

The MIT Faculty Newsletter

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Whither MIT? Some Thoughts on the Presidential Transition Stephan L. Chorover

It goes almost without saying that the present moment of transition has different meanings to different members of the MIT community. Our ideas about the present, and our hopes and fears regarding the future, condition and constrain our notions of the qualities required by the person who will lead this remarkable place into the twenty-first century.

Those who will choose the next president of MIT presumably already recognize that this diversity is vital. But, in order for them to be able to take it properly into account, it is necessary for all of us who live and work here to let them know our views.

Toward that end, I want to identify an issue that appears to me to be critical for the Institute at this point in its development.

Like many of my colleagues - including some of those whose views appear in this issue of the Faculty Newsletter -- I find that my ideas about the challenges that the next president of MIT will face are strongly influenced by my conception of conditions presently prevailing in the larger contemporary sociocultural context of which MIT is a part.

Let me be more precise. The omnipresent threat of nuclear holocaust aside, the deteriorating physical condition of the planetary biosphere that we inhabit is a fact of overriding importance to humanity as a whole. Although it remains fashionable in some quarters to ignore

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FROM THE FACULTY CHAIR Implementing Faculty Issues Bernard Frieden

One useful way to sort out faculty issues is according to whether or not we can deal with them through the MIT governance structure. The serious split between the faculty and the administration over the closing of Applied Biological Sciences was an issue well suited to the governance system. That system provided several ways for the faculty to register their views, and it engaged a series of faculty committees to deal with the problems faced by ABS professors and students. Once faculty opinion was clear, members of the administration

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worked energetically to repair as much damage as possible. Then the ad hoc faculty committee appointed to review the experience came up with practical and reasonable proposals to guide future departmental reorganizations.

Implementing these proposals depended on a spirit of restraint and compromise on the part of both faculty and administration. The new policy statement on tenure was the result of considerable negotiation back and forth. I believe it will serve not only as a peace treaty, but also as an explicit guide to future action. One conclusion I draw is that when the faculty speaks with a clear voice, we can accomplish many difficult things within the governance structure.

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Engineering and the Information Revolution Richard C. Larson

*Today's schools labor under the legacy of a structure designed for the industrial age misapplied to educate children for the information age.**

The technological world is undergoing fundamental changes relating to information, computation and communication, changes that will have profound effects on engineering research and teaching. Most engineering schools have four to nine separate departments structured along "traditional" lines. At MIT the engineering departments are numbered by birth order: (1) Civil Engineering; (2) Mechanical Engineering; (3) Materials Science and Engineering (formerly Metallurgy); (6) Electrical Engineering and Computer Science

***The new president of MIT
should address the difficult
problem of MIT's institutional
structure....***

(formerly Electrical Engineering); (10) Chemical Engineering; (13) Ocean Engineering (formerly Naval Architecture); (16) Aeronautics and Astronautics (formerly Aeronautical Engineering); and (22) Nuclear Engineering. To a great extent, the birth of each department reflected the "conquering" by scientists of a particular part of nature (e.g., chemistry, electricity) and the desire by engineers to exploit the newly found

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Editorial

Looking Ahead

This issue of the Faculty Newsletter will be the last one for this year. The Editorial Board wishes to thank all of you who assisted and supported this effort through your contributions, financial and editorial, and literary. Looking ahead to the fall, we would like to see some regular columns like the one in the current edition from the Chair of the faculty, more contributions from those of you who have been silent up to now, and a regular monthly schedule.

To continue publication in the fall, we need your help and are soliciting faculty nominations for new Editorial Board Members. These should be people willing to commit time to continue our efforts and institutionalize them next year, to assure that the faculty has a vehicle through which the range of their ideas and opinions can be regularly expressed.

A nominating committee of the Editorial Board has been set up to seek out all faculty members who might be willing to actively serve. Please help us by submitting your own or a colleague's name who you think would be interested in serving on the Board, to the Nominating Committee of the Editorial Board, Room 24-522, or to any current member of the Editorial Board. It is our intention to maintain a representation among disciplines and viewpoints to assure that the entire faculty community can be served. The new Editorial Board will be announced by June 1.

Whither MIT?

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or deny it, valid and reliable evidence from many sources points overwhelmingly to the conclusion that we are living in a moment of extreme human/ecological crisis.

This state of affairs did not arise all at once out of thin air; neither do its multifarious signs and symptoms exist in a vacuum. On the contrary, the nature and scope of the present crisis are systematically and comprehensibly related to historically-established and socioculturally-organized modes of human activity (and inactivity). Furthermore -- and here we come to the presently centrally relevant point -- included among these are patterns of human activity in which contemporary science and technology play a significant part. Readily recognizable examples include, inter alia, presently prevailing patterns of power generation, energy consumption, industrial manufacturing, agricultural production, and economic development, etc.

What is to be done? This is a question that I hope the selection committee will see fit to raise with any and all who are regarded as serious candidates for this important position. As I see it, this much, at least, is clear: in the decades immediately ahead, economically and ecologically sustainable responses must be fashioned to many and varied local and global environmental threats of unprecedented severity. Further to the point: Albert Einstein once remarked that the drift of humanity "toward unparalleled catastrophes" was due to the fact that the unleashing of atomic power had "changed everything save our ways of thinking." And he went on to say that "new ways of thinking" would be required in order for humanity to survive.

New ways of thinking! A daunting notion? No doubt. But this is precisely where those who would lead MIT into the next century can

and must come in. Again. Let me explain.

Once upon a time, when urbanization and industrialization posed formidable and unprecedented problems involving human health and environmental quality, the founders of MIT responded by seeing to it that the Institute became one of the world's leading centers for research and education in a congeries of fields collectively subsumed under the heading of "sanitary science and engineering." (Until the early sixties, MIT had a Department of Civil and Sanitary Engineering.)

Several years ago, the Center for Technology, Policy and Industrial Development and the Whitaker College of Health Sciences, Technology and Management, conjointly sponsored a semester-long, institute-wide faculty seminar on human health, environmental quality and industrial development. Among the dozens of faculty and staff members from all corners of the Institute who were brought together under its auspices, there was a clear recognition that a broad and diverse subset of this community stands ready, willing and able to respond in academically and professionally responsible ways to the aforementioned crisis. Some small steps in this direction are already being made in a number of quarters. But much more remains to be done to bring the great resources of this extraordinary place coherently to bear in this direction. In particular, committed, creative and innovative leadership "from the top" is needed.

