

RESEARCH MANAGEMENT REVIEW

The Journal of the
National Council of University Research Administrators

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Volume 9, Number 2

Winter 1997

Editor's Preface

This issue of the Research Management Review was a real pleasure to edit. I hope the reader finds it a pleasure to read!

We begin with Ardis Savory's wonderful Introductory Remarks made on behalf of Dennis Barnes, recipient of the 1996 Outstanding Achievement in Research Administration Award. Ardis' comments reflect the feelings that all who know Dennis have for him. Dennis' Acceptance Remarks follow. We are treated to a wistful and humorous look back at NCURA as he knew it when he was President. Readers will see a very different organization than the one we have now. He also offers us a brief glimpse at how positively he views our organization and the state of research endeavors today. Dennis' upbeat message is evidence of why he is so widely respected and admired.

A second pair of articles focuses on the issue of scientific misconduct. Bob Lowman offers an insightful view of how important it is for faculty and students to be educated in scientific ethics. He provides an analysis of some of the causes of misconduct and reviews some of the difficulties in solving the problem. He also looks at positive steps that can be taken by institutions to provide a long-term preventative solution.

The second article on scientific misconduct is written by Mark Frankel. He gives the reader an excellent view of the current state of the debate over developing a unified government policy on misconduct. His experience with the issue makes this public policy perspective important reading for all of us.

The third set of articles, authored by Caspa Harris, Frances Degen Horowitz, and Donald Langenberg, offer reflections on the state of research and research administration both presently and in the future. Harris discusses the Price of Higher Education. He states that universities are forced to increase prices because, in part, burdensome government regulations have increased their costs and have limited reimbursement. This results in increases in tuition and fees which, because of further inevitable consequences in other aspects of the lives of universities, will have negative impact on research.

Horowitz and Langenberg look to the future of research and how universities are likely to evolve to meet the demands placed upon them. They approach the topic from very different angles, and I urge the reader to take a few minutes to give these articles a careful reading. Horowitz

Research Management Review

and Langenberg speak to issues that will have a significant impact on our lives in the not to distant future.

Stephen Erickson
Editor

Outstanding Achievement in Research Administration

Introductory Remarks of Ardis Savory

It is with great pleasure and a personal honor and thrill for me to join Kim Moreland' in presenting NCURA's Award for Outstanding Achievement in Research Administration to Dennis Barnes. We are particularly pleased that his wife Nina and daughter Suzanne are here.

Most of you know Dennis, or have heard of him, and my first inclination was to skip over his many achievements and get right to the "essence of Dennis." However, Dennis is so unassuming even those who know him best often forget just how outstanding he is and how much he has accomplished. He is truly unique among the 3,000 members of NCURA. Without a doubt, he has managed research administration from more venues than any other individual in our organization. For 23 years, Dennis served the University of Virginia with distinction. During his 10 years as Associate Provost for Research, he established the University's patent foundation and later, as Associate Vice President, formed its Office for Federal and Governmental Relations. He also developed the Law School's course on Environmental Law. Amazingly, during this time he served three successive governors of Virginia in an official capacity.

Twice he was on leave from the University to serve the federal government, once in 1976 as a member of President Ford's Domestic Council in the position of Assistant Director for Science, Energy, and Space, and again for two years beginning in 1981, as the majority staff director for the Science Subcommittee on Commerce, Science, and Transportation. Since 1992, he has been President of SURA, a consortium of 41 universities from the southeastern United States. Under his strong and capable leadership, the 600 million dollar Continuous Electron Beam Accelerator Facility (CEBAF), serving a user group of more than 1,000 scientists from around the world, was brought on-line, on time, and on budget: a feat seldom accomplished in today's world.

Dennis has had not only a spectacular professional career, he has also been a determining force in the growth and vitality of several professional societies. Certainly that is true for NCUPA. In the early days of

NCURA's history, there was no National Office, and Dennis was in that small cadre of research administrators who gathered around Julia Jacobsen's dining room table to shape the future of this organization. Then, in 1978, he became Chair of NCURA Region III. Dennis, even today, nearly 20 years later, we take great pride in that. In 1980, he became the national President of NCURA. We were not the only association to benefit from Dennis' leadership, expertise, and supportive counsel. Twice he served on the Board of the Council on Governmental Relations (COGR), including three years on the COGR Executive Committee and two years as Chair of the Federal Management Development Committee. Only a handful of individuals has been asked to serve twice on the COGR Board. In 1985, he chaired the National Conference on the Advancement of Research.

His wisdom has been sought by others, many of them in federal agencies which sponsor our research. He served as a consultant to the National Science Foundation during 1989-1996, to NASA in 1988, and to the Inspector General's Office of the Environmental Protection Agency in 1986. In 1991, he was a key participant in the preparation of a position paper on OMB Circular A-2 1 which was submitted to the U.S. Congress by the Association of American Universities. He has contributed significantly to the advancement of research administration and to the understanding of federal policy for science and technology through his numerous presentations and publications. Between 1981 and 1993, he presented more than 25 sessions to the prestigious Brookings Institution on these issues, and his 1987 paper, "The Research Facilities Needs of Universities: A Critique of the NSF Report" resulted in the NSF annual review of university research facilities. In 1980, he was elected a fellow of the American Association for the Advancement of Science.

Dennis, the marvel is you make it look so easy!

Now to the "essence of Dennis." This past week, I have gathered impressions of Dennis from several who have worked with him, and in response to my request to describe him in a few words, here is what I heard:

Julie Jacobsen described Dennis as sophisticated and down home, a Virginian through and through who, no matter how long he worked in Washington, would never move inside the beltway. She is still amazed at how Dennis knows so much about so many things. To her, he is the closest there is to a renaissance man. However, she also remembers him sitting on the floor in her apartment in 1978 stuffing 800 envelopes for an NCURA membership drive. Probably, that is why Dennis started the National Office in 1979 and hired Natalie Kirkman as the Director.

Natalie remembers Dennis a little differently and describes him as a “nervous Nellie” who called about three days before the 1979 Annual Meeting he was chairing with a suggestion it be canceled! Fred Suderman, who followed Dennis as President of NCURA, declares Dennis is the nicest guy anyone could ever know. No matter how long it has been since you last talked to Dennis, you can always pick right up where you left off. Fred says it is the even, calm tone and seeming sense of fun that Dennis has about everything he does that has kept him from becoming wealthy. If only he had made it look harder, his bosses might have paid him more!

In the late 1970s, Pat Hawk was Dennis’ administrative assistant and remembers him as intensely dedicated to whatever he was doing, and definitely on a mission. In those days, one of his missions was physical fitness. Every day he ran a designated number of laps in the gym at the University, even on the day the gym caught fire, and Dennis refused to leave until he had completed every lap, smoke inhalation and all!

Ray Hunt, retired University of Virginia Vice President for Finance, can remember the days when Dennis was the whole show at the university in the area of sponsored programs. According to Ray, UVa was rather “rinky-dink” by today’s standards for a research university, but through Dennis’ considerable activity at the state and national level, he brought enhanced visibility and credibility to the university. Just as he did for NCURA!

I would like to close with quotes from two letters of nomination for this award.

Milton Goldberg, President of COGR, says of Dennis Barnes, “The quality I like best about Dennis is his ability to ask those fundamental questions that are the most difficult to answer. Many times, those discussions have opened up quite unexpected aspects of a problem. This has not only been valuable but also always pleasant, due to the elegant wit and humor which are characteristic of Dennis’ style. Perhaps Julie Norris, the 1994 recipient of this award, best summed up Dennis’ contributions: “He has a terrifically broad background and experience from which we, in the profession of research administration, have benefited greatly. He has been invariably kind, helpful, stressless, sharing, and funny! The humor Dennis shows about what is going on around him is not only endearing, it helps put things in the proper perspective.”

So, this is the essence of Dennis:

- 1 a renaissance man;
- 1 a nervous Nellie;
- 1 a nice guy full of fun;

- intensely dedicated and on a mission;
- a man of wit and style;
- helpful, kind, and sharing;
- a fundamental thinker with broad experience and expertise.

And finally, a mover and a man of vision who has raised the “rinky-dink” to success. For this, and for much more, we thank you and honor you.

REFERENCE

1 President of NCURA.

Outstanding Achievement in Research Administration Recipient Address. 1996

Dennis Barnes

Kim Moreland' explained to me that Steve Hansen' has dropped the big Sunday evening event this year, so that my remarks are the end of the program. Her implicit message to me was "don't add to their disappointment." I also realize that I could name a dozen others who are more deserving of this recognition than I am. Fortunately I wasn't asked.

