years (Lowman, 1991). We can encourage more students to go to graduate school by stopping the current "burnout process" (Barber et al., 1989), explaining the advantages of graduate school, increasing the stipend, providing teaching (Newton and Scholz, 1987) and research opportunities to undergraduates, pointing out the long-term economic return of graduate school (Kauffman, 1985), developing one-day workshops for undergraduates on graduate education (Blackmond, 1986), and selling students early on the joys of being a professor (Barber et al., 1989; Landis, 1989).

Another solution is to increase the percentage of Ph.D. engineers who become professors. Since salaries are competitive, other aspects of a professor's job need to be made more appealing. Innovative plans to lessen the sting of the probationary period for tenure may help. The employment guidelines of at least one engineering society now call on employers to expand opportunities for minorities and women, to encourage professional development, to provide employees assistance with dependent care, and to be flexible in hours and duties (AIChE, 1990). Innovative maternity and paternity leaves and plans to handle "the two-career problem" could attract well qualified engineers into teaching. Tickton (1982) lists a series of approaches used by different universities to attract and retain qualified professors. Matier's (1991) study shows that the reputation of the school is the major factor in assistant professors' choices of a first academic position. Other important factors over which the department has more control are teaching and research loads, teaching assignments, research opportunities, congeniality of associates, and rapport with departmental leaders.

Another approach is to change the definition of qualified. Wouldn't engineers with many years of industrial design experience be qualified and probably more qualified to teach design, laboratory, and possibly other courses than professors with no industrial experience? Perhaps innovative contracts will be needed to hire these engineers at the right level without typical tenure and publication concerns. Could more use be made of "loan" engineers or engineers from industry on sabbatical? Engineering departments should use their creative problem-solving abilities to solve the faculty shortage problem.

17.3. FACULTY DEVELOPMENT

The real quality of a university is not the facilities but the faculty and staff. Universities need to make a long-term commitment to faculty development or they will risk having older, tenured faculty memberswho are both obsolete and burned out. It is essential that engineering faculty remain current with technological advances and industrial practice. One argument in favor of having engineering faculty do research is that research keeps them current. This is true, but often only in the professor's narrow specialty. Only very large departments can afford the luxury of having professors teach only in their special area. Most professors teach some courses that are not their specialty, but if they do not make an effort to stay current, the course will soon become somewhat stale. For the purpose of teaching undergraduate courses, other methods for staying current such as writing a textbook, consulting, writing review papers, and attending workshops may be more effective than research.

A second reason faculty development is needed is that the roles of a professor change during his or her career (Graham, 1986; Sloan, 1989). The first three years are spent learning how to teach and starting on research. During this period new professors usually receive less help and mentoring than they want (Boice, 1991; Sloan, 1989). For the second two or three years, assistant professors are very concerned about tenure and may explore alternatives should tenure be denied. Associate professors enjoy the recent promotion and tenure and become more involved in their institution. However, they may go through a "sophomore slump" since they are no longer receiving the attention and help that assistant professors receive. Full professors often go through a transition period or midlife crisis (Levinson et al., 1978; Sloan, 1989). They may feel less enthusiasm for teaching and research and may suffer declines in student ratings and research productivity. In general terms, these professors must choose between stagnation and diversification. As retirement nears, the professor may start to withdraw gradually, possibly become more "mellow," and be very satisfied with service to the department and the profession. Professors need encouragement and help to be most effective in each of these stages.

Faculty development can be accomplished by the individual faculty member, but it is helpful if the department chair or the dean provides some encouragement and modest financial support. Growth or creativity contracts which list what will be done over a three- to five-year period are useful (Boyer, 1990; Simpson and Oggel, 1984). They should be drawn up by the professor. The advantage of a growth contract agreed to by the chair and the dean is that the

professor knows that successful completion will be recognized and rewarded. Otherwise, a professor embarking on a new path may find his or her efforts ignored. The growth contract recognizes that universities need faculty with interest and strength in a variety of areas, not just research.

Mentoring is another type of faculty development which can be particularly advantageous to new faculty (Sands et al., 1991). New faculty with mentors often get off to a much faster start in teaching and research (Boice, 1990). Those who receive role-specific modeling in teaching or research receive higher teaching ratings or are more productive in research. However, since people prefer mentors of the same gender, women are at a disadvantage in engineering. Women faculty get less faculty support than men but need more (Gibbons, 1992; Sands et al., 1991).

