

PLANNING FOR THE RESEARCH
MISSION

of

PUBLIC UNIVERSITIES IN THE 21ST
CENTURY

A compilation of papers originally presented
at a conference sponsored by
The Merrill Advanced Studies Center
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Edited by Mabel L. Rice

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INTRODUCTION

Mabel L. Rice, Ph.D.

University Distinguished Professor
Director, The Merrill Advanced Studies Center

This collection of papers documents the contributions of participants at a retreat sponsored by the Merrill Advanced Studies Center, on the topic of APlanning for the Research Mission of Public Universities in the 21st Century, held June 11-13, 1997. The participants were drawn from four research universities in the immediate region, Kansas, Missouri, Nebraska, and Oklahoma. The intent was to bring together administrators and researcher-scientists for the purpose of informal discussions that would lead to the identification of pressing issues, different perspectives, and particular plans for the enhancement of research productivity.

The following document begins with an Executive Summary of the highlights of the individual presentations, followed by the full text of the invited presenters. This compilation of papers represents an unprecedented collection of the current thoughts, perspectives, and plans regarding the research mission of public universities, from the academic leadership of four important public research universities in our region, combined with thoughtful and provocative presentations by four senior researcher/scholars. One cannot help but come away with a sense of urgency about the need to plan for a robust research agenda, and the need for open communication on the topic. This document certainly will contribute to the development of a dialog among differing perspectives.

The impetus for the conference came from the following observations, which are passed along here in the way of general background information.

This is a time of intense pressure on the research mission of higher education. The pressure comes from multiple sources. First, in a time of reduced fiscal resources, there is a need for externally-generated funding in order to support an ongoing research enterprise. At the same time, these resources are also more scarce, more competitive, and under heavy competition from prestigious research centers/academic units. This situation in turn creates university-wide pressures on academic administrators and researchers.

Concurrent with these developments are increased demands for high-visibility commitment to undergraduate education and the teaching mission of the university, which requires faculty scientists to divide their already oversubscribed time between escalating demands for research and teaching. Faculty scientists routinely teach at the graduate level, where future researchers are being prepared, and at the undergraduate level, where a more didactic approach is appropriate. This results in a wide array of teaching demands. Graduate teaching is crucial because, for many disciplines, participation of graduate students in a research lab is essential for carrying out funded projects, where a symbiotic relationship develops between research preparation and research participation. At the graduate level, Graduate Research Assistants can be responsible for tuition costs that are waived for Graduate Teaching Assistants, thereby adding to the financial burdens of the RAs and their mentors.

Other challenges appear in the fact that contemporary research advances are happening in the intersections of traditional disciplines, thereby requiring flexible cross-disciplinary configurations of enterprise. At the same time, the traditional academic departments follow the more conventional disciplinary boundaries and are inherently conservative in maintaining traditional boundaries. If research growth is to be achieved at the boundaries of the disciplines, it brings a world view often at odds with departmental priorities.

At least in part as a response to the previously listed pressures, centers of research endeavors have sprung up with the mission of supporting a flexible array of research configurations loosely organized around particular content areas. These centers often operate outside the mainstream of academic arrangements, in order to achieve their desired outcomes.

Another observation is that the highly technical substantive and financial realities of today's externally-funded research programs have exceeded the public's understanding of the enterprise, and indeed have surpassed the comprehension of many of the non-participating regular faculty of the university.

Finally, pressures, and potential misunderstandings, seem likely to increase in the future as computer-driven advances in electronic communication and information technology accelerate the transition to an information society and bring increasing and persistent demands on the universities.

There is presently a sense of frustration evident on the part of researchers, administrators and lay persons alike as to the conduct of research and, more broadly, scholarship in the life of the university. This is perhaps especially evident in public universities where the mission is broadly based, financial pressures are extreme, and accountability to the citizenry is rather direct. Because their current work loads are very demanding and time is scarce, administrators and researchers can go their separate directions and have little opportunity to carry out informal dialogs that help define key issues, clarify different points of view, and suggest workable solutions to resolve some of the frustration, and, most importantly, identify plans for the maintenance and growth of the research base of the University. In the process, the relationship between the needs of graduate students, research activities, and faculty members can be overlooked.

Because of its dedication to the support of research and inquiry, the Merrill Advanced Studies Center sponsored the workshop detailed here. In addition to the invited presentations reported below, a number of participants served as discussants. Although the discussants' remarks are not individually documented below, their participation was an essential ingredient in the general discussions that ensued, and in the preparation of the final papers.

On behalf of the Merrill Advanced Studies Center, I wish to extend my great appreciation for the time and efforts of the participants and in particular to the contributors of this collection of papers who allocated time in their busy schedules for the preparation of the materials that follow. On behalf of the participants, I express gratitude to Virginia and Fred Merrill for their enlightened endowments.

EXECUTIVE SUMMARY

Convened by The Merrill Advanced Studies Center on June 11 – 13, 1997, 23 administrators and senior faculty scientists from four Big Twelve universities gathered in Valley Falls, Kansas, for the first “Planning for the Research Mission of Public Universities in the 21st Century” conference. Participants had been charged to share their concerns regarding traditional institutional perspectives toward specified research issues. Additionally, they were asked to convey their ideas for a smooth and productive transition plan in order to ensure successful funded research in the next century.

Four panel discussions were held during the conference. Chancellor, Researcher, Dean, and Vice-Chancellor/Provost panels focused on four defining issues:

- The challenge to encourage colleagues invested in traditional, conservative disciplinary boundaries to engage in more flexible, cross-disciplinary configurations of research enterprise
- The need for externally-generated funding in order to support an on-going research enterprise
- The demands on researchers to be available for training graduate students in the laboratory and instructing undergraduates on a more didactic level
- The need to educate the public and non-participating regular faculty as to the highly technical substantive and financial realities of today’s externally-funded research programs

Following are some of the more significant points developed by each panel.

CHANCELLORS PANEL

Dr. Robert E. Hemenway, Chancellor
University of Kansas

Dr. James Moeser, Chancellor
University of Nebraska - Lincoln

- At the national level, a school’s research recognition determines its status. Our regional universities are not big enough to compete on this level; we need to construct interdisciplinary complexes.
- Scientists (funded in large part by “big government” over the past 50 years) need to consider what is happening to “big research” in an era when government is down-sizing. Are there ways to form partnerships with big business to obtain research support without losing our intellectual integrity?

- Accepting corporate funding for research initiatives is fraught with sticky questions: Who will retain the rights to end products? Is the desired work simply “contract research” which doesn’t develop new ideas?
- Universities need to make some changes and adapt quickly to several academic issues: academic departments (some of which are ceasing to be relevant) may not be the best “unit” structure; tenure needs to be re-examined; descriptions of what we have to offer (course titles) need to be updated/revamped on a regular basis.
- It’s important for the research faculty to become involved with faculty governance. Often, this group is filled with faculty who have little or no interest in scholarship or research, who are resistant to change of any kind. This body can easily become the engine of blockade to furthering the research mission.
- Trying to be all things to all people is a recipe for mediocrity. Marginal programs should be downsized; newly available funding should go into stronger programs.
- Legislators operate on the premise that our universities are designed mainly to provide teaching and undergraduate education. Consequently, when dealing with the representatives to our state legislatures, we should focus on these basic functions.
- Universities need to be the voice of research to our society at large; there is no knowledge without inquiry. There is a problem in the way research is perceived and prioritized in our society. It’s important to quash the attitude that science, as an enterprise, is just for the elite few.
- We have allowed research to be cast as the enemy of education by: permitting “teaching vs. research” to turn into a public debate, making basic science courses unattractive to undergraduates, providing inadequate undergraduate research opportunities, and not training the humanities faculty to work cooperatively.
- Universities need to be more responsive to the needs of taxpayers. Legislators make funding decisions which reflect American public opinion. Until recently, the public held its universities in the highest esteem. Currently, they see faculty as a “protected elite.”
- Important steps for regional universities include striving to capture our states’ top freshmen, focusing on excellence on all levels, developing character and value in our students so that our institutions will stand for something.

PANEL OF UNIVERSITY OF KANSAS SENIOR RESEARCHERS

Dr. Paul Cheney

Smith Mental Retardation and
Human Development Research Center
University of Kansas Medical Center

Dr. Elias K. Michaelis

Pharmacology & Toxicology Department
Higuchi Biosciences Center, Center for
Neurobiology & Immunological Research,
Center for Biomedical Research

Dr. Thomas N. Taylor

Department of Botany, Natural History Museum,
Biodiversity Research Center

Dr. Sidney A. Shapiro

Rounds Professor of Law

- Cutting edge research requires an interdisciplinary approach. Consequently, institutions that support “cross-pollination” among their scientists are those which will survive.
- For collaborative research to be successful, all participants must be fully involved, make a unique and needed contribution, see significant and tangible results, and receive appropriate recognition and credit.
- Interdisciplinary graduate degrees will be the norm in the future; now is the time to move toward interdisciplinary training.
- Most researchers are driven by uncertainty and urgency, constantly bothered by fears of “falling behind,” and always wondering “Am I asking the right questions?”
- Fierce national competition for grant funds stimulates faculty to strive to come up with the best ideas. Success at the national level establishes the authenticity of the faculty.
- Today’s scientist, besides having excellent research skills, must have entrepreneurial skills, be competitive and willing to gamble.
- Without inquiry and research, we would not have a true research university. Consequently, the business of funding research is part of the public business.
- Time and money are the paramount issues involved in the teacher vs. researcher dichotomy. It is imperative that institutions value teaching and research equally.
- Faculty time might be more efficiently spent if academic departments had more flexibility so they could assign individual faculty to different proportions of teaching/research/service. Faculty should be placed in slots where they can be most effective.
- Researchers need sophisticated advocacy skills.
- Undergraduate education is the foundation for future funding; citizens and legislators want good teaching. Undergraduates should be encouraged, and opportunities should be made available for them, to get involved in laboratory research.

- Institutional goals need to be shared by the public at large. Even if our universities do an excellent job internally of defining and defending goals, the effort will go no where if the public isn't "on board."
- Public relations matters must be coordinated with the university's goals to be effective.

DEANS PANEL

Dr. Larry Clark, Dean
Arts and Sciences
University of Missouri – Columbia

Dr. Andrew P. Debicki, Dean
Graduate School and International Programs
University of Kansas

Dr. Brian Foster, Dean
College of Arts and Sciences
University of Nebraska – Lincoln

Dr. Sally Frost-Mason, Dean
College of Liberal Arts and Sciences
University of Kansas

Dr. Deborah Powell, Dean
School of Medicine
University of Kansas Medical Center

- People who have problems with the six year tenure review are often those who are doing interdisciplinary work, which is what we purport to want them to do.
- Approximately 95% of academic jobs are not at research universities. However, we socialize our doctoral students to believe that jobs at other types of institutions are "below" them.
- In the past, patient fees financed some of the unfunded research carried on in medical schools. Since the advent of managed care, it has become imperative to figure out mechanisms to generate funding for this research which was formerly paid for out of clinical fees.
- It's important to find excellence in our faculties, and then nurture and support each member's strengths and interests. When we insist that everyone be a complete scholar, we are, perhaps, dishonoring the distinctive strengths of individual faculty members.
- Academic departments are the vessels that hold resources. They are often very conservative. They protect their resources by guarding their boundaries; if these boundaries are breached, the fear is that resources will flow out.
- Decentralization can strengthen a department (e.g., cross-listing courses, interdisciplinary curricular arrangements.)
- The vast majority of time in departmental meetings is devoted to teaching issues, not research concerns.

- Funding is inherently project-oriented (i.e. short-term), so very little long-term planning is possible. This orientation distorts the university agenda.
- We need to do a better job of training our graduate students to be teachers. Greater attention should be given to mentoring and informing graduate students about the realities of the job market and about the different types of possible teaching positions. In medical schools, the basic science faculty have never been taught how to teach medical students. Consequently, medical schools are also realizing that they need to spend more time on teacher training.
- There needs to be some flexibility within the six year tenure review requirement, especially for younger women. Women aren't productive at the same time in their careers as men, but overall, they do as much research as men; it's simply on a different timetable.
- Related to the (over) emphasis placed on research, many universities are hiring a lot more part-time teachers who do not carry research obligations. We have always advocated to the public that we are places where research and teaching are intertwined; that's why students pay more. However, this claim will become impossible to defend if we begin to hire more of these part-time teachers (winding up with a community-college level of teaching) and try to couple that with cutting-edge research.
- The future of public universities is tied to working with the private sector. Unfortunately, universities don't know how – or don't want – to deal with the private sector. We need to learn how to interact with industry, how to “tell the story.”

PROVOST/VICE-CHANCELLOR PANEL

Dr. Al Chapman, Vice-Chancellor
Academic Affairs
University of Kansas Medical Center

Dr. Nancy Mergler,
Senior Vice-President and Provost
University of Oklahoma

Dr. David Shulenburg, Provost
University of Kansas

- As research foundations proliferate and technology transfer activities intensify, we must be aware of, and respond appropriately to, conflict of interest issues. Legal action against the institution is a virtual certainty, and is part of the cost of doing business.
- To break down departmental barriers, institutions might include extra-departmental faculty (who have an interdisciplinary research viewpoint) on search committees; orient new faculty in a manner that establishes loyalty to a region, state and the institution; enhance cross-disciplinary knowledge; encourage flexibility of appointments; use retired faculty in a more deliberate manner; cut red tape for grants; and re-examine indirect costs.

- Our institutions have the franchise to be research universities, but we also have the duty to educate our states' sons and daughters. It's absolutely necessary to do quality instruction if we want to continue the research mission.
- "Virtual universities" can be of great benefit to society, especially to people with disabilities. However, universities are particularly vulnerable to this upcoming technology, especially at the freshman and sophomore level (i.e. our cheapest instruction). If we lose this monetary foundation, there are implications for future support of research. We need to make sure that the campus is a special place for learning that cannot be replaced by a computer.
- Our institutions carry out research (i.e. we *create* knowledge) which we immediately *give* away. Private publishers take up this information, and then turn around and *sell* it back to us at exorbitant costs. A big question facing us now is whether universities or private enterprise will have the ultimate control of knowledge resources.

* * * * *

All participants voiced the sentiment that there needs to be further dialog between and among our four institutions, hopefully at future events such as this one. Several administrators spoke of the need to include more faculty members in the interchange of information in order to ensure that all perspectives were equally explored.

The preceding summary is based on more complete remarks by each of the panel participants, plus commentary by other attendees. In the following section are text versions of the panelists' presentations.

THE STATE OF RESEARCH ENDEAVORS:

VIEW FROM THE UNIVERSITY-WIDE LEADERSHIP LEVEL

KNOWLEDGE FOLLOWS INQUIRY, WISDOM FOLLOWS DISCOVERY

Robert Hemenway, Ph.D., Chancellor
University of Kansas

I recently visited Japan where I spent much time talking to officials in the Japanese Ministry of Education. The Japanese have embarked upon a \$50 billion investment in university research--a segment of the Japanese university under-funded for years. Although Japanese industry has become the world's leader in transferring technology to the marketplace, Japan has concluded that without a continuing source of basic research they will eventually have little technology to transfer. Investment in technology has made Japan the world's leader in finding applications for research developed elsewhere, but such shrewd adaptation will not be sufficient to compete in a world economy increasingly driven by new discoveries about the very nature of the Universe. In short, Japan has decided to make a major investment in the kind of basic research routinely expected from American research universities.

What is the lesson here? On a practical level, we should be aware that Japanese intellectual skill and capacity for planning will present a formidable challenge for world leadership in research. We should be concerned about our own funding cutbacks in basic research and its impact on our future economy. Japan's actions, however, affirm the basic wisdom of the American research system. The U.S. has assigned responsibility for basic research to the American university, particularly in the post-World War II era. As a result, university discoveries in medicine, agriculture, biotechnology, polymer science, and computing have dramatically improved the American economy, health care, telecommunications, and general quality of life.

