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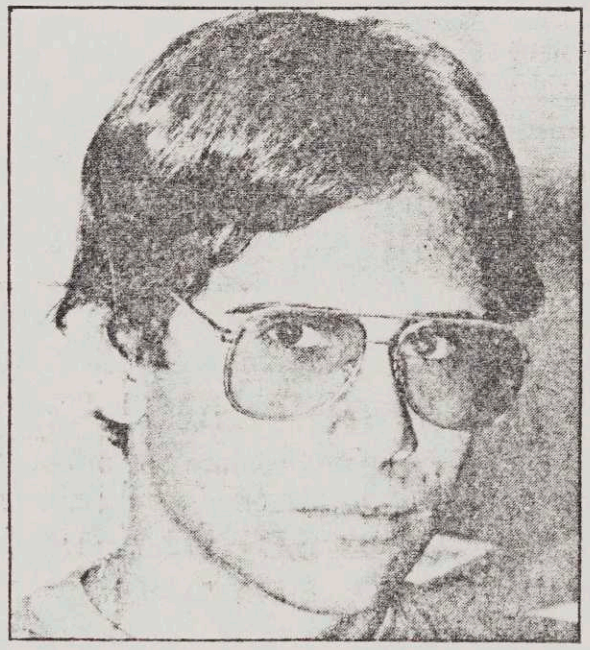

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GLOBE PHOTOS BY JOE RUNCI

Minorities catch up on science at MIT

By Betsy Rubiner
Special to The Globe

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"A cadre of minority intellectuals – that's what we are trying to develop – " says McLaurin, "who work together, who support each other. These are the people that are going to become the future leaders. They're going to turn this country around. Somewhere in this group, I hope, there's an Einstein."

Now in its eleventh year, the Minority Introduction to Engineering and Science program, known as MITES, has grown to include 55 students, from as far away as Guayanabo, Puerto Rico, and Macon, Ga., who for six weeks are immersed in a rigorous, advanced academic program featuring biochemistry, calculus, electronics and computer science.

The students, selected nationwide from a pool of 370 applicants on the basis of high school performance and test scores, are given a heavy workload, which, by all accounts, allows them, on average, about three to four hours of sleep each night. Yet no one seems to mind much. Both students and faculty say minorities have a great deal of learning to catch up on.

"Science historically has been nonminority," says Tom Tatlow, 16, an aspiring computer scientist from Mt. Laurel, N. J. "[Nonminorities] were all the great scientists of the past. Minorities don't tend to go into the field, and they don't have as many role models."

MINORITIES, Page A104

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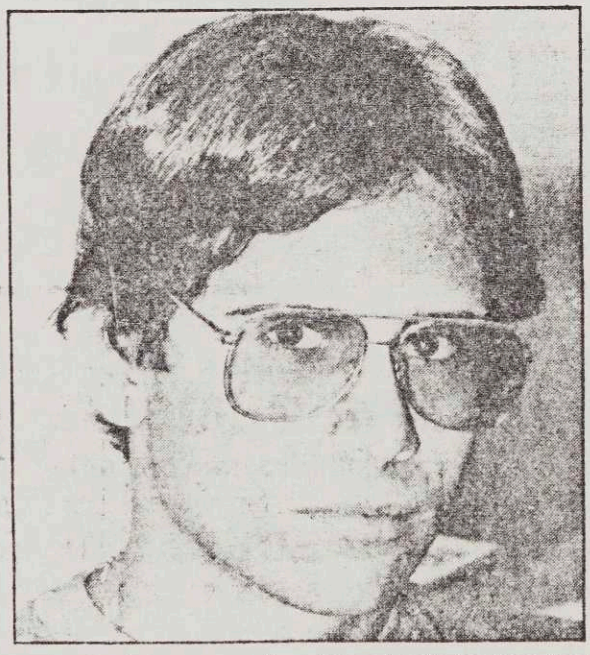

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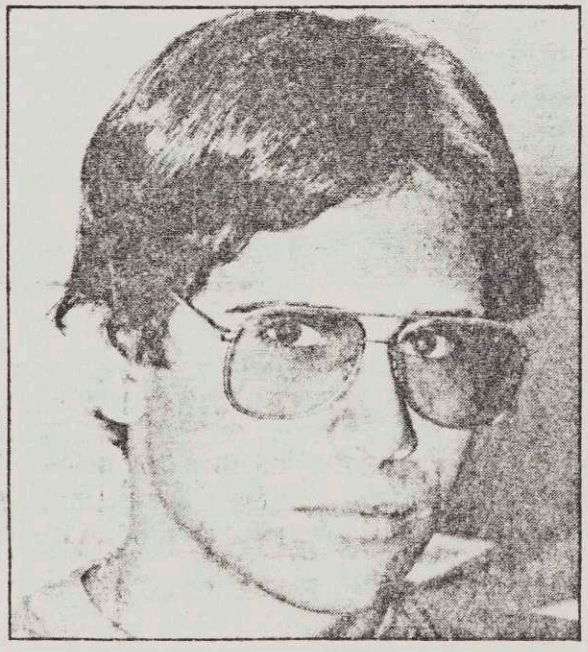

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"The ones (students) at the top of their class should come here. It puts you back on earth real quick," says Sobani Warner, 16, of Orlando, Fla., who adds that she is having second thoughts about going into electrical engineering after struggling with courses in that area offered in the MITES program.

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Once funded by the US Air Force's scientific research branch, the program, which pays for all costs except students' transportation to and from Cambridge, now relies upon financial support from MIT, private foundations, and, this year, for the first time, corporations who sponsor individual students, called "fellows."

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Despite the heavy concentration of high-technology activity in the state, McLaurin says Massachusetts schools are not doing as good a job as schools in New York, Texas and Georgia in offering quality science programs.

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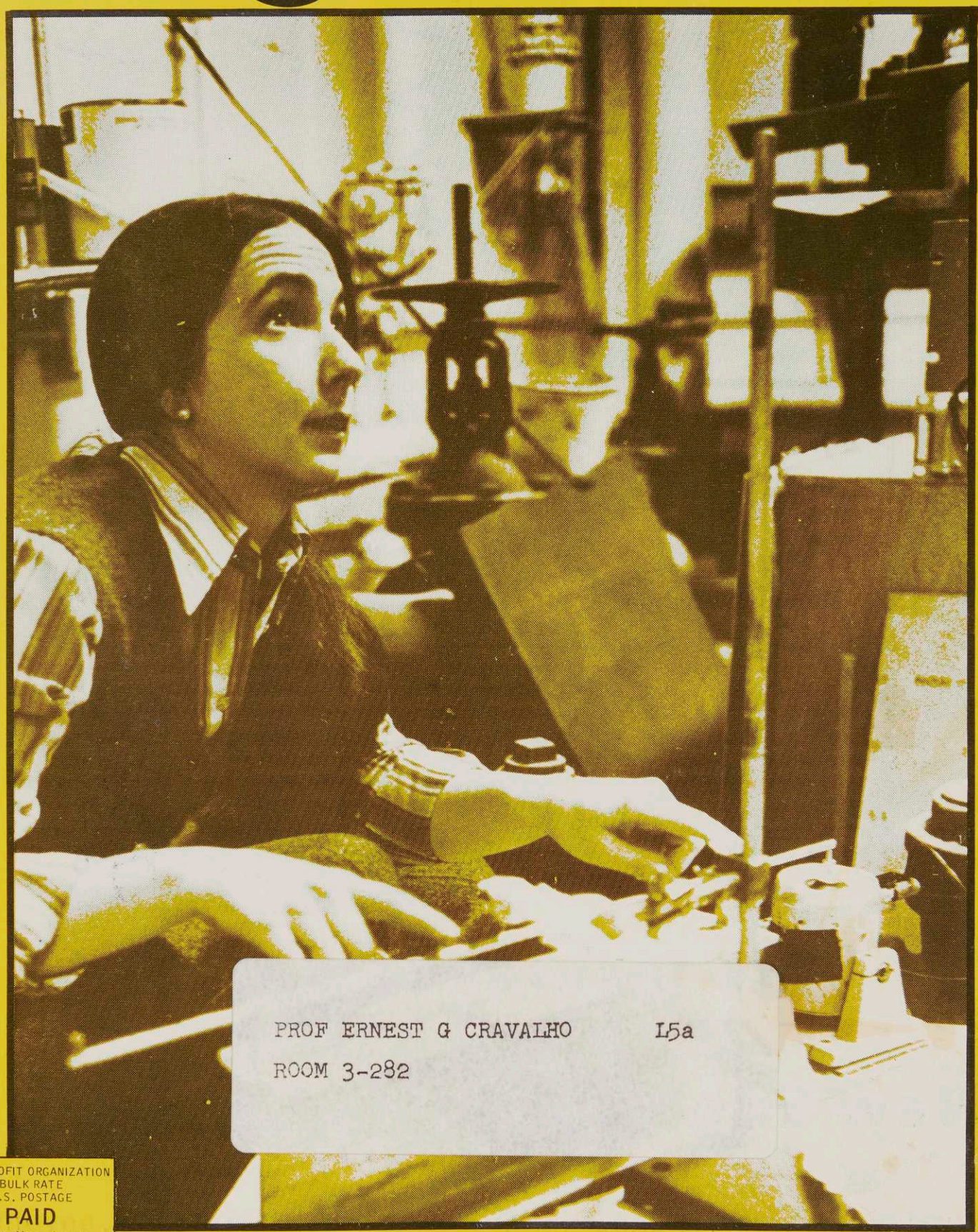

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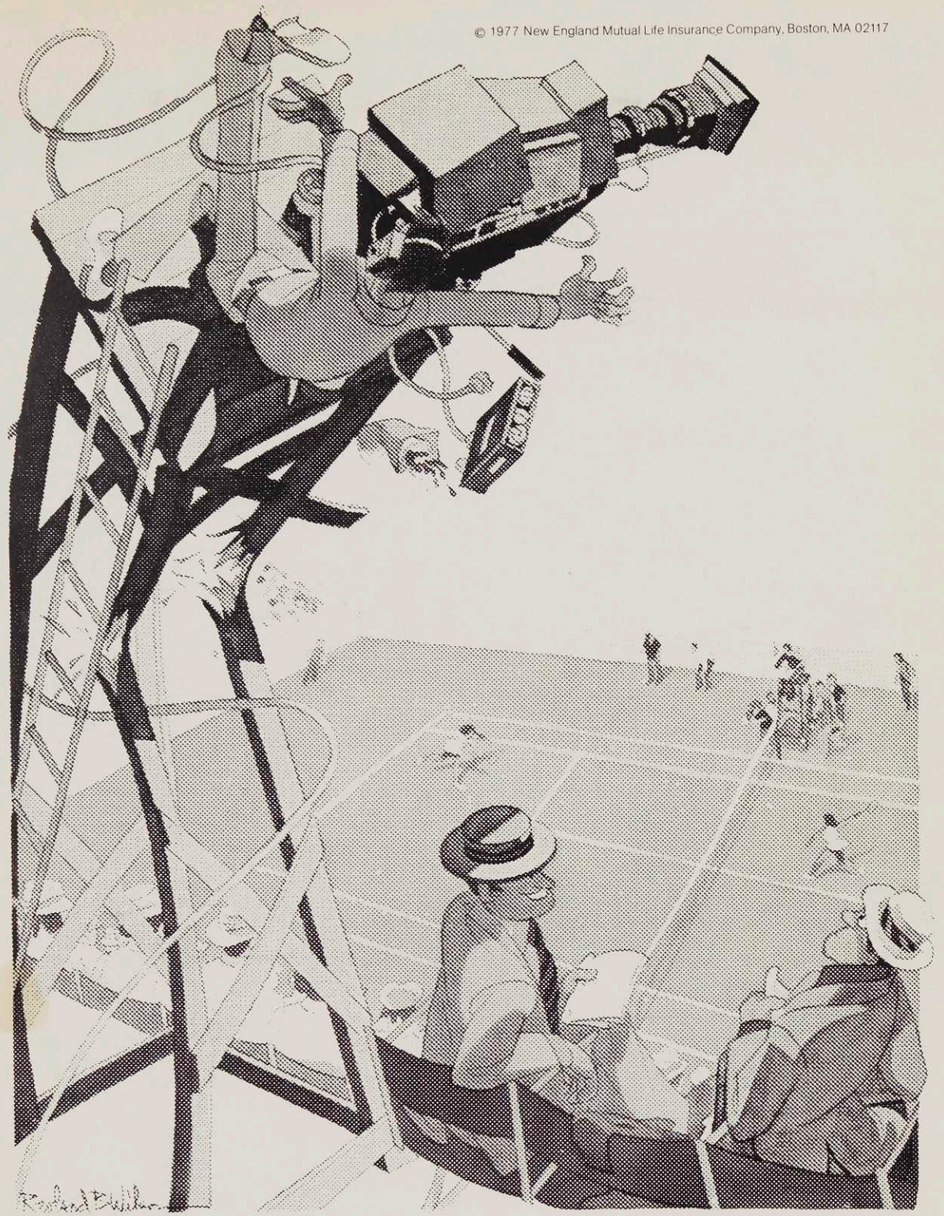