Such leadership -- were it to be forthcoming -- would help to put MIT in a powerful position to contribute meaningfully and effectively to the development of the "new ways of thinking" that the present crisis demands. I can think of no more worthy challenge that the next president of MIT will face than to bring us together in this effort and thereby to put the scientific and

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Who Should Be the Next

The Next President of MIT Should Be a Woman

J. A. Fay

There are women at MIT and other universities who are qualified to be the president of MIT. Now is an especially opportune time to select a woman to head the most prestigious scientific and technological university in the world. Within several decades, women will share equally with men in the development of science and engineering. Nothing would signify better a commitment to be the leader in this new era than appointing a woman to head MIT.

MIT has an exceptionally strong faculty, administration and alumni, that is overwhelmingly male. They can be depended upon to secure research grants, balance the budget and ensure a stream of gifts into the future. The old boy network is alive and well, and will continue to keep MIT at the forefront of the competition, even if we had a woman president.

But we all know that women students will eventually constitute half of the student body, both graduate and undergraduate, in any field that is attracting the best talent available. The future of the MIT faculty, students and alumni will depend upon our ability to leap ahead of other universities in securing the best students by convincing them that gender is no obstacle to a career in science or technology. Nothing would be as convincing as a woman president.

MIT has already benefited greatly from its women students. The largest single gift to MIT has come from a woman graduate. In proportion to their numbers, women faculty are as outstanding as their male colleagues. Women students contribute as much as their male counterparts. In future years, the

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Some Advice to the Next President of MIT

David H. Marks*

Make good and substantial use of the "Bully Pulpit"

Teddy Roosevelt referred to the Presidency of the United States as a Bully Pulpit because its high visibility gave the occupant a chance to really influence world policy. Past MIT presidents have used, very effectively, their position to comment and prod on important issues related to the external forces on higher education in science and technology. They have also served their country in key science and technology advisory roles for the government.

Clearly you will want to continue this. However I suggest that the decade of the nineties will be so turbulent that your response will have to be wider, more time consuming and more energetic than any of your predecessors ever had to consider. You will need to be visionary not only for MIT but for the nation. You will need to take some risks and stand up and be counted. You will need to lead the academic community in an agenda not just for dialogue but for change.

Federal policy towards academic research is in an ominous and counterproductive trend. U.S. Industry but not the Japanese are for the most part ignoring us. The number of young people prepared for and excited by careers in science and technology is rapidly decreasing. There are too many national and international problems for which we can not properly define the questions much less provide answers for. In many ways, you must lead the evolution of a new role for educational institutions as the provider of research and the educator of the people to lead a technologic

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Musings on the Presidency of MIT

Robert B. McKersie*

I made the mistake of missing a key meeting of the editorial subcommittee for this issue of the newsletter and I subsequently found out that I had been "recruited" to prepare a piece on the presidency. Clearly, this is a very delicate assignment. I think the best way to sum up my regard for Paul Gray is to say that I joined the faculty of MIT in 1980, the same year he became president, and I have been very happy at MIT and I give him substantial credit for that result.

Let me now turn to the general question of the qualities I would like to see in the next president of MIT. Asking this question of a faculty member is much like asking an adolescent what they want their parents to be like - it is a question they would just as soon not have to answer because a parent is a necessary evil. Perhaps, they would say something to the effect: "Keep a roof over my head and bread on the table".

While I was dean for a decade at Cornell, one faculty member said to me: "Your job is that of the inn keeper, in other words, to keep the linens changed regularly. And please leave the residents alone."

The job of university president is a tall assignment, requiring almost superhuman qualities. As faculty we tend to expect the leaders of our universities to be skilled diplomats, exquisite speakers, effective fund raisers and wise problem solvers. In the same manner that we once placed political leaders on a pedestal and ascribed unrealistic expectations to their performance, so we still do with the presidency of our universities. The inevitable result is one of

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President of MIT?

Our New President Needs to be a National Leader

Robert A. Weinberg*

The presidency of the Institute is a unique and unusual position in this country. To be sure, much of its responsibilities and obligation are very similar to those borne by presidents of several dozen of our country's leading universities. But this particular job looms larger than most of its kind because of MIT's unique prominence as a symbol of science and technology. One can argue whether or not the mystique attached to our name is fully justified, but it is there, undeniably, in the minds of tens of millions. Far more Americans recognize the name MIT than know of the existence of the National Academy of Science or Engineering. This prestige provides opportunities: the president of MIT can act as one of this country's several most visible and credible spokesmen for science and technology.

Our next president needs to seize the opportunities provided by this position to reinvigorate this country's commitment to science and engineering. Such a course might be viewed as a narrow, self-serving attempt at enhancing the status of and support for our profession -- the profession of discovery, of teaching, of creating technology. That motive is the furthest from my mind. I am concerned instead about our country and its future over the next generation. We need desperately to reverse a course that is leading to slow, steady deterioration of our abilities to function effectively in this modern technological world.

These issues are not peripheral to the functioning of our university, and MIT's concern with them should not depend on one or another president's personal tastes

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Fresh Perspectives Required of New President

Karen R. Polenske*

The MIT faculty, students, and staff have an important and exciting opportunity to influence the future direction of the Institute. As we review candidates for the position of President, we should look for a leader who can provide fresh perspectives on some of the critical issues we are confronting. I see a few very important issues that stand out from the others.

First, the new president will have to grapple with the way in which changes in the role of women in society are affecting us in the academic world. As an example, last year when the women faculty held a meeting about child care, many of the people attending were male. Adequate child care is no longer just needed by women who work, but all of us (staff, faculty, and students) would benefit if MIT were to provide better child care facilities.

Second, MIT has traditionally been a male-dominated institute of learning. Currently, more than 10 percent of the faculty and more than 30 percent of the undergraduates are women. The new president can use these changes in gender composition in thinking about the technological, scientific, and social issues we teach and research and how we may be able to change some of our teaching and research agenda to meet the needs of women in society.