In contrast to Japan, where research heretofore has been primarily a part of industrial planning, or to many European countries, where research is funded in government operated academies or institutes, most basic research in the United States has been wedded to the educational process. Beginning during the Second World War when university scientists helped win the war by developing atomic energy and microwave radar, continuing after the war with the "federal research compact" which funded university research through NSF, NIH and other government agencies, an elite group of 150 or so research universities--including the University of Kansas--accepted responsibility for a dual mission in modern American society. The research universities' mission has been to conduct the basic research necessary to expand the economy and maintain world leadership, and at the same time, and with the same faculty, educate the next generation of scholars, thinkers, and scientists.

The genius of this "research compact" is that basic research in the U.S. has been institutionally tied to education. The terms "research and graduate studies," for example, are virtually synonymous in American higher education. University vice presidents are often given

the “research and graduate studies” portfolio. “Research assistants” are not laboratory technicians but students studying for a graduate degree. “Teaching assistants” are those students “doing research” for a graduate degree while simultaneously developing and demonstrating teaching skills. “Earning” a Ph.D., the degree symbolizing the highest level of education, is the compensation for conducting research.

This identification has shaped the modern American university. We believe as an article of faith that research is the medium for learning. Faculty assign and students write “research papers.” University libraries rank themselves as “research libraries,” a category which distinguishes them from all but a few “public libraries.” Research may take place in the “public library” through the individual acts of inquiring citizens, but these acts occur outside the context of “sponsored research” conducted by university faculty “training” graduate students.

The American research university expresses the motto: knowledge follows inquiry, wisdom follows discovery. Research and education have become cause and effect. One “does research” in order to “become educated,” whether we are talking about the graduate or undergraduate level. The distinction between graduate study and undergraduate study is sometimes judged by the amount of new knowledge generated by the research process. The graduate student’s research is expected to contribute new knowledge to the field. The undergraduate’s research usually contributes new knowledge to the individual.

When one sums it up, one realizes that the American research university has become both the voice of research and the exemplum for its benefits to the educational process. Universities pride themselves on the number of Nobel Prize winners on their faculties, not simply because their labs produce the best science, but also because their very presence indicates “education” of the highest order. If Nobel-level learning takes place on that campus, by inference it must be a good place for all levels of learning. The causative circle of research to education, education to research, is presumed to characterize the entire place.

Society depends on the university to validate research, and the university benefits from its identity as a place where research shapes education. Given this dynamic, it is surprising to note how universities have sometimes failed to defend their dual mission of research and education. Too often in the recent past, the university has permitted research to be cast as the enemy of education. The irony of this failure is overwhelming--the university as voice and example of research failing to defend its own fundamental interests. Yet the American research university has engaged in a number of practices which have sometimes undermined research in the popular mind and separated it from education, at the very moment that its faculty was conducting activities such as discovering a cure for polio or revolutionizing the fields of modern chemistry and modern biology.

I see four ways that the research university has permitted research to be interpreted as the enemy of education. Perhaps if we understand how we have acted counter-productively, we can more readily fulfill our dual mission, and reaffirm the “research compact” which has meant so much to American society over the past half-century.

First, research universities neglected undergraduate education in the sixties and seventies, and as a result encouraged a dangerous debate between research and teaching. Although the last 15 years have seen a remarkable reform in undergraduate education, the terms of the original debate are still very much with us. Seized upon and distorted by the popular press, this debate between research and teaching led to the demonizing of university research faculty. Supposedly, selfish research scholars driven by the Faustian demands of their discipline rejected the simplistic questions of undergraduates, taught seldom, buried themselves in libraries or laboratories, spent lavishly on travel to foreign conferences, avoided callow freshmen and thereby destroyed the university's delicate "balance" between research and teaching. On most campuses this caricature was just that--more myth than reality. But there was just enough truth to the exaggeration to give popularity to this cartoon view of the research scholar.

This emphasis upon the individual faculty member has drawn our attention away from the mischief in the misplaced metaphor. The figure of a "balance" between research and teaching is fundamentally wrong. Teaching and research are not balanced on a fulcrum, nor are they part of a zero-sum game. They are causally linked. Neither can take place without the other. Without the knowledge generated by research, the teacher has nothing to teach. Without the discovery generated by the student's research, the student fails to learn. Without learning, there can be no wisdom. Research universities have largely failed to explain this causal circle between education and research, research and education. The idea of "balance" erroneously suggests that education is only a function of faculty time allocated to teaching. Rather than participate in such a debate, we would be better served to institutionalize our belief that the process of learning at all levels grows from the desire to know, a state of being only attainable through the act of inquiry. We should ask whether our curriculum, graduate or undergraduate, is truly structured around research.

Secondly, the current over-supply of Ph.D.s in many disciplines has called into question the economic consequences of educating graduate students without reference to the labor market they will enter. In both the sciences and the humanities, graduate students are disaffected, feeling betrayed that the consequences of pursuing intellectual interests to the highest professional level, and developing research skills of great sophistication, educates one out of a competitive labor market. The specialized learning which characterizes traditional Ph.D. programs proves not to be in much demand in an educational marketplace where universities are caught in a price-cost squeeze and federal and local governments are intent on shrinking the size of government expenditures.

In the future, programs will have to be more selective in their graduate admissions, more cautious about the size of their enrollments, less myopic about the practical consequences of educating "degree seekers" for nonexistent jobs, and more supportive of students seeking a venue for their training outside the academy. Nothing will call into question the value of research more quickly than a free market economy which seems to have no role for the human products of the research university.

In my own opinion, we are entering a decade where university graduate programs will need to have higher standards and less of a vocational purpose. They will be judged not by their size, but by their quality. Admission to the best programs will become more akin to admissions

to law school and medical school, and the program itself will be more a way of thinking, less a preparation for a career. Further, only the best programs will survive in an era of reduced funding.

Third, research universities have failed research by neglecting the responsibility for scientific literacy in the general public. As an advanced scientific society which sends probes to Mars, implants electrodes in Parkinson's patients' brains, and discovers the basic proteins of the human cell, our democratic way of life is threatened if we fail to understand complicated science. A democratic citizenry must comprehend science to make informed judgements about public policy. Yet many Americans, including many graduates of our research universities, have little understanding of science or the research that leads to scientific discovery. The National Science Foundation reports that only one in nine Americans feels well informed about science and technology, fewer than one in ten can explain a molecule, and only 2 in 10 understand that DNA is a molecule that contains the genetic information for each cell. Only 5% of the population can explain acid rain. What people do believe is that science and technology make their lives better-- 3 out of 4 have such a faith.

Fourth, universities have failed research by teaching science as though it were textbook memorization rather than active inquiry. Science in research universities is usually taught in a large introductory course, often without a lab. Too often, nonscience students find these experiences so unsatisfactory that they become science-averse for the rest of their lives. As Sheila Tobias and other analysts of this experience have pointed out, we lose early the interest of many of those who will eventually shape public opinions about research. We leave students with the impression that the complexities of science defy explanation. Science is a black box mystery which has all the characteristics of magic. Making matters even worse, the ability to disseminate pseudo-science or pseudo-research has become widespread with the growth of global Internet systems. Not only are complex research problems difficult to explain, but simplistic explanations of virtually everything abound. Just as "Black helicopters" reduce the complexities of international relations to a simple paranoia, so also does folklore about simulated space landings in New Mexico exempt people from mastering the science needed to understand a Mars rover. We have been too timid in reacting to such folklore, whether it is called "creationism" or "Star Wars," and we have not done enough to orient our curriculum around the act of discovery.

Research universities should restructure the curriculum in order to put greater emphasis upon research methods. If we really believe in the causal link between research and education, then we should embed the discovery process into our undergraduate, as well as our graduate, curriculum. We can ill afford to graduate students who think science is magic and research is for nerds. We graduate too many undergraduates who have not experienced firsthand the hard work of research and the joys of discovery. If we consciously built research into the curriculum, at every level, Freshmen to Ph.D., our universities would look different, and our public would better understand how our research contributes directly to our educational mission. (We would also have many more faculty than we have now, because research requires the personal interaction of mentor and student.) What if no introductory courses--in any discipline--were designed simply to disseminate basic knowledge in the field? What if every senior were required to complete a research project, and supplied with the money to build the apparatus, access the data base, or visit the special library necessary to complete it? There are few research

universities in the country which can feel proud of the size of their investment in undergraduate research, especially when compared to its investment in research generally.

The university does not bear the sole responsibility for public misconceptions of scientific research, nor the sole responsibility to explain research, but I do believe the university is positioned--given its pool of intellectual talent and its stake in the outcome--to play a major role in reaffirming the causal link between research and education that lies at the very heart of the Federal research compact. That compact has served the country well by ensuring that more than half the basic research in the U. S. takes place at institutions of higher education. It has also enabled the American system of higher education to become the most admired and most powerful in the world. It is the reason Japan is changing its system to emulate the American university, and it is the reason that all of the world wants to study at an American research university.

If we at such universities want to preserve our dual mission, and our international dominance, we probably cannot depend on anyone else to communicate why the research university is so central to American success in the 21st century. The next century will find many nations challenging our global leadership and intellectual resources. We should recognize the coming challenge and begin the planning to preserve our unique status.

THE AGENDA FOR CHANGE

James Moeser, Ph.D., Chancellor
University of Nebraska - Lincoln

I want to thank KU's Merrill Advanced Studies Center for convening this conference and for the opportunity to participate in it. It is a rare opportunity for a chancellor to sit with and listen to faculty, to hear them talk about their work, their aspirations, their fears and anxieties, and their dreams. It is an opportunity to be reminded of the real purpose of the university.

I hope that there will be future conferences like this one and that there will be greater opportunities for faculties from Nebraska, Missouri, and Oklahoma to join their colleagues at Kansas for more dialogues such as these. I am convinced that we must begin to engage faculties in these discussions.

I also want to thank the Center for focusing on these four universities and encourage you to continue the dialogue with these four institutions that are so similar in size, scope, mission, and relative quality, as well as sharing the contiguous heartland of America, often regarded as removed and remote from the centers of power and excellence on the coasts. I believe we have much to learn from one another and much to contribute to each other.

I have had the benefit of being able to listen to the presentations that have been made during this day and a half, and I would like to use my time, in part, to recapitulate some of what I heard. First, from Paul Cheney's presentation, I would like to repeat a quotation that he used at the very beginning of his presentation:

"The institutions that will succeed are those that can reorganize themselves to address scientific and educational questions in an interdisciplinary manner. The institutions that will have difficulty are the ones that keep the same rigid structure that prevents pollination among disciplines." (Mark Rodgers, Vice Chancellor for Health Affairs, Duke University, from The Scientist, 1995.)

If that statement is true for Duke, how much more true is it for Nebraska, or Kansas, or Oklahoma, or Missouri? It is a sobering statement, but I believe it is absolutely on the mark. We must change to survive. One of my colleagues has said that universities that fail to change will not necessarily disappear. Rather, they will be like the drive-in movie theatres still found on the outskirts of small towns in America -- still there, but very poorly attended.

Eli Michaelis described the two factors that motivate researchers as *uncertainty* and *urgency*. He also spoke candidly and revealingly about his own fear of failure, something that I appreciated very much. I will tell you that chancellors and presidents are motivated by these same factors, and if we are honest with ourselves, we live every day with the risk of failure. To attempt great things is to risk failure. The greater the attempt, the greater the risk. I believe that

we have an enormous challenge ahead of us, and the possibility of failure is very great. Yet, we must not be afraid to lead for fear of failure. That, in itself, would be the greatest failure of all.

Someone once said that a chancellor is a person who lives in a big house and begs for a living. A more recent definition, by former president James Duderstadt of the University of Michigan, is that a president is somewhat like the sheriff of the Old West, who every morning straps on his six-shooter and walks into town knowing that some morning he is going to meet someone who can draw faster than he does. That is another way of saying that we have a finite amount of political capital, and that with each crisis, we spend a certain amount of that capital, until it is gone.

The times that lie ahead will require expenditures of great amounts of political capital if we are to achieve what I think we need to do. But first let us examine the context in which we find ourselves.

American higher education is entering a very difficult period. The modern research establishment was built by the federal government during the Second World War as a means of prosecuting the war. With the advent of the Cold War, American science and technology, largely placed in research universities, was charged with keeping the West ahead of the Soviets. While aimed at supporting primarily science and technology, even the arts and the humanities benefited from this investment. Students at the University of Kansas are still practicing today on a fine Casavant tracker organ that we purchased using National Defense Education Act funds. I had several graduate students in music performance supported on NDEA grants -- learning to play Bach in the name of national defense!

Now, however, the Cold War is over, and a primary political impetus for research support has disappeared. More serious is the growing pressure on the discretionary portion of the federal budget, due to the inexorable growth of payments toward the national debt as well as the growing cost of social entitlements. Even with a strong will to maintain federal support for research, it is going to be difficult to find the financial means to do so as the noose tightens around the discretionary portion of the budget.

All across the nation we see growing hostility toward universities and faculty in state legislatures and in our governing boards. We often blame the politicians for their lack of understanding of what we are about, but when we do, we fail to realize that these elected officials are merely reflecting the popular opinion of the voters. Our fundamental problem is with the people themselves -- people who no longer regard universities or university faculty as above reproach.

What we see are more demands for accountability; more demands for faculty productivity (and this means productivity in the classroom, not the laboratory). They regard faculty as a kind of privileged elite, a new leisure class, with the protections of life-time job security available in almost no other sector of society. In an age of tremendous insecurity and anxiety over corporate downsizing and job elimination, faculty are increasingly viewed as somewhat arrogantly maintaining a level of privilege and security not enjoyed by others, all the while not working

very hard either. Thus, we see attacks on tenure and sabbatical leaves, and demands that we increase the amount of time faculty spend in the classroom.

Meanwhile, state budgets are facing pressures very similar to those at the federal level. Indeed, as the federal government passes down many of its responsibilities to the states, usually without the funding attached, states are scrambling to find resources to support social programs previously carried by the federal government. Mandatory sentencing laws and increased crime are causing a building boom in new prisons. Community colleges and K-12 education, both affected by reductions in property taxes, come with hats in hands to their respective state capitals.

Universities now face new sources of competition -- from corporate in-house graduate training programs, to for-profit educational institutions such as the University of Phoenix. This competition for both instructional and research functions will continue to grow. Increasingly, we will be competing with each other, as state boundaries become essentially meaningless in an age of web-based or satellite-based delivery.

All of these factors require the university to be more adaptable, flexible, and responsive to the needs of the private sector; more responsive to the needs of the taxpayers who ultimately determine state policy. These taxpayers' primary interest is that their children, our students, receive our undivided attention when they enter our classrooms. And increasingly, the taxpayers are themselves students, who want just-in-time delivery of courses to their home or office; they want to be well-served. Thus, becoming a "student-centered" university takes on an entirely new definition. It begins to suggest a whole new level of service orientation.

While this is a conference on research, I have spent much of this time on teaching because I want to drive home the point that this is the total focus of local and state support. We will ignore this issue at our great peril to continued state support. (It so happens that I think it is the right thing to do anyway.)

While the residents of our respective states tend to regard us by how well they think we are doing as teaching institutions, our national colleagues measure us by our research credentials. Clearly, we need to do a better job of reinforcing the link between these two enterprises, that it is the research we do that makes the teaching possible; that what we are really about is *learning*, an ongoing activity that engages college freshmen and full professors.

There is one avenue of political and popular support for research at the state level, and we discussed this in several of our sessions. That is the avenue of economic development. We like to say that we are the engines of economic development, and as some correctly pointed out, while we must be careful not to overstate this assertion or make broad statements that we cannot support, I think we can find ample examples to demonstrate how this is true for each of us in our respective situations. And while this is a helpful argument, it is not strong enough, in my opinion, to carry the day to create a strong reservoir of political support at the state level for research.

The Agenda for Change

If we are going to survive and be effective, it seems to me that we have to be willing to examine some heretofore sacred cows. Several of these were mentioned in the discussions preceding this presentation:

Academic departments may cease to be relevant except as a means of organizing undergraduate instruction, and even there I think we have to continually look at their structure. Knowledge just does not fit easily into the pigeon holes that we have created and continue to maintain. In many fields, the most exciting work is being done at the margins and at the places where the disciplines overlap. It is being done by academics who are often regarded by their departmental colleagues as working outside the traditional field and, therefore, of questionable utility to the department. These people often have difficulty getting tenure because they are thinking and working outside the box.