An announcement of an award like this gets you to reflecting on important events in NCURA's history of which you were a part. Among the pivotal events in my recollections of NCURA's history:

The decision in 1978 to fund and organize a Washington office. At that time the records of the organization were kept in the Washington home of Julia Jacobsen, who was the Executive Secretary and was a sponsored program consultant to Sweet Briar College. The President was Marge Hoppin of the University of Iowa; she was the first woman to serve in that office. While our membership was growing our treasury was not, so we found ourselves outgrowing Julia's dining room and uncertain of our ability to afford office space and staff. Marge summed up the situation in a report which was included in the NCURA newsletter.

"What does one do with a sleeping giant (meaning NCURA). Our size, nearly 1100, should also give us cause for concern. Do we need to look at the membership to see if we have encouraged too many to join? On the other hand there are those who would like us to expand so that we have special sections for hospital administrators and small institutions.

NCURA is not an economic success. This year there are sufficient funds to have a very small office in Washington for an Executive Secretary whose only function is to keep the management of organizational affairs in proper form."

Needless to say, the decision that Marge and the Executive Committee took was right. More important than the office itself was our

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hiring Natalie Kirkman in 1979. Kathy Larmett came on board in 1981 and they have since been joined by Tara Bishop and Barbara Amster. We have been able to provide the staff support and member services that made NCURA far more attractive than we anticipated with a staff that I think is the equal of that of any association in this town.

During my term as president in 1980, NCURA installed its first computer, aptly classified as a “dumb” terminal. I was still a Luddite, continuing to marvel at the IBM correcting typewriter, which struck me as the zenith of office technology. So the hard work was done by Marenda Weiss of the University of Wisconsin and John Thompson, our exquisitely prudent Treasurer from the University of Pittsburgh.

The formalization of professional development. In 1974 Julia Jacobson asked a few of us if we would participate in a new session called New Administrators Workshop. I understood that there might be an audience of as many as 50, who were expected to be people who were just beginning their careers in research administration and who wanted reassurance as much as instruction.

The morning of the session, at a planning breakfast, Julia informed us that they had moved the event to a larger room, because there would be more than three times the number originally expected. This revelation was itself unsettling and the feeling was accentuated when I entered the room and saw too many familiar faces of people whom I had always assumed to be more knowledgeable than I. I am not proud of the caliber of my presentation that day, but I did come to appreciate how broad and deep was the interest in professional development.

In 1978, I participated in the first two day workshop on Fundamentals of Grant and Contract Administration, which NCURA conducted jointly around the country with NACUBO. These too started off fairly informally and evolved into the elaborate offerings today, with carefully assembled, up to date materials, much of which is on topics that didn't exist then or of which we were blissfully unaware.

A number of people in this audience were involved in those early professional development offerings. Eric Rude of the University of Wisconsin, for one, and I worked on both the New Administrators and the Fundamentals workshops. Probably the best comparison I can make between those early efforts and what you have today is to draw a comparison from National Public Radio. If what you see now is comparable in erudition to “All Things Considered,” we were “Car Talk,” with Click and Clack, the Tappet Brothers. It wasn't that we lacked content, just polish and style.

The rise of the regions. The accounts of regional meetings suggest a high level of professional content in addition to a dollop of social activ-

ity among all of them. The disparity was much greater in 1980, when I visited a number of the regional events as president. In my home Region III, the hardest meeting decision was “what beach will we go to this year?” The second most important decision was whom to make Keeper of the Beverages, who was responsible not only for maintaining an ample supply but also to circumvent any corkage charges by the hotel.

Region IV approached its event with more determined seriousness, complete with training sessions and guest speakers who could actually expect a full audience. The tone recalled H.L. Mencken’s definition of “Puritanism,” as the “haunting fear that someone, somewhere may be happy.”

If Region III inclined to the decadent and Region IV to the dutiful, then Region II represented the world of real politick, where the weak and the hesitant got short shrift. Even then Al Sinisgalli of Princeton University showed the political acumen and social restraint of the Alfonse D’Amato of research administration, and Tony Merritt of the University of Pennsylvania as the Jimmy Hoffa. Always there questioning and dispensing thoughtful opinion like chicken soup was Nancy Greenberg of NYU.

I could characterize the other regions too, but you get the picture. There seems to be a much closer standard of professionalism among our regions now and much of the credit goes to the very people whom I have tweaked.

Perhaps the most lamentable change that I have witnessed was the demise of the Washington Reception. There was a tradition, when the organization was much smaller and maybe this town was more genteel, of holding a reception during the annual meeting at an elegant location. I recall the Kennedy Center, the National Portrait Gallery, and The National Geographic Society, as examples. The last should have given me a clue about what would become a fatal problem. It was at the National Geographic Society that our hosts offered Oysters Rockefeller among the hor d’oeuvres. My recollection is of a formally dressed waiter crossing the room with a tray of the delicacies above his head and slowly disappearing in a sea of grasping hands, not unlike a cow wandering into a school of piranhas.

The end came in 1979, when we were the guests of the Museum of History and Technology. Our host made the mistake of delaying opening the buffet while he said a few words about the Museum and his pleasure in hosting us. Well before he concluded his remarks the herd had begun stirring and the stampede to the food was well in progress by the time he beat a hasty retreat. That took place on my watch as Vice President and Program Chair. My successor, Fred Sudermann of Wichita

State University, put a merciful, if regrettable end to the tradition.

Nevertheless, this last week has given me a glimpse of why we are so fortunate to be in the profession we are at this time:

On Monday, there was a review of the overall program of the Thomas Jefferson National Accelerator Facility, which SURA manages for the U.S. Department of Energy. A retired Corporate Vice President for Research at IBM, a former President of SUNY Stony Brook, the head of DOE's Pacific Northwest Lab, among others, conducted the review and awarded very high marks for the quality of the science, organizational effectiveness, and interactions with the private sector.

On Tuesday, SURA hosted a meeting of member schools with ideas for "gigapops", a central element of the Internet II, or the successor to the Internet, or connections to the NSF's vBNS; all of these terms are related but are also distinctive concepts for achieving a new, higher order of networking connectivity for research and education. There is a lot of enthusiasm among our institutions for working toward this goal collectively, even while entertaining distinctive ideas of what this entails or how it will be used.

On Wednesday I attended a site review in Houston for the proposal of the National Center for Supercomputing Applications under the NSF's Program for Advanced Computational Infrastructure. SURA is a Regional Partner of the NCSA in this recompetition of the NSF's four national supercomputing centers. Our role includes building the user community in the Southeast for the NCSA facilities, by capitalizing on our experience in building SURANet, the first of the regional networks under the NSFNET, the forerunner of the Internet.

This was not a typical week for me or for SURA, and there are many other institutions and organizations that are pursuing equally compelling agendas. But these events made me feel good about the future of research in this country and about being a part of the nation's research enterprise at perhaps the most creative period in human history. We are all privileged to be getting an early glimpse of the future and to have a hand in its realization. Not a bad role for any of us or for this organization.

So let me thank you once again for this recognition, and we can all look forward to continuing the NCURA tradition of successful annual meetings.

REFERENCES

- 1 President of NCURA.
- 2 Vice President of NCURA.



Educating for Ethical Conduct

Robert P. Lowman

Abstract. Programs that teach scientific ethics in order to transmit the values of science from one generation of scientists to another are difficult to design and produce. Faculty members already see themselves as well versed in the culture of science and well equipped to recognize and deal with scientific misconduct. It may be more effective to reach faculty members through their students and to place emphasis on ethics training for the scientists of tomorrow. The principle of academic freedom leads to a sometimes exaggerated respect for the autonomy of a colleague and can result in unresponsiveness in situations in which action is desirable. Ethics education should stress maintaining vigilance for scientific misconduct, even though misconduct occurs with low frequency. Finally, while some behaviors may be nearly universally condemned as inappropriate, genuine disagreements exist in defining what is ethical. Ethics education must prepare scientists to accept and deal with ethical ambiguity in the area of ethics, as they frequently must do when dealing with the substance of their science. Ethics education should stress the importance of consultation and consensus, adherence to accepted standards of evidence, and commitment to due process employing procedures established in advance.

EDUCATING FOR ETHICAL CONDUCT

Imagine that all faculty members at your college or university are in a large auditorium together. The president of your institution is chairing the meeting, and the topic is research integrity. In the course of the president's opening remarks, she decides to take a little survey of the assembled faculty. First, she asks, "How many of you believe that research or scholarship or other forms of creative endeavor are an important part of the role of the faculty member?" Almost everyone in the auditorium raises his or her hand.

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Next, the president asks, “HOW many of you believe that integrity in research or scholarship is an important issue?” Again, almost all the faculty members raise their hands.