An obvious area for faculty growth is in teaching (Culver, 1990; Terry et al., 1991). Many professors are acquainted only with the lecture style of teaching, and then only with a noninteractive lecture style. Better teachers know instinctively what works but usually do not know why and cannot explain how someone else can improve. For good teachers a very modest amount of study can have a major impact on their understanding of the teaching process since they already have a rudimentary knowledge structure and are usually motivated to do better. Poor teachers need to read about teaching and observe good teachers. Then they need to experiment, receive feedback and encouragement, and try again. Of course, poor teachers must also have the motivation to improve. Boice (1991) found that new faculty wanted more help with teaching, and he observed that formal teaching development programs worked if the new faculty would enroll in them.

For engineering professors *ASEE Prism* is the most accessible source of teaching information on a monthly basis. The annual meeting of ASEE and the Frontiers in Education Conference cosponsored by ASEE and IEEE are good choices for workshops, symposia, and personal contact. Most universities have in-house teaching programs which can be useful if only as an opportunity to meet other professors who are vitally interested in teaching. There may also be for-credit courses with titles such as "Educational Psychology for College Teachers."

Even if there are no courses, good teachers can be talked to and observed. One possibility is to work with a master teacher (Carpinelli et al., 1989) or mentor (Gibbons, 1992; Sands, et al., 1991). This could be done on campus or while on sabbatical. A word of caution is in order when you observe any professor: Many teachers are good teachers because they have major strengths in the second dimension of good teaching—rapport. The performance (lecture) ability of these professors may just be adequate, but the students respond to the rapport. Thus the observer must watch much more than just lectures. A formal mentoring program where new professors are assigned to teach recitation sections and are expected to attend lectures is also useful. It involves an assistant professor closely with an experienced teacher and encourages informal discussions on teaching methods. In addition, since it is a rare professor who does not prepare for class when he or she knows a colleague will be present, the lectures will be well done.

Once you see, read, or hear about something you think will work for you, try it on a small scale. Students usually interpret change and experiments as interest in teaching, and they respond favorably.

A second major problem teachers have with teaching is content boredom. This is somewhat paradoxical since many professors are professors because they love the discipline, but anyone can become bored with teaching the same material semester after semester. Professors who teach because they love students are much less likely to suffer from boredom since the students change every semester. There are several obvious solutions when content boredom sets in, but all the solutions require a little extra work.

- Teach a new course.
- Team-teach, particularly a multidisciplinary course.
- Teach outside your discipline. Examples include teaching mathematics or physics or another area of engineering.
- Write a textbook.
- Develop courseware.
- Teach the same content but use a radically different teaching method.

The university can help a faculty member develop skill in teaching. Paying for trips to ASEE meetings sends a not-so-subtle message that these meetings are as important as technical society meetings. Modest engineering-wide grants awarded competitively can help professors develop innovative teaching methods. Sabbaticals can be granted for teaching as well as for research reasons. Departments can organize mentoring programs, luncheons to discuss teaching, workshops and seminars. Teaching awards are nice but are most effective if made as a salary increase so that they occur year after year.

Faculty members also need to consider development in research. Research in the same area year after year can become routine. To get past the routine and develop new ideas, a professor can start a totally new research area, though this is very time-consuming and is often easiest to do while on sabbatical. Perhaps one can ease into a new area by joining an interdisciplinary research team. Somewhat less drastic steps to invigorate a research program include going to different research conferences, auditing a graduate-level course in a new area, writing a critical review or a research monograph, serving as an NSF program director on a rotating assignment, and integrating research and teaching by teaching a graduate-level seminar. Particularly for new faculty, it would probably be useful to be mentored in how to serve as a research adviser.

Faculty may also want to have a long-term development plan in engineering practice. For young faculty with no, or very little, practical engineering experience, summer jobs in industry can be helpful. However, the common wisdom is that this should not be done until tenure has been obtained. This seems to be another case where tenure skews the educational system. Industrial sabbaticals can be useful, particularly in research areas where industry is at the forefront. Consulting is also helpful, although the contact is usually too short to get a complete industrial flavor. To a lesser extent, working with other engineers through professional societies can be useful.