Tenure itself has got to be questioned. We are seeing widespread implementation of various forms of post-tenure review across the country. What about more flexible tenure clocks that recognize the sometimes unique circumstances that individuals, especially women and people working in non-traditional or interdisciplinary fields, may require in order to succeed. Ultimately, I see more and more junior faculty questioning the process itself. Do we really need it? Is it forcing a kind of regimen upon us that, in fact, suppresses creativity and encourages conformity?

Perhaps most difficult of all, is the whole process by which we have traditionally governed ourselves. Faculty governance is a central value in our institutions. We like to say that the faculty *are* the university, and I believe this to be a fundamental truth. Yet, in fact, we have created a system of academic bureaucracy, of layers of faculty committees and a central parliamentary body known as the faculty senate.

I cut my teeth as a member of the faculty senate at the University of Kansas. In those days it was led by the most outstanding members of the faculty. My mentors were Charlie Oldfather, Ambrose Saricks, Del Shankel, and Ron Calgaard, among others. Being elected to the senate was a matter of some prestige and honor.

Today, too many of our best faculty refuse to participate in faculty governance. They view it as an exercise in empty rhetoric and wasted time on an endless succession of committees reporting to other committees. They have pressing research agendas and students, both graduate and undergraduate, who need their time. The result is that we have faculty senates made up of those who are coerced by their colleagues into service and do so grudgingly or those who have some personal political agenda to pursue.

The challenge for us, I believe, is to find a way to re-engage the faculty in a real discussion about the nature of the academy -- what we are and what we need to become -- for I am convinced that unless we do so, we will not be able to effect fundamental change.

The Agenda for Research

My discussion of research is based on two assumptions. The first one is that our national reputations as universities is based on the perceived quality of our faculty and our research programs.

The second assumption is that most of the departments at Nebraska (and I would imagine at the other three institutions) are too small to compete head-on with the Michigans and Berkeleys of the world. If one examines the NRC rankings of doctoral programs, one cannot escape the fact that there is a correlation between size and perceived quality.

Therefore, I believe at the University of Nebraska we must create large research clusters if we are going to create programs of national quality. Our Department of Chemistry or our Department of Physics is simply not going to be able to compete with a department that is three, four, or five times larger in faculty headcount, operating budget, number of graduate students, etc. However, if we are clever, we can create some unique clusters that will have that kind of mass and quality. That has got to be the strategy at institutions like ours.

In order to do this, we must look hard at all of our Ph.D. programs and begin to trim back those that are of marginal quality and divert the resources that support them to help build these clusters of strength. Some programs may need to be eliminated; others can simply be reduced in size and scope.

Why should we maintain a third-tier Ph.D. program? Where are the graduates of that program going to go when the Ph.D. graduates of the first-tier schools are taking positions at second- and third-tier schools? In the past, we have always been able to build strength through growth in the budget. There was always new money coming in -- in the form of enrollment growth, or federal grant support growth. In this new environment, we have to learn to do something that we have never done well at all, namely, begin to shut down some things that we do not do well, or that are no longer needed as they once were.

This will not be easy. Programs that are threatened typically mobilize a strategy to wear down the moves to eliminate or reduce. More times than not, these strategies work. The catalogues of our universities are filled with programs that survived previous attempts to trim offerings.

So far at Nebraska, we have chosen to move cautiously and incrementally, chipping away at the margins in order to free up funds for investment in areas of strength. We will reallocate approximately \$6 million over the coming biennium, or approximately 4% of the state-aided budget.

Part of our strategy involves enhancing the revenue stream, which we are seeking to do through the Capital Campaign, and which we have done with a new agreement with Pepsi Cola, which will provide about \$25 million to the university over ten years, including an \$11 million contribution to the foundation for academic enhancements. We believe we can continue to push up the level of funded research even in this more difficult and competitive climate, and we believe we can dramatically increase the income from royalties and patents.

The Message

Since I came to Nebraska a year and a half ago, I have taken a very simple message to the people in an attempt to build support for the university. Included in this message, is support for research. It is a very simple message, with three points:

First, we must keep the best and brightest in Nebraska, at Nebraska. This speaks to the need to be the institution of choice for the brightest high school students in the state. We have just implemented new selective admissions standards for the first time, and this, together with a focused program of recruiting top scholars, is sending a strong and clear message of academic quality.

Second, I have been telling Nebraskans that if they can have the number one program in football, they can and should also have some number one academic programs. This should be a matter of state pride. Here is where I begin to describe the focusing on a few programs of national level eminence. I talk about our internal reallocations and point out that we are trying to be good stewards of our state appropriations rather than asking for new allocations to support this effort, and I work in a pitch for the Capital Campaign. You never know who's listening.

Finally, I talk about recovering our responsibility as a public university to help our students develop character and values. I describe this both in terms of an individual ethic that involves integrity and responsibility and a societal ethic that values pluralism, diversity, and a respect for others.

I will tell you that I believe we are being successful in building support within the state for the university. So far, we have been successful in maintaining the trust of the faculty as we move to focus the resources of the institution toward those areas where we can make a mark nationally.

My uncertainty, my anxiety, and to use Eli's other term, my sense of urgency, is that we must push harder and faster, and the risk is that we will not be able to convince our own colleagues that this is what we must do. My fear is that if we are unsuccessful in that regard, at that moment we will begin to become marginalized as an institution. We will begin to lose ground. My hope is that the ferment and creativity that I found at the conference at the Barn can begin to spread among more and more.

What so stimulated me at this conference was the enjoyment of thinking together creatively. Our best research faculty are creative by nature; they work at the cutting edges of their fields. If we can only engage those minds and that creativity to work on the problem of how to reform the academy, we will be in good hands.

THE STATE OF RESEARCH ENDEAVORS:

VIEW FROM THE FRONTLINES

CROSS-DISCIPLINARY CONFIGURATIONS OF THE RESEARCH ENTERPRISE

Dr. Paul Cheney, Ph.D.

Smith Mental Retardation & Human Development Research Center
University of Kansas Medical Center

The goal of my presentation is to present a view from the front lines with a focus on the role of interdisciplinary research in today's research University. Most of what follows is based on my own experiences, but I have also drawn from some published articles on the topic of interdisciplinary research.

First let me introduce myself. I am a neuroscientist, specifically a neurophysiologist, with over 25 years of experience in the field. For the last 8 years I have been co-director (with Steve Schroeder) of the Kansas Mental Retardation and Developmental Disabilities Research Center and Director of the Smith Mental Retardation and Human Development Research Center. Interdisciplinary research is very important to our Center and something we try to foster.

Let me begin by trying to define interdisciplinary research. Interdisciplinary research means different things to different people. Webster's dictionary defines it as "involving two or more disciplines or branches of learning (integrating two disciplines as part of a single, unified effort), while "multidisciplinary" is defined as "having two or more disciplines." There is a subtle distinction that is often made between interdisciplinary and multidisciplinary which may not be apparent from those two basic definitions. Interdisciplinary implies a merging or integration of multiple traditional disciplines toward a common goal or problem. It requires communication among the disciplines. To illustrate this further, a medical center would certainly be viewed as multidisciplinary since it contains multiple disciplines but none of the efforts within the medical center would necessarily qualify as interdisciplinary unless members of the different disciplines worked together as a team on a common problem.

Enough about such subtleties. I would like to move on to consider some examples of interdisciplinary research. Of course, one of the basic premises supporting the concept of interdisciplinary research is that the individual disciplines have grown too large and too complex for any one individual to effectively master. Nowhere is this more true than in modern biomedical science. Some of the best and most successful examples of interdisciplinary research in the field of biomedical research involve teams formed by molecular biologists working with either behavioral scientists or systems (integrative) scientists.

Molecular biology and molecular genetics have taken center stage in biomedical research. One of its aims is to identify genes and their function. Identifying individual genes and their location on chromosomes is largely the territory of molecular genetics, for example, the human genome project. However, attaching function to individual genes is a much more

difficult undertaking. This requires participation of individuals who understand and know how to test function and behavior. Gene knockout models are currently an excellent approach to understanding gene function. Procedures are used to disable genes. Offspring with knockout genes can then be studied functionally and behaviorally.

An excellent recent example of the power and elegance of this approach is the recent work of an interdisciplinary team led by Susumu Tonegawa, at MIT. His team developed a mouse knockout model to analyze function of hippocampus in spatial memory. They developed a method for brain region specific/cell type specific gene deletion. Combining state-of-the-art molecular biology, electrophysiology and behavior in an interdisciplinary group of 16 investigators from 4 institutions, they showed that mice with a gene knockout disrupting NMDA receptors in hippocampal pyramidal cells have deficits in spatial learning and parallel deficits in LTP (long term potentiation) and place receptive fields. LTP is believed to be a fundamental process in learning and memory.

Another example is the use of a transgenic mouse model to study mechanisms involved in neuronal injury from HIV infection of the brain. An interdisciplinary group led by Floyd Bloom at Scripps Institute, San Diego, was able to insert the gene for a viral glycoprotein (HIV gp120) into the normal mouse genome, hence the term transgenic. Gp 120 is a HIV coat protein. Behavioral studies were able to demonstrate some classic features of HIV neuropathology in the brain and behavioral scientists showed cognitive deficits in the same mice.

Now let me turn to some examples from our own center (See Figure 1). We have recently developed a program focusing on neuro-AIDS. This is a highly interdisciplinary team brought together to study the mechanisms of brain injury from retroviral (HIV and SIV) disease. We are currently developing a non-human primate model of neuro-AIDS. To do this not only requires the efforts of molecular biologists and virologists to manipulate the viral genome but also several other fields to identify and document the functional consequences of brain infection and the extent to which the disease matches HIV disease in humans. Another successful example within our Center is a collaborative project focusing on aberrant behavior in people with mental retardation. This program benefits from a union of human behavioral scientists with neuropharmacologists.

EXAMPLES OF INTERDISCIPLINARY RESEARCH at KUMC

Molecular biologists team up with behavioral scientists and systems scientists

Kansas MRDDRC – Neuro-AIDS program

Neurovirology – Bill Narayan

Neuroimaging – Sol Batnitsky

Neuroanatomy – Nancy Berman

Neurophysiology – Paul Cheney

Neuropathology – Ravi Ragahvan

Behavioral Studies – Paul Cheney

Kansas MRDDRC – Aberrant Behavior Program

Human Behavioral Studies – Rick Saunders Neuroscience (rat model) – Rick Tessel

Human Behavioral Pharmacology – Steve Schroeder and Dean Williams

Figure 1

Another important category of interdisciplinary collaboration involves teams of clinical scientists and basic scientists. These teams are particularly important in addressing research questions related to disease. Some examples within our center are given in Figure 2. The basic scientists benefit from the clinician scientist's knowledge and experience with the disease; the clinical scientist benefits from the technical expertise of the basic scientist. These collaborations can also serve an important role in training young clinical scientists in the use of rigorous research methods. Two examples of this within our Center are given in Figure 2 in which Steve Schroeder and S.K. Dey are serving as mentors for Jessica Hellings and Jeff Riese, respectively. Finally, these teams can often compete more effectively for large program project and center grants. A recent example involving members of our Center is funding of the Pepper Center grant from NIA focusing on recovery of function following stroke.

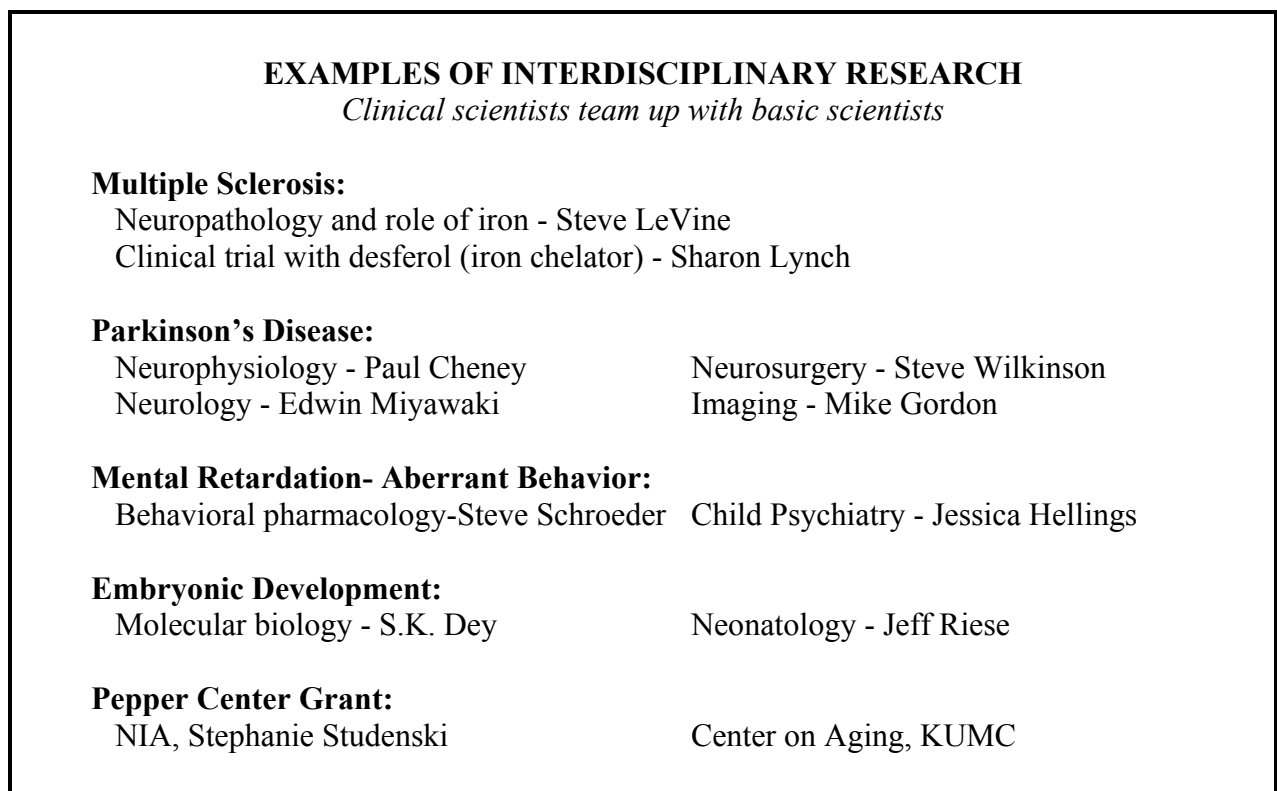


Figure 2

Why do interdisciplinary research? Many of the reasons are already apparent from discussions above but I have attempted to summarize them below.

- Most penetrating cutting edge questions require an interdisciplinary approach.
- Large grants (Centers and PO1s) almost always require an interdisciplinary program
- Brings national recognition and visibility to the parent institution.
- It's rewarding and more fun to work within an interdisciplinary group.
- Funding agencies (NIH, NSF) emphasize the importance of an interdisciplinary approach.

The essence of interdisciplinary research is contained within center grants and program project grants. One benefit that hasn't been mentioned so far is the prestige that Center grants bring to the Institution. For example, the Kansas Mental Retardation Research Center is one of 14 such Centers funded by NICHD. This Center puts us in very good company with such Institutions as Johns Hopkins, Harvard, the University of Washington, Vanderbilt, UCLA, etc. Interdisciplinary approaches have also been strongly emphasized by funding agencies in recent requests for applications. Often these announcements require an interdisciplinary team.

The nature of the research enterprise is clearly changing toward a model of interdisciplinary and multi-institutional collaboration and partnership. Examining authorship of papers in the journal *Science* is testimony to this trend. For example, a recent issue (May 30, 1997) published 14 original research articles. Of these, 11 were interdisciplinary; 10 of these were actually multi-institutional. Only three involved individuals from one department. This trend was also reflected in recent comments by pediatric cardiologist Mark Rodgers, Vice Chancellor for Health Affairs, Duke University, when he said

“The institutions that will succeed are those that can reorganize themselves to address scientific and educational questions in an interdisciplinary manner. The institutions that will have difficulty are the ones that keep the same rigid structure that prevents pollination among disciplines.” (From *The Scientist*, 1995.)