The president asks, “How many of you know personally of an instance in which you believe a faculty member behaved in an unethical or inappropriate manner?” Not a hand is raised, so the president continues. “Please raise your hand if you are willing to cut ethical corners in your research. Raise your hand if you are willing to copy someone else’s work, so long as you believe you can get away with it. Raise your hand if you have ever made up data before, or thrown out or ignored data because they violated your own preconceived ideas. Raise your hand if you unfairly exploit graduate students or post-docs or give them less publication credit that they deserve so that you will look more important.”

Of course, no hands would be raised in response to the president’s requests, except for the occasional offbeat faculty member who would do so as a joke, or to point out the ridiculousness of the situation. And that, in a nutshell, is the difficulty we face as research administrators when we address the issue of education our faculties for ethical conduct. Our faculty members all believe they are honest, ethical people. The overwhelming majority are in fact - just as they believe - moral, ethical people conducting research the best way they can, and committed to increasing our base of knowledge and providing high quality education and training to students.

Even those very few who are demonstrably guilty of scientific misconduct still generally hold the opinion that they are moral, ethical people. If a faculty member found guilty of misconduct admits anything, it will probably be an admission that he or she made a mistake, or an admission that people of good faith may differ in their definitions of what is or is not appropriate behavior. Very seldom do we read in *Science* or the *Chronicle of Higher Education* that a faculty member has admitted to a serious breach of ethical conduct. Even the guilty rationalize their behavior well, at least to their own satisfaction.

This has important implications for anyone designing a program of education on the subject of appropriate scientific behavior. No matter how eloquently you approach the subject with your faculty, no matter how appealing the materials you design or present, you are likely to find yourself speaking to people who believe they already know everything they need to know about research ethics, and most of them are probably right. That makes ethics education a hard sell to faculty members, and it brings us the first of four points this article will address.

Reach Faculty Through Their Students

It's pretty easy to reach a consensus among faculty members that research ethics is an important topic to teach students who may embark on research careers of their own someday. At most research universities, post-doctoral fellows would also be placed in the category of individuals who need such training. It may be that the education of students is the easiest way to reach faculty members with information about appropriate conduct of research. Among other things, some of today's students will become faculty members of tomorrow. But, the education of students has to be carefully designed, unless we are satisfied to allow ethics education to happen by accident through observation at the laboratory bench.

There are two basic approaches to the teaching of research ethics. One approach argues for the inclusion of appropriate content on research ethics in every substantive class, making the teaching of ethically proper behavior an integrated part of learning about the discipline of study. If done well, this is a reasonable approach that would be expected to produce ethically well trained scientists for the future. It has the advantage of involving the entire faculty in ethics education, with each faculty member relating ethical conduct to his or her teaching specialty. It has the advantage of presenting research ethics in context for students, so that ethical decision-making is seen as an integral part of doing science.

There are, however, significant disadvantages as well. Unless the entire faculty in a department coordinates its curricular offerings, students may be exposed to much of the same material in class after class, and some critical topics in research ethics may never be presented at all or may be presented in elective classes taken by only a small percentage of students in a field. Also, unless course content is monitored to a degree seldom practiced in American higher education, some faculty may only pay lip service to the inclusion of ethical content in classes, or may ignore the issue altogether, seeing ethics education as just another intrusion taking away valuable class time from what they believe are more important topics. Finally, the integration of ethics instruction into all classes in a discipline results in students completing their degrees without any indication on their transcripts that any education in research ethics took place at all. As a significant contemporary example, this approach gives faculty members nothing tangible to show NIH training grant reviewers who are expecting every grant proposal to demonstrate how ethics education is carried out.

The second approach to teaching research ethics advocates offering a separate class or identifiable units within several classes specifically on

the topic. This has the advantage of ensuring appropriate coverage of the most important content, of requiring students to focus on research ethics for an extended period of time, and of offering something tangible on transcripts and in research and training proposals showing departmental commitment to the teaching of ethics. It makes ethics education relatively immune from professors who are not enthusiastic about teaching the subject in their individual courses, but it also makes the majority of faculty members immune from teaching research ethics at all. Because many schools are opting for this second approach, and units and courses on research ethics are proliferating, the fact that most faculty members never have to teach research ethics would seem to undermine the strategy of reaching faculty members through their students; but, there is hope.

Some schools are choosing to offer courses or units on research ethics that are taught by large numbers of faculty members, each giving just a single or a few lectures on relevant topics. This can dramatically increase the number of faculty members involved directly in ethics education as teachers. A second approach, specially designed for graduate students, is to require active involvement by research mentors in the ethics class or unit, even if they are not teaching the class themselves. Possibilities include developing an ethics topic for analysis under the direction of the research mentor or having students interview their mentors on some topic related to the responsible conduct of research. Yet another way to insure the involvement of faculty in issues of research ethics is for schools to present major speakers on the responsible conduct of research which both faculty and students are expected to attend. If such events are held regularly, perhaps every semester, over time they will attract and involve a high percentage of active research faculty.

Academic Freedom and the Unresponsive Bystander

One of the most widely publicized murders of the past thirty years was the Kitty Genovese killing in New York City. Kitty Genovese was brutally attacked and stabbed to death on a public sidewalk within plain view of more than three dozen witnesses. At one point, her assailant was frightened off when pedestrians appeared on the sidewalk. When the pedestrians left, the assailant returned to finish the job. None of the witnesses tried to protect the victim; no-one intervened in any way. Not until Kitty Genovese lay dead on the sidewalk did anyone do so much as call the police.

The murder spawned a multitude of scientific research studies, and it permanently added a phrase to the discipline of psychology: the unre-

sponsive bystander. Bibb Latane and John Darley, two psychologists who studied this phenomenon carefully², found that in deciding how we will act in a given situation, we are influenced by those around us. The more bystanders there are, the less personal responsibility we feel to take action. We diffuse responsibility among all the bystanders. Applying this logic to the Kitty Genovese case, there were lots of witnesses, so no-one felt very personally responsible for action. As a result, no-one did anything to help.

There are other factors that influence us as bystanders, two especially relevant to research ethics. First is the cost of taking action, including such things as personal embarrassment, not being sure what to do, believing others must be better qualified to act, realizing that action will take a lot of time and trouble, or fearing disapproval from others if you act inappropriately. Not surprisingly, the higher the personal cost, the less likely people are to intervene. The second factor is the example of others. Several studies suggest that seeing one person help increases the helpfulness of others by providing a model and by calling attention to the need for assistance.⁴ The bottom line is clear. If there are a lot of bystanders, the potential costs of getting involved are high, and no-one steps forward in a leadership position, you may see a lot of decent people wringing their hands while something terrible takes place before their eyes.

Of course, our faculty members seldom attempt to murder each other (except in print!). But, the same principles apply when a case of suspected research misconduct occurs, with one important additional factor thrown in for good measure: academic freedom. Academic freedom is supposed to protect the expression of controversial ideas in the search for truth. It is a value dearly held by virtually all faculty members and a concept of inestimable value to a free society. But, over the years, academic freedom has sometimes become an excuse for avoiding any responsibility when it comes to policing the activities of peers. Far beyond the protection of controversial ideas, faculty members may put up with the most bizarre, unprofessional, and even deviant behavior on the part of their colleagues in the guise of respecting academic freedom. In this environment, stepping forward and accusing a colleague of unethical behavior carries with it a high risk of being censured yourself.

Concerns over academic freedom thus can increase the costs of becoming involved in a potential case of scientific misconduct. Perhaps, in part, because the costs of intervention are so high, universities lack respected role models for whistle-blowing. Finally, the large number of faculty members and graduate students on campus tends to diffuse responsibility. Put these factors together, and the unresponsive bystander is likely to be alive and well at colleges or universities.

There may not be a perfect solution to the problem, but one answer may lie in the existing formal process of peer review. Faculty members are used to evaluating and being evaluated through peer review when they submit grant proposals for funding or books and articles for publication. They also undergo rigorous review at the time of promotion and receipt of tenure and often in annual cycles for consideration for merit salary increases. Peer review works precisely because it is not “bystander” behavior, but a recognized institutional process with formal rules of procedure agreed upon in advance by the scientific community. Criticizing a peer as part of a formal process does not carry the same risk as does criticizing a colleague gratuitously as a “bystander.” It may be that in ethics education we should strive for full integration into the peer review process at all levels, stressing in our educational programs that consideration of the ethics of research is just as important as consideration of the scientific merit of a project. We have federal misconduct regulations today because scientists were perceived as unwilling or unable to deal with unethical behavior when it occurred. Safeguarding academic freedom requires that peer review at all levels regularly address ethical issues.

