Annual Report on Research, Scholarship and Creative Activity at the University of Michigan, FY2000

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In this year's annual presentation from the Office of Research, I would like to start by sharing with you OVPRs mission statement and the fundamental principles that guide our activities. Then, I will spend the bulk of my time to feature one of the most important groups involved in our research enterprise Ð our graduate students. Finally, I will close by giving you a quick update on the Michigan Life Sciences Corridor program and what we hope it will achieve for the State of Michigan.

As I reported to you in September, we had a very satisfactory year in terms of research expenditures, which reached $545 million in Fiscal Year 2000, an increase of 9.1% over the previous year. New research awards, which will fuel our research endeavors for several years ahead, jumped significantly to $650 million, rising 45% over the previous fiscal year. I have included additional detail and analysis in the reports you have in front of you.

For seven years running, you have heard Vice Presidents proudly report that Michigan is the number 1 research university in the nation as measured by expenditures to support research. The latest comparative data we have from the National Science Foundation is for Fiscal Year 1998, but we have no reason to expect the FY 99 figures to change our relative ranking.

The Responsibilities of a Leading Research University

But being a top research university clearly means more than spending the most money on research and scholarship. The money we spend is just a means to an end, but what is that end we seek?

In answer to this question, permit me to borrow from Francis Bacon, the English philosopher, who once said:

No pleasure is comparable to the standing upon the vantage-ground of truth.

Éand from the perspective of mathematician and physicist Isaac Newton, who said:

To myself I seem to have been only like a boy playing on the sea-shoreÉ whilst the great ocean of truth lay all undiscovered before me.

As a great university, our mission is to serve society through educating individuals, expanding the knowledge base in all areas of study, searching for truth in its purest form, and applying new knowledge and truths for the betterment of human kind. Research, scholarship and artistic expression are at the core of our mission and the catalytic agents of discovery.

Our concrete impact on the campus occurs through our work on research policy, administrative matters, support of faculty research and scholarship, and in a number of other ways. At any given time, more than 5000 externally sponsored research projects are underway

at the University, all of which receive administrative care from OVPR and other units that report to it. OVPR is deeply involved in issues related to the proper conduct of research and compliance with University and government regulations. We have about 7000 human research protocols that are active on campus, all of which must receive annual scrutiny from a number of campus boards and committees. Likewise, our use of over 150,000 animals in research is also scrupulously reviewed to insure compliance with the highest standards of care. To promote faculty collaboration and the development of new avenues of research, OVPR annually spends several million dollars in seed funding of faculty projects, cost-sharing with the schools and colleges, and for special initiatives aimed at promoting new areas of expertise on campus. In all of these activities, OVPR works in coordination with the Provost and her staff to support the overall academic mission of the University.

In summary, we in OVPR attempt to be guided by the same high-minded goals that permeate this great University, even as we operate on a fairly practical level to support research and scholarly pursuits on campus.

The Role of Graduate Students in Research and Scholarship

A year ago in my report to the Board of Regents, I devoted a major section to discussing research and the role of the faculty. We examined the qualities of our faculty that place them among the worlds best in their respective areas; we invited a few to speak via videotape about what motivates and excites them in their scholarly pursuits; and we talked about the multiple roles that Michigan faculty must balance.

What I want to focus on this afternoon is another group involved in research, namely our graduate students. The University has more than 15,000 graduate students, comprising some 29 percent of the overall student body. These students play a critical role at the University, for they are involved in all aspects of research, both as students learning about their disciplines and the process of conducting research, as well as significant partners in the research led by our faculty.

As Im sure you know, Michigan also has a record of undergraduate participation in research. Our Undergraduate Research Opportunity Program and Women in Science and Engineering Program are national models that introduce undergraduate students into the research enterprise. For today, however, I will focus my attention on graduate students.

OVPRs interest in graduate students is specifically linked to their role in research. The most direct way that this occurs is through OVPRs support of faculty scholarship and research, for we know that our efforts to provide funding or facilities to faculty also supports graduate students. We also work in concert with Rackham, which has primary responsibility for admissions and the quality of the educational experience of graduate students, and the Provost, who sets the institutions broad goals for all aspects of our academic and research missions. So clearly, when I speak about supporting the graduate student experience, I mean to include the efforts of Rackham, the Provost, as well as the schools and colleges, who all work to insure that these students have the highest-quality education while they attend the University.