I would now like to turn attention to the issue of how to do interdisciplinary research. There are many different approaches to interdisciplinary research. Many interdisciplinary collaborations are informal consisting of individuals from other fields serving on grants as co-investigators or consultants to fill a particular need. Formal mechanisms consist of research centers, program project and training grants. Important elements of successful interdisciplinary collaborations are listed below. It is most important that all participants make a unique and needed contribution to the program and that all benefit in a tangible way from the collaboration. All participants must also receive appropriate recognition for their contributions. Failure to recognize the participation and contributions of others can lead to very serious problems. Contiguous research space is not essential, but an important factor in the formation and development of meaningful and effective collaborations.

- Informal mechanisms (consultants, co-investigators, etc.)
- Formal mechanisms (centers, program project grants, training grants)
- Common research theme or problem.

There are several issues related to fostering interdisciplinary research which must be considered. Of course, many collaborations are investigator initiated and need little or no fostering. Others may require some form of facilitation. This may take the form of simply pointing an individual in the direction of another person who has the expertise they are looking for or it may involve much more ambitious undertakings such as organizing and submitting major interdisciplinary grants (center, program project and training grants). Resources are a very important element in the later. Organizing a major interdisciplinary grant involving 5-50 professionals from different disciplines is very labor intensive. Such efforts need to be supported with staff to organize meetings, etc. Funds to support pilot projects can also make the difference

between success and failure. Possible scenarios for the inclusion of various categories of researchers in an interdisciplinary effort include:

- Funded versus unfunded faculty.
- Formerly productive faculty member who can no longer obtain funding.
- Productive, successful faculty member for whom there may be opportunities for collaboration.
- New faculty member collaboration or independence?

Caveat: Match making is a tricky business in life and in science!

Steven Benowitz considers some of the obstacles to successful interdisciplinary research in a paper published in *The Scientist* (9, No. 13, 1995). Successful faculty may view a new collaboration, regardless of how interesting or how rational it might be, as competing for time with their existing projects, and to that extent, compromising their current source of income. Another major issue is that although research centers target interdisciplinary research and are best prepared to foster its growth, most resources go to traditional departments. Resources consist of faculty positions and discretionary funds for research. If Centers are to survive and grow, this model needs to change. Centers need to have direct control over some positions and be provided with financial resources to have some impact on fostering research within the university environment. Institutions that do this will find that their Centers will flourish and compete successfully for major grants; institutions that ignore this will find that their interdisciplinary research programs and Centers will eventually fail.

Another major issue concerns publishing and tenure. The gold standard of accomplishment for a junior faculty member going for promotion and tenure is obtaining a federally funded grant as a principal investigator and getting the grant renewed. One problem is the amount of time available for this. The standard six year model is too rigid and offers too little time to effectively evaluate young faculty, especially those participating in an interdisciplinary research environment. Also, interdisciplinary research often involves participating in a program project grant with a senior investigator as the P.I. Such grants are often discounted in terms of importance by Promotion and Tenure Committees. This culture must change. Ultimately, egos and paranoia represent one of the most serious threats to long term, successful collaborations. All participants in a collaboration must feel that they are being treated fairly and given credit for their accomplishments. Other obstacles to interdisciplinary research include:

- Income issues: time spent developing collaboration may be viewed as non-productive.
- Distance barriers: different buildings, campuses, institutions.
- Overly competitive atmosphere inhibits sharing.

We believe that Centers are ideal models for interdisciplinary research. Several examples could be drawn upon to illustrate this belief, such as the KU Reproductive Biology Research Center or KU's Claude D. Pepper Older Americans Independence Center; I will focus on one, the Kansas Mental Retardation and Developmental Disabilities Research Center.

The basic model of a Center is one in which core technical services support the scientific, training and administrative activities of the Center. The scientific core support facilities are targeted to the mission of the Center and types of research that are conducted. These services are essential to the success of the Center. They provide technical expertise and training to a broad range of scientists in areas that help move research projects to the cutting edge. They also provide an ideal environment for young scientists, especially clinical scientists, because they offer a support system that is so important to the development of a successful scientific career in today's environment.

With this in mind, I would like to offer a formula or blueprint for a modern biomedical research center. Focus on a disease, condition or process provides a self evident mission and a mental anchor for lay people that is important in achieving an identity within the community. This can also prove to be very important in fund raising efforts. The center should contain a mix of basic and clinical scientists. Each brings important tools and expertise to the table and the most effective collaborations will certainly involve both. Dedicated space, while not essential, is a major factor in establishing the identity of the Center and provides a resource for the recruitment and retention of talented scientists. Partial funding of the Center's infrastructure is very important to the long term health and success of the Center. Federally funded center grants, in many cases, have not increased in the last 10 years in real or inflation adjusted dollars, and can no longer be expected to provide all the resources that are needed to run the center. Support for some of these services should be derived from other sources. Discretionary funds to support a range of center related research activities (pilot projects, interim support, equipment purchases, etc.) are also vital to the success of a center. There should be a shared commitment with departments for faculty positions.

Strengths of the research center model of interdisciplinary research are:

- Much more attractive for fund raising purposes.
- Center is designed to reach out to faculty in different disciplines.
- Brings people together who share a common interest in a particular problem.
- Provides a broader research experience for students.
- Overall, centers provide an ideal environment for research.

Most of these issues have been addressed, except fund raising. Compared to traditional departments, research centers can be very effective tools for fund raising.

Finally, let me conclude by drawing some conclusions from all this. First, I hope we can agree that there is continued and increasing emphasis on interdisciplinary research and that research centers provide an ideal environment for fostering interdisciplinary research. With this in mind, institutions should take a close look at their programs and ask if there is an area that would be enhanced by a more formal center/institute designation. It is also important to consider whether existing centers are meeting the goals for which they were established. There should be some periodic review of centers. Centers that are no longer productive or are no longer in step with current needs should be discontinued and the resources directed to more promising efforts. Centers should not continue to exist unless they are fulfilling their mission. At the same time, it is important to consider whether existing centers are being adequately supported. Without

adequate support as described above, it is difficult to expect a center to compete at the national level. A very important issue concerns faculty lines. Faculty are the most important resource a university has and if centers are viewed as important, faculty lines should be shared between centers and traditional departments. This will provide centers with some control over the direction of recruitments which is vital to the future the center. Recruitments should be targeted to build and strengthen interdisciplinary research groups that will support centers and be competitive for program project grants. Targeted recruitments can be designed to not only meet the needs of a traditional department but to also strengthen an interdisciplinary research group or center. Finally, research centers should represent a very attractive focus for fund raising. With limited potential for additional state funds and with most existing state funds going to departments, alternative sources of funds need to be pursued aggressively to support the needs of centers.

THE NEED FOR EXTERNALLY FUNDED RESEARCH

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Research at the Frontline

Picture a young faculty member who has just received her or his new appointment as an assistant professor in a scientific field at a major university in the United States. If you are a professor yourself, and one who has gone through the whole process of promotion and tenure, chances are that the image you conjure in your mind is that of a young professional torn by ambivalent feelings of a strong desire to succeed but filled with the fear that she or he may fail. You will immediately recall the many demands placed upon a young assistant professor, such as the need to teach courses that she or he has never taught before; to start putting together a research laboratory; to begin the planning and writing of research grant proposals; and to conduct research studies as if there were no interruption, no translocation into a new environment, no other demands placed on this young assistant professor, and no discontinuity in the availability of talented research associates who can collaborate with her or him in carrying out the research studies. Why am I focusing on the difficulties facing a starting assistant professor? The answer is that if I am to describe as honestly as I can the view from the “frontlines” about the conduct of research, I have to confront the demands that gnaw at us continuously about the need to excel in teaching, to participate in service to our institution and our discipline, and to conduct high quality and highly competitive research and scholarship. The beginning of one’s academic career in many respects represents the zenith during an academician’s life of feelings of uncertainty about the likelihood of success and of the urgency to be productive in teaching, research and service.

Of the three tasks that each academician is supposed to execute with great aplomb, the one presenting the highest risk in terms of an enduring academic career and the one for which the evidence of success or failure accumulates most slowly is research. The truth is that none of us knows whether we are talented enough to conduct high quality research, the type of research that will generate new knowledge, that will push the frontiers of our field forward, and that will be of value to the discipline for many years to come. It has been said by some that most academic researchers do not ever achieve the lofty goals described above during their career as researchers. The same individuals would also contend that only the research of a minority of academicians, most operating in some of the finest research universities in the country, can be considered truly imaginative and generative of new knowledge and new ideas.

I know these arguments because I was the recipient of such evaluative judgments. As I was leaving the research environment of a medical center where I received my training, the general expectation was that I would fail in my research efforts as a faculty member in a department of the College of Liberal Arts and Sciences in a major public university. “Too much teaching and too little time for research,” I was told, would doom my chances to perform any

significant scientific research. These are, of course, not the words that build confidence in a young professional starting on his first position in academia.

The truth, though, about any scientist or academician who is fully immersed in the conduct of research is that he or she harbors a significant amount of uncertainty about his or her scientific work and research career regardless of the comments made by colleagues. Uncertainty is a constant companion in the life of most researchers - uncertainty about whether they are falling behind in the use of the newest technologies, whether they are asking the right questions, whether their work will be judged to be sound and substantial or trivial and pedantic, and whether they will receive support to continue their research efforts. The key questions are, of course, whether faculty researchers ever outgrow these abiding feelings of doubt and whether constant concerns about the quality of one's research and the gathering of new information detracts from efforts to succeed as teaching faculty. The answer to the first question is that throughout their careers researchers retain the sense of uncertainty with which they started in research. Success in publishing one's work and competing for research funding does not eliminate the fear of falling behind in completing research projects in a timely manner, adopting the most powerful technologies needed in their research, pursuing questions that may not have a measurable impact on the field, or having that vital funding for the research discontinued. The most successful researchers are those who are not only possessed by such uncertainties, but who transform those uncertainties into a strong sense of urgency.

Experienced and successful researchers will readily identify an important parameter for success in research: timing. Even a few months of delay in deciding to initiate a research program in a particular area may determine whether an investigator will make an important contribution to the field, or the field will move past him or her. In highly competitive areas of science, a delay of a few months may eliminate the chance that one's ideas will dominate the scientific thinking in a given area. This is not merely a blow to a researcher's ego, it may be crippling to an investigator's research program. Those who determine the theme of scientific discourse also control the ideas about what represents important research and, ultimately, which research efforts should receive support, i.e. be funded. If one loses in the arena of ideas, then one most likely also loses in the competition for securing funds. Loss of success in obtaining research funding could very quickly destroy the research productivity and future research career of a faculty member. Successful researchers know how important the timing of completion of a research project is, and it is for this reason that they are working today on those ideas that they hope to see funded two, three, or four years from now. As a fellow researcher once told me, "Use today's money to prepare to ask for tomorrow's research money."

What many individuals in the business world frequently do not appreciate is that successful researchers are similar to successful entrepreneurs; they have a strong drive to succeed, a sense of urgency about grabbing onto opportunities, a fear that they may not succeed, but also a gambling spirit that they will be the ones who do succeed. Not all faculty members, of course, have this strong sense of urgency and gambling spirit, any more than all businessmen have a true "entrepreneurial" spirit.

If the conduct of research by a faculty member requires these substantial efforts that are well above and beyond the daily tasks of class preparation, lecturing to students, advising, and

performing service for one's department, school, university, or discipline, then why do faculty pursue research in an academic environment? A partial answer is that the process of discovery of new facts is very highly reinforcing to any researcher. When a prediction is made about the possible outcome of an experiment and the data gathered confirm the prediction, this is as dramatic a moment in one's life as having won a large sum of money in the lottery. This is why the success or failure of an experiment can cause rather dramatic changes in a researcher's mood.

A second reason for pursuing research studies within an academic environment is the fact that such activity reaches to the core of what academic life is, i.e., the close intellectual interaction between professor and student. The mentoring of graduate students and post-doctoral associates takes us back to the process of teaching used in the earliest universities established, the philosopher-teacher who lived and taught in a continuously interactive environment with his (it was almost exclusively "his" in the early days of structured universities) students. The conduct of research in an academic environment also involves the sharing of knowledge between professor and student or research associate, the demonstration of techniques for experimental design and execution, the joint planning of a tightly reasoned experimental attack into unknown territory, the teaching of all precedents and intricacies of the discipline that may predict the outcome of an experimental study, and the sharing in the happiness of new discoveries or in the deliberate redesign of the experiments in case of failure. In my experience, the direct personal interaction involved in designing or analyzing experiments together with post-doctoral associates and graduate students who work with me, as well as the process of mentoring these individuals on the intricacies of the conduct of experimental research, is frequently the highlight of my day. As someone who still works at the "frontline" of research while trying to function also as a faculty member and an administrator, thinking about and discussing research ideas with colleagues is still one of the most thrilling aspects of my duties as an academician.

It is true that many of these activities do not need to be performed within the confines of an academic institution. But, the opportunity to incorporate the newest observations and ideas from recent discoveries into my lectures to graduate and undergraduate students, transforms what could become a routine experience of teaching the same topic again and again into an exciting undertaking. In my years in academia I have observed that many excellent teachers are also outstanding researchers who derive pleasure by being able to transfer their knowledge and their excitement about their research areas to their students. In their way, these faculty researchers are paying their debt to society for the training that they received as students and post-doctoral associates and for the opportunities they were given to pursue this very high form of intellectual activity. These are the reasons, I believe, why so many excellent research scientists do not leave academia to pursue careers in research institutions or in research divisions of industrial companies.

What I have described above is the life of a faculty researcher, a life full of many wonderful reinforcers for success in the research arena coupled with many periods of self-doubt and worry. Accomplishments in this arena by any faculty member of a university, whether young or old, experienced or inexperienced, frequently come at the expense of having free time to engage in extra reading, social interactions, and just plain enjoyment of life. Planning and thinking about new experiments, executing the crucial experiments that prove or disprove an important idea, analyzing large arrays of data, putting intellectual order to the results of research

findings, writing up the results of the research endeavors in manuscripts prepared for publication or in proposals submitted to funding agencies does take its toll on the time that a faculty member has to pursue other interests. As a faculty researcher I can easily recognize those who are performing well in research and teaching. They are frequently the ones who are in their offices or laboratories late into the night, during weekdays, weekends, and holidays.

University Support for Faculty Research

It is not surprising that some of the very productive research faculty are impatient with colleagues who perform little research. The faculty who have structured and manage very active and competitive research programs are sometimes perplexed by the expectation that they and their cohorts who do not carry as many burdens should share equally in the distribution of both reinforcers (primarily merit pay increases) and teaching or service burdens. Some of these very active researchers may also feel that the administrators of their academic units or of the university do not appreciate their contributions, or are too willing to judge their worth to the academic unit and the university solely on the amount and extent of undergraduate teaching and advising that they perform. If a university values the contributions of its research faculty and the dedication that most of them exhibit in the pursuit of excellence in both research and teaching, then it should provide substantial and clearly distinguishable reinforcers to the productive research faculty and should modify some of the expectations with respect to the amount of teaching and advising that they perform. It is not necessary that a university pamper these individuals, rather that it frees some extra time for active researchers to pursue the conduct of investigative work.

What should a major research university do so that the likelihood of success of the research faculty is enhanced? In my opinion, this begins by providing an adequate “start-up package” to newly hired faculty, especially to faculty researchers in scientific areas that need expensive instrumentation and supplies to set up a research laboratory and initiate a research program. Given the very high competition for research funding that exists currently in the United States, we should not be thinking only of providing adequate funds for the purchase of instrumentation and supplies for the laboratory of a new faculty member, but also of providing support for the hiring of research assistants and associates for a two year period. Individuals who can perform the experimental work while a new faculty member works hard at writing grant proposals to receive external funding or while she or he is putting together the materials for new courses, is an almost absolute necessity. In addition, recognition of the enormous amount of effort that it takes to get a research program started and funded, most universities should make it a policy that the expectations for teaching during that first, critical year in the life of an academic researcher, are minimal. A faculty member who has to prepare for two or more new courses that he or she may have to teach during the first year at a university is a faculty member who is not likely to pursue research grant funding very vigorously, let alone succeed in receiving such funding.