Third, MIT has made limited progress in dealing with racial issues within the academic community and Boston area. Much more needs to be done. I have advised many minority students since I began teaching at MIT in 1972. When I talk with those students, I am struck by the nature of the traumas they face within our

supposedly supportive environment.

Fourth, staff, students, and faculty from the working class (and from low-income countries) already have a very difficult time being at MIT. Our staff and faculty are not well paid, and our students are charged exceedingly high tuition. Many of the students do not have full fellowships and must work, but work reduces the amount of time they can spend with their studies and with their families. Also, the cost of living in Boston is one of the highest in the United States. The new president can help to find means to assure that lack of an adequate income does not prevent people from working here or students from studying here and that those who do work and study here do not feel the financial pressures as much as the presently do.

Fifth, the research and teaching community is increasingly interlinked with the rest of the world. New technological and scientific advances may outstrip our ability to deal with the new technologies in our social, economic, and political worlds. As a leader of one of the major technology institutes in the world, the new president will need to meet the challenge of coordinating our scientific and social research and teaching agendas.

In order to deal with these and other critical issues, the new president should be willing to experiment with new ideas and institutional arrangements and have a broad perspective on the historical and future role of MIT.

*In response to a request by
the Faculty Newsletter
Editorial Board, the above (*)
authors have submitted
articles for this special
Presidential Issue.

Jacoby to Assume Faculty Chair

In June, Henry D. (Jake) Jacoby will take over from Bernie Frieden and begin a two-year term as Chair of the Faculty. Jake is an engineer-turned-economist who has been a member of the Management School faculty since 1973. He did undergraduate work in Mechanical Engineering at the University of Texas at Austin and subsequently worked as

Stirred by work experience...he took leave "to spend a year...learning all I needed to know about economics."

an engineer for several years, first in the Civil Engineering Corps of the U. S. Navy and later for an architect-engineering firm.

Stirred by work experience with the financial analysis of electric power projects, he took leave to return to school, "to spend a year, I thought, learning all I needed to know about economics." That move eventually led to a PhD in Economics from Harvard in 1967, and to six years on the Harvard faculty in the Department of Economics and the Kennedy School of Government.

Over the years, most of his research and writing has been concerned with the interaction of technology, economics, and management. His particular interests have been energy and environmental quality, and at various time he has led multi-disciplinary research groups in these areas. At Harvard he was the Director of its Environmental Systems Program, and at MIT has taken various leadership positions in the Energy Laboratory including several years as Director of the Center for Energy Policy Research. His own work spans air and water pollution, national and international markets for

oil, gas and nuclear fuels, and problems of energy policy and planning. Most recently he has focused on new methods of analysis of energy investment projects in an environment of highly volatile output prices.

At Sloan, Jake has taught applied economics in a variety of courses and programs. Since 1984 he has been Chairman of the MIT Program for Senior Executives, which is a nine-week program serving a clientele of managers with about 20 years of work experience.

As background for his duties at Faculty Chair, he has served in various Institute-level activities, including most recently his year as Chair-elect and two years on the Faculty Policy Committee. Jake also was a member of the 1988 Committee on Reorganization and Closing of Academic Units (the ABS Committee).

Implementing Faculty Issues

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Another troublesome issue, however, seems beyond the grasp of any governance system we have yet devised. As I got to know many faculty colleagues for the first time I was struck with the incredible richness of knowledge and experience collected at the Institute, but saddened that the pace of work makes it so hard for us to get to know one another in any but the most superficial ways. The endless demands of work bring us into contact on the fly, and keep us from enjoying collegial associations with people in other parts of the Institute. Work pressures also take a heavy toll out of our family lives, as Peter Elias and the committee he chairs on family life and work are discovering.

For this problem, policy statements are not helpful. Paul Gray recently described the situation this

way to a Wall Street Journal reporter: "I said in my inaugural remarks that the place would be better off if we turned the throttle back a little. I was not talking about making the place Suntan U., but simply turning the throttle back a little. Did I succeed? No. I never even laid a glove on it."

Some people maintain that the workaholic culture of MIT simply comes with the territory: when you take up an appointment here, you have to take the whole thing. Finding a way to reduce our self-inflicted wounds is a worthy challenge for even the best minds at MIT.

The Next President of MIT Should Be A Woman

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inevitably greater proportion of women in the faculty, administration and student body will make MIT a more resilient and open institution.

Science, and especially engineering, have traditionally been male preserves. Access by talented women to these professions can only come through a university education. The appointment of a woman president at MIT would reassure these women that there is ample opportunity to prove themselves at MIT and that they too can be leaders in their field.

I'm tryin' so hard to be what I am, but everybody wants me to be just like them.

R. Zimmerman

Long Range Planning at MIT

Saving for a Rainy Day

Thomas W. Eagar

As a private not-for-profit institution, MIT sits in a precarious position; we rely on the charity of others for our continued existence. The current situation requires massive donations merely to meet yearly expenses. This is not the case at other prestigious private or public universities. Most of the former have established larger endowments over the years, while the latter receive annual public disbursements equivalent to endowments of many billions of dollars. One might ask how MIT came to such an unenviable position?

On the public sector side, MIT has exceedingly poor relationships with the City of Cambridge and the Commonwealth of Massachusetts, especially considering what MIT has contributed to this city and state. What would be the median income or employment in this region if it were not for MIT, Harvard and a handful of other universities in the Boston area? One could easily compare Cambridge to a few of the surrounding cities to the east or south; or Eastern Massachusetts to other regions of the United States with relatively few natural resources, in order to find the answer. Why has Boston become a hub of high technology, high paying, white collar industry? The answer to this question is complex, but surely, the presence of MIT is an important factor.

A few years ago, a large public news service ran an article on "MIT; the Engine that Drives the Massachusetts Economy." It is not difficult to make the case for this. MIT spinoff companies employ hundreds of thousands of Massachusetts citizens, in positions that are the envy of nearly every other region of this country and the world. Hundreds of millions of dollars in taxes are paid by these companies to the cities and the state. Yet what is

our reward? Cambridge politicians use MIT as a scapegoat; blaming their city's problems on our existence. What problems would Cambridge have if MIT did not exist?