Maintaining Vigilance for Low Frequency Behaviors

You may remember as a child anticipating on Thanksgiving Day the arrival of your grandparents or some other beloved relatives. If you were like many children, you may have run out to the end of your driveway or into your building’s parking lot soon after breakfast to wait for them, not having any conception that it would be hours before they arrived. Of course, inevitably the child’s attention begins to wander, and he or she moves on to other pursuits. As likely as not, when the grandparents do arrive, the child is busy playing elsewhere and is completely surprised by their appearance.

This is not to suggest by analogy that faculty members have short attention spans when it comes to monitoring scientific misconduct. It is only to suggest that detecting the occurrence of any event that occurs infrequently and unpredictably is a difficult matter, for two simple reasons. First, because no-one is expecting misconduct to occur on any given day, no-one is especially watching for it. Second, because misconduct is not an everyday occurrence, observers may not recognize the symptoms of its presence when it does occur.

There are settings in our society where low frequency occurrences are so important that it is worth the time and expense to monitor for them and to train people to recognize and respond to them immediately when

they occur. A malfunctioning nuclear power plant would be a good example. But even in a nuclear power plant, where there is unanimous agreement that no malfunction can be tolerated and where operators are on duty twenty-four hours every day, vigilance is a major problem. Experts have found the only way to be sure that unusual events are noticed immediately is to establish rigid performance tolerances and have lights flash and alarms ring automatically whenever those tolerances are exceeded.⁵

No lights flash and no alarms ring when a scientist falsifies data or plagiarizes the work of another scientist. No-one is on duty twenty-four hours every day to watch for such events. Ethics education and the integrity of the overwhelming majority of scientists are the only tools we have with which to work. Our educational programs have to make people aware of the symptoms of possible misconduct in ways that will set off alarm bells in their minds when those symptoms are encountered. Some danger signs are obvious, such as missing laboratory books. Others are more subtle, such as an inability to replicate results, or data that are much “cleaner” than expected. Ethics education has to encourage everyone in the laboratory to be open to the possibility of misconduct whenever suspicious symptoms are uncovered, without attempting to create a climate of mistrust or an environment in which people jump to conclusions before all the facts are known.

Our legal system is based on the principle that a person is innocent until proven guilty. In our society, we subscribe to the philosophy that it is better for a guilty person to go free than for an innocent person to be punished unjustly, and for that reason, we have established careful procedures of due process to protect the rights of the accused. If we apply the same ideals to cases of alleged scientific misconduct, there are immediate implications for our ethics education. Not only must we educate our faculty and our students to recognize the patterns of behavior that suggest misconduct, we must also educate them to understand and respect the procedures of due process that have been established to ensure protection of the rights of the accused. As scientific misconduct is a low frequency event, so too are the procedures used to investigate allegations of misconduct and determine innocence or guilt.

Ethical Behaviors Would Be Easier To Teach If We Agreed of What They Are

Ethical principles of research, in their broadest form, are relatively easy to describe. For example, “develop your own research ideas and use

the ideas of others only with their permission” would probably draw widespread agreement as an important principle of ethical behavior in science. Generally accepted principles, however, are much more difficult to define and apply to individual, specific cases. What does it mean to “develop your own research idea?” How do you factor in the influence of other scientists or students with whom you have spoken about a scientific problem? How much input can another person have on your project before the project is really no longer yours alone?

There are no absolute standards of behavior that answer these questions. The point at which a colleague has contributed enough intellectual content to have earned co-investigator or co-author status is a matter of professional judgment upon which there is less than perfect agreement.^{6,7} Scientists of good will and outstanding ethical character may not agree where the line should be drawn, and these differences in professional judgment may be further clouded by variations in practice across disciplines or professional settings. For example, a behavior appropriate in the classroom may be inappropriate in the lab, and a behavior appropriate in a lab may be inappropriate in the clinic.

To the extent there is less than perfect consensus about what constitutes ethical behavior in scientific research, the probability increases that unethical behavior will go unrecognized, unreported, and uncorrected. Ambiguity encourages inaction, especially where the price of incorrect action (e.g., falsely accusing a colleague of scientific misconduct) is high, and the price of inaction (minding your own business) is low.

Programs to teach scientific ethics have to deal head-on with the inherent ambiguity of the subject matter. They cannot, however, artificially force consensus where none exists. They have to strike a balance between legitimate disagreement about ethical behavior and understandable and enforceable standards. Ethics education must prepare scientists to accept and deal with ambiguity in the area of ethics, as they frequently must do when dealing with the substance of their science. Ethics education should stress the importance of consultation and consensus, adherence to accepted standards of evidence, and commitment to due process employing procedures agreed upon in advance.

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A Public Policy Perspective on Research Integrity and Misconduct

Mark S. Frankel

One might reasonably ask why and how matters related to research integrity and misconduct in science have found a place on the policy agenda of the federal government. The answer is based on a mixture of perception and reality. The reality is that science consumes a sizable portion of the discretionary part of the federal budget, and the public's general concern about waste, fraud, and abuse involving government funds has spilled over into the science arena as well. Furthermore, research practices that damage the integrity of science are unacceptable not only because of their immediate, detrimental effects on on-going scientific investigations, but also because they betray the personal trust of colleagues as well as the more general public trust; they waste scarce resources; and, when they impinge on health-related or political matters, they can lead to inappropriate, and possible harmful, treatment or policy decisions.¹ And published reports of scientists who have been found to have fabricated data, falsified results, and stolen the ideas or words of others have heightened public anxiety about the ability and willingness of scientists and their institutions to guard against such misbehavior.

Experience and social science research have demonstrated that the content and features of public policy are just as readily influenced by people's perception as by the reality of the situation.² This is not to deny that "facts" are unimportant, but rather that the ambiguity of situations, "the uncertain and diverse possible implications of news," is what "creates the fears, hopes, and search for authoritative cues that public policy often satisfies." Faith in the legitimacy and norms of science will be undermined if contradicted by situations that people perceive as threatening. The seemingly constant barrage of publicly reported incidents of scientific misconduct³ led to a series of Congressional hearings and reports in the 1980s and 1990s⁴ that catapulted scientific misconduct into the arena of public policy. Research has moved from the relative isolation of the laboratory into the highly charged arena of public opinion. While few would contend that scientific misconduct was widespread, the visibility accorded several such incidents in the popular press during the last

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two decades contributed to a perception outside the scientific community that government intervention was needed. That resulted in greater demands for accountability on the part of the scientific community as well as an expanded presence in these matters by the federal government.

FEDERAL GOVERNMENT INTERVENTION

The federal response was anchored by Congressional passage of the Health Research Extension Act of 1985. It required the Secretary of the Department of Health and Human Services (DHHS) to issue a regulation requiring institutions seeking research funds from the Department to establish procedures for reviewing and responding to allegations of misconduct in scientific research that it sponsored. The law also required DHHS to create a process for receiving and responding to reports of misconduct from those institutions. In August 1989, the Public Health Service (PHS) issued a regulation defining an institution's responsibilities for handling allegations of scientific misconduct.⁵ Two years earlier, the National Science Foundation had promulgated its initial regulation on misconduct in science and engineering research which was subsequently amended in 1991.⁷ Both the PHS and NSF established investigative offices to oversee the implementation of their respective regulations.

Complementing these efforts to respond to incidents of scientific misconduct was action taken by the National Institutes of Health (NIH), the major funder of biomedical research in the United States, to require that beginning in July 1990 applicants for institutional training grants demonstrate that they provide instruction "in the principles of scientific integrity [as] an integral part of the proposed research training effort."⁸ NIH did not attempt to dictate specific curriculum requirements, but it did encourage applicants to develop instructional programs that included discussion of authorship practices, data management, policies for handling misconduct allegations, human and animal research, and conflict of interest.⁹ Applications without an acceptable plan of instruction are not funded. At least one federal official has characterized this training requirement as "the single most important federal policy to influence the development of formal instructional programs at extramural institutions."¹⁰ and a special federal Commission has recently recommended that this requirement be expanded to encompass "all individuals supported by PHS research funds."

The most recent policy initiative came in 1993 when Congress passed the NIH Revitalization Act of 1993, which created the Commission on Research Integrity to advise the Secretary of DHHS on ways to improve the Department's response to scientific misconduct in research. Among

the issues to be addressed by the Commission was the definition of research misconduct.

NEGOTIATING THE BOUNDARIES OF RESEARCH MISCONDUCT

Undoubtedly, the most spirited debates triggered by the government's involvement in matters relating to scientific misconduct and research integrity have been those focusing on the definition of misconduct in scientific research. How a problem is defined has implications for determining the nature of the response, how it will be implemented, and what parties will be involved in making those decisions. The debate over what constitutes misconduct in scientific research has raised all of those issues.