The first few years in the career of faculty researchers are the most crucial in determining the future productivity and success of these individuals. A research program that operates with minimal funding and is operating in spurts of activity followed by inactivity will never become a solid platform on which future accomplishments can be based. If a university truly values the

research talent that it has managed to attract to its ranks of faculty members, then it should create all conditions for guaranteed success. This should include providing well-planned mentoring of the new faculty members by accomplished research faculty as well as readily available assistance in research grant preparation and review prior to submission to funding agencies. Success early on in a faculty member's career begets success for the long run.

It is obvious that the approaches that a university takes to cultivate its research faculty should not be restricted solely to efforts made to enhance the success of the newly hired faculty. As important as any "start-up" package that a university might put together is, the creation of a "research-supportive" environment is equally important in attracting and keeping research faculty in a university. What characterizes a "research-supportive" environment are some of the things described above, such as reinforcing faculty who are active in research and setting up differential levels of teaching obligations. A "research-supportive" environment should also include the creation of facilities and services that enhance research productivity. Universities need to make major investments in the purchase of shared instrumentation and the establishment of modern computational facilities, the provision of special services such as statistical consultants, instrument design laboratories, laboratories that perform sophisticated measurements in the physical and natural sciences, and support staff for establishing liaison with funding agencies, preparing manuscripts and grant proposals, managing budgets, and preparing materials for effective communication. Furthermore, as funding from the federal and state governments is diminishing, another important aspect that universities need to include in creating a "research-supportive" environment is that of providing staff with expertise in negotiating contracts with the private sector for the support of research, in fostering technology transfer efforts from universities to private companies, and in protecting the intellectual property of the faculty and the university through patents and license agreements.

The Need for the Pursuit of External Funding for Research at a University

The creation of excellent research programs within the university community of faculty researchers requires very substantial investments which undoubtedly diminish the pool of funds available for other needs of a university, possibly even constrain some investments made in the area of instructional improvements. This poses a great dilemma for most comprehensive universities. The issue, of course, is why should a university make these substantial investments in the research sector. The answer is based on what the mandate of a comprehensive research university is. The conduct of research and graduate training are two key components of this mandate. Extended a bit further, one may argue that the reason that society gives faculty at universities the right to earn life-time tenure is because it expects them to pursue the generation of new knowledge unhindered by political or social pressures. Tenure is not granted merely for the purposes of performing good teaching. But, as outlined above, the conduct of research requires very substantial investments and it is for this reason that both public and private funding for research is being pursued vigorously by all major universities.

It is nearly impossible for a comprehensive university to train graduate students in the physical, natural, behavioral, or social sciences without adequate funding for the conduct of original research. There are few programs in those fields that can attract graduate and post-graduate students solely on the basis of offering excellent theoretical training without any

component of laboratory or applied scientific research training. If one assumes that students are attracted to the programs that offer the best opportunities for “hands on” research training, then not only should those programs maintain active and well-funded research, but they also need to have established well-funded graduate training programs. Thus, a key ingredient of a “research-supportive” environment is the partnership between government, private sector and universities in the funding and support of the training of graduate and post-graduate students in the disciplines represented in a comprehensive research university.

Success in achieving external funding to assist in the establishment of vibrant graduate training programs depends heavily on the presence of faculty who are active and well-funded researchers and who direct vigorous research programs. The majority of the faculty in academic units with successful graduate research training programs are tenured for life, as one would expect for truly accomplished academicians who have succeeded in all spheres of academic performance. Yet, it has frequently been pointed out that the most dangerous aspect of tenure is the feeling of self satisfaction and the slow but progressive diminution of the efforts of the faculty to be bold and to work hard to discover new horizons for their disciplines. Although, in my experience, most faculty members do not retire “on the job” just because they have received tenure, there is some truth to the observation stated above. There is certainly no magic bullet to cure creeping complacency in the post-tenure period. Not even devotion to research can guarantee the prevention of slowing down in one’s dedication to the pursuit of new knowledge. However, if one subjects himself or herself continuously to the scrutiny of their peers, especially their peers outside their own university, there is a greater probability that she or he will remain current in their knowledge and research skills. This is one of the major reasons why faculty should never stop conducting research or having their research papers and grant proposals reviewed and evaluated by the community of researchers around the nation and the world. Subjecting both one’s own research program as well as the graduate training programs of the department to a peer review process may be the only antidote to complacency and slow drift to a state of irrelevancy. Therefore, the need to pursue the funding of vibrant and successful research and training programs should be a characteristic that spans the entire career of a faculty member, from the shaky first steps into the world academic research by a young assistant professor to the more secure and confident walk through programmatic research by a seasoned full professor.

TEACHING AND RESEARCH: A FACULTY PERSPECTIVE

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Introduction: Background and Influences

Addressing issues as they relate to teaching demands on the researcher is much like the advice I once received from my father when I was ready to purchase my first house. The three most important things are: location, location, location, he said. The parallel as it relates to teaching and research, is time, time, time – a scenario that I believe we will hear more than once during these discussions.

My thoughts and perhaps philosophy have been molded by the institutions that I have been associated with during my academic career, and perhaps to some extent, the thirty plus years I have been a teacher and researcher. My undergraduate degree is from Miami of Ohio, then a liberal arts college of about 8,000, with no graduate degree programs, but a botany faculty that prided itself in having undergraduate research participation. As I recall, none of the faculty were extramurally funded. The pride component is important because in my class of undergraduate botany majors that totaled 16, 15 went on to obtain Ph.D.'s. From Miami, I moved to the University of Illinois for doctoral work. The botany department there was modest in terms of extramural funding, but nonetheless had a strong tradition of graduate education. Following this was a year at Yale as an NSF postdoctoral fellow with no teaching responsibilities.

My first academic position was at the University of Illinois at Chicago, a new campus, with what seemed to be unlimited funds for equipment. The Illinois Circle campus Biology Department was a large (35), interesting mix of young turks who thought only of research, and a carryover of faculty (many with terminal MS degrees) who had little or no interest in research. To say that the faculty meetings were lively is an understatement. Despite the antagonism, the undergraduate biology students received excellent training. My next position was a two year stay at Ohio University in rural Athens, after which I accepted a position at Ohio State University. This job included not only chairing a twenty person department, but also keeping my research and teaching program viable. With about 46,000 students at that time, Ohio State had graduate programs in all departments, but a relatively modest research enterprise of about \$60 million. I served on the Board of Directors of the Ohio State University Research Foundation at a time when there was a determined effort to increase research and extramural funding. (Being at KU now, I feel a strong sense of déjà vu.) Two things stand out in my memory as major impediments to progress toward our goal:

1. There was an inherent culture that separated teachers and researchers. Those were the days in when you could be one or the other, but not both, and to a certain degree, that philosophy was promulgated by the administration.
2. There were ample internal funds from the state that meant that the solicitation of extramural funds were often not necessary.

To a large degree, researchers were isolated and there was little attempt at coordination among units and researchers. This was also the phase in history when universities believed that they could be all things to all people. Today, each of us might rank Ohio State with the Big 10 (now 11) for research; but I would venture to say that few of us would include Ohio State University in the same category with Michigan, Illinois, Northwestern, Wisconsin and Indiana. Some of this perceived underachievement is a result of faculty attitudes surrounding teaching and research.

How does all of this relate to the importance of time in the teacher/researcher scenario? Allow me to offer some comments that I believe partially address this issue.

Continue to Change the Culture

It has always been my belief that all faculty must engage in research and scholarship, and participate in the solicitation of extramural funds that variously support the unit (defined here as the department). When I first chaired a department many years ago, I naively believed that every faculty member needed to apply for research funding from institutions like NIH and NSF in order to support all of the activities that we have come to associate with graduate education.

I now believe successful administrators need to be far more cognizant of where an individual may be in his or her career, and what the strengths of that individual are. Further, the administrator needs to substitute flexibility for increasing faculty frustration so as to search for alternative methods of supporting the unit. Examples of alternative support for graduate education research would be programs such as Research Experience for Undergraduate Students, various forms of summer institutes for K-12 teachers, in-service programs and workshops, minority recruitment funds, contracts, endowment association assistance, etc.

The flexibility to adjust expectations during a faculty career is critical as it relates to supporting the research enterprise of a unit. One important key is that when someone opts to increase teaching at the expense of research, everyone in the unit is still rewarded. This action can take on a more positive “spin” when viewed as giving someone else in the department the opportunity to have increased time for his or her research. At KU, the ability to adjust a faculty work load following the granting of tenure, is an important component of this flexibility and is a strength of the institution.

Expectations

If we add to my initial premise (related to available faculty time) the fact that not everyone possesses the same talent profile, an equally important component in this discussion becomes what I call “performance expectations.” At every institution during my academic career, I was required to annually submit a list of papers published and presented, grants written and funded, courses taught (including student evaluations), membership on committees, etc. Before I arrived at KU, the Systematics and Ecology Department that I now chair had taken the faculty evaluation concept and turned it into a new “art form”: it provided points and fractions of points for everything a faculty member might do during the year. One inspired colleague asked me if he could get an additional 10 points for obtaining a sabbatical leave this year! This must

illustrate a new faculty concept of increasing one's merit by being away from one's institution, and will, no doubt, appear soon on the opinion pages of the Chronicle of Higher Education!

Perhaps a more accurate faculty evaluation relative to teaching, service and research activities is one that begins with the development by the chair and the individual faculty member of a list of expectations for a specified period of time. The subtleties of such a system, I believe, decrease the conflict between teaching and research, and perhaps most importantly, decrease the frustration level of everyone who is being measured.

While our current system of annual evaluation rewards individuals via merit, perhaps an alternative is one in which the unit (department) is rewarded. This provides the opportunity for all faculty to share in the success of the unit, and, I believe, decreases the dichotomy in faculty time that is devoted to the teaching and research missions of individuals. The downside is an increase in administrative time for department chairs. In a very real sense, each unit has a variety of functions to perform that include teaching, research and service, in the very broadest context. We typically deal in the currency of weighted student credit hours measured again faculty FTE, etc., and of course there is some administrative expectation about number of courses taught per faculty member. The flexibility of differential faculty workloads will continue to allow faculty to be used where their talents are best suited. While we assume that we make excellent choices in hiring and granting tenure, the fact of the matter is that not everyone moves along at the same professional pace. The research enterprise of an academic unit is multifaceted and can better use the talent of all faculty, but with different expectation levels.

Mentoring and Graduate Education

One of my favorite concepts is mentoring, whether at the undergraduate or graduate level, or for junior faculty. While we all purport to become better mentors, the concept actually gets little more than lip service; as such, our graduate programs continue to train students pretty much as we were trained, directing many to careers in the academy. We collectively do an even poorer job in mentoring junior faculty. Having just spent some time evaluating faculty for three year reviews, I can attest to the fact that in some quarters, the level of expectation has not been delivered, and obviously has not been heard by the faculty member in question.

There are distinct market factors at work that, to some degree, will dictate how graduate students are trained. Faculty expertise in teaching and research as it applies to graduate education now necessitates extensive collaborative attention, yet our graduate programs are still pretty much unchanged. Graduate degrees that are truly interdisciplinary - where perhaps several students obtain advanced degrees while working together on aspects of a single topic, but from highly different disciplines - will be the norm of the future. For example, having just spent some time in western Kansas (and with some intimate knowledge of feeds lots, as a result of the Chancellor's 1997 Bus Tour), I know that water quality and quantity issues in that part of the state are important. Policy decisions regarding economics, geology (ground water reserves and uses), biological diversity and wetlands, water chemistry and pollution might all contribute to a research topic that involved teams of students from different traditional disciplines, all contributing to a fundamental series of research questions.

There is nothing really new about such an idea, but still, there are relatively few examples one might point to in higher education where radical changes have been instituted in how we train students and in the focus of their work. To be sure, funding for basic and applied science will eventually dictate that this dimension be added to faculty scholarship and teaching profiles. Why is this type of training germane to our discussion? Because some faculty can be more effectively utilized within such a collaborative activity than they currently are as “individual operators.” Paying less attention to who gets the “points” for having the graduate student decreases the conflict and increases efficiency in training; and, oh yes, turns out a far better product for what we anticipate the future will require.

Hiring and Tenure

The faculty job description has changed and will continue to change in the future. Not all hires are going to be successful teachers and researchers. Increased scrutiny and difficult decisions will have to be the norm when granting tenure. In my opinion, there is no dichotomy between teaching and research; they, together with participation in other aspects of the academy, are what make this profession such a wonderful endeavor. Within the biological sciences at KU, hundreds of undergraduate students actively participate in research laboratories side by side with faculty mentors. I am confident that this experience is what motivates many of these students to select careers in some facet of science. Is the one-on-one interchange with the faculty member a form of teaching, or of research, or of both? The answer, of course, is both, and much of what faculty members do falls within the scope of this “both” category.

Excellent hires must be coupled with tenure decisions that insure retaining faculty who are able to continually change in a changing university landscape. The opportunity for departments to be well positioned for these (certain) upcoming changes will come about only if administrators make decisions that provide flexibility in faculty assignments. An important step in this process is convincing faculty that job descriptions will continue to change. Part of the responsibility that goes along with the concept of tenure, is adapting to, and accepting such changes along with the associated accountability factor. Undoubtedly, various forms of change will be incorporated into the University’s research and teaching mission of the next century.

Finally, the University can no longer be all things to all people. While this is not a novel idea, we rarely witness the collective courage to make truly meaningful changes. For example, a department’s mission could change from providing a combination of teaching and research to focusing entirely on instruction. The increased centralization of certain aspects associated with the research enterprise (such as a research foundation) will greatly help to focus on the research mission and to develop research agendas throughout the entire University. Critical to meeting the needs of the research enterprise in the twenty-first century is a centralized graduate school with uniform admission and exit standards, stable infrastructure support, and University-wide coordination and counsel as we re-engineer what will constitute graduate degrees in the future.

Summary

Faculty must continue to appreciate that the job description will always be in a state of flux. Administrators will have to become better people managers who strive not to measure

performance against some universal standard, but rather to assist faculty in defining their niche within the unit, and then addressing performance accountability.

We need to take to heart the concept that the University cannot be all things to all people, and that difficult decisions will have to be made that dictate which programs will be supported and which will be reduced or eliminated. In the final analysis, there is no conflict between teaching and research. Both are necessary components of a modern university. The challenges we all face is to anticipate where disciplines will move in the future in order to answer increasingly complex questions, to be better managers of people and resources, to better communicate our ever-changing role in society, and to insure that the students we train have the necessary skills to effectively meet the demands of the next century.

ADVOCACY ISSUES SURROUNDING EXTERNALLY-FUNDED RESEARCH PROGRAMS

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Background, Assumptions, and Introduction

My teaching and research interests are government regulation, public policy analysis, and lobbying. That is, I teach and study the process by which government reaches decisions, the extent to which those decisions are the products of policy analysis or political power, and how one goes about influencing legislative and executive decision making. I am the author of a law text book on “Regulatory Law and Policy” and I teach a clinic focused on how to be an effective lobbyist. Before I begin teaching, my practice involved public policy analysis and advocacy, and I continue to consult occasionally concerning these areas.

Considering this background, I am particularly interested in one of the topics for discussion in this retreat: “the need to educate the public . . . as to the highly technical substantive and financial realities of today's externally-funded research programs.” More specifically, I have the topic of “Advocacy Issues Surrounding Externally-Funded Research Programs.”

I will begin with this assumption: A successful research program requires both externally-generated funding and adequate state support of the research infrastructure. In my talk, I will defend the following perceptions:

- Obtaining and maintaining adequate state support requires the use of sophisticated advocacy techniques and skills
- My university and others have failed to employ the advocacy tools that businesses and others employ to obtain their goals. Worse, some of what we now do is positively harmful to our aspirations.
- This failure has several causes, including the fact that typically no top level administrator, with the necessary experience, is in charge of public advocacy. In other words, the responsibility of “managing” a public university includes the responsibility to manage the outside environment. University administration needs to be better at this function.
- The remedy is to adopt the corporate model of advocacy that assigns a vice-president to be in charge of governmental affairs, which helps ensure the coordination of internal management and external advocacy.