The Commonwealth on the other hand, prefers to ignore our existence. While other states pump hundreds of millions of dollars of public funds into public universities, technology parks or subsidized research centers in hopes of creating what MIT does for Massachusetts, the politicians here devote considerable effort to ensuring that MIT does not benefit in any way from public funds. Research centers are situated as far away from MIT as possible, while "open" public research grants are

MIT...does not know how to manage its resources, and...never has known how to manage money.

purposely written with conditions which will exclude MIT and others like us. If the public attitude in Massachusetts towards MIT continues, while other states and cities use public funds to subsidize high technology research and education, Massachusetts may learn one day that it "killed the goose which laid the golden egg."

On the private sector side of MIT's resources, MIT's benefactors have been generous over the years. Most universities would be delighted to receive as many gifts as we do. I believe the problem lies within MIT itself. MIT as an institution does not know how to manage its resources, and from the sketchy financial history of which I am aware, the Institute never has known how to manage money.

For the past several years the Institute budget has ranged somewhere between \$800 M and \$1 B, certainly

an impressive figure. Our rate of savings over the past decade (and I suspect over the past century or more) has been considerably less than one percent of our income. I do not know of any individual or any company that can exist for long with such meager savings. If you walk on the edge in the good times you might have a serious fall when things get difficult. The only way in which we have survived has been through generous donations from our friends. George Eastman gave millions of dollars to MIT at the beginning of this century (a tremendous sum at that time) to save MIT from bankruptcy. Others continue to give to us, but whatever they give, it seems that we spend it as fast as we receive it. We have not learned to save for the bad times.

Some may argue that we have saved; MIT's endowment exceeds \$1 B; but I contend that this is enforced savings; and as our leaders tell us, it is an insufficient amount. The vast majority of our endowment is held in restricted funds. Our donors are often wiser than we are. By restricting their gift, they force us to save. Nonetheless, MIT does receive considerable sums of unrestricted funds which we could choose to save but which we do not. Generally, these amount to several millions of dollars per year.

One might argue that several millions of dollars per year from a \$1 B budget is an inadequate savings rate, but in fact MIT's "discretionary" budget is only on the order of one-third of the total budget. Two thirds of the budget constitutes contract research which must be spent when it is received. The savings must be found in the area of education and non-research operations; admittedly areas which already are severely resource-limited. Still, one can

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Our New President Needs to be a National Leader

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about involvement in the public arena. MIT's successes drive our country's technology and at the same time depend critically on outside support sustained through technology's successes. For better or worse, we and our future president can not concern

We have begun to run out of the well-trained, highly motivated young people needed to keep our ship sailing effectively....

ourselves exclusively with the issues raging within our own small cloister.

The deterioration is found at many levels. It begins at the level of primary and secondary education and is readily sensed by those of us teaching increasingly ill-prepared freshmen. It shows itself in the rapidly eroding interest of bright young people in going into professions like teaching, science and engineering. It is seen in the dramatic drop in numbers of Americans going on to advanced degrees in engineering. We have begun to run out of the well-trained, highly motivated young people needed to keep our ship sailing effectively for the next several decades. I fear that this trend will accelerate in the coming years and will not be adequately addressed by the constant influx of foreign-born talent onto our shores.

These trends are not MIT's doing. We have not created them, but fault has little to do with a responsibility for initiating a remedy. We all know that the blame lies in many quarters. At one level it comes from an increasing anti-scientism in the general public, a consequence in turn of technology's failures to deal effectively with increasing global

environmental deterioration, reliable nuclear power generation and the threat of nuclear holocaust. It comes from an economy that rewards recent business and law school graduates with much more than veteran teachers, engineers and scientists. And it comes, equally importantly, from an elected administration that over the last eight years overtly fostered anti-intellectualism and a thinly veiled contempt for many goals beyond those concerned with making lots of money.

The new MIT president cannot cure all these ills, but can lead a national vanguard that effects a shift in our present course. He, or she, needs to be among those who help reestablish sound national priorities, who help establish the centrality of education, the glory of learning, the importance of competence. In the absence of these, all future changes in the Institute will be for naught. The future of our ivory tower depends critically on the vitality of the world around us and our future incumbent will have a unique opportunity to carry a light and lead us away from the increasing darkness.

Whither MIT?

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technological resources of this institution at the services of humanity as a whole. I am not being melodramatic.

There is already altogether too much talk around here these days about narrowly partisan economic "competitiveness" (a/k/a "the Japanese challenge") and not enough serious discussion of alternative prospects for locally and globally sustainable modes of industrial and agricultural development. Is it not evident that the true, long-term advantage that makes a difference will accrue to those nations and communities of nations that succeed most completely and

effectively in applying their scientific, technological, and managerial resources to the task of devising and implementing more ecologically sustainable modes of power generation, energy consumption, industrial manufacturing, agricultural production, and economic development? And should not MIT be in the forefront of the effort to make such developments a reality?

If so, then the next president of MIT should have a vision of what science and technology might most meaningfully have to contribute to a resolution of the present crisis. At very least, that vision should be accompanied by a commitment to the serious exploration -- at all levels of study: undergraduate, graduate and postgraduate -- of the increasingly problematical ethical and environmental entailments of presently-prevailing scientific and technological beliefs, values and practices. In short, s/he must have not only the ability, but also the courage to promote changes in Institutional priorities and directions toward these ends.

"To prophesy is extremely difficult," says an old proverb, "especially with respect to the future." But clairvoyance is hardly required to see that the present moment presents the next president of MIT with a truly historic opportunity to foster the advancement of science and technology along lines that might eventually lead to a reconciliation -- both locally and globally -- between traditionally antagonistic economic and ecological imperatives. From such visionary leadership, might also be expected to follow not only a whole host of conceptually and materially unique and far reaching contributions to human health and the quality of human life, but also a more sustainable image of the proper place of science and technology in the presently endangered planetary biosphere of which humanity is a part.

Some Advice to the Next President of MIT

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renaissance for the country and the world.

MIT must do more than produce the world's best science and technology. It must help provide the disinterested forum and focus for the translation of our research into sound policy.

Unless MIT can build a policy component well integrated with its science and technology, it will have to depend on others to translate or mistranslate its work to the world. We must take a step farther. We have to learn how to do this ourselves both in terms of influencing specific technologic policy and in understanding how to do so in a generic way. The Commission on Productivity, The Leaders for Manufacturing Program and the Knight Fellows Program are examples of going a step further. MIT should strengthen its activities, faculty, students, resources, reward system and organizational structure in an outreach beyond our campus to the world.