The current PHS and NSF definitions of misconduct in science both include language that refers to "serious deviation" from commonly accepted practices in sciences for proposing, conducting, or reporting research (see box below) and have generated considerable controversy. Some scientists and regulators believe the language is too much of a moving target, subject to a wide range of conflicting interpretations, and that it might discourage creative approaches that challenge current scientific practices. Others, however, embrace the clause as offering the necessary flexibility to police unethical conduct beyond specific acts of fabrication, falsification, and plagiarism.

Definitions of Scientific Misconduct

U.S. Public Health Service

"Misconduct" or "Misconduct in Science" means fabrication, falsification, plagiarism, or other practices that seriously deviate from those that are commonly accepted within the scientific community for proposing, conducting, or reporting research. It does not include honest error or honest differences in interpretations or judgments of data.

National Science Foundation

"Misconduct" means

- (1) fabrication, falsification, plagiarism, or other serious deviation from accepted practices in proposing, carrying out, or reporting results from activities funded by NSF; or
- (2) retaliation of any kind against a person who reported or provided information about suspected or alleged misconduct and who has not acted in bad faith.

The Commission on Research Integrity met over the course of eighteen months, concluding its deliberations and submitting its final report in November 1995.¹² Its very first recommendation is that a new federal definition of research misconduct must be adopted. The Commission's proposed definition (see box below) has come under fire from some quarters of the scientific community. The concerns expressed are both conceptual and practical. One commentator¹³ contends that the definition "does not adequately take into consideration ambiguity inherent in normal practice of science ... It is precisely this ambiguity that has made defining and dealing with misconduct so troublesome within the scientific community." He argues that the Commission's expansive definition is "inappropriate" and that "we need to begin with a narrow definition of misconduct based on conceptually unambiguous examples such as reporting experiments never carried out or reporting as one's own the published work of another." Of course, there is ambiguity in any professional endeavor, and one of the hallmarks of being a professional is the responsible exercise of discretion in the face of such ambiguity. Over time, a profession can be expected to develop standards of conduct intended to help its members anticipate and respond effectively to morally ambiguous situations. Whether it is appropriate in the current circumstances to begin from that premise, as reflected in the Commission's recommendation, or to proceed more cautiously remains a focus of current debates over the definition.

Commission on Research Integrity, 1995
Research Misconduct

Research misconduct is significant misbehavior that improperly appropriates the intellectual property or contributions of others, that intentionally impedes the progress of research, or that risks corrupting the scientific record or compromising the integrity of scientific practices. Such behaviors are unethical and unacceptable in proposing, conducting, or reporting research, or in reviewing the proposals or research reports of others.

Examples of research misconduct include but are not limited to the following:

Misappropriation: An investigator or reviewer shall not intentionally or recklessly

(a) plagiarize, which shall be understood to mean the presentation of the documented words or ideas of another as his or her own, without attribution appropriate for the medium of presentation; or

(b) make use of any information in breach of any duty of confidentiality associated with the review of any manuscript or grant application.

Interference: An investigator or reviewer shall not intentionally and without authorization take or sequester or materially damage any research-related property of another, including without limitation the apparatus, reagents, biological materials, writings, data, hardware, software, or any other substance or device used or produced in the conduct of research.

Resrepresentation: An investigator or reviewer shall not with intent to deceive, or in reckless disregard for the truth,

(a) state or present a material or significant falsehood; or

(b) omit a fact so that what is stated or presented as a whole states or presents a material or significant falsehood.

Free scientific inquiry naturally includes proposing hypotheses that may ultimately prove to be false, offering interpretations of data that conflict with other interpretations, and making scientific observations and analyses that may prove to be in error. The Commission's recommendations pose no threat to such inquiry, which is essential to the advancement of science.

The Council of the National Academy of Sciences has also weighed in with its objections. In a March 15, 1996 letter to DHHS, the Council describes the Commission's recommended definition as "incredibly broad, vague, and intended to grow over time under a 'case law' approach that is totally alien to scientists and scientific process." It refers to the language used in the illustrative examples cited by the Commission to assist in interpreting the basic definition as "arcane and legalistic" that "could cripple US science with a source of endless litigation and dispute forcing "scientists to practice overly cautious defensive science in the same way that excessive litigation has forced physicians to practice defensive medicine." Additionally, the Council worries that a "greatly expanded definition of misconduct" will "mean an expanded role" for a "greater federal bureaucracy, and an increased intrusion by federal committees on scientific misconduct." The Council urges DHHS to adopt a narrowly constructed definition that includes fabrication, falsification, and plagiarism.

On the other hand, proponents of the definition favor it because it goes beyond the narrow constraints suggested by the Academy's Council. A journal editor has characterized the Commission's definition as "the benchmark by which to judge the definition of misconduct in the future" and intends for it to be the "standard of judging the scientific conduct of authors" who submit papers to his journal. For some, outright fabrication, falsification, and plagiarism are not the major problems in research conduct. Rather, they are more concerned about the misleading manipulation and reporting of data which '(have become so widespread that they are a substantially greater threat to progress than relatively infrequent occurrences" of fabrication, falsification, and plagiarism.¹⁵ Clearly, the debate over definitions is far from over.

A WHISTLEBLOWER'S BILL OF RIGHTS

How the scientific community, research institutions, and the government respond to persons who report allegations of scientific misconduct has been a vexing issue for many years. The detection and subsequent investigation of scientific misconduct often rely on the willingness of individuals to step forward with their suspicions and to cooperate with those charged with investigating the allegations. Recognizing the critical role of such whistleblowers, the 1989 PHS regulation requires that institutions receiving PHS funding establish procedures that provide for "undertaking diligent efforts to protect the positions and reputations of those persons who, in good faith, make allegations."¹⁶ Yet, as the Commission on Research Integrity report acknowledges, "whistleblowers

in research ... have at times found themselves penalized and retaliated against..., rather than being recognized for their effort."¹⁷ These problems led Congress to include a whistleblower protection provision in the NIH Revitalization Act of 1993, although the provision has not yet been implemented by regulation.

Several whistleblowers have taken matters into their own hands by circumventing designated institutional procedures and voicing their complaints through the False Claims Act, where the law's qui tam provisions can award the whistleblower up to 30% of the proceeds of whatever action or settlement a court approves.¹⁸ The use of the courts to resolve scientific misconduct disputes troubles many scientists, who believe that the courts are ill-equipped to resolve such matters and that increased litigation will chill scientific creativity. Even a federal court recently acknowledged that "the legal process is not suited to resolving scientific disputes or identifying scientific misconduct."

To strengthen whistleblower protection, the Commission on Research Integrity drafted a "Whistleblower's Bill of Rights"²⁰ and recommended that the DHHS "develop regulations guaranteeing the standards expressed" in it.* For the Council of the National Academy of Sciences, this recommendation may go too far; the Council claims in its letter to DHHS that the recommendation "ignores ... that whistleblowers can be wrong or even malicious, and that the rights of the accused must be preserved. There is no such balance" in the Commission's report.

While the Commission produced eleven recommendations in all, many of which bear directly on federal and institutional policies, my sense is that the definitional issues and efforts to balance the rights of the accused scientist with those of the whistleblower are likely to be the most contentious. In referring to the political process, the late Kenneth Boulding wrote that "we live in a perpetual state of unresolved conflict,"²² where people and organization continually seek to influence public policy. The Commission's report is the most recent policy initiative in what promises to be another chapter in the "perpetual state of unresolved conflict" about the conduct of scientific research.

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The Price of Higher Education

Caspa Harris

This morning I will discuss several changes applicable to higher education and the possible impact they may have, or will have, on our industry.

The issue that I will spend a few moments discussing is the increasing price of higher education and its current and future impact on the industry as a whole. Please note that I said price and not the increasing cost of higher education, as is frequently confused by both the press and some associations in discussing tuition and fee increases.

It is no secret that during the past ten to twenty years that the price of higher education has exceeded the Consumer Price Index (CPI). During this same period, however, so have a number of other commodities from time to time. Educators are finally coming to the conclusion that too much emphasis has been placed on tuition and fee increases in comparison to other commodities in the market, and the fact that external forces, have in large part been responsible for much of the increases. As an example, all of us have become familiar with a number of federal regulations from Clear Air, Clean Water, campus crime regulations, research time and effort reporting, and on and on. This is not to say that all of this is necessarily bad because it is not, but it is to say that it has become increasingly expensive.

In addition, appropriations have been drastically reduced in a number of states, and this has had a major impact not only on price increases, but also on downsizing. The reduction in state appropriations has impacted not only public institutions, but in some cases private institutions since several states have provided some funding to private institutions, such as the states of New York and Maryland. Where does the money come from to meet or replace these expenditures? Some funding has come from restructuring or downsizing, but primarily it has come from increases in tuition and fees.