The Corporate Model

My starting point is the corporate model. In his book, *Fluctuating Fortunes: The Political Power of Business in America*, David Vogel, a professor of business and public policy

at Berkeley, has written about the history of the corporate model of government affairs. Vogel explains the legislative successes of environmental groups, labor unions, and other progressive forces in the 1960s and early 1970s. This is of interest because conventional political theory predicts that business forces will have greater political influence than others who are not as well organized and financed. Vogel attributes the failure of the business community to stop legislation to the fact that the business community had little or no representation in Washington. In the 1950s, business simply had its way in Washington, without the necessity of having a significant lobbying and public relations presence.

Vogel attributes the political resurgence of the business community in the 1980s to the substantial corporate commitment to all forms of public advocacy. The capstone of such efforts is that almost every American business of any significance has a vice-president in charge of an office of "Government Affairs". This move is important for two reasons. First, it ensures that a top level manager is in charge of the ground troops -- the day-to-day lobbying and public relations efforts. Second, it makes it possible for the corporation to integrate internal management with the way that they handle external public affairs.

The Public Manager

Philip Heymann of the Harvard Law School and the Kennedy School of Government recognizes these lessons in his book, *The Politics of Public Management*. The book is for persons who become administrators of government agencies. He argues that such persons conventionally think of management as involving internal management, but management of external relations is even more important in a public organization. He explains:

To a far greater extent in government than in a private corporation, the power to control major management decisions is shared not only with superiors, colleagues, and subordinates, but also with others outside the organization who also have power to share its future and goals. That is called democracy. Each of these outsiders has his own views of what should be done and how. There is no agreed-upon bottom line, such as profit or share of the market, to define success. Only in government is an individual's success so often measured by his ability to influence what an organization will regard as its task, not by its success in carrying out a generally accepted set of goals. Similarly, the willingness of crucial outsiders to support the agency will depend as much on their appraisals of its choice of goals as on its execution of them. (Heymann, p. 13)

Heymann's insight rings true for me. Our ability to achieve our internal goals depends heavily on whether those goals also have public support. Equally important, we can do a bang-up job of achieving our goals, but unless the public agrees that they are the right goals, we will receive little credit and support for what we do.

This insight is important because of the public skepticism about the functions of government. While any of us in this room can talk for hours about the benefits of public education for our students and our states, the simple fact is that the public and many legislators do not share this viewpoint.

Heymann's other important insight is that the public manager can influence the public's choice of goals. This is a key thought because it establishes that universities, or any similar public institution, need not be a passive recipient of political fortunes. Heymann then offers a way of modeling or picturing the external environment that suggests what public managers can do to be influential in the legislative process. I would like to turn now to Heymann's model.

The Legislative Process

As the enclosed chart indicates, Heymann explains the legislative process as consisting of six steps:

- Step 1: What motivates legislators and influences decisions?
- Step 2: What activities influence these motivations?
- Step 3: Does an entity have a comparative advantage in influencing votes as compared to the advantages of its opponents?
- Step 4: What Resources does an entity have to have to influence votes?
- Step 5: How can the institution develop additional resources?
- Step 6: What is the impact of legislative rules on legislative decisions pertaining to the entity?

This model offers a rich and complex understanding of the legislative process. Today I can only touch on several aspects that are particularly relevant to my topic.

Legislative Motivations

Legislators are influenced by a multiplicity of factors including how a vote will affect the chances of their reelection, and their view of what is public policy. Any vote can implicate all six dimensions, and there can be a tension between the ways in which the six dimensions pull the legislator.

Activities

An organization can engage in several activities that affect the factors that motivate legislators. The state of Kansas had a rare event this year. There was a substantial budget surplus. This was therefore the ideal time to seek additional funding, and the Board of Regents made a halfhearted attempt to do so. Ultimately, this effort was unavailing given the tax-cutting mood of the House of Representatives.

I draw this lesson from our failure. As Heymann teaches, good timing can win votes, but there are other things that must be done as well. The Board of Regents was not ready to put on the type of lobbying campaign that the budget surplus warranted. In particular, higher education lacked a message specifically to counter the tax-cutting sentiment. As indicated, two of Heymann's activities are the design of a legislative initiative and the timing of it.

The University's lobbying efforts are governed by the Board of Regents. But if the

University had as a senior executive official someone in charge of government affairs, he or she could make it a priority to convince the Regents to be more flexible and timely in setting a lobbying agenda. Moreover, if this person had prior experience in the business world, he or she would be more likely to accomplish this goal. The University could also form a Board of Advisors, which would be composed of corporate lobbyists and others with relevant experience. This would be a resource that could assist the Regents, as well as the University, in setting lobbying priorities.

Comparative Advantages

The difficulty for universities becomes more obvious when we move to step three and begin to assess the resources that higher education has in influencing the legislative process. The state budget is a limited and shrinking pie, and as compared to other claimants, higher education is lacking in resources merely to maintain, let alone increase, our share of the budget.

Current Resources

Consider our resources. Only a few legislators are from districts containing universities. Moreover, the leadership of the House of Representatives is extremely hostile to government as a whole, and they are no particular friends of the University. Thus, we lack what Heymann describes as the ability to bargain (bargaining) and the ability to call on leaders in key positions (centrality).

I would argue that, at least at the University of Kansas, we also lack the capacity to persuade. Our lobbyists simply lack a deep understanding of what it is we do. This not because the lobbyists lack skill, but because they are not enmeshed in the day-to-day life of the University in the way that a Vice-Chancellor for government affairs would be. Moreover, the current lobbyists seldom, if ever, call on faculty to explain themselves. Indeed, I believe that they regard faculty as an embarrassment. They are deathly afraid that if a legislator ever met a faculty member, the legislator would never again vote for our appropriation. As a result, legislators gain their impression of the University primarily from knowing our lobbyists, and perhaps an occasional meeting with a University administrator. This is not a setup that is likely to educate legislators about why faculty, and particularly researchers, are important to the state's future.

Future Resources

Heymann's final notion is that legislative success comes when an entity seeks additional resources to augment the ones it already possesses. An entity can try to put its supporters in key positions of power, but this is an unlikely tactic for universities. However, we can change legislators' attitudes and beliefs, and the beliefs and attitudes of voters.

Let me offer a brief example of how this can be done. The Kansas Trial Lawyers Association (KTLA) has done well with its legislative agenda in the House of Representatives. How can this be? Tort suits and trial lawyers are hardly popular among conservatives, whose main base of financial support is usually the business community. KTLA, however, stressed that

the entire point of the tort system is “personal responsibility” and that the various roadblocks that prevent plaintiffs from recovering damages deter personal responsibility. This approach recognizes the values of its audience and speaks to what concerns them.

The goal of changing legislative and public attitudes has several implications for universities. First, public relations matters. Second, public relations must be coordinated with a university's legislative objectives and lobbying efforts to be effective. This requires university leaders to choose topics and themes for their speeches and talks, and to constantly reemphasize these themes to educate both the public and its legislators. In politics, saying something once or twice will not work. The same theme or idea must be repeated again and again. I do not perceive that university administration takes this approach to its public education efforts.

Another important point is that universities cannot send mixed messages. Someone has to be in charge of vetting what the University says and does for consistency with its legislative efforts. Allow me an example. The Endowment Association of the University of Kansas just announced that it is purchasing a new plane for the Chancellor and others. The press release explains that because the engines on the existing plane can no longer economically be rebuilt, the Endowment Association found it more cost-effective to purchase a new airplane. So far, so good. But the Endowment Association chose to replace the existing propeller airplane with a \$4 million private jet. I frankly do not know whether the University needs a jet instead of another propeller airplane. What I do know is that this a significant public relations problem.

Faculty and administrators understand that the state should provide the basic infrastructure for the functioning of our universities. Additionally, we know that private funds are given to provide a margin of excellence. Finally, we all know that the University of Kansas, like other universities, is always seeking additional support from the legislature. Our explanation that we are lucky to have generous alumni whose directed gifts improve the university's circumstances seems to go unheard by many of those who are divvying up the financial pie. To them, money is money; they reply, AYou can't need money all that badly if you can afford a \$4 million airplane.≡

There are ways that the story could have been presented to reduce the damage, but to an outsider, it appears that no one recognized the importance of defending the choice of the more expensive jet plane over the significantly less expensive propeller plane. Better yet, if the University had someone in charge of government affairs, that person might have tried to head off the purchase altogether.

Spinning Is Best Left to President Clinton

By now, I suspect you may be appalled at the idea that I am urging universities to engage in what politicians call “spinning.” As Debra Stone, a political scientist explains, politics is about telling stories. My contention is that it takes a good “story” to compete against the other stories. We did not make the political system and although we would probably like to reform it, it is not going to change any time soon. Thus, the reality remains. Unless we have a good story, we will get left behind. Indeed, we have gotten left behind.

Spinning has gotten a bad name because it is associated with the idea that any goal or end can be sold if you put the right spin on it. I do not believe this. Unless you have a good story to tell, the public and the legislature will see through what you are trying to do, at least a good percentage of the time.

But we do have a good story to tell. The problem is that we do not know how to tell it. And until we address this problem, I see little hope to escape the creeping mediocrity that is slowly infecting our efforts to do good teaching and research.

THE STATE OF RESEARCH ENDEAVORS:

VIEW FROM THE ADMINISTRATIVE LEVEL

Larry Clark, Ph.D., Dean
Arts and Sciences, University of Missouri-Columbia

The Apparent Teaching/Research Conflict

I believe much of the rhetoric that has suffused the debate about the conflict between teaching and research is based more on myth than on reality; however, these myths are persistent. One recurring belief is that the university's reward system is out of kilter. (Interestingly, one can hear this charge leveled against both "sides" of the argument). I believe we do a reasonably good job of rewarding both **outstanding researchers** and **outstanding teachers**. Conversely, we have little problem in withholding rewards from researchers and teachers who are clearly nonproductive. Not unreasonably, however, the bulk of our faculty fall somewhere between these two extremes, and the problem with our reward system is that we find it difficult to evaluate **both** activities in any meaningful fashion.

The question we need to ask is simple: Is teaching seen as an adjunct to, an integral partner with, or an intrusion upon the research enterprise of the university? The answer is complex and ephemeral, depending upon the individual researcher and the nature of the institution where he/she works. Nevertheless, much of the apparent conflict between teaching and research grows from our attempts to pigeon-hole these activities into separate percentages of faculty time rather than to see each "job" as an integrated whole.

In my view, faculty who choose to work at major research institutions, by the very nature of those institutions, are responsible for the "scientific literacy" of **all** students, not just those fortunate enough to "assist" in a faculty laboratory. Our research faculty must help us decide what that highfalutin term means and be willing to accept responsibility for seeing that students have the opportunity at the very least to learn how to find solutions for problems that are scientifically based. The research enterprise must be integral to the teaching enterprise, and vice versa. We commit resources and provide opportunities for faculty to do research primarily because we think students - undergraduate and graduate alike - will be better educated in that atmosphere and under the tutelage of a cadre of active researchers than they will at an institution where the faculty may read avidly about research but do almost none of it.

Faculties of departments at major research universities must exercise their responsibility to ask tough questions about the research enterprise. Nothing is exempt: Not the nature of the questions scholars and scientists undertake to answer; not the potential impact of research on the discipline; not the implications - if any - inherent in the source of funding for the research; and not the relevance of the research to the curriculum of the particular department and university within which it occurs. On the other hand, the research community of scholars has the same responsibility to ask equally tough questions about the way students are taught and the

curriculum that underpins that portion of the business of the university. Once these important responsibilities are accepted, the line between teaching and research blurs.

The Increasingly Interdisciplinary Nature of Research

Putting together interdisciplinary teams to find solutions to broad research questions is rapidly becoming the *sine qua non* for obtaining large grants in the hard sciences and the social sciences. Since I spend much of my time trying to erase the barriers created by the hard lines that have been drawn between disciplines and departments, I have become convinced that the department is no longer an administrative unit that can successfully manage today's academic enterprise.

In a flight of fancy, I once mused: What if we stripped departments of all administrative responsibilities except those best relegated to that level, such as the keeping of payroll and personnel records? We could deposit the names of all faculty in a large drum and draw out at random the number deemed to be the ideal size for such an administrative unit (say, 25?). The first group might be called the "Eagles," the next group the "Bears," etc., until all faculty were so assigned. It would then be up to faculty to find their own colleagues for all other aspects of their jobs that need collegial support. For instance, each person might associate with one particular group for research and quite a different group for teaching.

An interesting side question would be which group ought to be responsible for decisions about promotion and tenure. I would argue that the randomly assigned unit would be best, for unless faculty can convince colleagues who know little or nothing about their specialty of its value, their contributions to its knowledge base, and the effectiveness of their teaching, they may well not deserve advancement.

In all seriousness, tenure is not an entitlement; it must be earned and justified. If the very concept of tenure is to be preserved as a viable contract between faculty and the institution, we need to find ways to make our evaluation system less esoteric and to continue serious evaluation of faculty work after tenure has been granted. To do less will eventually lead to the undermining of public confidence in the university as a whole. By the same token, research is more often than not a multidisciplinary effort, and the best place to evaluate individual contributions to a project will probably not be the traditional department. In fact, the collegial research group may well shift from project to project, and individual faculty members may migrate to several groups during the course of a career.

Andrew P. Debicki, Ph.D., Dean
Graduate School and International Programs, University of Kansas

Any discussion of research goals and patterns must take into account changes currently occurring in graduate education, since graduate students comprise much of the staff of research activity on the one hand, and represent the researchers of the future on the other. In addition, teaching and research activities are inextricably connected parts of the process of learning, of discovering knowledge.

National conversation about graduate education has stressed, recently, concerns about the overproduction of Ph.D.'s. In many fields of the natural and social sciences, such overproduction is probably overstated: actual unemployment is low. But increase in "supply" has led to increased use length of post-doctoral appointments preliminary to eligibility for tenure-track academic positions. It has also led research universities, in the humanities and social sciences, to demand previous full-time teaching experience as well as significant research accomplishments of candidates for tenure-track assistant professorships. All this makes the progress to an academic career longer and more arduous. In some cases, it leads graduate students to do a "cost benefit analysis" and leave at some point (the M.A. level, the early Ph.D. level) for more lucrative or earlier careers outside the academy.

An additional issue, raised by Brian Foster, is that most positions in academia that will become available in the future will not be at Research I institutions, but rather at four-year colleges, community colleges, and comprehensive universities. Faculty members mentoring Ph.D. candidates should realize that they are preparing them for positions at such institutions more often than for positions at institutions comparable to their own. This suggests that they should pay attention to various skills in teaching and service, and also offer guidance on the variety of academic institutions to which a graduate might apply, and the advantages and disadvantages of all of them. (And to avoid communicating a sense that any position outside of a major research institution constitutes a career failure.)

In many disciplines, mentors should be alert to the career opportunities available outside academia – in governmental organizations and in industry. Mentoring and guidance of doctoral students, as well as the breadth of training recommended in the COSEPUP Report, are ever more important in the current setting. Also important will be each program's continued assessment of its graduates, and of their placement and career as they move on beyond their degrees.

Brian Foster, Ph.D., Dean
College of Arts and Sciences, University of Nebraska-Lincoln

My central theme is this: we have to learn to do high quality research and train researchers without dishonoring everything else we do. This is going to be the key to the success of research universities in the next decade or two.

Research universities have many constituencies which make legitimate, conflicting demands. We:

- train K-12 teachers
- provide post-graduate professional education
- train technicians
- provide non-credit professional development training
- train R&D people for industry
- train basic researchers
- do undergraduate education in arts and sciences
- do undergraduate preprofessional education
- train the post-secondary professoriate
- provide support for government (e.g., policy analysis)

All of this and much more is part of the mission of every major research university. In fact, for much of it, the research universities are the main (even the only) providers (e.g., post-baccalaureate professional education, training basic researchers and high-end R&D people, training the professoriate). Moreover, providing good undergraduate education is a prerequisite for being allowed to do the things for which we have an exclusive franchise.