Let me take a few minutes now to try to communicate what it means to our students to attend Michigan. From the perspective of our students, graduate school is a wonderful opportunity to experience the creation of new knowledge and the discovery of hitherto unknown truths. The questions every dissertation committee always asks of a Ph.D. candidate include: "Whats new

in this work? How does your dissertation work contribute to the knowledge base in this field? What impact will your discoveries impart on our understanding of ourselves, of society, or of the physical world?"

The graduate student is given the opportunity to work with faculty mentors who spend innumerable hours, often a significant fraction of their life and career, listening to the students ideas, challenging him or her to reach greater heights, together plotting a course to answer a question, and when they have their answer, to once again plot a course to answer new questions raised by the previous answer, and so on. This one-to-one experience exists today at a large university like Michigan, just as it did 500 years ago at Cambridge or Oxford. It is indispensable in the training of future intellectual leaders.

In many fields of study, students are exposed to a diversity of views that they may never experience again. Over a five- or six-year stint as a member of a relatively small, close-knit group, graduate students will often work closely with individuals from many social and ethnic backgrounds, some of whom may be foreign-born and educated. In this setting, the graduate student develops life-long bonds with these people, and their view of the world grows in intangible, but very important ways.

Now, I dont want to be the only person you hear from about the process that graduate students go through to become scholars and researchers. So my office produced a video, with the assistance of the Biomedical Communications unit, that shows a number of graduate students speaking for themselves. To prepare this tape, we interviewed more than three dozen graduate students who were suggested to us by faculty from many fields of study and programs on campus. The interviews generated over eight hours of recorded material, which has been whittled down to about 9 minutes of the best, and, we think, most representative comments. Weve grouped their commentary into four areas:

- Why they chose Michigan for graduate study;
- What the excitement of discovery means to them;
- How important do they view their relationships with faculty mentors and other students; and,
- What are their aspirations for after graduation.

Let's hear from them now

Why I chose the University of Michigan for graduate school

I wanted an art program that wasn't specifically in an art school. In other words, a program that would provide the resources like any department in a university would, but one that was kind of couched in a university that's very committed to interdisciplinary collaborations in learning
Ceci Mendez, MFA in Painting and Drawing, School of Art and Design

The facilities here are unparalleled in our field, with the Kelsey Museum and the large faculty.
Bjorn Anderson, Classical Art & Archaeology

I just didn't see anyplace I could go where I could have the research advisors that I wanted except the University of Michigan.
Scott Shaw, Chemistry

I found that it was such a supportive community that I really felt like this would be the best place to do my graduate work because it was so supportive and there were a lot of resources and the students seemed very content.
Zaje Harrell, Psychology and Women's Studies

I don't know what different people's motivations are for coming to graduate school, but mine is that I really love this subject and I really love this school. I've been having a wonderful experience here, but I think a lot of it has to do with my attitude and my convictions.
Cali Mortenson, Public Policy

Interdisciplinarity is alive and kicking at the University and that is really important to me to come into a field of ethnomusicology that is interdisciplinary by its very nature.
Michal Rahfaldt, Ethnomusicology

My research interests are incredibly interdisciplinary and I wouldn't have been able to do the work that I did anywhere but at Michigan
Karen Parker, Biopsychology

I was really impressed with the University's research reputation. I valued going to a large research institution and certainly the University is parallel to none when it comes to research
Clair Sullivan, Nuclear Engineering

I got accepted to all the schools that I applied to, and I was ready to go to Chicago and I met a professor from the University of Michigan out in Thailand who was doing exactly the same type of research as I was interested in. And we met, I met his family and he persuaded me to come to Michigan.
Rachel Lucas, Population Studies

The Excitement of Discovery

Three have definitely been moments when I've gotten really excited because I think I've discovered something or I have a really novel interpretation. But at the same time, whenever

that happens to me, I become kind of scared.
Molly Swetnam-Burland, Classical Art & Archaeology