What about the possible impact this may have in the immediate future? The public is concerned; and if higher education continues to place this issue on the back burner, it may have public relations issues that will be difficult to overcome. First and foremost, this has now

become an issue with both major political parties, friend and foe alike in the Congress.

On July 18, 1996, President E. Gordon Gee of the Ohio State University, on behalf of the American Council on Education and a number of other higher education associations, testified on college prices before the Postsecondary Education, Training, and Lifelong Learning Subcommittee of the House Economic and Educational Opportunities Committee on this issue. While his testimony was well received, I do not believe that this single hearing will satisfy the Congress much less the general public.

At the request of twenty members of Congress, the General Accounting Office performed a study on tuition price increases in colleges and universities. In addition to other statements and conclusions in the report, the GAO stated that "Tuition charges at public four-year institutions have risen nearly three times as fast as median household incomes, making higher education less affordable to many students." The report also stated that "Despite significant tuition increases, public college tuition remains a bargain." How many of you believe that the latter statement will satisfy either the public or Congress? In fact, according to the October 1, 1996 issue of the Chronicle of Higher Education, Congressman Howard E. (Buck) Meehan, who heads the House panel directly responsible for higher education policy, said his committee would look closely in the next Congress at the "runaway costs" of colleges.

Many of us have forgotten that the amendments to the Higher Education Act of 1992, Public Law 102-325, already has a provision for the establishment of a National Commission on the Cost of Higher Education. When and if this commission is implemented is anyone's guess, but higher education should be ready to influence the appointment of the four citizen members by the President since the other eight members, according to the legislation, will be coming from the Congress.

I have been involved in the administration of contracts and grants for over thirty years, starting with the old Blue Book regulations. Over those years, I have seen numerous changes that have required tons of paperwork, creating many jobs to monitor the expenditure of funds in this area. This has made the job of the principal investigator a nightmare and has taken the investigator away, to a large extent, from his or her research task. It has been my view that these changes have done little to enhance either the results of the research or the reduction of expenditure of research funds. The process has now become so complicated that few institutions can implement the new regulations on their own and are forced to hire external firms to assist in this endeavor. It would seem to

me that the better proof of the expenditure of research funds, barring actual fraud in the expenditure of these funds, would be the final results of the research project. After all, is that not the purpose for awarding the contract or grant in the first place?

In order to obtain research funding, from federal or private sources, the investigator has to submit a budget. Once this budget has been agreed upon, especially from federal funding sources, the principal investigator and the institution should not have to be subject to constantly changing regulations to monitor the contract or grant. Unfortunately, every time some institution or individual is mentioned in the press for allegedly violating the provisions of a contract or grant provision, regulations are changed for an entire industry.

During the past several years, major changes have occurred in the administration and reimbursement of indirect costs, including a cap on administrative costs. Some have even advocated the elimination of federally sponsored research funding in colleges and universities. Unless the higher education industry satisfies the public and congressional decision-makers on the issue of price increases, I would anticipate that additional restrictions will be placed on all aspects of higher education administration and funding, including research on campus.

Thirty years ago, the higher education industry hardly knew what litigation was about unless you happened to be at a law school. Today, many institutions spend enormous amounts of their budgets in this area. A staff of in-house legal experts has become a necessary requirement of operations, not to mention the expense of utilizing external counsel when an issue is to be litigated. Few institutions have available adequate funding if a major case is lost, and therefore they take out liability insurance which is not inexpensive. Like many physicians today, colleges must practice defensive business operations in order to avoid costly litigation. Items such as social security increases, pension funding, medical coverage, and other fringe benefits that are expected from employers today, are very costly and to remain competitive with their peers or other employers in their areas, institutions of higher learning must incur these costs. I would be remiss if I failed to mention the high cost of technology and the fact that colleges and universities cannot utilize old obsolete equipment in the classrooms if they expect to remain first class institutions.

In conclusion, the question is asked, will this issue of increased tuition in excess of the CPI have a negative impact on campus research? I believe it will. The constant pressure to downsize in order to meet other pressing fiscal needs without incurring large tuition increases is beginning to bring into play the issue of faculty workload and the issue of tenure. Clearly, the public, and many legislators have no idea what the

duties of faculty are all about. They assume that the faculty should teach students, period. Since decision-makers do not understand many of the reasons for tuition increases, to a large extent we have only ourselves to blame since our explanations, at least in years past, were simply inadequate. We all need to assure that our educational institutions clearly articulate the facts behind their decisions to increase tuition and fees, especially when it exceeds the CPI.

For Want of a Crystal Ball

Frances Degen Horowitz

In thinking of how to respond to the request that I play prophet for this plenary and predict the future of university research, I reached quickly for the proverbial crystal ball. But in doing so, I was reminded of that period in life when one's first child enters the toddler stage of independent locomotion and the consequent exercise of going around the house baby-proofing every location; deciding what was breakable and needed to be removed from the toddler's reach and what was unbreakable and could be left in place. Crystal balls, even the most leaden of them, are definitely in the breakable category. Actually, the finely wrought ones are more easily shattered, not by the random reach of a toddler but by the seemingly random appearance of unforeseen realities.

I recall most clearly a forecast made to me a number of years ago, when, as a department chair at the University of Kansas, I made a request of our beleaguered provost that he thought terribly unreasonable. It was the era of big main frame computers and growing demands for access, as well as a year of budget reductions. To demonstrate how unreasonable my request was, he likened it to the outlandish idea that the university could one day provide each faculty member with his or her own computer. The increasingly inconvenient centralization of main frame computing was a fact of university life, he said, and that was not ever going to change. Of course, in less than fifteen years, this provost is long gone, his successor by four was in the business of figuring out how to do exactly what had been prophesized as completely impossible.

I have often used this small experience as an ungenerous example of the ways in which the leadership of limited vision during difficult fiscal times can misguide one about the potential of an expensive future. I say ungenerous because indeed that provost was working under terrible pressures of fiscal austerity and, by his lights, was doing the best he could - however dim I thought then and think now those lights were. Whenever we accept someone's limited vision of the future, based upon a seemingly reasonable assessment of current realities, we run the risk of intimidating our creativity and discouraging our imaginations. Too often, we mistake a depiction of the present for the definition of the future.

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My cautionary tale notwithstanding, it is difficult to think of the future of American higher education without being influenced by current realities. The threats of budget reductions, the introduction of new technologies, a broadened base of students seeking an education, and the heightened expectations that our graduates will have both more specific as well as more general competencies comprise a well known list of the issues facing our colleges and universities, be they large or small, better or more poorly funded, research oriented or non-research oriented.

These pressures are more ominous for colleges and universities that count research as one of their responsibilities and that have thrived over the past half-century as a creative coalition of teaching, research, and service. After World War II, fueled by the Cold War, these institutions bought into a model of education that valued the discovery of new knowledge in their midst. The model required a healthy and diverse research base of faculty and students, libraries, and facilities. In this model the federal government became the major funder of research, with industry, private foundations, and private benefactors following behind at a distance. In this model, most of the funding did double, triple, and quadruple duty - strengthening university infrastructures for research and training, and service, while also supporting faculty research and the training of graduate students.

This model has been spectacularly successful. It has brought this nation to the forefront of a surge in new knowledge that is unprecedented in history. But many say the model is now threatened, no more vociferously than at a time each year when the Nobel Prizes are announced and Americans take a large share. Gazing into their crystal balls, the commentators mourn the halcyon days of university research and predict that in fifty years far fewer Americans will take their places on the Nobel stage.

Such pessimism is understandable given current trends: the desire to reduce government expenditures; shortened sight lines that call into question long-term investment in basic research; the belief that anything funded by public money intrinsically involves waste, and thus the private sector can do more effectively and efficiently what has been done publicly. The ethos of doubt and self-doubt is familiar to all who follow the issues.

But there are other reasons to be concerned. They have to do with what is happening in our universities, particularly the large, publicly-funded research universities. On the one hand there is the widely-acknowledged need for more and more of our citizens, young and middle-aged, to pursue higher education. There is the need to know more and to be more competent. But there is also the need for a work force that is

more generically educated at a high level, with graduates well prepared in problem-solving skills as well, especially in jobs requiring creativity and initiative. On the other hand, changes in the student population enrollments, growing cultural diversity, and the growing need for financial and academic support have come at a time when budgets for higher education are hard pressed. The pressure comes from changes in public funding at the state levels, the need for adequate endowment funding in private institutions trying not to increase tuition, aging physical infrastructures at many schools, and the increasing need to upgrade the technological infrastructure.

Budgetary squeezes have resulted in the use of more part-time faculty, along with demands that full-time faculty spend more of their time in the classroom. Questions are raised about the cost and value of research as some seem determined to pit the needs of undergraduate education against graduate education - much of this in the form of asking whether we "can afford" to do all that has been done in the past.