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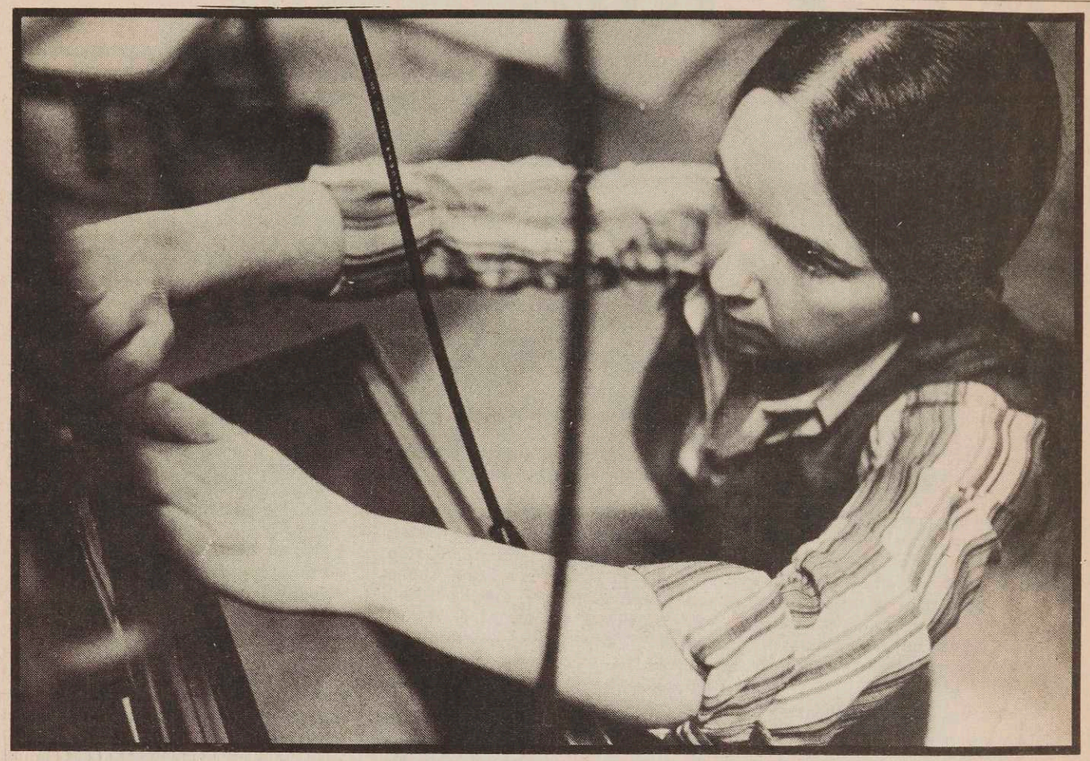

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Get a Job!

CAREER PLANNING & PLACEMENT

The Career Planning and Placement Office can help you at any stage of your progress through M.I.T. if you have questions about your options after graduation or where your academic program may be leading you. You can use us simply as a Placement Office or you can actively involve us in your thinking about your future. This is what we are most interested in doing.

We will be delighted to talk with you whether you are a freshman or sophomore trying to decide what to major in, a senior making up your mind between a job or graduate school, a candidate for an unspecified degree who doesn't know what your degree may be good for, or a graduate student who needs to decide how far to pursue your studies. Feel free to make an appointment with a member of the staff. We have considerable information about most of the professional fields represented at the Institute and about many professions that are not represented here. If your questions extend beyond our expertise we will be glad to suggest other people with whom you can talk.

Specific services of the office include the following:

1. Sponsoring recruiting visits by over 300 companies and government agencies each year.
2. Sponsoring recruiting visits by graduate schools of business and other graduate schools.
3. A department-by-department file of specific job openings.
4. A comprehensive collection of graduate school catalogues from the U.S., Canada, and overseas.
5. Files on 400 to 500 employers (some overseas).
6. Information on careers in the Federal Government.
7. Resume workshops.
8. Applications for the G.R.E., Graduate Management Admissions Test (G.M.A.T.), and other tests.
9. Reference material on career fields and classes of employers; (e.g., small businesses, research laboratories, organizations interested in the environments, etc.)
10. Seminars on specific career fields and on such topics as "Engineering as an Entree to Management."
11. A freshman seminar on career options, involving visits to places of employment.
12. Advice on resume writing.
13. Publication of a resume book for students graduating in science and engineering.
14. Information on qualifying as a Professional Engineer.
15. Special programs for minority students.
16. Gathering and making available statistical information on what recent M.I.T. graduates have done after graduation, statistics on salaries, etc. (If you will be graduating this year please help us by returning the questionnaire we will be sending you.)
17. Seminars by company representatives on the recruiting process.

CAMPUS RECRUITING

The recruiting visits by employers and graduate schools give you a unique opportunity to look over — and submit your qualifications to — organizations in which you may be interested. We encourage organizations to recruit on campus but we exercise no selection among those who choose to come. Our only requirement is that an organization which comes recruiting should be recruiting on its own behalf (not for a client), that it should represent itself fairly, and that it should treat you fairy as a candidate. We subscribe to the principles of the College Placement Council, a national organization of college and employer representatives. We feel that students should be free to choose for themselves what organizations to interview on campus just as they are free to apply to any organization they like by mail. This freedom of choice is in keeping with academic freedom.

The company representative who comes here to interview — because he has invited himself — is more likely to be interested in your qualifications than the unseen representatives you approach by mail. He is also easier to approach. If the interview goes well, it may be the first step to your getting an offer. If an offer isn't forthcoming, the result is no worse than if you had written to the company and received a negative letter. If you have even a potential interest, you should take advantage of the recruiter's presence here. Having interviews with a variety of companies can give you a perspective on the opportunities open to you. It can also make you a better interviewee.

SIGNING UP FOR AN INTERVIEW

The only requirement we have before you sign up for an interview is that you give us ten copies of your resume and sign a release card allowing us to give copies to companies you interview. We give a copy of the resume to each employer you plan to see so that before you sit down with him he already has some information on you. (We do not require a resume if you plan to talk only with graduate school representatives.) Once your resume is on file you can sign up with any visiting employer who has expressed an interest in people with your qualifications. It is your responsibility to have enough resumes to cover the interviews for which you sign up.

We ask each employer before he comes to describe the positions for which he is recruiting and the qualifications he is seeking. The descriptions provided by employers coming in a given week are published three weeks in advance. We use large colored posters which we send to all departments and living groups. Spare copies are available at the Career Planning and Placement Office. You can sign up to see an employer as soon as his visit is announced on one of these weekly posters.

Sometimes your qualifications may not match an employer's requirements on paper but you can imagine that you are qualified in fact. If your qualificatins are pretty clearly applicable (for example, the employer wants mechanical engineers and you are an aeronautical engineer with a good mechanical engineering background) we will be glad to put you on the interview schedule. If it is less obvious to us that an employer will be interested in you (for example, he wants Ph.D.'s and you are a master's candidate), we will give him your resume but we will not sign you up. If you phone us after 10 a.m. on the day the employer is here, we may be able to tell you whether he would like to meet you. A more certain approach, however, (one which we have found works well) is to call or write to the employer yourself, requesting him to let us know whether or not you may sign up

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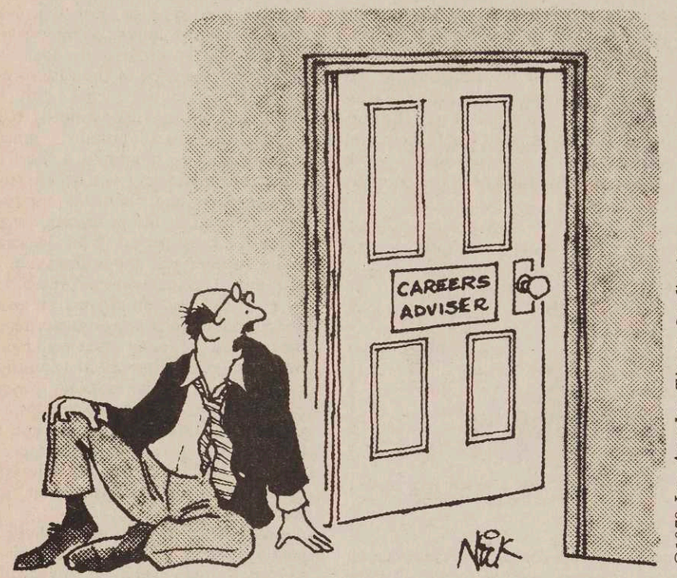

"Very impressive, Ainsworth—but I have no information on how one becomes a bouncer."

to see him rather than counting on the recruiter agreeing to squeeze you in at the last moment.

We have found from experience that we must be careful about the match of qualifications because employers often have good reason to state their requirements rather narrowly. On the other hand, some employers are not familiar with M.I.T. and do not realize how many departments we have in which they might be interested, or how much our departments overlap. You may want to talk with a member of the staff about the relevance of your qualifications to firms on the schedule. We will be glad to discuss your qualifications with recruiters when they are on campus.

We ask you to sign up in person. A friend may make an appointment for you but we cannot take appointments over the phone. If for any reason you wish to cancel an appointment you should tell us immediately. Late cancellations deprive other students of the opportunity to talk with interviewers.