When you first get your task or what you want to achieve, you go and sit there, and ask, "How am I ever going to achieve this? But then you realize, "OK, it's impossible, but I have to do it."
Jayshri Sabarinathan, Electrical Engineering

It's pretty rewarding to have learned something or done something that perhaps no one else has done or learned and to contribute back, I find that very rewarding and exciting. That doesn't make the next long night in the lab seem quite so difficult.
Jeremy Busby, Nuclear Engineering

There isn't always going to be somebody there who is the resident expert in the field who can teach you everything you need to know. Sometimes you have to develop yourself into the resident expert.
Scott Shaw, Chemistry

I think that the ability to be able to shift into new ideas and to incorporate new kinds of information, and the skills that the faculty, particularly my faculty advisor, has taught me in terms of how to access different kinds of documents and how you can look at them and what kinds of questions you can ask them, is one of the greatest opportunities that I've had since I came back to school.
Michelle Craig, History

When you get something that works, you get something that kind of solves the problem or get close to a solution, it feels good just because no one has done this before. You know that no one has done it before and you're the first one to figure this problem out. To me, that's pretty neat.
Jason Atkins, Computer Science & Engineering

Just about a week ago, I ran into a scholar from another university who had been thinking along the same lines. It was really exciting to me because I felt like I was kind of on the cutting edge of inquiry in just this one little place, and it was really exciting because it challenged some old interpretations.
Molly Swetnam-Burland, Classical Art & Archaeology

Being in this state where I feel like Ôthis is something that no one has done exactly like this before,' is exactly what I've been doing and it's exciting.
Jon Star, Education and Psychology

The crux of it is to just keep working. Ninety percent of the time, whatever I'm working in fails. And when you finally think that it's just not going to work is when it actually works.
Jayshri Sabarinathan, Electrical Engineering

Mentoring and Learning Relationships

I can't stress too heavily the importance of having faculty member who focus not only on being excellent researchers because that's what draws graduate students. But they also have to be focused on teaching and mentoring.
Scott Shaw, Chemistry

Michigan is a very large history department. So there's a very large faculty and a very large student body. That might be seen as a negative, but I actually saw it as a positive, particularly after I met the students here. It is a very collegial institution; a very collegial department. The students help each other. We read each others' work. We provide comments for each other. We look out for each other when we're doing research and pass information on. And that's very different than some of the other universities that I visited, where there was a much more competitive nature.
Michelle Craig, History

All of the faculty members and all of the graduate students get together once a week to talk about articles. There may be a faculty or student presentation. Or just some kind of discussion of issues related to the fields. It's been really helpful in creating this comfortable environment for graduate students.
Michal Rahfaldt, Ethnomusicology

As a student of color, I've received a lot of support and as a woman graduate student, I've received a lot of support.
Zaje Harrell, Psychology and Women's Studies

There's nothing better for the advancement of a student than to be treated like you're more than you are so that you will rise up to that level
Matt Bianchi, MD-Ph.D. Program

In the art sphere, it's very challenging to be challenged on these things. You're making something. You're wearing your heart on your sleeve and you're putting it up on the wall and you're being open to criticism essentially, with the idea that criticism will make you stronger. So it's very important, I think, to develop relationships with faculty that will be

critical but who will also be encouraging and supportive
Ceci Mendez, School of Art and Design

When I joined my advisor's group, the first thing he told me in interviewing was, "I want you to get enough experience that you're coming to me and telling me where we should take this project and what the next step might be."
Katrina Peariso, Chemistry

One of the advantages of working with a variety of different people, you see the world form different perspectives.
Markus Kemmelmeier, Social Psychology

I think I've learned like 90% of what I know from my peers in grad school.
Rachel Lucas, Population Studies

I rely pretty heavily, I guess, on the post-docs and other graduate students for technical questions or ideas of what experiments I do or why maybe something is not working or I got a different result than expected. And I guess that's really where a lot of the learning comes from is those interactions with other graduate students and post-docs.
Karen Hajra, MD-Ph.D. Program