Finally, some professors may want to include service or administration in their development plans. This is not really a sign of the onset of senility. One of the duties of faculty is to do their fair share in faculty governance (see Section 17.4). The faculty member may decide to do this by becoming involved in the university senate, the faculty union, the American

Association of University Professors, or heavy university committee duties. An alternative is administrative duties such as assistant department chair, department chair, or assistant dean. It would be nice if universities helped to train professors for these positions, but in the absence of a formal training program the professor can talk to professors who have held these positions in the past, read a few books, and perhaps find a suitable workshop.

A fully functioning department needs faculty who are interested in all areas of research, teaching, engineering practice, service, and administration. Astin (1985) states that many universities suffer from a "Jack Armstrong" syndrome and expect faculty members to excel at everything. Very few professors can be good in all areas simultaneously. A functioning department needs professors who specialize in one or two. The current problem and challenge for the future is that some areas such as research receive many more rewards than the others. A department can find itself with few professors interested in students, service, engineering practice, or administration. The results can include student revolts, a breakdown in service and a lack of curriculum development, difficulty at accreditation time, and a lack of leadership. Balance is needed but is difficult to maintain for long periods.

17.4. PROFESSIONAL ETHICS

The privileges of academic freedom, the latitude given to professors to choose research areas, and the security of tenure must be balanced with self-policed ethical behavior. Engineering professors have fewer constraints than their industrial counterparts and fewer external agencies watching their behavior than medical doctors or lawyers, so ethical behavior must be self-directed. Since ethical behavior must come from within, it is useful to study codes of ethics and to reflect on the applications of these codes. Henninger (1991) has a useful list of references on academic ethics.

Some behavior, upon reflection, will clearly be seen as unethical. Other behavior falls into grey areas where it is arguable whether it is ethical or not. The professor may decide to avoid this behavior so that there is no question of impropriety. Alternatively, she or he may decide that the behavior is ethical, but in order to avoid the appearance of unethical behavior will inform the proper administrative authorities in advance. An example of behavior in a grey area involves a professor who commercializes the results of university research by starting a high-technology company. Since large amounts of money may be involved, some people will question the ethics of almost any arrangement.

A general code of ethics for engineers was introduced and discussed in Table 12-1. Naturally, this code applies to engineering professors as well as other engineers. The ramifications of any ethical code for an individual are often not clear until particular cases are discussed in detail. For example, does teaching when one either does not know how to teach or when one is not a competent teacher violate Canon 2 ("Engineers shall perform services only in areas of their competence.")?

The engineers' code of ethics was not written with the requirements of engineering professors in mind. The professorial aspects of the engineering professor's position are more

TABLE 17-3 SUMMARY OF AAUP STATEMENT ON PROFESSIONAL ETHICS
(Adapted from AAUP, 1969)

The professor recognizes special responsibilities:
1. Seek and state truth in **subject** as he or she sees it. Intellectual honesty must be practiced.
2. Encourage **students** in the pursuit of learning. The professor will respect students, avoid exploiting students and honestly evaluate students.
3. Respect **colleagues** and defend their right of free inquiry. Acknowledge academic debts and accept faculty responsibility for institutional governance.
4. Determine amount and character of outside work with due regard to paramount responsibility within **institution** to be an effective teacher and scholar. Give due notice of intent to leave.
5. As a **citizen** speak as an indivdual bound by the rights and obligations of a citizen.

closely related to the statement of professional ethics made by the American Association of University Professors. The AAUP statement of ethics is summarized in Table 17-3 (AAUP, 1969). Engineering professors need to adhere to both the engineering code of ethics and to the AAUP statement.

There are many ramifications of the AAUP statement of ethics. A complete enumeration is obviously impossible, and each case must be looked at individually. As an example, a few of the ramifications of each paragraph of the AAUP statement are delineated below.

I. Intellectual honesty obviously requires that research data be reported accurately. Falsification of data is unethical and illegal. Data which may be questionable can be reported, but all questions about the data must be fully discussed. Prior work must be acknowledged (see also item III).

II. Exploitation of students includes the sexual exploitation of students. It is obviously unethical to exchange grades for sexual favors. Dating a student can inadvertently lead to ethical problems. It is probably better to wait until the person is a former student to begin a romantic relationship.