THE INTERVIEW

You should come to the interview prepared. The interviewer will assume that you know something about his organization (or else why did you think of talking to him?), and you should brief yourself so that you can talk with him intelligently. Most employers send us handout literature for candidates to read, and we have considerable background material on companies on our library shelves. You should also consider beforehand what account you can give of yourself. You need not worry about having concrete plans, provided you have thought about the things that interest you and have considered how they might relate to different career areas. Any interviewer responds most warmly to the student who seems able to help himself. Questions, even probing ones, are welcomed if they show that you have read up on the company andd have been thinking intelligently how you might fit in. A question about salary, or rate of promotion, which would be damaging if it seemed to be the only thought in your head, will seem entirely sensible if it reflects a weighing of all the factors that should concern you. Do not project an exaggerated view of yourself. In the same vein, able as you may be, do not expect an interviewer to turn cartwheels for you. Most of the companies that come have hired M.I.T. students in the past (which is why they are here again), and they can make a pretty good appraisal of you. Many of the interviewers are from M.I.T. themselves. On the other hand, do not dwell on your weaknesses. If your shortcomings give you pause, they will make an interviewer pause also. The person every interviewer wants is the one who gives evidence that he is intelligent, personable, energetic and effective — and preferably who has a skill which will make him or her immediately useful. Most M.I.T. students have such a skill to offer. It is worth remembering, however, that most firms which want their people to stay will consider your immediate usefulness a temporary merit. It will look to you to contribute in an increasing number of ways as you gain experience and the company's needs change. In the end it is your personal qualities that count the most.

YOUR RESUME

Your resume will normally give an employer his first impression of you. How you describe yourself will influence how he appraises you. It is therefore worthwhile to prepare your resume with care, thinking out what you want to report about yourself and how you want to report it. Writing a resume is notoriously difficult and you should allow yourself sufficient time. Much can depend on the form in which you present yourself — how you arrange your story, how lucidly it reads, how intelligent it sounds. Do not discount such things as neatness and spelling. It can be useful to have a dispassionate friend review what you have written. We would be glad to help you edit your resume before you put it in final form.

A resume includes a statement of the candidate's professional objective or professional interest. The purpose is to in-

dicate the sort of work for which he wants to be considered. Defining one's job objective can be difficult because one is reluctant to close out possible options, but an employer normally has specific vacancies to fill and he is interested in candidates who want the sort of opportunity he has to offer. One should steer a middle course between stating too general an objective, where the reader will not learn what you want to do, and to narrow an objective, where no employer will think he has a suitable job for you. A resume is effective if it states a recognizable, realizable job objective and then lists qualifications which indicate the candidate can do the job. You may feel there is too little you can say about yourself to write a resume that will impress anyone. Don't worry. If you stop and think what you have learned at M.I.T. and what you have accomplished along the way in seeking an education here (one of your successes, for instance, may be your skill in juggling academic obligations and term-time jobs), you can probably make a pretty good statement. We will be happy to help you sketch it out. We propose to hold a number of workshops on resume writing during the fall and spring recruiting seasons.

We will also be happy to help you with other aspects of your job search — for example, how to write to employers who may not be coming on campus, how to ask for more time before deciding on a job offer, how to refuse an offer politely. We can show you models of letters to guide you in these and similar situations. However many employers you may want to approach, never resort to a form letter!

Candidates for academic positions are often asked for a curriculum vitae rather than a resume. The difference is only in the name. A candidate for a teaching position, however, should include a section where he lists his areas of teaching competence. It may also be helpful to prepare a separate sheet listing the courses one has taken, with the name of the instructor and the grade obtained. Academic institutions which think they might like to hire you may ask you to have your credentials sent, by which they mean a dossier, prepared and sent by your degree-granting institution, containing your transcript and letters of recommendation. M.I.T. has not made a practice of preparing such dossiers, thinking it better that students ask professors writing letters of recommendation to write directly to each employer. M.I.T.'s faculty generally have secretarial help and they are willing to write as many letters as you need to secure employment.

Students in architecture and design who are writing to employers should include with their resume a mini portfolio. How imaginatively it is put together can itself indicate the candidate's skill in design.

PLANT VISITS & JOB OFFERS

You should hear within two or four weeks of a campus interview whether the company wants to consider you further. If it is interested in you, it will probably invite you to visit the company, at the company's expense, to talk with the people with whom you would work. The purpose of the "plant visit" is to help you decide whether you would like to work for the company if it makes you an offer,

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"I can't afford a raise, Simpson. How about doing less for the same money."

and to help the company decide whether it really wants you. In some cases the company has more or less made up its mind on this second point and the chief purpose of the visit is to make up yours for you. But you may find yourself asked searching technical questions by managers who are not yet convinced they want you. A Ph.D. candidate is often asked to give a talk on his research. If you are invited on a plan visit, read up on the company so that you can talk intelligently with the people you see, and be prepared to talk knowledgeably about your major field. In any case, be a good guest. Don't give the impression that you could run the company better than your hosts (true as this may be). And write a note when you get home thanking the company for its hospitality.

A company may tell you at the conclusion of your visit that it is making you an offer, or it may write to you during the next few weeks. If a company makes you an offer and asks you to reply to it before you have heard from other places, write politely asking for more time. The company will respect you for wanting to make the right job decision. It is much better to accept an offer after a delay than to renege on an acceptance you made prematurely.

FOREIGN STUDENTS

Since February, 1971, the immigration regulations have made it extremely difficult for a company to offer permanent employment in the United States to a foreign student who does not have a permanent resident visa. For this reason most companies coming to interview ask to see only U.S. citizens and students with permanent visas, or in the case of companies doing military work, only U.S. citizens. Companies are permitted to offer foreign students 18 months' "practical training" but 18 months is a short time for a company to get much benefit from a new graduate and not many companies are interested in hiring foreign students for such a short period. While we cannot make an interview appointment for you with most U.S. companies if you have an F1 or J1 visa, we can, if you like, give individual companies your resume. Then, if the company representative would like to talk with you, he can tell us. You should check in with us the morning the interviewer is here. This has worked for a few students whose qualifications were particularly attractive to an employer. We can only undertake to do it in cases where there are strong reasons why it might work.

Any foreign student who would like help in finding employment in his own country should at least send his qualifications to the Home Country Employment Registry, a registry of available students maintained by the National Association for Foreign Student Affairs. The Registry is increasingly being used by employers abroad seeking returning foreign students. Registration cards are available in the Foreign Students Office (Room 3-107) as well as the Career Planning and Placement Office. We are very conscious of the difficulties foreign students face as they seek meaningful employment. If you are a foreign student who would like help finding employment either in this country or back home, we will be gald to talk with you about the possibilities.

LOOKING FOR A JOB DIRECTLY

Besides introducing you to campus recruiters — the mountain coming to Mahomet — we are also able to help you go to the mountain. We maintain several sets of job books, including the following:

1. A set of job books containing notices of job vacancies for new graduates in business and government. The jobs are grouped by discipline and copies of the job notices are sent to the appropriate academic departments.
2. A similar set of books containing vacancies for experienced people (alumni). These jobs usually require three or more years of experience.
3. Books containing vacancies in school teaching and in college and university teaching.
4. Books containing vacancies abroad.
5. Bulletins listing Federal vacancies.

You are welcome to pick up a copy of the *College Placement Annual* for 1978 which gives brief descriptions of over a thousand employers and the qualifications in which they are interested. This year there will be a minimal charge of $.25 to cover what it costs us. We have directories of small businesses, of technical firms in the Greater Boston area, and of employers in particular categories (like engineering consulting, environmental protection, etc.). And we keep a card file listing the employers who came recruiting last year and the qualifications they wanted. These listings may give you sufficient leads but it may also be useful to sit down and talk with us about the sort of job you are looking for. We may be able to suggest employers who are particularly interested in M.I.T. candidates or employers in business which might not otherwise occur to you. In addition we have information on technical and executive search firms.

An effective approach with employers in the Boston area — especially if they have listed a specific vacancy — may be to phone them. Normally, however, it is best to write enclosing your resume.

HUMANITIES, SOCIAL SCIENCES, DESIGN

If your courses at M.I.T. have given you more of a liberal education than a marketable professional training, you will find few employers on our placement notices asking for your background. This does not mean that we cannot help you. The staff, who graduated in the humanities themselves, will be glad to help you explore possible avenues of employment. The presence on the recruiting schedule of predominantly large companies implies no bias on our part towards big business. We are just as sympathetic to journalism, publishing, school teaching, soical work, the Peace Corps, etc.; do come in to see us.

GRADUATE SCHOOLS

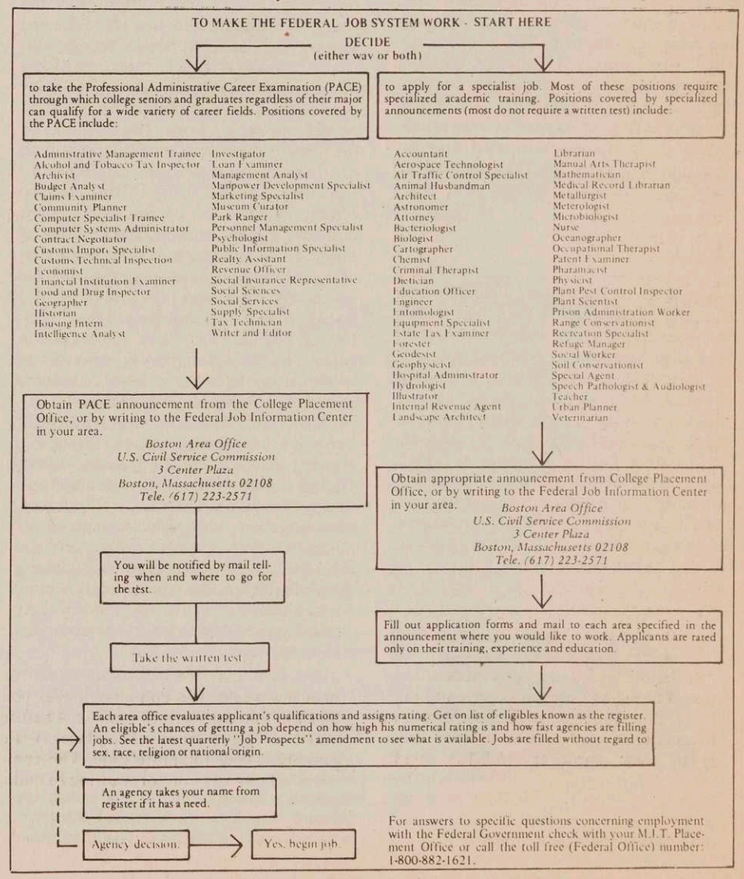
The Career Planning and Placement Library maintains a comprehensive collection of graduate school catalogues grouped by type of school (arts and sciences, engineering, urban studies, etc.). Also available are various guides for graduate study, including *A Rating of Graduate Programs* by Kenneth D. Roose and Charles J. Andersen, American Council on Education, Washington, D.C., which rank-orders graduate schools in 36 fields. We maintain a supply of application forms for the various graduate school admission tests. A number of graduate schools, particularly graduate schools of business, come to the Office to recruit. Check the weekly notices for details.

Plans for graduate study should be made early in the fall, especially if you plan to be a candidate for a national fellowship. A nomination for a Danforth must be in by November 1; the deadline for a National Science Foundation Fellowship is the first week of December. Many graduate schools also have very early deadlines. January is the last month to apply for financial aid at most competitive schools.