But what have we done? We have honored research above all else except perhaps graduate education. Even in graduate programs we pretend to focus mainly on training research faculty for research universities--at best a distortion of our role in training the professoriate. We've dishonored undergraduate teaching, which has become punishment for not doing research. Service to the institution and society is ignored in our reward systems. All resources are skewed toward research. I think this is wrong as well as suicidal. We must do at least a credible job with our important obligations--and yes, I think these are obligations to our many constituencies.

Resources

We will continue to suffer from well known resource pressures: aging facilities, deferred maintenance, library acquisitions, and other problem areas will persist. They will get worse if we don't become more responsive to the constituents on whom we rely for resources. Our most important resource problems, however, are human resources. We must get past the belief that all faculty must do everything well. We must seek out, honor, and support excellence wherever we find it, not diluting it by insisting that people who are really good at one thing (e.g., teaching or research) spend a lot of their time doing something they are not very good at (e.g., research or teaching). This will require a revolutionary cultural change.

Cross-Disciplinary Flexibility

It is a truism that much of the most interesting intellectual activity is at disciplinary boundaries. The cultural differences among disciplines are important and difficult to negotiate. Often we confuse "interdisciplinary" with "interdepartmental"--the latter posing equally difficult organizational problems. There are many conservative forces protecting the boundaries--e.g., the rating games, disciplinary organizations, turf in the universities, and performance evaluations in units where tenure is lodged. These problems pose a bewildering array of organizational issues: joint appointments, assignment to centers, spatial separation from home units in research facilities, and participation in interdisciplinary degree programs, to name a few. Achieving programmatic cross-disciplinary programs is especially difficult organizationally--and it is critical.

Teaching and Research

The topic of undergraduate teaching has been discussed at length in many forums. I'd like to add that there is also much to say about graduate education, especially that we have conflated training researchers with training the professoriate. The fact is that 95% of higher education jobs are not in research universities; we have the responsibility to train all postsecondary faculty. We have dishonored most jobs other than those in research universities, doing both ourselves and higher education a terrible disservice. We MUST find a way to honor the positions that our graduates will be filling. If we don't, we'll be damaged greatly in the eyes of our most important constituents, and we'll have done terrible damage to the research and graduate training enterprise that we value so highly. That is, we risk further diminishing the pipeline of well trained undergraduate students who come into our graduate programs--undergraduate students who are trained by the professoriate that we have educated in the research universities.

Communication and Advocacy

We often say that if people only knew what we were doing, they would support us better. I fear that if they really knew what we do, they would be horrified. It is true, however, that we grossly overestimate how much people understand about universities. Their support is often premised on fundamental misunderstandings of what we do--e.g., "creating new knowledge" has something to do with facts, not with the research process as we know it.

This brings us back explicitly to where I began. We must learn to tell a compelling story to multiple constituencies with opposed, inconsistent interests and, therefore, with conflicting demands on us. Moreover, we must tell a consistent and true story to these many and diverse people. We can't fail to convince our many constituents that we are serving them well--and we have to actually do it, not just talk about it. Research is one of the things research universities are very much about. We need to find a way to do it well while not dishonoring the other things we do--in fact, while performing our other obligations with a high level of excellence and commitment.

Sally Frost-Mason, Ph.D., Dean
College of Liberal Arts and Sciences, University of Kansas

The investment that administrators, in particular deans, make is primarily in people. The most important resource we have is not our budget or any other money that happens to be available to us, it is the people that we work with who are actively engaged in teaching and research.

As deans, it is important to understand that our truly significant role in administration is one of facilitator. For example, we facilitate the hiring and mentoring of faculty, the recruitment of students, both graduate and undergraduate, and the acquisition of resources to sustain the academic enterprise. The topic we focused on at the Merrill conference dealt exclusively with the research enterprise, although it was argued effectively that to separate research and teaching at a research university is not an easy or desired objective. Consequently, my comments focus on research, but with the caveat that research and teaching are interwoven throughout the fabric of the entire academic enterprise.

Facilitation of the research enterprise is expensive, both in terms of time and resources. Salaries for new faculty in the humanities begin in the mid-\$30K range but can extend well into the \$40K range; in the natural and social sciences starting salaries begin at about \$40K and can range up to or exceed \$50K, all depending on the level of experience and discipline of the individual. Some disciplines, such as economics, can command starting salaries that exceed \$50,000. The costs to initiate the research efforts of young faculty can also reach staggering proportions. Startup packages for new faculty in the sciences can range from \$50,000 to \$500,000; social scientists are commanding increasingly larger startup costs which may approach \$50,000 or more in certain disciplines; even a person new to the humanities faculty comes to us not without significant cost in terms of computing capabilities and library resources. The pressure on deans and academic units to raise and allocate dollars for the recruitment of new faculty is enormous. The costs will continue to escalate along with the dangers that young faculty will fail to meet today's standards for promotion and tenure at research universities. Can a Chemistry Department with a \$300,000+ investment afford to have a young physical chemist fail to be promoted, for example? And how does the dean respond to the request to hire yet another physical chemist with a similar startup investment when the return on the failed hire, in terms of research productivity, was minimal? These are dilemmas commonly faced by administrators today.

Consider next the needs of the faculty once they have joined a research university. In addition to startup costs, which typically include renovation of laboratory space and acquisition of equipment and supplies, there is great pressure to hire/find personnel who can assist in the research enterprise. This is especially critical in the sciences, where multiple "hands" are necessary to conduct complex arrays of experiments and operate sophisticated equipment. Graduate students, postdoctoral fellows, technicians, and even undergraduates have been the standard resources that scientists have relied on in the past, but while undergraduate interest in the sciences continues to increase, the opportunities for graduate and post-graduate students are

flagging. Many graduate programs are down-sizing - some by necessity and others by design - as the quality of programs is being assessed in conjunction with the apparent "glut" in the academic job market. Fewer graduate students will inevitably lead to fewer postdocs, and researchers will be forced to either scale back their own efforts or rely more significantly on training and sustaining technicians and undergraduates.

We hear increasingly that the trend now is to encourage and support interdisciplinary research. Large consortia of researchers from a variety of disciplines are collaborating to solve "big" problems, many of which have social, scientific, and even humanistic implications. Policy makers and administrators encourage these types of activities and have urged faculty to seek out collaborators and the large program project grants that might arise from such interactions. And yet our system of incentives, put in place largely by the faculty and governed by the faculty, continues to lag behind. Promotion and tenure committees still insist that an individual's contribution be devoted almost exclusively to a single, focused, or discipline-specific research initiative. Multiple collaborations are still not as highly valued as single-authored papers or the individual research grant. Despite the rhetoric of those in Washington and many here at home, the incentives and real rewards for large, interdisciplinary collaborations are best left for those who are tenured and fully promoted. This does not serve our young faculty well, nor does it encourage eventual changes in behavior toward collaborative interactions once the faculty member has established a career as a scholar. Indeed, we continue to encourage and reward the "independent contractor" and "individual entrepreneur," both terms that have been used to describe faculty and faculty behavior.

Amidst all this, the Dean sits in a most interesting place: close enough to the faculty to understand the drive and motivation behind research, scholarship, and the creative enterprise, and yet positioned to see and understand the "bigger picture" in terms of how research interfaces with the university and beyond. A dean is often confronted by a public that clearly has little appreciation for or understanding of the connection between research and teaching. Outreach and development activities have become essential roles for a Dean, and I would argue that they should be roles that faculty should at least appreciate and embrace as important to their long-term health and survival. The primary focus of the faculty should continue to be their involvement in the research and teaching that are essential to universities. At the same time, they should not be afraid to engage in active discourse with segments of the population outside the university for the purpose of sharing the passion and enthusiasm that comes with successful activities in the laboratory and classroom. Indeed, we hurt our cause and our image when students, parents, alums, or the public at large fail to understand the connection between research and teaching. When faculty fail or refuse to explain the significance of their scholarly endeavors publicly, we are not fully engaged in the multiple activities that are a part of our overall mission. If we look only inward, we miss opportunities to partner with business and the corporate world in ways that might be mutually beneficial. If we look only inward, we train students who are ill-prepared to face the rapidly changing times and technology that face us all now and in the future.

There is little room or reason for pessimism in today's society, especially where higher education is concerned. The ideas, opportunities, and investments that have been spawned from our research universities literally drive the world's economies. While the physical structure of our universities may not change significantly over the decades, the personnel involved in the

enterprise - faculty, students, administrators - and the world around us does and will continue to change, and with this dynamic flux will come new ideas, new technologies, and new ways of thinking and analyzing our world and its problems. I can think of no more exciting time in history to be involved in research and higher education than as we approach a new millenium.

Deborah Powell, M.D.,
Executive Dean, Vice-Chancellor for Clinical Affairs
School of Medicine, University of Kansas Medical Center

As a medical school dean, I would like to comment briefly on several areas which I believe must be addressed if the research enterprise in our state university academic medical centers is to survive in the 21st century. The order in which these are presented does not reflect necessarily the order of their importance.

Payment for Non-Funded Research

Research for faculty in academic medical centers is important for several reasons. Research by clinical faculty is important to advance our knowledge of disease as well as to advance the academic careers of the faculty. For many clinical faculty in academic medical centers however, the opportunities to develop significant extramural funding for research programs is limited. This is due to a variety of factors but a major determinant is that clinical faculty time is becoming increasingly directed toward patient care activities. Thus both teaching of medical students and residents and research activities are short changed. Many faculty however, still manage to remain academically productive in terms of publications and presentations.

Much of the funding for research activities resulting in these scholarly products has traditionally come from clinical income. Recently however, the advent of managed care as well as cuts in federally funded program reimbursements (i.e., Medicare) has resulted in somewhat traumatic decreases in clinical revenues. This has already been demonstrated to decrease the academic research productivity in areas of high managed care penetration.

The issue of how we are to maintain the non-funded research activities (particularly of our clinical faculty) which are vital to academic advancement and to their satisfaction with their careers in academic medical centers, is a critical problem that faces us today and I believe will continue to plague us in the 21st century. I do not believe that it is an option to relegate research to basic science departments and to a few basic scientists housed within clinical departments. We must address the issue of critical numbers of faculty and funding for clinical research, recognizing the need to keep our clinical faculty academically productive.

Maximizing Scarce Resources

Even extramurally funded research programs are feeling constraints due to the limitations of resources. It is important in academic medical centers that resources be maximized to further the research enterprise into the next century. Core facilities are important in this process since they can be shared by multiple users and can make expensive technology available to a large number of scientists. Core facilities which support a school or an entire medical center require not only major equipment but personnel and adequate oversight to run the facility. It is important that these facilities be of high quality and most importantly that they be centralized with the school or medical center so that we avoid duplication of costly services and technologies.

Centers of Excellence are another way of maximizing resources. Centers of Excellence allow mechanisms for clustering of faculty from diverse academic units around themes or programs of research interest. This can be valuable in maintaining the traditional departmental or other academic unit structure so vital for the advancement and mentoring of faculty, while allowing research collaboration to take place around a common theme of interest. If possible, it is important that centers be created so that scientists within the centers can share facilities, in close proximity, which allows for dynamic interactions. The concepts of centers bringing together investigators interested in a theme or subject from diverse academic backgrounds is important in developing multidisciplinary programs or projects, particularly where extramural funding sources are looking for a variety of approaches to a single disease related problem.

Introduction of New Paradigms for Research and Education

An important mechanism for expanding the research enterprise in the next century will be development of new multidisciplinary programmatic areas which will allow us to accept new paradigms for education and research, particularly in the basic sciences. We must recognize that while the academic disciplines of the sciences basic to medicine may remain separate, much of the scientific technology has blurred. Departments of Physiology, Biochemistry and Cell Biology, now and in the next century, are and will be composed of scientists utilizing similar technologies. This was not true twenty or thirty years ago. Because of the similarity of research technologies it is appropriate to reconsider traditional structures and develop multidisciplinary programs which allow us to consider new paradigms both for research and for education. It is important in this process to maintain some structural integrity of units which will allow for faculty growth and development as well as advancement and it is important also to recognize the separate nature of the academic disciplines. I believe that institutions that are able to develop acceptance of these new paradigms will be the most competitive for increasingly scarce extramural funding dollars.

Blending of the Teaching and Research Programs

It is important for the research enterprise to succeed in the next century that we consider the focus and purpose of both our teaching and research programs and the products they produce. Currently, in the basic biomedical sciences much of the research enterprise is intertwined with and in many instances dependent upon the graduate training programs. Many laboratories are run by graduate students and post-doctoral fellows who carry out much of the productive work of the laboratory. Nevertheless, it is becoming apparent that we may have been training too many Ph.D. graduates in the biomedical sciences and that these young professionals are having more and more difficulty in finding satisfying careers.

We must focus not only on the conduct of research but also on our role both as scientists and as teachers. It is important that in our graduate training programs we remember that our students are there to develop their own careers, to learn by doing, but not to have doing as their sole function for existence. We must concentrate on preparing our graduate students for successful careers whether in industry or academia. We must focus on training them both to be excellent technical research scientists and also to be independent thinkers, exhibiting scientific curiosity as well as to become able teachers of the next generation of scientists.

It is important for us to focus on separating the conduct of our research from the training of our students. We must continue to train outstanding basic scientists to follow in our footsteps and we must continue to run productive research laboratories, but we must have clearly in mind the goals and the conduct of each. We must staff our laboratories appropriately so that the research is done and we must train our students with the goals of our training programs clearly in mind. This will be an increasing challenge for us in the next century as we make sure that the supply of students emanating for our program is appropriate for the needs of the country as a whole.

Faculty Advancement

The research enterprise of the next century is dependent on our faculty. I have already mentioned briefly the demands on the time of clinical faculty for clinical patient care and teaching as well as research. At the very time that these demands are being increased, the need for disease related research both in the basic sciences and in the study of the outcomes of different interventions, therapies and health economics are critically important to the health of the nation and rightly should be the research portfolio of our academic faculty.

In the face of all this we are still, in many instances, enmeshed in traditional structures of promotion and tenure for faculty which were developed decades previously. We must question whether these remain appropriate for our faculty in the 21st century. For clinical faculty in medical schools, it is the security and structure of tenure, particularly the latter rather than economic issues, which continue to make non-tenure track faculty consider themselves as second-class citizens. In the systems in which we find ourselves currently, many young faculty members, particularly young women faculty are disadvantaged by the time of probationary periods. Consider the case of a young woman faculty member, a physician, who wishes to pursue an academic career with a research program. By the time this faculty member finishes residency training, say in internal medicine or pediatrics, she is on average between 26 and 28 years of age. This is presuming that she has also taken subspecialty training in a specific area of her chosen specialty. If she wishes to pursue an academic career and is accepted as an assistant professor, she will have six years to demonstrate her academic prowess before she must be either promoted or told she can not advance at her chosen institution. At the same time, if she desires to have children, this is precisely the time when she must begin her child rearing since there are compelling biological reasons why delaying child rearing into one's mid-thirties is less advantageous. For many young women faculty, the pressures of trying to deal with a young family and the demands of beginning a career in academic medicine with pressures to see patients, teach and develop a research program become overwhelming and they choose to leave academic careers where they may have shown great promise or to opt for non-tenure track clinical positions where they are able to maintain a more balanced life style. Clearly, we cannot afford to lose young academic scientists in this way. We must address some of the problems attendant upon traditional pathways to promotion and tenure, if we are to maintain and develop the careers of young faculty and maintain the excellence of our academic programs.

THE STATE OF RESEARCH ENDEAVORS:

VIEW FROM THE CAMPUS-WIDE LEADERSHIP LEVEL

A.L. Chapman, Ph.D.,
Vice Chancellor for Academic Affairs, Dean of Graduate Studies and Research
University of Kansas Medical Center

The following is a brief summary of some of the points that were discussed at the Merrill Conference.

Merging and Combining Existing Departments into Larger Units

This is a direction that seems to make sense in order to create a critical mass of talent for both teaching and research. A trial effort at KU Medical Center will be initiated this fall by providing a combined curriculum from five basic science Ph.D. programs. This faculty-initiated effort has resulted in a modular curriculum that all new students will be required to take during their first year. The emphasis will be on molecular biology and genetics. In order to bring about any merging of programs requires a “buy-in” by the faculty. This program was unique in that a group of faculty met, organized, and with support from the departmental chairs and administration spent a year in working out the nuts and bolts of the program.