MIT must rekindle the interest of its faculty in undergraduate education and undergraduate student interactions

What are we here for anyway? We for the most part have let this get away from us since the distrustful times of the seventies and with the increase in research pace. Just reexamining our curriculum is not enough. The faculty must be out among the students, learning of their concerns, mentoring and providing role models. This is not happening now and there seems little role model nor career rewards for doing so. Examples from the top are needed to turn this around.

Any good vegetarian will tell you that you are what you eat. MIT is who it hires and who it admits

The sleeping giant that is MIT is just waking up to the fact that admissions policy has changed (or for that matter may not have - you will need to determine this). We need a

We need a healthy debate about what sort of students we want to admit...and a strategy for how to attract them.

healthy debate about what sort of students we want to admit, the matching of an educational program to that set of students and a strategy for how to attract them. It also seems that the MIT administration has quietly and tacitly made many decisions about items such as minority admissions, financial aid, and even the subsidizing of NSF fellowships that have implications on the educational process and the budget here. Hopefully a larger discussion will reinforce these decisions but none the less the assumptions being made do need to be more openly aired.

From a faculty point of view, I see it harder and harder to attract and retain good faculty at both the junior and senior level. Part of the problem is that fewer people are electing these careers. But another part is the housing situation in Boston, the resultant long commutes, the low salaries compared to industry, the over reliance on leverage in our research program, and the difficulty of an MIT career in the context of a two professional marriage. Lets keep up our good start in helping to deal with these issues.

Finally question old traditions and realize that new ones are easy to start

My 20 year love-frustration

relationship with the Institute (I hold no MIT degrees so I have less of the Mental Marine spirit of the place) tells me that we ought to question some of the myths we seem to be governed by. This is a very flexible place, the most flexible I've ever seen. Don't be afraid to challenge us to rethink every aspect of what we do, even those that appear to be unwritten laws made in 1861. We want to be as predominant in Research and Education centered around Science and Technology in the 21st Century as we have been in the 20th and we will meet you more than half way in figuring out how to do that and then accomplishing it. Good Luck.

The fraction of the year in which first- and second-year undergraduate courses are given is too small to meet the needs of many students. Four years of preparation for professional accreditation in an Engineering speciality - along with acquisition of culture and intensification of social responsibility - are too few for many students. The MIT President who can lead us to give up IAP for underclassmen so as to enlarge classroom time per year, and to require five years for professional accreditation, will have to exhibit the abilities of a U.S. President who can get the Armed Services to give up advanced weapons for basic training of troops.

**David Frisch
Prof. Physics, Emeritus**

Letters

To the Faculty Newsletter:

This is to respond to Professor Zahn's article on frustrations with the MIT "bureaucracy" which appeared in the December 1988 edition of the MIT Faculty Newsletter.

Telecommunications

We have discussed Prof. Zahn's comment with Mr. Morton Berlan, Director of Telecommunications Systems. The message center is staffed by one to two persons at any given time and processed in December 1988 576 telex messages and 6610 pages of fax messages. The center does try to identify and give special handling to "urgent" messages. Mr. Berlan cited a December urgent request from a parent for a student to call home as an example. Obviously each person's description of urgent will differ; however, it is clear that special handling of messages tends to increase the staff required in the message center.

Changing Overhead (Indirect Cost) and Employee Benefit Rates

We acknowledge the examples cited in Professor Zahn's article as accurate and we regret the volatility reflected in the movement of indirect cost rates between the fiscal years 87, 88 and 89 when the rates were 61.0, 56.5, and 63.0 respectively. We do, however, refer you to Mr. James J. Culliton's announcements dated February 6 and July 28, 1987 of the 1988 rate reduction to 56.5 (from 61.0) and his caution that this was a temporary reduction to an "artificially" low rate to allow a payback to sponsors of overcollection of prior year indirect cost. Mr. Culliton's letter to all principal investigators emphasized that a return to a more normal rate (the "true" rate undepressed by the payback reduction) would occur in the follow on year of 1989. The increase in 1989 to 63.0 was a reflection of the removal of the

payback reduction and a projected research volume growth of zero. The zero volume growth projection was based on actual volume growth in 1988 of less than 3% coupled with the uncertainty created by the Gram-Rudman-Hollings deficit-reduction act.

This increase in Employee Benefit rates, which was announced in Mr. Culliton's memorandum of January 15, 1988 was primarily the result of inflationary pressure on the cost of Health Insurance plans and the additional numbers of RAs and TAs being added during fiscal year 1989. At the same time the Research On Campus Salary and Wage Base is increasing at a rate of only 2 - 3 percent thus resulting in a rate increase.

Capital Equipment/ Fabricated Equipment

The comments on Capital Equipment and fabricated equipment relate to the comparative difficulty of administering the federally mandated modified total direct cost base (MTDC), for determining and collecting indirect cost. A salary and wage base for the distribution of indirect cost to projects is the method preferred by most because it is directly related to effort expended on a particular project and is generally considered a more fair and accurate measure of indirect cost consumption. As noted, however, the federal government requires that the MTDC base be used. The modified total direct cost base is simply a mechanism for collecting indirect costs on a highly averaged basis. As a result the application of the indirect cost rate to individual transactions that make up the base often appears excessive. This method of applying burden is not intended, nor does it in fact, reflect the actual indirect cost associated with an individual transaction such as the processing of a travel voucher.

In an attempt to recognize and to some extent modify inequities which may occur when non-salary items of

considerable cost are fully burdened with indirect cost, OMB allows institutions to exclude certain items, such as equipment, from the MTDC base. Base excludable equipment expenditures are segregated from base includable material expenditures by the following OMB definition. "Equipment is an article of tangible personal property having a useful life of more than two years and an acquisition cost of \$500 or more a unit". Once finite dollar parameters are introduced, be it \$500 or \$5,000, they generate borderline decisions which require the application of the sound judgement expressed in Professor Zahn's article.

I am sure the faculty appreciate that exclusions from the MTDC base do not cause the associated indirect cost to disappear but to merely redirect the same indirect cost to a smaller MTDC base thereby driving up the indirect cost rate for those projects and costs remaining in the base.