I've also worked with undergraduates on research too, and that's really fun because you get to see the process all over again through somebody else's eyes, and maybe encourage them not to make the same mistakes that you did.
Clair Sullivan, Nuclear Engineering

Aspirations

In some way, shape or form we're going to go out into a different world, not the world of being a student in a place like this. And I think that the connections that we make will be very useful and inspiring, even if we don't recognize that connection of being important ten years down the line
Ceci Mendez, School of Art and Design

I see myself eventually having a career in academic medicine, so probably overseeing a research laboratory.
David Karow, M.D.-Ph.D. Program

The industry is very good right now and they need lots of people. So that looks good. As far as faculty goes, it is also a field that gives you freedom to do research in any area you wish.
Jayshri Sabarinathan, Electrical Engineering

I have offers from Stanford, from Johns Hopkins or Columbia University to go and do post-doc there if I want. So you can

go anywhere you want. It's just right at the level where it's nice because you have more choices.
Maricel Kann, Bioinformatics

My long term goal is I would love to be at some type of large research University really teaching to a lot of undergrads and having more of an undergrad research program than a graduate program.
Melissa Batchelor, Chemistry

What I want to do is, with my research and my work, is to extend it beyond traditional ethnomusicological boundaries and audiences, and it's really taught me to talk about things in music and theorize music in a way that is intelligible to a large audience.
Michal Rahfaldt, Ethnomusicology

I'm hoping that the kind of traditional divide between public history and academic history is beginning to get a little fuzzy, and that hopefully I can navigate the two when I finish my program here. That's certainly my hope; my objective anyway.
Michelle Craig, History

Graduate school has not always been easy and it has not always been fun, and I have not always been happy. But I know that I am in the right place doing the right thing at the right time. That's a pretty fun thing.
Clair Sullivan, Nuclear Engineering

As you can see, we have many graduate students who bring great energy, passion, and intelligence to their studies, and contribute much to the research and scholarship at Michigan. These students also contribute to the professional lives of our faculty. From the faculty mentors point of view, there is tremendous pleasure and gratification in seeing a young mind flourish with ideas, creativity, and the excitement of learning and discovery.

The faculty member also has the opportunity to explore several interrelated concepts simultaneously by working with several graduate students, with each focusing on one component of a larger puzzle. You might imagine this role as that of an intellectual orchestra conductor, who is guiding many "instruments" of inquiry to create a larger piece of work.

Then there is -- even for the faculty member -- the wonderful feeling at the final defense, when the student reaches the final milestone of his or her formal graduate education.

I can share with you from my personal experience as a mentor of graduate students that it is so wonderfully gratifying to observe the intellectual transformation that occurs in these young people over the course of their graduate work.

One of the first humbling lessons that new graduate students learn is that even though their undergraduate education may have been pretty broad, it probably was not very deep. Also,

these students are no longer the very best in their classes; in fact, every student around them is equally good or better.

These realizations tend to shake their self-confidence at first. Yet over the next five years, they not only regain their self-confidence, but they actually reach a point where each one of them becomes an expert in some area that is very special to him or her. It may be a very narrow or specific subject, but it is based on their personal effort and discoveries.

Very few experiences are more gratifying for a faculty member than to see his or her student become such an expert as to "outmaster the master" and know and understand a topic better than the teacher.

Our graduate students make a tremendous impact beyond the University. These students are one of the primary sources of the next generation of leaders and creators of new knowledge. Through these students -- as they pursue their careers, as well as through the professional and academic literature that they contribute to -- enrich our way of life, and society enhances its capacity to meet its long-term needs.

Update on the Michigan Life Sciences Corridor Initiative

I want to close by providing an update on the Life Sciences Corridor Initiative, an exciting collaboration that we are engaged in with the State of Michigan, biotech and pharmaceutical companies, and a number of academic institutions in Michigan. By way of a quick review, the Corridor Initiative is a billion-dollar investment being made by the State over the next 20 years designed to enhance both life science research and related economic activity in the State. The Initiative is funded from the State's settlement with the tobacco companies.