We all know the tough phrases, the macho metaphors, commonly used to describe what we must do to face these difficult challenges: we are told to bite the bullet, tighten our belts, hold OUT feet to the fire, work leaner and meaner, and get more bang for the buck. Never mind that biting the bullet can result in broken teeth, that belts pulled too tight can choke off the life force. Holding feet to the fire can burn the soles and, hot enough and long enough, the souls as well; leaner and meaner can be a recipe for hardness that sacrifices the heart and essence of an enterprise, and some of the increased bangs from the buck can turn out to be explosions.

Quality of education can be devastated by the policies that embody these macho metaphors, by invoking short term solutions based on expediency. We have only to look at the condition of most of our urban public schools to understand what happens when we lose our will and relinquish a commitment to the highest standards and expectations; whether in skills and knowledge we expect K . 12 students to acquire, or in our standards for physical facilities or technology.

After the fact, in this last decade of the twentieth century, we are in a desperate scramble to recover our schools - and it will be costly. This is especially true in cities such as New York, where years have elapsed since many of the high schools have had functioning laboratories for the teaching of science. Some schools have been permitted to deteriorate so badly that they are all but inhabitable.

The failure to support public schools, particularly in our cities, has already been costly, socially as well as economically. It has taken away some of our hope and some of our competitive edge. In that light, we ought to consider what will be lost if we repeat for American higher edu-

cation the policies that have affected K-12 public education so adversely.

It will be more ironic if we permit the quality of American higher education to slip to the degree we have permitted in K -12 public schools. American institutions of higher education have been second to none. They have been the social engines for unparalleled economic mobility, the setting for creating the cultural and intellectual ferment necessary for new ideas to flourish, and the source of new knowledge, new understandings, and new technologies. Why else have American colleges and universities been destination number one for students from around the world?

While it takes five, ten, fifteen years to build true excellence in a college or university program, it takes only one or two to lose it, and recovery can be painfully slow. This is especially the case in research capability. More that at any time in recent years, this nation's research capability, so intimately related to the fortunes of higher education, has been truly threatened, both directly and indirectly.

The direct threats, of course, come from pressures to decrease federal support for research, the most recent increases in appropriations notwithstanding. This is especially true when so many institutions that previously relied upon a healthy level of support from federal grants cannot make up for the decline in indirect cost returns (those funds that reimburse for the provision of facilities, libraries, and research equipment on behalf of the research enterprise). Indirect cost funding has done double and triple duty on our campuses to the benefit of quality education for undergraduate and graduate students.

Our research enterprise is threatened by a whole range of actions and forces which, if not stemmed, will erode completely that which has fueled progress and innovation in our society. For example, if we continue to increase our reliance on part-time faculty, faculty who are not expected to be active researchers, we will reduce the pool of those on our campuses who understand their job as faculty to include the asking of questions not asked before, and who keep the independence of mind so necessary for creativity.

If pressures for faculty to spend more time in the classrooms do not abate, we face turning college and university education into grades thirteen through sixteen. This will involve diminished expectations that those who teach will also be those who create the new knowledge and innovations so essential to scientific and technological progress, to social and economic advances, and to adding to our cultural heritages. And we shall lose the synergism between good teaching and good research that I believe has made the university based research in this country so especially vibrant.

Similarly, if the threats to tenure succeed, there is the potential to undermine faculty willingness to settle in for the truly significant long haul research programs even more than is the case with current funding patterns. How much an assault on the tenure system might contribute to destabilizing the faculties of our institutions is currently unknown.

There are some who see distance learning and computers as a way to reduce the cost of higher education. This development could translate into smaller faculties and, in turn, into a weakened research portfolio on our campuses. However, I think we must avoid a knee-jerk negative reaction to distance learning and computer aided instruction. We should not automatically count computer-based learning systems as a threat to our research future. They are like all technological advances. Ill used they can have negative effects, but well used they can improve learning and free up faculty resources for more advanced and labor intensive instruction and research.

Still, while the thoughtful use of technology is to be encouraged and exploited, we must be wary of those who tout technology only for its cost savings implications. Like mindlessly advocating more bang for the buck, ignoring the potential negative consequences of innovation may prove deleterious in the broadest sense to learning, to teaching, and to research.

Other elements, and likely to grow more insistent on a place in American higher education, are the for-profit institutions promising focused, narrow curricula, and the use of distance learning and technology, as a means of providing cost-effective and time-efficient degree programs while promising high employability for their graduates. How much of the market share of the college-going public these enterprises will capture remains to be seen. If they prove to be highly profitable and to serve well a segment of the education-hungry public, then they can be expected also to serve the purposes of those who advocate further reductions in the investment of public dollars in higher education. Such institutions seem unlikely to have a mission that relates to expanding knowledge, though they will most certainly make use of new knowledge. Where these endeavors settle out on the landscape of higher educational opportunities remains to be seen; they could affect significantly the future contours of that landscape.

Having said all of this and laying out what could be called a doomsday scenario for the future of research, I find it hard to believe that this nation will, ultimately, turn away from the historic course on which it set itself some fifty years ago. True, we no longer have the Cold War as the rationale for the model that married research with the federal interest on the university campuses. It is true that American higher education is in

something of a period of ferment. No-one knows exactly how changes in the academy, technology, and for-profit institutions are going to influence how we teach and learn and how we do research in the decades to come.

But we need only look about to see the future of research. It lies in all the pressing questions still to be answered and the challenges still to be met. These issues are in many ways more challenging, difficult, and complex than those which motivated American research fifty years ago. There are myriad of social, economic, and educational problems which await understanding and solution - whether it be in the wise use of technology, developing new technologies, making progress on understanding human behavior, solving matters related to the sources and uses of energy, protecting the environment, unlocking the causes and discovering the cures of illness. Our only chance for significant advancement in any of these areas is to invest in research - both basic and applied (the boundaries between these two categories sometimes increasingly fuzzy). Our only chance is to place the bet that the investment will pay off if we support a critical mass of minds, mature and young, investigating these problems in the midst of our college and university campuses. I do not believe, in the long run, that there is any real substitute for a research enterprise that involves a student-teacher mentoring relationship that pushes the envelope of knowledge. This is the essence of a productive culture of advanced learning and research.

There are arguments enough to support the importance of this model on the grounds of the knowledge that we need to discover to relieve human suffering, to create a better society, to enable the fullest realization of human potential. There is an economic argument as well. Recently, when threatened with a significant reduction in federal support for research in areas related to their field, leaders of the biotechnology industry talked bluntly to congressional leaders about why such budget reductions would be, in the long run, counterproductive to the economic interests of this country. They argued the case successfully and the budget knife was withdrawn.

In this instance, the economic argument was somewhat obvious. In other instances it is less obvious, but, if articulated well, no less compelling. New understanding of human behavior and productivity, the ability to create new and good jobs and have a well functioning and educated work force - these are all clearly in the long term economic interest of this nation. They are also in the interest of those who want to see that they and their children will continue to live in a democratic society. For we will not remain a democracy if there is insufficient sprouting of the seeds of social discontent, if growing economic disparity and inade-

quate education render increasing numbers of Americans susceptible to the blandishments of demagogues.

When you invited me to speak with you today, you in effect gave me a crystal ball and asked me to gaze into it. Heeding my own criticisms of my provost friend some years ago, I have tried to suggest that we not permit ourselves to be convinced by a leadership of limited vision during these difficult times. The future is expansive. It is filled with possibilities. We should be wary of solutions that would have us bite bullets and break our teeth, choke out our life force with tightened belts, or bum our soles in the fire.

When we imagine the future of research institutions, we must do so not only in terms of threats but also in terms of opportunities. I will be curious to see, and I know you will too, how the issues I have sketched here today will turn out, and whether my crystal ball proves as fragile as crystal balls are wont to be.

The Past as Prologue: What the Future Holds for Research Universities

Donald N. Langenberg

Thank you for inviting me to join you today. I am delighted to be here and I appreciate this opportunity to discuss with all of you my vision of higher education's future.

When I heard the topic we were going to discuss: "What the Future Holds for Research Universities," I was tempted to title my remarks "What Research Universities?" I am only half joking.

We find ourselves today in the midst of an extraordinary evolution - some would say revolution - in information technology. The implications of that technology for all of higher education and for research universities in particular are so profound that it is entirely reasonable to ask whether research universities might change beyond recognition in the 21st century - or perhaps whether they will even survive.

Why should technology's effects be so dramatic? Because information is higher education's elemental material, or silicon, as it were. From that basic fact it follows that any fundamental change in our ability to handle information will necessarily lead to fundamental changes in our academic institutions. What is occurring now on the Infobahn in cyberspace is truly fundamental change, and comparably fundamental change in our institutions cannot be far behind.