Do not let the bill for your undergraduate education deter you from graduate study. Most graduate departments in science and engineering have considerable aid to offer. A fellowship, teaching assistantship, or research assistantship will typically cover your tuition and pay you a stipend of $ 300 or more a month. Other fields are less well endowed but virtually every graduate department has some funds at its disposal. A graduate degree in business administration from a respected school is likely to pay for itself in short order even without financial aid. It is wise to apply to a number of graduate schools not only to insure admission but also to find the best financial support.

SUMMER EMPLOYMENT

The Student Employment Office in the Student Aid Center, 5-119, is the Institute's clearing house for information on summer jobs in the United States. However, some of the companies and



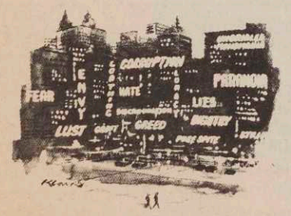
government agencies coming to interview for permanent employment will also be interviewing for summer jobs. A student interested in summer employment should consult the Placement notices beginning in the Fall, as many companies will be coming only in the Fall. Companies interested in interviewing for summer jobs are so identified in the weekly notices. Companies not so identified are normally only interested in students seeking permanent employment. It is worth noting, however, that many a company offering a senior permanent employment is delighted to hire him for the summer when he has decided to go to graduate school.

GRADUATION QUESTIONNAIRE

It is important to the Institute to know what its students do after graduation. When you graduate, you will be sent a questionnaire seeking information on your forthcoming occupation, how you chose it, where you will be located, etc. We urge your cooperation in completing and returning the form. The information will be used purely statistically, without revealing your own particular circumstances. The information we have gathered in past years may be interesting to you as an indication of what may be ahead in your case. We shall be glad to share our statistical information with you.

ENVOI

The staff of the Career Planning and Placement Office will be delighted to discuss your career plans with you. We may be able to help you by referring you to a useful source of information, by telling you what we know of the career patterns of former students, or by simply helping you sort out your own ideas. We also offer seminars during the year at which alumni and others who are in a good position to talk about their own career field discuss its rewards and frustrations. Look for announcements of these on Institute bulletin boards and in *Tech Talk*.



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"I like this city—it's honest."

JOB PROSPECTS

"This is THE busiest season we've had since 1969. It's really a tremendous recruiting year for students." That is the enthusiastic appraisal of Robert Weatherall, Director of MIT's Career Planning and Placement Office. Weatherall and his staff coordinate most of the on-campus recruiting done at MIT. Indeed, this Spring has been one of the busiest recruiting periods, as almost 200 companies sent interviewers to woo promising MIT students. The companies and students are apparently both happy with the results. Weatherall mentioned that the number of job offers made to students was up, and added, "I'm not sure of the percent increase in job offers, but there's no question that the salaries in engineering are up higher than the inflation rate. The peak year in salaries, in real dollars, was 1969, and we're getting back to that 1969 figure now."

The type of companies that come recruiting to MIT has changed over the years. Weatherall said this trend started several years ago, but is now very prominent. "There is much more emphasis now, particularly in engineering, on firms coming from the commercial market than on defense sector firms. If one thinks of the 1960's, there was a tremendous rush of defense sector firms coming and recruiting. When I came to this job, the office was full of model war planes: bombers, fighers, rockets, and that sort of thing. 1969 was (perhaps) the beginning of the revulsion against weapons, war, the war in VietNam, and that sort of thing. I just think that weapons were a poor symbol of engineering. Then the recession came, and lots of engineers were out of work in the defense sector (not students so much, but people in midcareer)."

"Since then, the pickup has really been buoyed by commercial firms. Firms like Hewlett-Packard, Bell Systems, IBM, Digital Equipment, Data General, and Prime Computer. The chemical industry, of course, was always a commercial industry: DuPont, Union Carbide, and the rest of them. There has been a very strong demand out of the commercial sector. And, I think students are making their choices more with firms in the commercial sector lately."

As a result of this shift, defense contractors are having some difficulty in finding M.I.T. graduates to employ. "Some of the firms out of the defense sector are wondering where the students are! They haven't seen their share of students. These are not so much the Armed Services as General Electric, which is making guidance systems for the Trident submarine, helicopter manufacturers, McDonnell Douglas, Lockheed, Electric Boat, Rockwell, and firms like that. There's a whole lot of defense contractors. What I'm saying," Weatherall added, "is that it's by no means an absolute swing, but a lot of the demand now comes out of the commercial sector."

When asked about the interview process itself, Weatherall gave us some of the inside tips. "There are two kinds of representatives that they send: one is a technical man, and the other kind is the personnel man. Half of the interview, in both cases, is partly a selling job by the company: wanting to display to the student that it's worthwhile taking this company seriously. So, if they like you, they hope you'll be interested in the company."

"The other part (of the interview) is, of course, a preliminary sizing up of the student: whether he or she is worthwhile, and whether to invite them back for a plant visit. If they think they want you, they'll decide to invite you to take a more seirous look at the plant. And, they want you to say yes if they invite you. So, they're trying to sell you on the merits of their company. The real decision (about the job offer) is usually made at the plant visit, at least for engineering students."

Weatherall expressed his views on the whole interviewing process. "I think the whole thing is rather hit or miss. They're trying to make a decision on whether to invite you for a plant visit in really only 15 minutes; half of which may be spent telling you about the company and maybe stuff that you'd want to know about benefits, etc. The other half is spent appraising you."

We asked Weatherall for some insight into how companies actually try to "size up" students. "In engineering, it's the look of technical competence. In the case of Ph.D.'s, it's a more careful technical appraisal. In that case, they may write to you when you make the plant visit to give a seminar on your thesis."

"Some of the companies, for the lower degrees, may ask you technical questions. A student the other day was saying that he really had to scratch his head because he was asked a technical question about computing a circuit diagram. He hadn't done that particular chore for a year or two, and it stretched him somewhat to have to do that. I think this happens a lot. The personnel man wouldn't do this, because they wouldn't know the answer!"

Specifically, Weatherall mentioned several aspects that companies are looking for in a student's personality and professional background. "I think they're looking for qualities that anybody can begin to discern just after talking to most people. A look of competence, a style that looks like you would fit into other people's activities, that you are interested in what they are doing, that you are responsive. They're looking at certain known traits that everyone else is looking for, like whether a person gets things done, looks practical, looks like they accomplish things. They're looking for ambition, drive, energy, good sense, ability to work with other people, and they like you to be articulate."

"In the areas of engineering and science, they're always looking for the person who will go beyond the present job which they're filling, and be a candidate later for higher positions in the company. That's not always the case: there are people who come with a specific job to fill, and aren't thinking at all of the needs of the company downstream. But as Proctor and Gamble is interviewing chemical engineers with bachelors and masters or doctoral degrees, they know that their needs today are only today's needs: that five years from now you might still be with them, that they'll be working on other products in a different business climate, and different technology will be coming along. They want people who will be moving with the technology and with the company, moving up into leadership positions."

"The companies that come here are very conscious of the fact that many of their own leadership in their company are M.I.T. people. They can't escape that. In fact, they'll sometimes say 'you know, our president is an MIT man, and our Vice President for Research is an M.I.T. man, and we've got two M.I.T. people below them. What we want is more people like them!' They're often saying that or implying that they just wish they could get more of them. Many of the interviewers coming are in fact M.I.T. men themselves, who've moved up somewhat in the company."

Weatherall extends an invitation to all M.I.T. students to come and visit him personally. He would be glad to discuss employment prospects in the fields you are interested in, and advise you on how to best approach the job market. The Career Planning and Placement Office and its staff have an impressive array of information and advice about job hunting. We have printed some excerpts from their current Placement Manual, which give an overall view of the job hunting process. Your best bet, though, is to visit them in room 12-170. Better get there soon: your prospects have never been better!

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"Sisters, let's leave the men to their mindless chatter and get the cigars."

File Those Forms!

The M.I.T. Graduate School may be losing several hundred thousand dollars of federal funds for support of graduate students because need analysis forms have not been completed by graduate student teaching assistants.

Federal funds for education are distributed to colleges and universities on the basis of need as determined by a need analysis system approved by the Office of Education. Each year M.I.T. files an application with this office for funds based on the "need" of their undergraduates. The data is collected from the financial aid forms filed each year with the Student Financial Aid Office.

This past year a plan was devised to fund Graduate Student teaching assistants from college-work study funds if their need could be determined as it is for undergraduates. A form was designed with the help of faculty and departmental representatives who work with graduate students to allow the Student Financial Aid Office to collect the information necessary to analyse the need and assign federal work study funds. (These forms as well as the loan applications filed by some 900 students will be used as supporting data for the federal application). To date of the 360 TA's only 216 have completed the forms, leaving M.I.T. far short of the amount we hoped to use in providing support for graduate students.

Other colleges, (Harvard, for example) are requiring all graduate students who request aid from their university to file the Graduate and Professional School Financial Aid Service Application (GAPSFAS). M.I.T. has not required this form, preferring to treat grad students as professionals who would want to help the Institute in its effort to increase the money available to graduate students.

Your help is critical, if not to you directly, then to other graduate students at the Institute who may be in departments where funding is not easy to find. If you have suggestions or questions about how we might work with students on this project please let us know. Nels Armstrong and Dotty Bowe (5-119) would like to hear from you.

While minority freshman enrollments in engineering have been steadily increasing, problems of retention appear to be offsetting such gains and may make the goal of parity with nonminorities difficult to attain. This problem and how to deal with it were the subjects of a four-day workshop held at the Massachusetts Institute of Technology beginning October 30. The workshop, cosponsored by M.I.T. and the National Research Council's Committee on Minorities in Engineering, attracted more than 100 participants, primarily from educational institutions and industry. Most were already intimately involved with entry of minorities into the profession.

The difficulties of attaining adequate statistics on retention were noted in a report presented by Dr. William E. Hogan, associate executive vice chancellor at the University of Kansas. Dr. Hogan, who headed a task force commissioned by the National Research Council to study the problem, defined retention in engineering "as the number of students graduating after five years from enrolling at their respective institution."

Students who transfer into engineering were excluded since, according to Dr. Hogan, "most educational institutions do not have these data." In fact, the task force study revealed that in general, institutional data pertaining to student retention for both minorities and whites are incomplete or nonexistent.

Dr. Hogan said that when he visited campuses and asked a relatively simple question such as how many minority students were enrolled, he encountered answers such as "I'm not sure," "I don't know," or "Gee, I wonder what that number is?"

Despite the difficulties of data collection, the task force did obtain information from directors of minority programs at 33 schools, representing over 40 percent of the total minority engineering student enrollment. Not surprisingly, the study found that the most important factors affecting attrition are insufficient preparation in mathematics and physical sciences, inadequate motivation toward a career in engineering, and a lack of adequate financial resources. Other important factors are a lack of self-confidence, personal or family problems, and too much time expended on social and nonacademic student activities.

Hogan did note, however, the "while some colleges and universities show a large proportion of minority students not being retained, others show quite the opposite. One common element among these minority engineering programs is that their support programs do indeed seem to impact retention."

Many student support programs were discussed at the workshop. Precollege and college academic support was the focus of a presentation made by Professor Wesley L. Harris, director of the Office of Minority Education at M.I.T. and chairperson of the workshop planning committee. Professor Harris described a study that found black students at M.I.T. performing at a different level compared to nonminority students in grade point average, overall performance in general departments, attrition rates, and performance on national standardized tests in high school. Scores on the Scholastic Aptitude Test and high school grades did help predict academic performance but did not predict retention, he said.