A grey area of the ethical code involves the ethics of requiring students to purchase your textbook for a course. One solution to this problem is to donate the royalty income from your students to the university.

III. Professors should not let personal differences cloud professional evaluations of the work of colleagues. Accepting a share of institutional governance requires that the professor do his or her fair share of committee duties. This may also mean that the professor should accept her or his turn as a member of the faculty senate or as the departmental chair.

IV. Professors should observe the regulations of the institution as long as they do not compromise academic freedom. (The AAUP is very clear that academic freedom is a higher value than following the institution's regulations.) The professor may constructively criticize and try to change institutional regulations. However, we interpret this as meaning that trying

to punish the institution would be unethical. Thus, a professor could ethically sue her or his university, but collecting punitive damages may well be unethical. If there is a conflict between outside work such as consulting and university duties, the university duties should be considered more important.

V. The professor has all the rights and obligations of a citizen. This can be interpreted to mean that outside her or his subject area the professor has no special privilege of academic freedom beyond those of every citizen.

Intellectual honesty and responsibility in research has become a topic of national importance, and the federal government through the Public Health Service has established a policy (Public Health Service, 1989). This policy goes beyond statements of ethical codes since it states that individuals have a responsibility to report on others. Briefly, it states:

1 Academics have a responsibility to report the lack of integrity of others in research and scholarship. "Whistle blowers" should be protected from reprisals.

2 Investigations should not be handled by associates of the person whose work is being investigated.

3 Investigations must be confidential.

4 The person being investigated has the right to communicate with the investigator(s) and should be advised of any decisions.

In actual practice many professors have been very reluctant to accuse others formally of unethical scholarship or cheating on research results. Such allegations can become very time-consuming, and it is widely perceived that whistle blowers often receive reprisals in some form. Clearly informing all students doing research of the ethical standards they are expected to follow can help eliminate the need to report others.

With all this talk of ethics it is useful to insert a healthy note of skepticism. "In all of this, however, we must be on guard against any group which seeks recognition as spokesman for "the profession," and then seeks to impose its narrow definition of engineering ethics on us all" (Florman, 1976, p. 31).

17.5. GUIDEPOSTS FOR ENGINEERING EDUCATION (HOUGEN'S PRINCIPLES)

Olaf Hougen was one of the pioneers in chemical engineering education. In a memoriam, Bird (1986) delineated the principles that Hougen used to guide the development of the Department of Chemical Engineering at the University of Wisconsin. We repeat these principles here since we believe that many of them will prove to be useful guiding principles for all engineering educators. The statement of the principles are quotations from Bird (1986).

1 "The undergraduate program should be practical and conservative, whereas the graduate program should be imaginative and exploratory."

Undergraduate programs are to a large extent training for industry and thus should prepare students for responsible engineering jobs. Graduate research should move boldly into new areas.

2 "There should be a smooth flow of information from graduate research to graduate teaching to undergraduate teaching."

Since the graduate program moves boldly into new areas, it can serve as a testing ground for new material. Once this material has proved its worth, it should be moved into the undergraduate program. Note that this implies that professors are involved in teaching at both the graduate and undergraduate levels, and in research.

3 "If you can't find relevant problems to give the student, then you shouldn't be teaching the material to the students."

If there are no industrial problems currently or in the future which can be solved with a method, then that material should not be part of an engineering curriculum.

4 "Use the best available information from the modern sciences."

Engineering should be based on scientific knowledge, and it should be up-to-date.

5 "Well-founded and well-tested empiricisms are to be preferred over theories that have only a limited range of applicability."

Correlations should be scientifically based, and founded on extensive data. The data should be as comprehensive as possible since graduates will hold responsible industrial positions.

6 "It is vital for engineers to know how to solve problems with limited and incomplete data."

Complete data is a luxury that is often unavailable. Students must be well-versed in estimation methods, particularly for physical properties.

7 "Students are impressionable and learn quickly, and therefore a professor must make certain that he [or she] teaches in a responsible way."

Wild conjectures presented as fact or unethical behavior have no place in teaching.

8 "It is important that the students have a good grounding in the basic fundamentals; there's nothing worse than a student who has a thin veneer of high-powered theory."