With respect to the process of administering fabricated equipment accounts as described in Professor Zahn's article we are certainly open to suggestions which will facilitate the process but retain the controls necessary to validate the propriety of the exclusion.

Final Reports

It is true that final report costs, if not initially identified, often require special handling. The key here, in the current system, is to clearly identify the charges as final report charges when they are initially incurred and processed. Once again, we welcome any suggestions which will improve the current processing system for these charges.

Philip J. Keohan
Comptroller

**Professor Zahn
 Responds - Page 11**

**Professor Zahn Responds
To Comptroller Keohan**
(Continued From Page 10)

Mr. Keohan's response to my concerns about MIT procedures that hinder my efficiency is essentially that the government dictates procedures which MIT must follow. I appreciate the constraints that he must work under and only hope that when he hears of better ways of doing things that he communicates his ideas to the appropriate office so that the policies might be made more efficient. I don't like the "gamesmanship" that I must employ to maximize my research funds or the time I spend as untrained bookkeeper and accountant.

It would appear to me that the Institute should strive for optimum productivity as a whole rather than by one office at the expense of others. For example: Mr. Keohan's response to my complaint regarding telecommunications was that they are overburdened with an average of 576 telexes per month. However, if

...the Institute should strive for optimum productivity as a whole rather than by one office at the expense of others.

uniformly spaced this reduces to about 3-4 telexes per hour. Telexes to me are always under a page in length. The time spent by telecommunications staff in phoning me to inform me of a telex arrival would not increase significantly were they also to read a one-page message. Using faculty time for routine administrative functions is costly and wasteful. Their time is better spent teaching, working with students, doing research and obtaining funding for continued research.

This attitude is also symptomatic of other MIT offices and partially contributes to MIT's troubled financial structure. To maintain the viability of all MIT services, MIT

money should be spent on services available within MIT. Such services may include machine shops, copying, illustrations, video productions, laboratory analysis, etc. Many times a MIT service costs more and is less convenient than the same service purchased outside MIT. Purchasing service outside MIT removes MIT money and lessens the productivity of the inside-MIT service. Each service center within MIT should strive to improve its productivity without decreasing quality or convenience that charges can be lowered.

In the same vein, the MIT Coop should also make it easier for purchases to be charged to an MIT account number without need for a purchase order. The Coop's prices should also be reduced to match prices easily obtained elsewhere. Forget the rebate at the end of the year and lower prices across the board. If the Coop won't do this get a new MIT "bookstore." There are countless ways that improved procedures could lessen the daily hassle to the MIT community and thereby make all of us more productive and happier.

Markus Zahn

Long Range Planning at MIT
(Continued From Page 7)

imagine saving one percent of this budget. Hard decisions would have to be made; some whole programs might have to be eliminated; but our leadership is being paid to make decisions. Anyone can make the easy decisions; a real leader makes the hard decisions.

One could ask the question whether MIT would cease to exist if our unrestricted donations were to suddenly shrink to zero? The answer is, "of course not." Hard decisions would be necessary and they would be made. We would restructure in a way that would make us stronger in the

future. I would ask the administration - why not make these hard decisions now? Pretend that we do not receive gifts to help us balance our budget. What decisions would be made? Let us make them now.

MIT's unrestricted annual donations over the past decade amount to something on the order of three million dollars per year or about one percent of our "discretionary" budget. If we had saved and invested these funds for the past decade, we would be much stronger both now and in the future. For example, saving one percent for the past decade would mean that we would have a much smaller deficit this year and for every year to come. We would not be walking constantly on the edge. If we were to invest this one percent savings from one decade in "endowing endowment", the proceeds of this fund would spin off one endowed full professorship every year. If MIT had saved one percent of its educational expenses every year for the past century, fully one-half of the faculty would have endowed chairs today and we would endow another 10 faculty every year! In a few years we wouldn't have any faculty left to endow and we would be able to endow the building custodians and others!

Why do Harvard or Princeton or Stanford have larger endowments than MIT? In part because their leaders have saved for the future. All of MIT's current financial problems cannot be laid at the feet of our current administration; it is the neglect of a century of MIT administrations which have not been willing to make a "one percent" decision. Certainly it is harder in the short term to make these decisions; but the future of the Institute depends on it. Let us not complain about the past; rather let us resolve to correct our error in the future. The time to save is now; not in the future when it will be "easier." It is never easier. It requires self-discipline, but it can be done.

M.I.T. NUMBERS

COMPARISON OF TERMS TO DEGREE

<u>Department</u>	<u>MS/Ph.D.</u>	<u>'75 to '77</u>	<u>MS/Ph.D.</u>	<u>'84 to '86</u>	<u>Change</u>
	<u>Number</u>	<u>Number of</u>	<u>Number</u>	<u>Number of</u>	
	<u>Degrees</u>	<u>Reg. Terms</u>	<u>Degrees</u>	<u>Reg. Terms</u>	
Aero/Astro	29	11.1	25	11.6	+0.5
Applied Biological Science	9		10		
Architecture	1	---	2		
Biology	4		0		
Brain & Cognitive	2		0		
Chemical Engineering	22	11.1	28	10.9	-0.2
Chemistry	3		4		
Civil Engineering	30	8.5	35	10.3	+1.8
Earth/Atmospheric	20		7		
Economics	7		1		
Electrical Engineering	91	11.1	129	13.0	+1.9
Linguistics/Philosophy	0		0		
Management	11		10		
Materials Science	22	9.4	35	10.7	+1.3
Mathematics	5		2		
Mechanical Engineering	56	10.0	42	12.0	+2.0
Nuclear Engineering	33	10.1	38	10.2	-0.1
Ocean Engineering	9	10.1	10	10.4	+0.3
Physics	19		8		
Political Science	3		13		
Urban Studies	4		4		
TOTALS/MEANS	381	10.3	413	11.8	+1.5

[Information provided by the Dean of the Graduate School]

WHAT DO THESE NUMBERS MEAN?