Harris described a precollege program at M.I.T., Project Interphase — a seven week intensive look at mathematics, chemistry, physics, computer programming and the humanities. During their first year, participants in Project Interphase did not perform as well as minority students who had not taken part in the program. But by the end of the fourth semester, the two groups were academically indistinguishable. Harris also described pedagogical aids used at M.I.T. such as Tutored Videotaped Instruction (TVI). No student enrolled in a physics course who attended TVI sessions failed the course, whereas a fourth of the minority students enrolled in the same course but who did not participate in the TVI program did fail.

Support for Minority Engineering Students

by Harold G. Kaufman

The importance of intervention in dealing with academic problems was stressed by Marion Oliver, director of Carnegie-Mellon's Action Project as well as associate dean at CMU's School of Urban and Public Affairs. Oliver reported data from a study at a CMU program that provides group help from three counselors for underachievers. Participants in the program had less than half the attrition rate (27 percent) of nonparticipants (55 percent). This is all the more striking since the nonparticipants had been judged to have the greatest potential, based on such factors as admission test scores and high school grades. Among those who did not drop out, the participants in the counseling program demonstrated higher gains in grade point average as well.

Oliver also presented data indicating that students who followed the recommendation of advisors regarding courses were much less likely to end up on probation than those who did not follow their advice. The latter suffered from what he called the "hard head syndrome."

Of great significance were the data Oliver presented demonstrating that predictions of academic success using established procedures do not work for minorities — their academic performance is consistently understimated. Therefore, the criteria and norms used by engineering schools for selecting students may not be applicable for minorities.

Although the focus at the workshop was on academic support programs and on enhancing the commitment of engineering faculty and administration, the role of industry was not neglected. By providing funds at both the national and local level, industry can help alleviate the problem of financial aid. In addition, according to the task force study, motivation to pursue a career in engineering is enhanced by work experience in industry provided through co-op programs and summer jobs. Some participants, however, noted that the lure of high paying jobs in industry discourages minority students from pursuing doctorates in engineering. Since it is from among these doctorates that minority faculty will come, faculty role models will continue to be scarce in schools of engineering.

The perspective of the minority student was provided by William A. Johnson, former chairperson of the National Society of Black Engineers, who noted that it is in the graduate schools themselves "where the minorities are receiving the greatest resistance." Johnson also felt that a minority engineering organization is important to retention, and can play a role similar to that of the Society of Women engineers in providing a sense of identity for students.

Although Johnson criticized the poor guidance and support systems as contributing to attrition, he nevertheless concluded that "it is the minority individual who must bear the greatest load in preparing to undertake the rigors of an engineering program."

Industry itself is not immune to the problem of retention. Edward R. Kane, president of DuPont, noted, "after five years of DuPont experience, the retention rate for black engineers is about 16 percent below that of their white counterparts."

Although many leave for better opportunities,there are potentially negative implications. "If young minority engineers don't stay with us," Kane noted, "we can't advance them on either the management or professional ladders." This broadened view of retention was extended even further by Kane who emphasized, "efforts at the community level, initiated much earlier in the minority students' schooling, are essential in retaining tomorrow's engineers."

Minority Graduates

At the national level, access for blacks to graduate and professional schools has worsened over the last two years. According to a recent study by Dr. Tollet of Howard University published in the book, *More Promise Than Progress — A Continuing Assessment of Equal Educational Opportunity for Blacks in US Higher Education: 1974-75,* there was an 8 percent decrease in the number of blacks in graduate and professional schools in 1974 and a similar decrease in 1975. Blacks are better represented in community colleges and private vocational schools than in four-year colleges and universities.

While minority graduate student enrollment has declined nationally, M.I.T.'s minority graduate student enrollment continues to increase, we believe primarily as the result of the strong commitment and active minority recruitment programs in the following departments: Architecture, Urban Studies and Planning, Management, Physics, and Economics. The minority graduate student enrollemnt for fall term of 1976 increased 15.6 percent over the previous year's enrollment, from 154 to 178 students (Table I), and the numbers receiving graduate degrees are rapidly increasing (Table IIb).

Our focus for the next few years at M.I.T. will be to increase our recruiting and to support joint efforts with faculty in the Schools of Engineering and Science where minorities make up only 2 percent and 3 percent respectively of the total enrollments. At the same time we will try to maintain our momentum and progress in the other departments. Specifically, we hope to launch a comprehensive recruitment program during academic year 1977-78 involving M.I.T. faculty in those departments that currently have low enrollment of minority graduate students. We would like to triple our enrollment of minority graduate students in the School of Engineering by the fall term of 1978-79. Such a massive effort will require cooperation from the departments, financial assistance from the Institute, and time and commitment on the part of individual faculty members. A number of departments, interested alumni, and several concerned individuals inside and outside of the Institute have indicated that they believe our goal can be achieved and are willing to help.

In addition we have become active participants in several programs that should also help to increase our minority enrollment in Engineering over the next three years.

In 1976, 19 universities and eight research centers founded the National Consortium for Graduate Degrees for Minorities in Engineering, Inc. The Consortium's headquarters are located at the

University of Notre Dame because of its central location in the country and the strong support given to the program from Father Hesburgh at Notre Dame. M.I.T. is one of the founding members, and Associate Dean John B. Turner is a member of the Board of Directors.

The Consortium's objective is to increase the number of minority men and women granted advanced degrees in the field of engineering. To meet this objective the Consortium will provide summer employment/educational programs in which minority undergraduate students will have three summers of work experience at participating research centers and up to two years of graduate education at participating engineering schools. It is hoped that eventually 100 minority students who are in their junior year of undegraduate study will be selected for the program each year. Each school makes its own graduate admission decisions and contributes the first $ 500 of tuition for each student admitted. Tuition costs between $ 500 and $ 2,500 are shared 75 percent by the Consortium and 25 percent by the university. All tuition costs over $ 2,500 are paid by the university. The Consortium will also provide a $ 3,000 annual stipend to these students while they are attending a participating graduate school.

The Consortium is off to a good start having recently received a grant of $ 450,000 from the Alfred P. Sloan Foundation for "start up" money to supplement the annual contributions of $ 15,000 each from the 10 participating laboratories. The program recruited its first group of students during the 1976-77 academic year, admitting 30 students from the 73 applications received from minority college juniors. M.I.T. placed the largest number (6) of students in the program. Since research laboratories are very interested in attracting minority engineering students from M.I.T. upon graduation, we were not surprised by the fact that all of our students who applied were admitted to the program.

We also have our own summer work and study program for minority students at Lincoln Laboratory. Starting in summer, 1975 Lincoln Laboratory has provided employment for 10 students each year who have successfully completed one year of undergraduate study at a predominantly black institution and whose major or intended major field is in Electrical Engineering or Physics (applied). Students so selected may be reappointed in subsequent years; i.e., the summers following their second and third years of study, provided that they have successfully completed that year of study and are still pursuing a degree in Electrical Engineering or Physics. Students in the program are assigned to positions in the Laboratory as technical assistants and paid a weekly salary. They are also expected to attend classes established for them and presented in the Laboratory or at the M.I.T. campus under the auspices of M.I.T.'s academic departments and Lincoln Laboratory.

The students in the program have progressed well and Lincoln Laboratory hopes to continue the program indefinitely. There will be 21 students in the Program during summer, 1977; 10 sophomores, 8 juniors, and 3 seniors. We in the Graduate School Office are very interested in the program's development and success, for we feel that this arrangement with the black colleges is a viable means of generating a large number of black students to pursue future graduate study at M.I.T. The benefits of the program to the student are immense. The exposure to varied talent, equipment, laboratory projects, as well as the exchange of technical knowledge and information between the student and scientist are invaluable aids in enhancing the educational development and career of the student.

In addition to these national efforts focused on engineering, we have joined two other national efforts to increase minority representation in graduate programs.

We are one of the founding members of an informal organization called the Ad Hoc Consortium on Minority Graduate Education formed in mid-1976. Senior administrators at several institutions of graduate education participated in discussions leading to the concept of "institutional bloc-grants" and to a national proposal to support and partially finance efforts to enroll more minority students at these institutions. The graduate institutions involved in the Ad Hoc Consortium (Berkeley, Brown, Cornell, Harvard, Johns Hopkins, Michigan, Minnesota, M.I.T., North Carolina, Notre Dame, Ohio State, Princeton, Stanford, U.C.L.A., Vanderbilt, Washington, Wisconsin, and Yale) are hopeful that Congress will appropriate funds to start the program in fiscal year 1978.

Another group, The Cooperative Minority Student Recruitment Program, composed mostly of black associate deans from 20 of the leading graduate institutions in the country, met at the University of Pennsylvania in February 1977 and agreed to exchange the names of their minority seniors and juniors. The exchange of names is intended to recruit more minority students to the participating graduate institutions by minimizing the difficulties of identifying minority students nationally as well as reducing the cost of recruiting trips to these institutions. The students' permission was sought before their names were placed on the exchange list. By April 1977 over 1,200 names of minority juniors were exchanged by these 20 institutions.

Table I REGULAR GRADUATE STUDENT ENROLLMENT, FALL TERM 1976

	Foreign*	Women	Minority**	Total
School of Architecture and Planning	56(+3)	99(+10)	59(+9)	288(+27)
School of Engineering	604(+10)	110(+19)	44(+6)	1774(+50)
School of Humanities and Social Science	72(+13)	69(+9)	27(-3)	285(+15)
Sloan School of Management	96(-2)	79(+5)	17(+8)	396(+60)
School of Science	231(-2)	189(+16)	31(+3)	1031(+19)
TOTAL	1059(+22)	546(+59)	178(+23)	3774(+171)

* Includes Canadians
** Includes Black Americans, Puerto Ricans, Mexican-Americans, and Native Americans

Women

Although from 1975-76 to 1976-77 the number of graduate women enrolled grew 12 percent (Table I), the total fraction of women in the graduate body grew by only one percentage point (from 14 percent to 15 percent). No major changes have occurred in the past several years in the distribution of women throughout the five Schools. In 1976-77 the percentages of total enrollment were:

(continued on page 17)

THE GRADUATE STUDENT MEDICAL SURVEY

The primary purpose of the MIT Graduate Student Council is the representation of the graduate student body in "all matters pertaining to their general welfare as graduate students." Toward this goal, the GSC is distributing this questionnaire in an effort to determine more accurately the opinions, problems and circumstances of our constituency concerning the use of medical services.

Please take the time to answer the questions carefully. Data from this survey will give us the information we need to propose changes and new ideas through the Medical Advisory Board.

We have tried to keep the survey short, so if we have neglected to ask you something that you think we should know about, feel free to add your own comments. Naturally, all responses will be treated confidentially.

Thank you,
Joseph Hoffman,
Graduate Student Representative on
Medical Advisory Board

NOTE: This Survey is designed to be pulled out of the magazine and sent through interdepartmental mail to the GSC. Just fold and seal, as indicated on page 16, and drop into any interdepartmental mailbox.