Enhance Research Through the Formation of Private Research Foundations

We accept the basic premise that unless we maintain a strong position with federal and national funding agencies, we will not be successful with the private sector. However, it is possible to build on that foundation by bringing in both private foundations and the commercial business sector, resulting in a stronger research funding base.

In an effort to address this issue, some five years ago KU Medical Center organized a non-profit foundation specifically designated to address research in the private sector. It was organized into three divisions: Grants Management, Clinical Trials and Technology Transfer. The purpose was two-fold, first to develop a Research and Development fund for the faculty along with a means to expedite expenditure of grant funds without going through the state. It was agreed that support for this foundation would not be dependent upon state resources. To date, this has been accomplished and over \$300,000 is being returned to the faculty each year through request-for-proposals. It is of interest that the return on these funds has been over 10:1, and the funding agencies have, for the most part, been from the federal side. This strengthens our position and makes us more competitive in the private sector.

Out of over \$40 million total extramural research funds at the KU Medical Center, more than \$11 million in private grants and contracts are currently managed by the Research Institute. The Technology Transfer Division is growing through the issuing of patents, licensing agreements, and setting up of new companies. As a part of this effort, a small research building

has been leased from the KU Endowment Association as a business incubator building. It is currently leased by a company founded and run by one of our faculty members.

Based on our brief experience with research foundations, we believe that each institution needs to be increasingly involved with the private sector as a means to broaden our base and supplement our extramural research pool of funds.

David Shulenburger, Ph.D., Provost
University of Kansas

Being on a panel at the end of this gathering provides me the opportunity to make two observations about universities and to consider how our conversations to date butt up against these observations.

First, universities are idealistic by their very nature. But, during this conference, we have been nothing but pragmatic.

Second, the university is the most conservative of all institutions. Its task is to preserve knowledge as it creates knowledge and, for that reason, its ways are hard to change. Again, our conversations have been about change; thus, the tension that characterizes some of our conversations is to be expected.

We are talking about changing institutions in very pragmatic ways. James Moeser made the following observation: The bigger the task we give ourselves, the higher the probability of failure. Giving ourselves the task of pragmatically changing our institutions is creating a high probability of failure. We want to reflect on two words within these observations, *give ourselves*. Our institutions can continue as they are without addressing the problems that have had our constant attention for the last day and a half. They have coasting power. We are talking about giving ourselves a very large task. A task that need not be taken on. Failure to take it on, of course, will lead to other institutions assuming the challenges or the challenges remaining unassumed. We can choose to coast, but be assured that our route will be downhill.

It is my firm conviction that society will be better off if we do give ourselves these challenges and attempt to alter our institutions.

The need to make changes within the institutions largely arises from three sets of pressures. First, there is the diversion of federal and state resources away from our institutions to other societal needs. We are familiar with losing budget shares to prisons and welfare, and the recent loss of budget shares to the taxpayers as taxes are reduced. Our institutions are, by their nature, investment vehicles for government. It is a great irony. When President Clinton came to office, his goal was to shift the federal budget away from consumption sorts of expenditures toward investment expenditures. When he leaves office, the budget which he and congress have put in place in an effort to eliminate the deficit will be one in which the consumption component is hardly reduced at all, and the investment component dramatically reduced. I do not believe that this failure to invest suits society's ends, but we have not, through our elected representatives, been able to get government at any level to back away from consumption in favor of investment.

The second force is rapidly changing technology -- especially in the computing and communications area. The irony, of course, is that the rapidly changing technology is a product of basic discoveries made at universities. Changing technology forces change if we are to keep up with society. But, as I will mention later, the changing technology, particularly in the overlap

of the computing and communications area, is going to force a change in the nature of one of our major “products” -- instruction.

The third major force we feel is that of competition. Other research universities, of course, are competing for the same dollars for which our research universities compete. The private sector is an increasingly fierce competitor for our dollars. Competition from this sector is not only for research funding, but increasingly for instructional funding. I am struck by our conversations of yesterday regarding the nature of doctoral education and how that has forced additional competition upon us. Only one out of twenty doctoral students ends up at a research university. The other nineteen who work in academe are at institutions dedicated more to instruction than to research. But those doctoral students were trained to do research -- and trained well. That training often results in their converting institutions where they have found employment into versions of research institutions. Former teacher colleges and regional institutions now look more and more like us and compete with us at federal agencies for scarce research funding. In an age in which science requires ever increasing concentrations of dollars in order to be effective, this dispersion of dollars across more and more institutions is dysfunctional.

I suspect we need to revisit how doctoral education is carried out and to train more appropriately the nineteen out of twenty for the task which they are to do. I am not sure how to vary doctoral education, but I do want to point out the irony of our current production method.

University of Kansas Response

In a world with these stresses, institutional agility comes at a premium. We have been about making the University of Kansas more agile in the last several years. Let me give you some of the way in which we have done so.

First, we have just established a private research foundation into which all externally-funded research will be placed. This foundation will give us the flexibility to be entrepreneurial in an environment free of the bureaucratically-based rules which previously governed the expenditure and conduct of research. We will be able to invest and to be clear about the objective nature of that investment in this new vehicle.

Second, we have created a mechanism for managing conflict of interest. This power is absolutely critical in these days in which the form of research endeavor is changing. One cannot discuss technology transfer for very long without dealing with faculty members' proprietary interests in some of the fruits of their efforts. Conflict of interest rears its head immediately without such a mechanism. It is hopeless to expect the institution to be a natural responder.

Third, flexible work loads for faculty beyond the assistant professor level are now the rule at the institution. We live with the relatively inflexible institution of tenure. While as research institutions, we wish to hire individuals who excel at teaching and research, and through the tenuring process keep only those who do that, the 25-30 years of a career that follow the tenure decision are often years in which one's abilities change. Through our concept of flexible loads, we endeavor to have those faculty members who are extraordinary in teaching -- and not

quite so good at research -- teach a lot more, while freeing up those faculty members who are extraordinary in research, but perhaps not quite as gifted at teaching, to spend more of their time on research. By encouraging individuals to put their effort where their talents are greatest, I think we are likely to both increase the quantity and quality of teaching and research.

Fourth, in a similar vein, this past year the faculty of the university, at the urging of the Regents, established another criterion for dismissal of a tenured faculty member -- that being failure to perform academic duties. In this age in which agility is required, it is not possible for institutions to tolerate the presence of those who don't contribute to our missions in some substantial way. This is particularly true since the abolition of mandatory retirement. Many safeguards are built into our policy statement, such that no faculty member can be dismissed without a full opportunity to improve (we quadrupled our resources available for faculty development when this policy went into place). The message is nonetheless clear. It is critically important that each faculty member be productive. In fact, I suspect that we will see an increase in productivity as a result of this new standard for dismissal, not an increase in the number of faculty members dismissed.

Fifth, we have also increased our emphasis on the quality of instruction. This seems a peculiar item to place in a listing of actions taken to improve a university's research productivity, so let me explain. What the public expects of research universities, among other things, is that we provide high quality undergraduate instruction to their sons and daughters. In return for providing this level of instruction, our Regents and legislators essentially have given us a franchise which also permits us to do research. Failure to perform high quality instruction violates the terms of the franchise and will result in our losing the opportunity to perform the research which we are well prepared to do. Thus, the connection!

Rhetoric is ever important. Given that we are research institutions, we have had to defend to the public why they should send their sons and daughters to us rather than to institutions whose emphasis is solely on instruction. Our answer appropriately has been that we provide the best instruction from those who are really up-to-date in their fields -- by faculty members who are in fact generating the knowledge by performing the research.

Larry Clark observed that he will not be dean of an institution that creates within itself a junior college to provide instruction. I fully agree with this notion, as I think we all do. To do so -- to hire those who aren't involved in the creation of research to teach students -- is to perform a bait-and-switch operation that does not ennoble us. The best and brightest should come to our institutions to learn. We should give them as their instructors faculty members who are creating research and we should endeavor to involve those undergraduates in that research so they leave our institutions with sound educations and a full appreciation for the research process.

Sixth and finally, we have been working on the problem of having resources captured within very small organizational boxes. When one has some seventy departments -- as we do -- it is inevitable that borders will keep resources in some departments that don't fully utilize them, while denying them to places where they could be far better utilized. Our effort has been to reduce the number of organizational boxes, and we have had some modest success at this. I should note that the success we have had has come at significant costs. I do appreciate this

conference's focus on organization. It is something that must be changed if we are to be agile enough to face the challenges of the future and thrive. I suspect we have had difficulty with changing organizational boxes partially because we haven't had a strong vision as to how those resources would be better utilized in other organizational formats. The notion put forth here of centers as a repository for resources might well be that better vision.

Our second reason for difficulty in changing organizational boxes is faculty governance. Please don't get me wrong. I am a proponent of faculty governance and have been a practitioner of it myself. I do observe though that faculty governance on our campus and other campuses has not drawn in a representational manner from all faculty. In particular, faculty members who have very heavy research programs and accomplishments are under-represented. This makes it difficult to put into place some of the ideas that are expressed here about how the university ought to be organized. I would urge research faculty to take the time to be involved in university governance or else the interests expressed here aren't likely to be fully represented.

Four Concerns that Must be Dealt With

1. In arguing for resources for the university, we repeatedly have played the economic development card. I believe that our institutions have a role in economic development. Indeed, I suspect the Great Plains region would be far less prosperous than it is were it not for our presence. We can do even more in the future to make a difference.

Our rhetoric is heard both externally and internally. However, some of the internal constituents don't particularly appreciate the economic development rhetoric because it is difficult for them to understand how it applies to them. Those individuals from the humanities, and some of the social sciences, and indeed some scientists who do the most basic research, have difficulty in creating an immediate connection between what they do and economic development. Brian Foster warned us to be careful not to dishonor that which we do in the process of attempting to do research. I fear that these internal audiences have felt that we have dishonored them as we played this economic development card.

This feeling is baseless. I think we all believe that the only way we can make progress is for the whole individual to be developed. Liberal arts-based education prepares individuals for the world better than a narrow technical education. Thus, in making the economic development argument for additional resources, we need to stress repeatedly that we are working on the whole person, and the whole society, and that our colleagues in the humanities, social sciences, and basic research areas are essential to a sound economic development impact from the institution.

2. The virtual university. Peter Drucker, in a recent issues of *Forbes* magazine, said that the university as we know it -- as a residential-based experience -- would not exist in forty years. His basis was his conviction that electronic-delivery of what we do would make campuses superfluous. He particularly had in mind the delivery of instruction to the desk top -- the Internet. The Western Governors' Association has vigorously pursued the development of the virtual university. Phoenix University is thriving using this

mechanism for delivery and many private corporations are delivering massive amounts of education to their own employees by this inexpensive medium.

How does this virtual university fit in a catalog of items which threaten the research enterprise? The answer to that is simple. The instruction most likely to be captured by the virtual university is mass instruction. And mass instruction occurs primarily at the freshman and sophomore level. By its very nature, creation of a course for the web requires immense up-front preparation. Once that preparation has been put in, though, it can be delivered to large numbers of students quite inexpensively. A recent conference I attended in North Carolina had a presenter claiming that web-based instruction, could be delivered to large numbers of students profitably for \$40 per course.

If we lose freshman and sophomore instruction in a significant fraction to the virtual university -- whether to private or public vendors is irrelevant -- then we lose a major subsidy for upper-division and graduate instruction and for the research that we do. Critical underpinning of our economic structure will be gone.

I am not arguing that we should mount an offensive to keep the virtual university from succeeding. To do so would be folly. It is showing success now because it serves individuals better than they are currently served by us. Those individuals who are geographically distant are served well by desktop instruction, as are those individuals whose busy work lives make it impossible for them to get to our classes at the time they are offered. Virtual instruction is for them. In addition, I am confident that virtual instruction can be a far better medium for those with learning disabilities. You can manipulate the virtual instruction to compensate for disabilities far better than you can in the classroom environment. Thus, we must continue to deepen our involvement in virtual instruction.

At the same time, we have to increase the value that we offer on campus if we are to continue to have face-to-face instruction occurring there and if individuals are going to be persuaded to pay more for that face-to-face instruction than virtual instruction costs. When I discussed the peculiar nature of instruction in a research university, I gave the hint of how we do this. We must have research faculty members in front of the classrooms. We must have undergraduates involved with faculty in research. We must create a learning environment on campuses that is absolutely seductive such that the best and the brightest will want to come to us.

3. The scholarly communications problem. In the last several years, our ability to afford the knowledge which our faculty generate has deteriorated sharply. Private publishers have bought from professional associations the journals that they publish and have raised the prices of those journals to absolutely unconscionable levels. As an example, Elsevier recently acquired the Lexus-Nexus system from Meade. They have just informed us that over the next several year, they will raise the cost of Lexus-Nexus from the current \$170 per port to \$3,700 per port. This is extreme, but the inflation of library costs for all sources of information is such that we can't cope. Every university is cutting back on the number of journals and books that it is buying.

Access to the knowledge we create is obviously critical to the research effort. We can't know where to go in the future if we don't know what succeeded in the past. This access difficulty occurs because we have given to faculty members 100% ownership of the knowledge which they create and choose to publish in journals or in books. Publishers realize this, and have demanded that faculty members turn over to them this 100% ownership right if they are to publish the knowledge that they create. Faculty members are in quite a bind. Promotion and tenure rules insist that the research be published in distinguished outlets, so faculty members have no choice except to sign over 100% rights to the literature. This gives the journal publishers a monopoly that they are now exploiting.

We must find some way to retain a residual right for use of this knowledge created by our faculty within the academy. It is simply wrong for us to bear the burden of the costs of the knowledge and then to pay for that knowledge a second time when we wish to access it. There are at least two possible solutions. One is for professional associations to reclaim the rights to their journals. Many are doing so and are publishing those journals in electronic forms at rates that aren't astronomical. The American Research Library Association is actively involved in promoting the generation of electronically-produced journals in an effort to combat this inflation.

Another possibility is for universities to somehow join together and to create an intellectual property management organization that would hold in common for all of academe the right to the knowledge we generate. Ultimately, faculty members might then assign the right to a journal to publish an article, but retain for all of academe the right to use that knowledge on a royalty-free basis. The road to creating such a property rights management organization is going to be difficult because the private publishers have huge property rights invested in the current situation. They will resist it, but ultimately the current system is going to crumble by greed if we don't create such a common property management system for our intellectual property.

4. Graduate study. We must face the question of quantity versus quality. One of the participants in this conference was very candid. The participant said that the brightest undergraduates at his school were more capable than the average individual in the graduate programs. What is unique about this statement is its candor. I suspect that all of us could say that about a significant number of graduate programs at our institutions.

Again, I want to emphasize the power of our rhetoric. We have played the economic development card and, having played that card, we will be measured the way other entities are measured. One criterion will be efficiency. If we are producing graduate students in excess of the numbers who can be placed in their fields, then we fail this efficiency criterion and we will be increasingly put upon by external forces to correct the situation.

We have justified our graduate student numbers by unproductive criteria in the past. Some have been justified by the need to have graduate students to staff labs. Some have

been justified by the need to have a critical mass of graduate students so that each faculty member could have graduate students with whom to work. Promotion and tenure systems sometimes demanded such an environment. Still other numbers of graduate students were justified by the need to have graduate teaching assistants to teach undergraduates. At the University of Kansas, we now have a graduate teaching assistants union, born in part of this latter motivation. Having cheap labor to teach undergraduate courses is not a good justification for bringing individuals into these very expensive programs.

I suggest that we will have to treat quite seriously the question of market demand as we determine the size of graduate programs in the future. Doing so ought to give us the opportunity to use the needs of society as a criterion for selection. We will need to select the best and brightest, including those who must be represented in academe if we are to serve society. I am particularly mindful that we are undergoing an enormous demographic change that must play a role in the selection of graduate students. Ultimately, whatever criteria we use to select students, we must be mindful of market demand.

I have only addressed four challenges facing us. There are many, many more, but these are the ones that were on my mind today and haven't been discussed by others.

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