The new information technology emerged in part from university laboratories, of course, and university researchers were among the first to explore uses in those same laboratories. Like proud parents, we are inclined to take credit for what we have created and to presume that we can control our progeny. It should be obvious to us by now that we can no more control the technology to which we gave birth than we can expect to control our children.

Consider, for example, what has happened to a particular breed of university researchers, the elementary particle physicists. Decades ago the cost of the particle accelerators they use in their research exceeded the financial capacity of any university. More recently (witness the fate of

the Superconducting Supercollider), their cost exceeded the financial capacity of even the richest nation. So there emerged the great national and international accelerator laboratories, built around machines that cost tens of billions of dollars. These machines could not be designed, built, or operated without the aid of modern computer technology.

Individual experiments using these machines typically require detectors costing hundreds of millions of dollars. Designing, conducting, and analyzing the results of each experiment commonly occupies a few hundred physicists from fifty universities in dozens of countries for a decade or more.

The glue that ties such a massive enterprise together and that makes it possible is modern information technology. Out of such experiments comes greater fundamental understanding of our universe and, often, new technology. The famous World Wide Web, for example, was invented just a few years ago at a particle physics laboratory (CERN) for the purposes of facilitating information exchange between far flung particle physicists. Now look what has become of it!

You will observe in this example some clues to the possible future of our research universities. The research physicists whose world I have just described are very often university faculty members. They stand before blackboards and lecture, just like other university faculty. But their research lives bear little resemblance to that of the traditional scientist - Madame Curie, for example, slaving away alone in her little laboratory. Their research world has delocalized and gone global, and it has become partially virtual. One of the ironies of this evolution is that the technology that has strengthened, enriched, and made possible this new "virtual" research environment is the very same technology that may eventually cause the disappearance of some elements of the "actual" research environment.

It is not that great a technological leap from the particle physicists laboratory to any professor's research university. For more than two millennia, the basic model for all colleges and universities has been a community of scholars gathered around a great library. Now, two mighty rivers are converging to undermine the traditional idea of a library, and with it, perhaps, the notion of a community of scholars. One is the information technology revolution, and the other is the evolution of our store of information.

One example of how quickly new information is becoming available comes from an article Eli Noam published in *Science* magazine last year. Most of you know *Chemical Abstracts*, the key bibliographical tool of the field of chemistry. It publishes abstracts of all scientific papers in that field, worldwide. According to Noam, *Chemical Abstracts* took thirty-one

years to publish its first one million abstracts; eighteen years to publish the second million; and only one year and nine months to publish its third million. And just as the production of knowledge seems to be increasing exponentially, so does the cost. In 1940, a year's subscription to Chemical Abstracts cost \$12; in 1995, the cost was \$17,400.

We are, in fact, being confronted with so much new information so fast that it no longer needs to be, nor even can be, stored and handled in one central place. That being the case, is it really any longer necessary to have physically co-located communities of scholars? The experimental particle physicists have long since demonstrated that, for them, most of the time the answer is "No!" (And I can testify from my own experience that that's not because they do not need to interact strongly with one another. In that sense, physics is surely the most social of the science.)

If that result is generalizable to other kinds of scholars, including students - and there is no apparent reason why it should not be - then we clearly need to ask some tough questions and do some hard thinking about the future of our colleges and universities. In short, we need to reexamine and redefine their roles in tomorrow's society.

When asked what his light bulb would mean for the candle industry, Thomas Edison reportedly replied, "We will make electricity so cheap that only the rich will burn candles." I believe we are entering an era in which most colleges and universities must decide whether to change a little (and thus remain in the academic candle industry) or a lot (and launch themselves into the academic electrical business). I believe we have no choice but to change, and to change as rapidly as we can persuade our faculties and our staffs to make the transition. Let me touch briefly on a few of the reasons I find this so important.

First, the economic climate for research universities is not getting any better, and it is not likely to any time soon. This is not because the economy itself is not getting better - we are hardly a poor country. It is because the political watch words of the day have become efficiency, accountability, get what you pay for, get more for less, and, if at all possible, get something for nothing. The notion of cost has obscured the concept of investment.

Part of the answer for our research universities is to diversify revenue sources. What this means and how to do it is a large subject for which there is insufficient time here today. Let me simply say that very often this involves partnerships, partnerships that combine resources to achieve common goals. For years, as we have faced tight research funding, many of our universities have responded by forming partnerships with private industry. If we want to continue to have vital research enterprises, we must look to forming more global partnerships, much as the

particle physicists have been forced to do. Information technology makes this easier than it used to be. Depending on the lab, depending on the scientist, it is sometimes easier to reach a colleague in, say, Sweden than to get hold of someone in the lab across the hall.

Second, concerns about state and federal government funding are increasingly taking a back seat to the challenges we face from unprecedented competition from unexpected quarters. We in universities are used to competing with one another individually and institutionally. Now, aided and abetted by the new technology, we are beginning to see other kinds of competitors entering “our” markets. We face competition from a variety of commercial firms, already more sophisticated than we are in using information technology to provide and distribute information less expensively and more rapidly than universities can. We face competition from the makers of software, who can develop courseware for mass-market core curriculum classes as well as more advanced courses. We face competition from commercial publishers who can offer material on the Internet as they quickly convert their print products to cyber-texts to keep their own industry alive. And we face competition from for-profit private education and training companies that are responsive to the needs of the workforce for training and retraining.

For years we have been telling the citizens of our nation how important we are to the economic vitality and social health of the nation. Guess what? They have bought it! They are convinced that education is essential to their well-being. And they are ready and eager to buy it from whoever can provide high quality at low cost in a user-friendly manner. That may or may not include us! If you are looking for a way to stay awake during boring staff meetings, I recommend imagining how your institution will position itself to compete head-to-head with Disney Microsoft University when it appears in your cyberspace locality next year.

Third, and last, that crowd we thought were visiting grandparents are our students, and that other bunch that we thought was from outer space are also our students. That is to say, our student bodies are diversifying along every conceivable dimension, and fewer and fewer of them resemble me at any stage of my life. I say “me” because I am fairly typical of a senior professor nowadays - male, white, middle class, of a certain, shall we say, “mature” age, bred in the Great Depression, and academically fledged in the Eisenhower Era. No wonder we have trouble figuring out how to deal with this new lot.

Let me give you just one example. Recently, I have heard faculty complain that this generation of students cannot think, cannot reason, does not seem’ as bright as students used to be. They cannot construct and

write a tightly reasoned argument, they balk at reading a book a week, etc., etc. And yet, when experts look closely at these new students, they find they are just as smart and capable as we were. They just have a very different set of skills. They have grown up in a world in which rapidly changing visual patterns are far more common than sequential oral stories or linear printed text, and that really does seem to have had some effect on their cognitive styles. Put simply, their brains apparently work differently than ours do.

We are the ones who need to catch up. We need to respond to all these stressful realities, and quickly. As we do, I think technology will be the key. We are only beginning to learn how to harness the potential power of information technology, both for education and for research. The options continue to grow for interactive video, for teleconferencing, for the “virtual university.” Traditional classroom learning is becoming only one option among many, and for many of the new non-traditional students, it is the least appealing.

One example of how quickly non-traditional education is growing is the University of Phoenix, which is now the second largest private university in the country, with more than thirty-two thousand students with an average age of thirty-five. Established just twenty years ago, Phoenix owes its phenomenal success and rapid growth to its ability to deliver distance education programs to students not just in Arizona but across the country. Phoenix is projecting a student body totaling one hundred thousand, by the year 2000 with more than half expected to earn their degrees by way of the Internet.

It seems clear that research universities must come up with their own formulae for nurturing intellectual growth, balancing education and research, and reconfiguring the concepts of teaching and learning. Each will have to find its own way. Some may fail, but I strongly believe the net outcome will be an even more vibrant and powerful American higher education enterprise. I believe that the outcome of the information technology revolution is likely to be a substantially diversified higher education enterprise that is capable of delivering high-quality education and training tailored to the requirements of any citizen, in a society in which work and learning are intertwined throughout almost everyone’s lifetime.

When I saw the title for this conference, and particularly the phrase “The Past As Prologue,” I remembered a story President Eisenhower used to tell about a visitor to Washington who was touring the city in a taxi. When the cab passed the National Archives, and the tourist saw the words *The Past Is Prologue* inscribed on the front of the building, he asked the cab driver what that meant. The driver scratched his chin and

thought for a minute. Then he turned to the tourist and said, "I guess pretty much what it means is 'You ain't seen nothin' yet.'"

That is a pretty good summary of what I have tried to say today: We ain't seen nothin' yet!

Thank you.

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