1. Were you enrolled in the MIT Health Plan and assessed the MIT student health fee for both spring and fall semesters in the calendar year 1977?

both semesters	one semester	neither semester

2. If you are married, did you pay for your spouse for the services provided with the student health fee in 1977?

yes	no	not married

3. How many times did you (or your spouse) use any of the services of the Medical Department in the year 1977?

0	1	2-3	4-7	8-12	13 or more

4. If you (or your spouse) received any bills from the MIT Medical Department for services provided in the year 1977 on a fee-for-service basis, what was the approximate total amount of those bills?

none	less than $20	$20-40	$40-70	$70-100	over $100

5. Did you (or your spouse) subscribe to the MIT Student Outside Hospitalization Plan in the year 1977?

none	yourself only	spouse only	both

6. How many claims, if any, did you (or your spouse) make on Student Outside Hospitalization Insurance in the year 1977?

0	1	2-3	4 or more

7. If you receive financial assistance from any private or governmental institutions, does your financial support cover:

	yes	no
The student health fee?		
The Student Outside Hospitalization Insurance premium?	yes	no

8. If not covered now, would the following be covered if included as part of tuition costs:

	yes	no
The student health fee?		
The Student Outside Hospitalization Insurance premium?	yes	no

9. Would you favor including the student health fee as part of tuition costs for graduate students?

yes	no

10. To what extent do you beleive the fees you pay for the following are too high?

about right	1	2	3	4	5	much too high

11. The following is a short list of services in the Medical Department that are currently not covered by the student health fee, but are instead billed to students on a fee-for-service basis. Would you favor including the cost of any of these as part of the health fee, assuming the health fee would need to be increased to pay for these services?

	yes	no
eye refraction?		
routine dental care and instruction?	yes	no
oral surgery?	yes	no
restorative dentistry?	yes	no

INTERDEPARTMENTAL

To:
The Graduate Student Council
Room 50-110
M.I.T.

FOLD HERE

SEAL HERE

Beyond Tokenism

(continued from page 12)

Architecture and Planning	33%
Humanities and Social Science	24%
Sloan School	19%
Science	18%
Engineering	6%

Thus, one of our greatest challenges remains that of attracting more women to the engineering and physical science fields where the largest number of our total graduate student population is enrolled. In an effort to recruit more women to Engineering, the Committee on Engineering Education in the School of Engineering has been working with Mount Holyoke College to develop a Master's program in Engineering which would better prepare women in liberal arts colleges for admission to engineering graduate schools. At the same time, this program hopes to alert women to career opportunities in the engineering field. This program is currently in early development stages and involves primarily Mount Holyoke, Wellesley, and M.I.T.

The Institute received almost 1,200 applications from women this year; this represents a 44% increase from 1973 to 1976 with a corresponding increase of 15 percent for male applications. In an effort to increase the pool of women applicants, the Graduate School Office developed and mailed about 400 posters depicting "Women in Graduate Study at M.I.T." to leading universities throughout the United States, particularly to those institutions which include undergraduate training in mathematical, scientific, and engineering fields.

A steady increase in the number of degrees awarded to women has continued. (See Table IIa.) However, the majority of women are enrolled in departments such as the Sloan School, Architecture, and Urban Studies, whose graduate programs lead primarily to Master's degrees. The number of doctoral degrees awarded to women remains small: eight doctoral degrees in Engineering, none in the Sloan School, 10 in the School of Humanities and Social Science, two in Urban Studies, and 31, the majority, in the School of Science (18 percent of Science doctoral degrees). Note that these statistics do not include Engineer's degrees which are often awarded as simultaneous degrees and to date very few women have received these degrees.

Women graduate students, no less than men, are being affected by the decrease in financial aid for graduate education in the face of the increasing tuition and other costs of a graduate education. This situation may have a disproportionate effect on M.I.T.'s graduate women in that many of them are enrolled in those departments whose financial resources are most limited.

For the fourth year the Graduate School Office awarded Ida M. Green fellowships to seven incoming graduate women from the fund which has been set up by Cecil and Ida Green for this purpose. In addition, one continuing graduate woman was awarded a Collamore-Rogers Fellowship from endowed funds given to M.I.T. to help women in their graduate studies. Such funds to support graduate women are important in encouraging and attracting women to M.I.T. However, like all M.I.T. endowed funds, income from them is limited and as costs increase the number of individuals who can be supported by these funds must necessarily decrease. In addition, this year M.I.T. women have been the recipients of fellowship awards from IBM, Xerox, and Arthur D. Little, who have established special fellowship porgrams for women and minorities who are studying in science and engineering fields. Hopefully as their numbers increase women will become more competitive for research and teaching assistantship money within departments.

M.I.T. women continue to be successful in winning graduate fellowship support in national competitions. This year three M.I.T. graduate women won dissertation fellowships from the American Association of University Women, and of the 11 Danforth Fellows studying at M.I.T. this year three were women. There were 18 National Fellowship Fund recipients enrolled in M.I.T. graduate programs during fall, 1976, including nine women. Other women students received fellowships from the National Science Foundation, the National Institutes of Health (N.I.H.), Hertz Foundation, Wellesley College, and Bell Laboratories for their graduate work at M.I.T.

Women have always valued an M.I.T. education and degree. However, in some instances their isolation in certain research areas and their difficulty in finding mentors and role models has put a certain personal cost on the value of their education. During the past year the Graduate School Office has sponsored various activities in an attempt to reach out to graduate women and bring them together.

Table II — GRADUATE DEGREES AWARDED, 1976-77

Advanced Degrees Conferred	M.C.P., M.Arch., M.Arch.A.S.	S.M.	Engineer	Sc.D.	Ph.D	Total
September 1976	14(+ 3)	172(+17)	16(+ 6)	14(- 1)	111(+10) 3WH*	330(+35)
February 1977	15(- 8)	220(+25)	27(+ 3)	19(- 7)	84(-33) 5WH*	370(-20)
June 1977	63(+11)	487(+61)	48(-12)	20(+ 1) 1WH*	120(+19) 2WH*	741(+80)
TOTAL	92(+ 6)	879(+103)	91(- 3)	54(- 7)	325(- 4)	1,441(+95)

Table IIa — GRADUATE DEGREES AWARDED TO WOMEN

	1975-76	1976-77
Master's Degrees	93	145
Doctoral Degrees	32	51

Table IIb — GRADUATE DEGREES AWARDED TO MINORITIES

	1975-76	1976-77
Master's Degrees	29	45
Doctoral Degrees	7**	8

* Woods Hole Oceanographic Institution
** A total of 8 Doctoral degrees was awarded to minorities in the 15-year period prior to 1975-76.

"When I ask a guy to do homework with me, he sees it as a social event."

"Fellow students can cause you to drop out. Peers are often disbelievers . . . and they isolate you."

Women engineering students uttered these lines. While the first may attest to the foibles of men in an environment containing precious few women, the second illustrates the gravest of consequences for a profession lurching toward equal opportunity.

Both shed some light on the deceptively dispassionate question, "Do the educational experiences of men and women engineering students differ?" Since they suggest that the answer is yes, we are obliged to find out what the differences are and whether they may be keeping women from finishing college and becoming engineers.

In open-ended interviews a group of 71 men and 102 women attending seven engineering schools reported in their own words the incidents, large and small, that affected their commitment to engineering. The ways in which the women's experience differed from the men's shows that insensitivity to women's aspirations still exists among men on campus and elsewhere.

Past research provides some material to draw on to answer questions such as "Why do women choose engineering?" "Do men and women engineering students have different characteristics?" "Are the differences crucial?" (If they are not, then certainly the money budgeted for special programs could be better used elsewhere.)

Research on engineering students who attended the University of Minnesota between 1961 and 1970 showed that women students have wider interests than their male counterparts. Not only do they enter with more diverse interests, but they also often leave because of them. They feel the technical curriculum doesn't leave them enough flexibility to find outlets for their nontechnical interests, so they gravitate toward something that in their eyes is less rigid.

Cornell's continuing national survey of freshman students in engineering in 1975 and 1976 substantiates the first of the Minnesota conclusions — that women coming into engineering have more diverse interests than their male peers. The women's extracurricular activities extend through technical interests to music, drama, sports, journalism, and student government. Although the men may have wide technical, mechanical, and sports interests, their activities are not as likely to extend into the artistic, social service, or literary arenas.

Can Women Make It as Engineers?

by Sandra O. Davis

Cornell's questionnaire method has not unearthed any overpowering sex differences in why men and women choose engineering. Both men and women cited intrinsic interest in the field, availability of jobs, and a chance to work with ideas as their primary reasons for choosing engineering. According to the proceedings of a conference entitled "Women in Engineering — Beyond Recruitment," however, women students are especially motivated by rewards and recognition while in school and by the long-term goal of a good salary.

A critical finding from the Cornell data is in the area of academic backgrounds and academic expectations. More women than men were in the top 5 percent of their high school class and more women than men had an A or A-minus grade point average. However, "larger proportions of male students than of females expected to rank in the top 10 percent of their class [in college], and larger proportions of men . . . expected to obtain an A average," the Cornell researchers reported. Thus, although the women had superior high school grades, the men seemed to have higher levels of self-confidence. Or perhaps the women simply viewed engineering as a more difficult curriculum than did the men.

Although data are being gathered that help to describe the characteristics of women in engineering, we do not have a high-quality supply of data to help us answer our questions: Do the educational experiences of men and women engineering students differ? Are special programs or interventions necessary? What kind of intervention might be most appropriate at what stage in the educational process? The current data base does not shed much light on these tough questions. In fact, the current data base suffers from a profound limitation. Most of our data come via questionnaire or survey, where respondents are locked into a multiple-choice format. The individuals' free and open responses remain unknown and only open to conjecture and armchair guesswork.

In our study, the focal research question was: "Do men and women students in engineering have different experiences in college?" Because of our criticism of questionnaire data, our design revolved around semi-structured individual interviews. Each institution selected a random sample of male and female students from all four levels, freshman through senior. Three to five students were interviewed in each category (freshman women, freshman men, sophomore women, etc.). Thus, each school contributed a sample of between 24 and 40 male and female students. In addition, a small group of students who had entered engineering in 1972 and had subsequently withdrawn was interviewed. Table 1 shows the composition of the sample by school and by sex.

Pertinent ability and achievement information were gathered from student files (SAT scores, major, and college GPA). Students were also asked to rate their chances of graduating in engineering on a scale of zero to 100. The women had a slightly higher mean SAT-Verbal score and GPA than did the men, although the differences were not significant. The males scored slightly higher than the women on the SAT-Math, although this too was not significant. The mean SAT-V for the total group was 528; the mean SAT-M was 621; and the average GPA was 2.43. Men and women seemed equally confident of their staying in engineering. Men rated their chances of graduating in engineering as 88 out of 100, while women reported their chances as 92 in 100.

The interviews were conducted in the late winter and early spring of 1976. The interview consisted of six basic questions:

1. What contributes to your staying in engineering?
2. Have you experienced any critical incidents that have increased your commitment to engineering?
3. Have you ever considered dropping out of engineering and why?
4. Were there any critical incidents that occurred that created doubts about your staying in engineering?
5. In your opinion, are there any special reasons why a woman would stay in engineering?
6. Are there any special reasons why a woman would drop out of engineering?

Since the six basic interview questions were open-ended, they required a special coding system. A random sample of men's and women's interview protocols were selected, and the author and two psychology graduate students with research expertise developed the categories the data demanded. Then all protocols were coded by another individual. The critical incidents were treated separately because so few students reported critical events.

