

## **Rackham 50th**

### **Introduction**

Congratulations on the 50th year of this marvelous building -- and this bold experiment in graduate education.

Rackham has become a cornerstone of intellectual life in this University.

Yet, there probably has not been a time throughout its history when people on our campus have not raised the obvious question: "Why?"

Why do we need a separate graduate school?

After all, many distinguished universities get along just fine without one...

Further, the disciplines themselves, the schools and colleges, departments and programs already carry most of the load for graduate education and scholarship... why not just eliminate this additional bureaucratic structure...

(Incidentally, the deans and chairs are most prone to ask this question during budget time... ...and, also interestingly enough, the rank and file faculty is always the first to come to the defense of this venerable institution...

### **My Theme: Why Rackham?**

Hence, on this Golden Anniversary of the Rackham School of Graduate studies I feel obliged to address once again some

of the reasons I believe support its existence.

Some caveats first, however:

i) First, I begin with the premise that graduate education and scholarship go hand-in-hand and cannot be separated...indeed, faculty and graduate students work together, learn together, and discover together...

ii) Second, rather than look to the past, to the rich intellectual history of this University, for the rationale behind the need for a strong graduate school, I will instead be somewhat more daring and look to the future, attempting to speculate a bit about the changing nature of graduate education and scholarship...

iii) And finally, I will toss aside my various University hats...

...as a member of the graduate faculty

...as the father of some 20 PhDs and the  
uncle of over a hundred more...

...as a former member of the Rackham  
Executive Board and Divisional Boards

...and as a University bureaucrat...

and instead don somewhat different hats...

as a member both of the National Academies  
and the National Science Board, two of this  
nation's primary sources of policy related  
to University-based research.

With this as background, I wish to focus on three topics:

- i) the balance between disciplinary and interdisciplinary scholarship
- ii) the importance of venturesome or high-risk research
- iii) the importance of change and renewal in scholarship

## **Interdisciplinary Research**

Perspective:

For the past year I have served on a NSB committee examining the appropriate balance between "Centers" and "Individual Investigators"...in effect, examining the appropriate balance between interdisciplinary and disciplinary research (Stimulated by the present mad rush of the NSF toward research centers...ASCs, ERCs, and now SRCs, which will eventually comprise roughly 40% of the NSF budget!)

As Provost I have been frequently caught between

Those who believe that the most exciting work today is occurring not within the disciplines, but at the interfaces between them where there is a collision of ideas that leads to new knowledge.

Some would even contend that this deification of the disciplines may be leading the academy toward intellectual stagnation, trapped in the sterile pursuits of increasingly specialized studies.

But there are also those who believe that there is a certain faddish nature to interdisciplinary work... and that efforts to stimulate this activity are, in reality, just causing people to staple

together unrelated projects into proposals

It is certainly true that the academic disciplines today tend to dominate the modern university...whether in the areas of curriculum, resource flow, administration, or rewards.

Further, it also seems clear that increasing specialization has led many of our colleagues to focus their loyalties on their disciplines, thereby losing the sense of the community of scholars so important to a University

As we attempt to build stronger and stronger programs in the traditional disciplines, we also tend to create strong centrifical forces which tend to push the various components of the University to the periphery.

On the other hand, we can also diminish the intellectual core of the institution by forcing interdisciplinary activity where it is not really appropriate, thereby perhaps diverting badly needed resources from the disciplines and starving the core of the University.

Achieving the appropriate balance between the disciplines and interdisciplinary teaching and scholarship is one of the major challenges before institutions such as ours...just as it is before the nation's research establishment.

### **The Role of Rackham**

Fortunately, this University has a very natural mechanism to stimulate and sustain interdisciplinary

activities without the bureaucracy frequently associated with major centers and institutes...

It is Rackham.

Furthermore, Rackham plays a uniquely unifying role by serving to draw us together in a common effort as a community of scholars.