M.I.T. NUMBERS

COMPARISON OF TERMS TO DEGREE

<u>Department</u>	<u>Ph.D. Only</u> <u>Number</u> <u>Degrees</u>	<u>'75 to '77</u> <u>Number of</u> <u>Reg. Terms</u>	<u>Ph.D. Only</u> <u>Number</u> <u>Degrees</u>	<u>'84 to '86</u> <u>Number of</u> <u>Reg. Terms</u>	<u>Change</u>
Aero/Astro	16	8.2	9	8.3	+0.1
Applied Biological Science	39	8.6	43	10.5	+1.9
Architecture	0	---	7	13.6	---
Biology	49	10.0	70	12.0	+2.0
Brain & Cognitive	17	8.3	16	10.4	+2.1
Chemical Engineering	13	10.2	44	11.1	+0.9
Chemistry	106	8.2	105	9.3	+1.1
Civil Engineering	19	8.7	22	9.1	+0.4
Earth/Atmospheric	54	10.0	58	10.7	+0.7
Economics	61	7.6	71	9.0	+1.4
Electrical Engineering	25	9.0	19	9.3	+0.3
Linguistics/Philosophy	11	7.9	32	9.2	+1.3
Management	27	8.1	38	10.1	+2.0
Materials Science	40	8.7	60	9.3	+0.6
Mathematics	64	7.6	65	9.3	+1.7
Mechanical Engineering	11	7.5	24	8.7	+1.2
Nuclear Engineering	27	9.4	35	9.2	-0.2
Ocean Engineering	10	7.8	15	9.1	+1.3
Physics	103	9.9	129	11.5	+1.6
Political Science	39	6.2	30	12.6	+6.4
Urban Studies	16	8.2	26	13.0	+4.8
TOTALS/MEANS	763	8.6	920	10.3	+1.7

[Information provided by the Dean of the Graduate School]

SHOULD WE BE WORRIED?

Engineering and the Information Revolution

(Continued From Page 1)

physical laws or properties of materials in order to design and build things. The birthing process of the various departments spans the years from approximately 1860 to 1930, with Nuclear Engineering added later. This interval coincided with the final decades of the U.S. industrial revolution, a period that brought about automobiles, radios, new bridge design and building techniques, aircraft and exotic useful chemical products.

Today we are in the midst of another revolution, one perhaps even more dramatic and fundamental than the industrial revolution. That revolution is rooted in the new science and technologies of information acquisition, processing and communication. The proliferation of computers of all sizes and capabilities, the establishment of global telecommunication networks, and the growth of data acquisition technologies have all led to an information revolution that touches nearly every aspect of our lives. Today mechanical engineers designing automobiles use CAD (computer-aided design) technologies and wire their new creations with computer controlled "nervous systems." Aeronautical engineers are finding that airline profitability depends more and more on carefully designed computerized seat reservations systems. Electrical engineers and computer scientists are worrying less about component electronics and more about linked network design of subsystems, many etched in silicon and capable of performing the tasks of thousands (occasionally millions) of separate components available twenty-five years ago.

The smooth and cost effective operation of complex integrated systems - be they logistics systems, chemical processing plants, computer networks, airline networks, electric

power grids or automobile assembly plants - is an increasingly important concern for engineers. In this new revolution, most emerging topics of importance cut across traditional engineering departmental boundary lines. Engineers from different departments must now be exposed at some level to computer science and engineering, information acquisition technologies, telecommunications technologies, modern materials and - to design integrated systems in operational contexts - operations research.

The institutional form of most engineering schools, arranged by department according to scientists' conquests of various parts of nature, is

**Engineers from different
departments must now
be exposed...to
computer science.**

an anachronism. It is an historical artifact of the latter part of the industrial revolution. It positioned us well for teaching and research in that era, but it imposes impediments to engineering research and teaching in the era of the information revolution. The traditional departmental lines should be replaced with a new structure that positions us well for the remainder of the 20th and the beginning of the 21st century, the period of the information revolution.

Information, from the perspective of the new engineer, is the raw asset upon which design and operational decisions are made. More timely, accurate and detailed information can provide more accurate models and statistical inferences upon which to design and operate complex technology-based systems. A traditional parochial engineering

department is not likely to provide students with the integrated framework and methodologies related to information acquisition, processing and decision-related inference, nor are its faculty likely to address such concerns in their research.

The new president of MIT should address the difficult problem of MIT's institutional structure and the manner in which it impedes (or supports) education and research in this new era. Universities, due to the tenure process and centuries of tradition, have one of the largest institutional "time constants" known, posing immense resistance to change. But the old institutional form is woefully inadequate. Today's and tomorrow's engineers should be educated in systems, computers, materials, telecommunications, data acquisition technologies and operations research. These subjects, together with traditional freshman subjects, could comprise the core engineering program for all engineers, with juniors and seniors perhaps taking electives in various contextual ("traditional") areas.

Because manufacturing efficiencies are tied ever more closely with engineering design and because effectiveness of large scale technological systems is dependent on technology literate managers, perhaps MIT's School of Management should be drawn into any effort to restructure the School of Engineering. The enormity of the task of institutional reform is matched by its importance. If MIT does not take a leadership role, some other university undoubtedly will.

[*Everybody Counts, A Report to the Nation on the Future of Mathematics Education, Mathematical Sciences Education Board, Committee on the Mathematical Sciences in the Year 2000, National Research Council, National Academy Press, Washington, D.C., 1989, page 11.]

Musings on the Presidency of MIT

(Continued From Page 4)

disappointment that ordinary mortals can not perform like gods.

As I think about the qualities of the presidents that I have know at three different universities, they evidence very different styles and profiles. I have been surprised how many of them have been either hard scientists or lawyers. This no doubt reflects the orientation of hard scientists and lawyers to get the facts, get projects accomplished and to adopt a very pragmatic orientation to life in general. All of the individuals have been distinguished scholars, which comes back to the important point about the faculty only feeling comfortable with leaders who are imbued with the values of scholarship. This leads to a type of "catch 22"

This leads to a type of "catch 22" situation wherein the faculty become suspicious of anyone who would want to be considered for the job....

situation wherein the faculty become suspicious of anyone who would want to be considered for the job of full time administration: "So and so must have lost his/her mind to want to take on the presidency of this institution".