The basic ideas need to be stressed. Both undergraduate and graduate students with weak backgrounds should be encouraged to take remedial coursework.

9 "We must always recognize that our students and our teaching assistants are young professionals."

The students and teaching assistants need the challenge and reward of helping to develop the engineering profession.

10 ". . . faculty members have an obligation to assist colleagues in other institutions."

Visitors, particularly those from other countries, should be treated with respect and be provided with whatever information they need. In addition, faculty members have a responsibility to prepare excellent textbooks.

11 "We have, as faculty members in a state-supported institution, a responsibility to serve the taxpayers by performing our job well."

Even though resources might be limited, the faculty needs to perform its assignments as well as possible.

12 "Do not show emotions of bitterness or beratement or belittlement; ascribe the best motives to your associates; say nothing derogatory."

Florman (1987) points out that there is a fine line between useful argument and divisiveness. We must believe that all our associates have the best wishes of the university and the engineering discipline at heart. Hougen's is difficult advice to follow; however, if followed, it will lead to a collegial atmosphere within a department.

17.6. CHAPTER COMMENTS

Many of the topics in this chapter are only indirectly related to teaching in the classroom, yet they can have a major impact on how well a professor teaches. Tenure and promotion are issues of vital interest to potential faculty members. The other topics in this chapter seem to be of more interest to older faculty. Ethical concerns don't suddenly arise when one becomes a professor; courses at all levels should consider ethics. As is often the case, however, the topic is appended awkwardly to the end of a class, with the result that students don't appreciate its relevance. Graduate students are no different in this regard; however, they do find case studies to be of considerable interest. We suggest then that ethics be taught by case studies.

17.7. SUMMARY AND OBJECTIVES

After reading this chapter, you should be able to:

- Explain what tenure is and discuss the usual procedures followed for promotion and tenure at universities.
- Discuss the environment for engineering faculty and ways to improve it.
- Discuss methods for developing faculty and prepare a personal development plan.
- Outline the AAUP ethical standards and discuss case studies to determine if the AAUP guidelines are satisfied.
- Determine the applicability of Hougen's principles in one's own engineering discipline.

HOMEWORK

1 Make a list of ten advantages of tenure. Make a counterlist of ten disadvantages. Develop an alternative to tenure which would retain many of the advantages but have fewer disadvantages.

2 Develop a plan for how you will get promoted to associate professor.

3 Assume that you have just been appointed department chair. At your university the department chairs set raises within very broad guidelines. However, the total dollar pool for

raises is a fixed sum which averages to 5 percent of the total faculty salaries. Determine a scenario for how you will reward faculty. Consider the following faculty members:

a R does research. He is nationally known and has a standing offer for a position from another university. His teaching ratings are absymal.

b T is a wonderful teacher, but he has not done research for ten years. He routinely alternates winning the best teacher award with professor S.

c E is a good teacher, does modest research, and serves the department whenever asked to do so.

d A is the best known professor in your department and is a member of the National Academy of Engineering. He is getting ready to retire in a year or two and is no longer doing research.

e S is the chairman of the undergraduate curriculum committee, does all the departmental advising of undergraduates, is adviser to the student professional society, and is a good teacher. The students talk to him all the time, and he single-handedly prevented a revolt of the seniors in Prof. R's class. He is not doing research.

f D has been an associate professor for the last twenty years. He is the outstanding racquetball player on the faculty, but you cannot think of anything else outstanding about him. He is a member of the organizing committee for a proposed faculty union.

g N is a new assistant professor who has been with the department for one year. She seems to be off to a fast start in her career and already has one research grant.

4 Discuss the following case studies. Is the professor's behavior ethical?

a B is single. She has started dating one of the graduate students at your university. Consider three different sub cases: 1. The graduate student is not in Prof. B's department. 2. The graduate student is in Prof. B's department, but she is not his adviser and he is not taking any courses from her. 3. Professor B is the graduate student's research adviser.

b C is a highly sought-after consultant. He normally teaches Monday, Wednesday and Friday and is often gone on Tuesday or Thursday. He has the opportunity to make a great deal of money consulting for a new client, but would have to miss his Wednesday and Friday classes.

c K is the department chair. He has allowed other professors in the department $1000 for travel to professional meetings. So far this year Prof. K has spent $3000 for travel to professional meetings himself.

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