Reasons for Staying in Engineering

At first glance men and women seem more similar than dissimilar (see Table 2). About 70 percent of both sexes mention they stay because they see themselves as similar to engineers in that their interests and abilities are in line with engineering. Other frequent statements were that the students stayed because they liked the school, its student support programs, or its academic departments. Although encouragement and support from others was mentioned by half or more of both men and women, women were more likely to point to its importance (Category 1). This factor of encouragement and support also figured significantly in comparisons of seniors; slightly less than half of the men versus *three-fourths* of the women point to encouragement and support from others as a reason for persisting in engineering.

In analyzing the critical incidents of the men and women, we found that 30 percent of the women's incidents related to this area of support and encouragement. Here are some examples of what the women said:

When I was a freshman, I had a computer programming class. I was working late one night and got a program through on the second run. My brother (an engineer) said, "You may learn to think logically yet." It was important that someone said he believed in me.

As a sophomore transfer student I found classes quite difficult and demanding. I was passing but feeling I didn't understand the

material well enough. I began to doubt my ability to make it, but my boy-friend was very adamant. He said, "That's stupid, you can make it."

My sister told me that one failing grade in first-quarter chemistry didn't mean I was dumb.

My father suggested I might be interested in engineering and to attend a career conference for women interested in engineering. I went and decided to go into engineering.

I had decided to leave school. A professor I knew heard about it, went to the dean, and told him I was one of three students in his department worth having. They found me a job and I stayed.

I remember a particular professor, who said, "You can."

My second quarter here I had a math professor who was very influential. He was kind of a model for me — motivating me to learn and do well in whatever I did. Taking his class was like watching a magic show; he had such presence. He was also friendly and approachable and I realized professors are human, too, not just on a pedestal.

The area of greatest difference between the men's and women's reason for remaining in engineering concerned the importance of extrinsic rewards of engineering. Almost half of the men versus only a quarter of the women talked about engineering offering them a chance to make a good salary or to be respected. Thus, men students attach importance to extrinsic rewards while women students de-emphasize them. The following quotes illustrate men's stress on extrinsic rewards.

I like being viewed as an engineer. People think I have a logical, analytical mind.

Engineering is practical and useful.

Engineers have opportunities for good salaries.

Engineers are singled out — they have status.

Men and women students were equally likely to talk about intrinsic rewards, such as challenge or satisfaction. However, the tone of the women's comments about intrinsic rewards seemed different from the men's. The women seem motivated to achieve, to enjoy the difficulty of the subject, and to persevere for the sake of being satisfied.

Men

I enjoy engineering — it's a challenge.

I like finally coming to a solution to a problem.

Engineering is a good way to help people.

The work is interesting.

Women

I like the challenge of succeeding in a difficult area.

In engineering there is more expected of you, and that's what appeals to me.

Engineering is the most challenging thing I can imagine for myself.

There's satisfaction in seeing something standing there and you know you've built it.

A second area of male-female differences appeared in Category 5 — competition. This category is directly linked to that of intrinsic rewards, because it encompasses statements like "I want to prove I can do it." Only 13 percent of the women mentioned competiton as a reason for staying in engineering, yet not one male student brought up the idea. In fact, many critical incidents reflected this theme of "I'll show them." Here are some samples from the women's interviews.

A doctor at the club where I had a summer job told me I'd never make it because I was too feminine. I decided to do it to spite him.

In 1972 my advisor told me I should consider leaving engineering to go into the liberal arts college. That motivated me to persist.

When I was a freshman, my home-town neighbor who was a chemical engineer took me through his plant. He implied I would probably drop out. This made me even more determined.

I had an insulting, discriminatory scholarship interview with women in a women's auxiliary. It made me want to fight — who are they to imply such things?

People always told me I had all these great talents that would make me a super this or super that. I think of most of those as nonproductive, noncreative professions. I rebelled against the traditional role of a smart, pretty girl who goes into a humanities-based profession.

These results lend credence to the idea that women in particular think of engineering as a difficult, challenging path to follow. Cornell's data also seem to support this concept: despite their superior high school academic records, women have less confidence than men have in their ability to do well in engineering. Perhaps one reason that more women do not even consider engineering is that they perceive engineering and the path to it as so difficult that they are reluctant to attempt it.

TABLE 1-THE SAMPLE COMPOSITION

	Persisters		Drops	
School*	Male	Female	Male	Female
University of Minnesota	10	18	1	2
University of Colorado	12	14	5	5
Carnegie-Mellon University	12	9	-	-
Purdue University	15	17	-	-
Georgia Institute of Technology	11	11	4	3
University of Michigan	-	21	-	1
University of Delaware	11	12	-	-
Totals	71	102	10	11

*Lehigh University is part of the research group, but our questions were embedded in a longer, structured interview done by Lehigh in the fall of 1975. Lehigh's conclusions have been reported separately.

Reasons for Leaving Engineering

When students were asked if they had ever thought of leaving engineering, almost three-fourths of both men and women said they had considered it (Table 3). The most common reasons for thinking of leaving engineering were similar for men and women, namely, poor academic performance or a feeling that their interests and abilities were not congruent with engineering.

The following comments show the students' major reasons for considering leaving engineering.

Men

At times engineering was too restricting.

I had poor grades in early math classes.

My grades were not as good as others in my class, and I was frustrated.

The high volume of work, which was somewhat inconsistent from semester to semester.

Women

I had an unrealistic picture of engineering, and I thought it might be too limiting.

I am not that good a student — gradewise.

The atmosphere is tense, engineering students are harassed and under pressure.

Engineering students seemed narrow-minded and illiterate.

Some sex differences did appear. A higher proportion of women (22 percent) versus men (7 percent) cited "situational obstacles" that might prevent them from persisting in engineering. When students discussed problems with a living situation or finances, or talked of marriage or family responsibilities, their responses were coded as "situational obstacles." According to an article in *New Engineer* (February 1977), two out of five women drop out of engineering because of family responsibilities. In light of this conclusion with a very small sample, this area needs scrutiny. Of the 102 women in this study, only two mentioned marriage or family as reasons for leaving engineering. In this sample most of the women who complained about situational obstacles were referring to living situations, especially a dorm environment incompatible with studying.

Two other reasons stand out in Table 3. These are social pressure and absence of support. A minority of women (in other words, slightly more than 10 percent) discussed these two areas as factors in considering leaving engineering, yet only one man said anything similar. Here are some examples of these areas from the women's critical incidents:

I had a professor who said to me, "Why don't you get married and have six kids?"

I was very depressed about school one day and went to the assistant dean's office to talk with someone about my troubles. They told me I should just leave and never gave me any encouragement at all.

When my grades were low one quarter, my advisor said, "Maybe you should quit."

One pertinent fact is that the women who talked about social pressures or the lack of support as reasons for leaving engineering were almost all seniors. One wonders if there were others who left before then for precisely those reasons.

Opinions About Women Persisting in Engineering

We asked both men and women if they thought there are any special reasons why women in engineering might persist or drop out. A sizable proportion of both groups said the reasons are not different for a woman than they are for a man. However, 40 percent of both men and women (see Table 4) thought women remain in engineering because being in the minority brings special status or brighter financial prospects. The following are examples of these ideas:

Female students are treated as special — that works pro and con.

Women are a "desirable commodity."

Job market advantage is the only *advantage women in engineering have.*

Women have an easier time in engineering, because everyone wants to hire them.

The uniqueness of being a woman engineer.

Furthermore, about 30 percent of both men and women felt women persist perhaps because they *are* different or because they have some special qualities that help them weather the storm. Here are some examples:

You have to be willing to "take the guff" from a prof who's not used to women.

Guys expect you to be really smart in class, and that helps you work harder.

As a woman you are an exception, so you try a little harder.

Female engineering students may be tougher than the norm for women of their ages.

Since female students are so few, they must really want to be here — really motivated.

In relation to why women stay in engineering, one clear sex difference emerged. Women were more likely than men to suggest that women persist because of special support they receive from others, such as faculty, family, or peers. Few men brought this up as a reason why a woman might persist in engineering. The following excerpts from the women's interviews illustrate that point:

If she has support from the Society of Women Engineers to help her not feel isolated.

A woman will make it if she is really sure of herself and has the support of people who are close to her.

One thing that helps is lots of help and encouragement from guys and professors on an individuals basis.

A woman will stay if she feels accepted.

Opinions About Women Leaving Engineering

The most salient and the largest sex differences were found in answers to this question: "In your opinion are there any special reasons why a woman might drop out of engineering?" Thirty-five percent of the men claimed that men's and women's reasons for dropping out do not differ. However, 90 percent of the women pointed to differences between men and women (Table 5, Category 1). The women seemed to be saying clearly that sex does make a difference and that women drop out for different reasons than do men. In fact, isolating just the data on seniors, one finds that all senior women said women have different reasons than men do for dropping out.

When we look only at the responses of those students who felt women drop out for special reasons (Table 5, Categories 2 to 7), we find agreement between men and women about potential causes. The most probable reason, according to almost three-fourths of the sample, fit under the

TABLE 2-RESPONSES TO "WHAT CONTRIBUTES TO YOUR STAYING IN ENGINEERING?"

Category	Women (N=102) N	Women (N=102) %	Men (N=71) N	Men (N=71) %	Percent difference
1. Encouragement and support from others (parents, friends, other students, professors, etc.)	70	68.6	36	50.7	+17.9*
2. Support from the environment-the school (tutoring, counseling, financial aids, quality of teachers, intern program, general supportive atmosphere, etc.)	64	62.7	43	60.6	+2.1
3. Self-percept as as engineer (interests and abilities are similar)	71	69.6	48	67.6	+2.0
4. Occupational outlook	51	50.0	41	57.7	-7.7
5. Competition (prove I can do it)	13	12.7	-	--	+12.7*
6. Rejecting other areas of interest	23	22.5	15	21.1	+1.4
7. Commitment to engineering or to a career	43	42.2	28	39.4	+2.8
8. Extrinsic rewards of engineering (prestige, association with others of similar interests or intelligence, compensation, flexibility and versatility, etc.)	25	24.5	33	46.5	-22.0*
9. Intrinsic rewards of engineering (challenge of the work itself, work satisfaction, autonomy and independence, etc.)	41	40.2	31	43.7	-3.5

*A significant difference. The percent difference must be at least 15 points for significance.

title of "excessive pressure to leave." This category includes examples of active discouragement, social pressure, or academic pressure. The following statements reflect those ideas:

Not being taken seriously as women. (female)

The flak of people saying, "We know how you get your grades." (female)

There's pressure for girls to be better than average. (female)

Male students and profs generally tease and provoke with comments like "Why are you wasting your time?" (male)

Women get many stares and a rough reception, so they have to be really good. (male)

The preceding comments paint a picture of external obstacles to a woman's succeeding in engineering. However, the second-most-frequent response to this question about why a woman might drop out of engineering described another type of barrier, this one internal to the individual woman. The category "perceived deficit of women" included any comment that depicted women as lacking some essential ingredient for success in engineering. Here are some illustrative remarks from both sexes.

Girls haven't fooled around with things [e.g., electrical] as boys have, so girls have an initial handicap (female)

She'll drop if her make-up is such that she can't take discriminating attitudes. (female)

Women may not be as competitive as men. (male)

The technical aspect of engineering is too involved for women. (male)

Thus men and women who felt women have special reasons for dropping out agreed on the two most probable causes. However, 36 percent of the women versus 20 percent of the men (significant) felt women might leave in the absence of support or encouragement. This finding is strengthened too by the fact that within the tiny sample of students who had already withdrawn from engineering, the women all say a woman might leave because of a lack of support.