An interesting question is whether the new president should "come from the ranks", as has been the pattern for the past several decades at MIT. Many presidents at other institutions have come from the outside. I think this is explained by the advantage of bringing in someone with a fresh perspective. However, MIT has fared very well with inside

talent and a strong president at the University of Chicago was Ed Levi who started in nursery school at that institution (a laboratory for the School of Education) and rose through the ranks to become president for over a decade. Certainly, if an insider can gain acceptability, then the risk of a big mismatch is lessened substantially. [Sometimes the devil who is not known (the outsider) looks like the paragon that everyone wants, only to materialize into a disaster and then the board of trustees scrambles to undo its mistake.]

Perhaps, the single most important attribute of a college president is the ability to select a top team. The demands on the president from faculty who feel the leader should be accessible because he is "one of us", from the student - customers who are always close at hand, from alumni who want to be charmed and from community leaders who always have an urgent agenda are intense and unrelenting. To cope with this wide array of constituencies takes a very skilled group of key administrators. So the ultimate test of an effective president is the capacity to assemble a high quality, talented group of associates.

With the right person selected the next challenge is to ensure that the incumbent is able to sustain enthusiasm - which reminds me of the quip the Clark Kerr, former president of the University of California made about how he entered upon and departed from his career in academic administration: "Fired with enthusiasm." The then Governor Ronald Reagan was one of the dramatis personae in that episode.

Because of the high expectations and also because of the incredible array of responsibilities and constituencies the job of running a place like MIT can lead to burn out

very quickly. Paul Gray says that "ten years feels about the right length of time". It is amazing that he did not come to this decision sooner - he has continued beyond the natural academic cycle of seven years out of determination and commitment to important goals associated with the MIT campaign.

I have long thought that the governing bodies of universities fail to

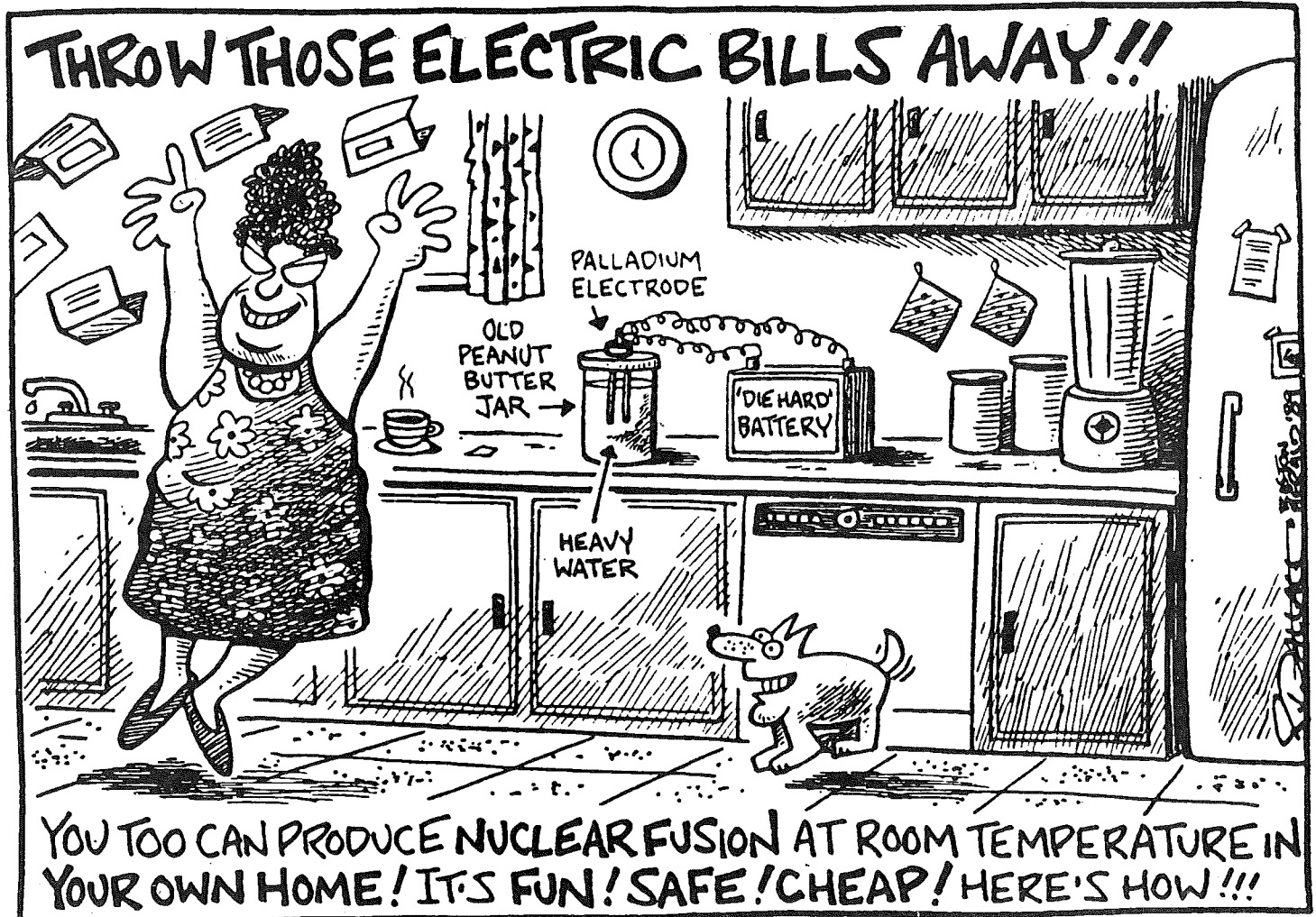
...everyone would be better served if a present could be off campus for significant period of time...to continue research....

help the leaders of their institutions find ways to refresh themselves and recharge their batteries. I do not know the specific circumstances of our own president's situation, but I am certain in the case of other presidents that if the board of trustees had developed a plan, indeed insisted upon a plan, for the president to take a break of at least one semester every 3 or 4 years, then the tenure of presidents would be much longer. Karl Compton, who served as president during the critical years of WWII, lasted years 18. It is a big undertaking to find a new president and I would argue that everyone would be better served if a president could be off campus for a significant period of time at reasonable intervals to continue research - some type of mind-focusing project in order to gain the perspective that only comes from a change of scenery. A sabbatical system for presidents would also give other leaders in the university a chance to "fill in" and exhibit their qualities and learn the ropes.

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