We are nearing the completion of the first funding cycle of the Corridor, including the official announcement made yesterday afternoon of the specific research and development activities to be supported. Then we will begin the heavy lifting involved in building up life sciences R&D in the State of Michigan.

The University of Michigan has fared very well in obtaining research support from the Corridor Initiative. Based on the recommendations of the Washington Advisory Group hired by the Corridor to conduct scientific merit reviews of all of the proposals, the UM and UM-linked start-up companies will receive about nearly $48 million in funding for the first two years of the Initiative.

In addition to individual research projects, the UM joined with Michigan State, Wayne State and the Van Andel Research Institute to propose the collaborative development of five core technologies to enhance life sciences R&D by both the academic and commercial sectors in Michigan. The proposal calls for the establishment of capabilities in five areas -- genomics, proteomics, structural biology, animal model development, and bioinformatics. A primary site of activity will be established for each of these areas at one of the four institutions Ð the UM will provide the headquarters for the proteomics and bioinformatics cores. Satellite facilities will be located at other partner institutions.

By establishing these core technologies, we hope to accomplish several goals:

- Provide access to the best technological facilities needed to support cutting-edge biotech research in both the academic and corporate worlds.

- Promote collaboration throughout the Corridor.
- Stimulate new avenues of research that wouldnt be possible if individual institutions needed to establish these kinds of facilities on their own.
- Offer the research resources that will attract many bright minds to the State of Michigan, both as students at our universities and as scientists needed by industry.

Here are the five Core Technologies that we hope to support for use state-wide. At the top, the Michigan Center for Genomic Technologies will provide state-of-the-art DNA sequencing and related capabilities. The Michigan Proteome Consortium will support studies of protein interactions crucial to the design of new biotech drugs. The Michigan Center for Structural Biology will offer cutting-edge research in protein chemistry and structure. The Michigan Animal Model Consortium will provide access to the many animal models of human disease that are important to the early stages of biotech research. And last, the Michigan Center for Biological Information will offer links among all of the Centers through the bioinformatics work, mathematical modeling of molecular structures, automated data analysis and database management to enhance the sharing of research findings.

The development of the Core Technologies through the Corridor will enable us to pursue research that we could never conduct as easily without the Corridor support. In part, this is because funds for these kinds of activities that support many research projects and users is not typically available from federal agencies. Also, equal access to the Core Technologies sites and services will be provided to both academic and commercial entities to support the research and development needs of both of these communities.

Participating in the creation of the Corridor Initiative has already been a very rewarding experience for us at the University, as it has been for members of our sister institutions and the other private and public partners. What we have begun to build is very encouraging. There is an elevated level of collegiality among all of the partners, both at the policy level as well as at the level of individual researchers.

Next let me show you some summaries of what was funded. This first slide shows that of about $36 million allocated to basic and applied research projects, the University will receive about $14.5 million. In addition, start-ups based on UM technologies and other commercialization efforts that the University will be involved received almost $14 million.

Finally, here is the core technologies slide again, but with the approximate dollar figures attached to each center or consortium.

- Genomics - $6 million
- Animal Models - $5.7 million
- Proteomics - $12 million
- Strutural biology - $13.5 million plus another $12.5 million to support a beamline at Argonne National Laboratory
- Bioinformatics - $9 million

Let me add that the individual research projects and the Core Technologies being supported through the Life Sciences Corridor will dovetail beautifully with our campus Life Sciences Initiative. In fact, some of the additional space required for the two Core Technologies that will be headquartered on our campus will be located in the new Life Sciences Complex on Palmer

Drive. The interrelationships between the campus life sciences and the statewide corridor efforts are already in place and will benefit both initiatives.

In closing, let me summarize the year by noting that the health of the Universitys research enterprise is in excellent shape, as indicated by the sense of excitement and enthusiasm expressed by our faculty and students, as well as by our growing research expenditures and new awards. In this context, I would like to express my appreciation to the Regents for their support, to my fellow Executive Officers for their guidance, and to the staff across the whole institution for all the time and effort they expend in processing the necessary paperwork, handling the accounting tasks, and supporting the vast infrastructure in so many other ways, thereby freeing the faculty and students to pursue their search for knowledge and truth. Thank you.