The final two questions were fascinating, too, because the women quickly forgot about talking about women in general. They often launched into descriptions of their own experiences. The following quotes show the flavor of the women's responses:

Women in engineering tend to be stereotyped as bright and unapproachable, and that tends to force the women out.

It's easier for a woman to drop out, because she's socially expected to do so.

Men students in engineering and other majors react negatively to women in engineering.

Women aren't taken as seriously by faculty and other students.

When I ask a guy to do homework with me, he sees it as a social event.

Guys will easily get together and do homework. They view the girls as non-contributing members of their study groups.

Fellow students can cause you to drop out. Peers are often disbelievers. They can't believe you are really in engineering and they isolate you.

In some labs and classes you are at a real disadvantage, and you feel that you are dumb because you don't know the equipment. And the guys look at you as if "what are you doing here if you don't know that?"

If you are at all unsure of yourself, people could make you feel guilty and weird.

TABLE 3-RESPONSES TO "HAVE YOU EVER CONSIDERED LEAVING ENGINEERING AND WHY?"

Category	Women (N=102) N	Women (N=102) %	Men (N=71) N	Men (N=71) %	Percent difference
1. Never considered leaving	30	29.4	19	26.8	+2.6
2. Academic performance or criticism of the academic program	39	38.2	31	43.7	-5.5
3. Self-percept as being dissimilar to engineers (interests elsewhere, abilities deficient, ambivalence about field, negative impression of occupation)	29	28.4	21	29.6	-1.2
4. Social pressure (from traditional stereotypes that women shouldn't be in engineering, active discouragement from boyfriend, parents, etc.)	14	13.7	1	1.4	+12.3#
5. Absence of support	12	11.8	1	1.4	+10.4#
6. Emotional factors (anxiety, tension)	3	2.9	4	5.6	-2.7
7. Situational obstacles (finances, family responsibilities, living situation, marriage, no time for other interests)	22	21.6	5	7.0	+14.6*
8. Experiential deficit (lack of familiarity with mechanical devices, no shop courses in high school, etc.)	4	3.9	2	2.8	+1.1

#Bordering on significance, particularly since only one male student gave this type of answer.
*A significant difference. This difference must be at least 15 points for significance.

TABLE 4-RESPONSES TO "IN YOUR OPINION ARE THERE ANY REASONS WHY A WOMAN AS OPPOSED TO A MAN MIGHT STAY IN ENGINEERING?"

Category	Women (N=102) N	Women (N=102) %	Men (N=71) N	Men (N=71) %	Percent difference
1. No special differences between men and women	23	22.5	24	33.8	-11.3
2. Differential treatment (special favors, etc.)	11	10.8	3	4.2	+6.6
3. Academic progress (if she's doing well)	3	2.9	2	2.8	+0.1
4. Rewards of being in the minority (special or conspicuous, opportunity to meet men, economic prospects)	42	41.2	28	39.4	+1.8
5. Non-differential treatment (no one is singled out, etc.)	5	4.9	8	11.3	-6.4
6. Support from others	28	27.5	7	9.9	+17.6*
7. Special characteristics of women (handle pressure, personality, pride, motivation, etc.)	28	27.5	24	33.8	-6.3

*Indicate significant difference. A difference of 15 percentage points is significant.

This last question has documented the pressures, barriers, and realities faced by women students in engineering. Although more women are choosing engineering now than a few years ago, the women's experiences as students appear to be qualitatively different from the men's. One wonders how many women have actually left engineering because of such experiences. One also wonders for how many women is undergraduate work more of a struggle than it needs to be.

Back to the basic question "Does sex make a difference?" The answer is both yes and no. Men and women seem to persist in engineering for similar kinds of reasons: 1) they see themselves as similar to engineers in terms of their interests and abilities; 2) they point to the quality and extent of academic and institutional support programs; 3) they appreciate the encouraging occupational outlook; and 4) they find the support and encouragement they receive from others as vital. In discussing their persistence, however, women place more emphasis on support from others and men place more emphasis on the extrinsic rewards of the occupation.

Both sexes agree that the two major factors in their leaving engineering would be poor academic performance or seeing themselves as somehow dissimilar to engineers. However, women are more likely to mention situational obstacles, social pressure, or absence of support as reasons for leaving.

The question about why women in general might persist or drop out of engineering vis-a-vis men yielded some of the most powerful data. Ninety percent of women versus more than half of the men maintain that women's reasons may vary from those of men. Women explicitly and often personally describe social pressures and situations that might operate to make a woman give up. They view support as important to a woman's persistence and even feel that a woman's success may depend on special qualities and characteristics over and above her interest in engineering.

Women also seem to see engineering as difficult and challenging. They were more likely than the men to point to the competition and the challenges they face as important to being in engineering. On the one hand, challenge seems to work as a motivator; on the other hand, when the barriers seem to be too many, challenge is actually a motivator in reverse, leading a woman to drop out of engineering.

TABLE 5-RESPONSES TO "IN YOUR OPINION ARE THERE ANY SPECIAL REASONS WHY A WOMAN WOULD DROP OUT OF ENGINEERING?"

Category	Women (N=102) N	Women (N=102) %	Men (N=71) N	Men (N=71) %	Percent difference
1. There are no special reasons	10	9.8	25	35.2	-25.4
	The remaining percentages are based only on those students who said there are special reasons.				
2. Differential treatment (discrimination)	19	20.7	4	8.7	+12.0
3. Academic progress (poor grades, etc.)	2	2.2	2	4.3	-2.1
4. Perceived deficit of women (experiential, personality or characteristics, "clean hands" syndrome)	41	44.6	17	37.0	+7.6
5. Career-home conflict	22	23.9	9	19.6	+4.3
6. Excessive pressure to leave (social pressure-professors' bad jokes, active discouragement or teasing from men; perceived pressure-social stereotyping of women, feeling alienated or alone; academic pressure-time demands, rigid curriculum)	67	72.8	35	78.3	-5.5
7. Inadequate support from people or academic environment (no role models, no study partners, etc.)	33	35.9	9	19.6	+16.3*

*Indicates a significant difference. A difference of 15 percentage points is significant.

Although no one would want to remove the challenge from engineering, the scientific and technical community has a responsibility to help eliminate non-academic challenges or barriers to a student's persisting in engineering. Some of the obvious barriers for women in this study were lack of support or encouragement, active discouragement, and excessive social or academic pressures. Each individual college of engineering should take a hard look at its academic environment. What extraneous barriers exist that make persisting in engineering too much of a struggle? How can the academic environment be changed so that most of the student's energy can be focused on learning engineering, on self-development, and on other educational goals?

Further research is needed, especially that which investigates the effectiveness of special programs for women students. Exit interviews too might be a means of providing us with badly needed individual data about why students leave.

Eliminating barriers is a tough assignment, particularly when many of the barriers to a woman's persistence involve societal attitudes as well as student and faculty behavior. Given that attitude change does not occur overnight, something is needed in the interim. Support programs, study groups, assertiveness training, contact with role models, student organizations, empathic counseling, career planning courses, a women's lounge or office, special classes, and adding women faculty members all represent ways of helping women students cope with the barriers they experience. Some will resent any help or efforts they perceive as "hand-holding." Others will appreciate seeing their concerns legitimized (there is always the fear that "maybe I'm the only one who feels this way") and the chance to learn how to handle their unique experiences.

Credit classes that have both academic and personal impact are often effective. In a recent *Boston Globe* syndicated column, Ellen Goodman bemoaned the failure of educational institutions to offer courses that help one solve basic life dilemmas. Her suggestions fit here. How about some required classes like Change 211; How to Make It in a Hostile World 312; Coping Strategies 104; or Decisions 500? We have our work cut out for us — to make the engineering college a more effective learning environment.

Graduate Student Council Teaching Awards

Nominees for the Irwin Sizer Award for "the most significant improvement to MIT education," are being sought by the MIT Graduate Student Council.

The Award, which carries a cash gift, was established by the GSC in 1975 as a permanent tribute to Dr. Irwin Sizer, former Dean of the Graduate School and now president of the Health Science Fund and consultant to the Resource Development Office.

Nominations are also being sought for the Graduate Student Council Award for "effective and dedicated teaching of a graduate level course." Through this award, the Council hopes to focus attention on faculty who devote increasing amounts of time and resources to improved teaching.

Letters of nomination for both awards—including references and supporting material—should be submitted to the Graduate Student Council Office, Room 50-110, by April 14th at the latest.

GRADUATE STUDENT OPEN HEARINGS for SEATS ON INSTITUTE COMMITTEES

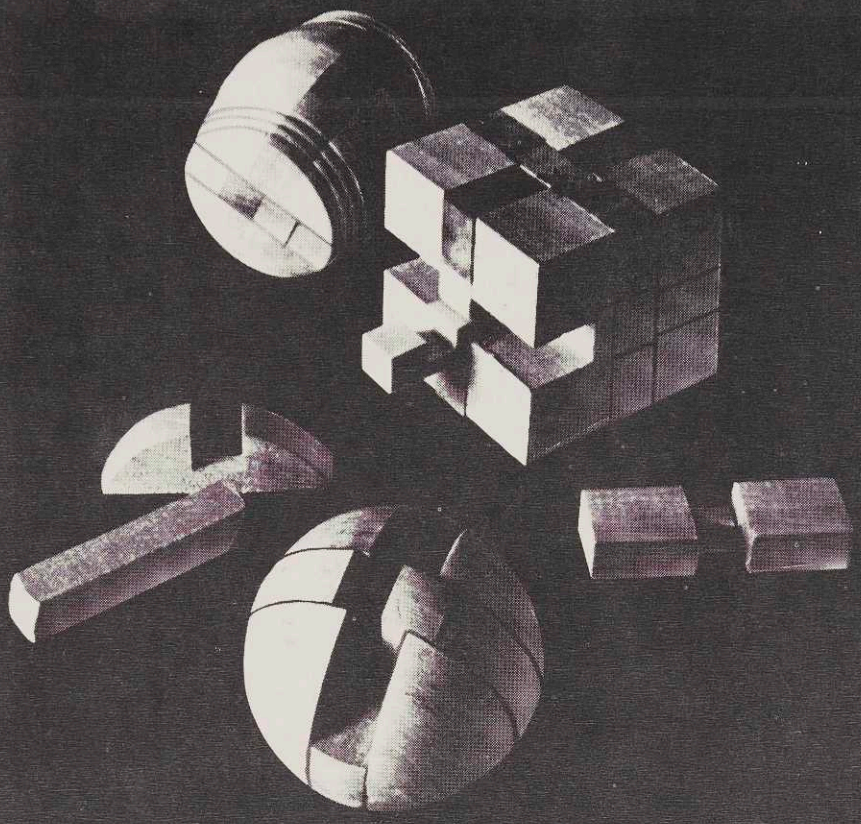
Call the Graduate Student Council office (3-2195) for Information and Appointments

INTERVIEWS ON MARCH 23, 5:30-7:00 THURSDAY

for the following committees:

- AdHoc Committee on Grading
- Equal Opportunities Committee
- Pre Law Advisory Council
- Independent Activities Period Committee
- Advisory Committee on Shareholders Responsibility
- Strengthen Alumni Involvement in the Institute Committee
- Committee on Visual Arts

All hearings will be held in the International Student Lounge on the second floor of the Walker Memorial Building. Rm. 50-210



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