Score one for Rackham.

### **Venturesome Research**

University must be responsive to changing intellectual currents.

Intellectual leadership...

demands pushing to the forefront of discovery

All too often academic institutions tend to regard their role more as the keepers and transmitters of existing knowledge than as the creators of new knowledge.

Here I like to refer to the image of the growth of knowledge in a field as an S-shaped or sigmoid curve...

In the early stages, the growth of knowledge is exponential, since the more you learn, the more rapidly the rate of knowledge increases...

At this early stage, a few individuals of exceptional ability and great intellectual span can have truly extraordinary impact, essentially stimulating and defining entirely new fields of knowledge...

This is the "high risk" area...since it can frequently take years (in addition to great talent) to achieve something...

As a field matures, the growth in knowledge becomes linear with time...

In this stage, the more resources you throw at an area...the more people or dollars...the more you learn...

This is where it is "safest" to work... easiest to get grants and to achieve tenure...

As the field matures still further, the growth in knowledge tails off...a law of diminishing returns sets in as one milks most of the new knowledge out of a field.

All too often, many of us get trapped in this area...essentially trapped in a rut.

Some of my colleagues suggest there may be a fourth phase...they refer to it as senility... where continuing to work in a field actually is counterproductive and reduces its knowledge content.

One of the great challenges of research universities is how we can encourage more people to work down in the high-risk, exponential part of the knowledge curve... without unduly jeopardizing their academic careers.,

Shift to a change-oriented, risk-taking culture

Relish change!!!

Stress bold, new initiatives...

We must stimulate more of a risk-taking intellectual culture  
in which people are encouraged to take bold initiatives.

### **Role of Rackham:**

Once again, Rackham comes to the rescue...

1. As a home for highly venturesome scholarship
2. As a source of stimulation, encouragement,  
and support of high-risk activities

Score two for Rackham...

### **Change and Renewal**

The Challenge

I believe that it was Burke who said that:

"A state without the means of change is without the  
means for its preservation"

The capacity for intellectual change and renewal  
has become increasingly important to  
academic institutions.

New ideas and concepts are exploding forth  
at ever increasing rates...

In many fields, the knowledge base is doubling every  
few years...

We have ceased to accept that there is any  
coherent or unique core of wisdom that serves  
as the basis for new knowledge...

Particularly in the face of concepts which time  
after time have blown apart our traditional  
views of a field...

the theory of relativity

the uncertainty principle

the molecular foundations of life...

We are increasingly surrounded by radical critiques of fundamental premises and scholarship...

Profound, new ways to approach knowledge...

As the pace of the creation of new knowledge accelerates, it seems apparent that we are entering a period in which permanence and stability become less valued than flexibility and creativity... in which the only certainty will be the presence of continual change... and the capacity to relish, stimulate, and manage change will be one of the most important abilities of all.

#### Traditional Approaches

Part of the problem is that most of us have been trained to think in terms of change as a linear, causal, and rational process. We have been taught that by looking at the past, we can extrapolate into the future.

Yet, perhaps because of my background as a physicist, I have become increasingly convinced that change in most complex systems, organizations, or fields of knowledge is:

- i) highly nonlinear
- ii) frequently discontinuous
- iii) and usually stochastic...random in nature...

Where classical science used to emphasize permanence, we now find change and evolution.

Stability and simplicity have become exceptions.



Let me expand on this theme for a moment...

### A Modern View of Change

We now know that most complex systems that may first appear to be stable and unchanging are, in reality, comprised of components that are continually fluctuating or changing...

In these systems, a situation sometimes occurs in which a single fluctuation becomes so large, as a result of feedback and nonlinearities, that it shatters the stability of the system. At this singular point, called in the language of physics, a bifurcation point, it becomes quite impossible to predict in advance which direction change will take...

...whether the system will disintegrate into a highly disordered or chaotic state...

...or leap to a new higher level of order or organization...

Of course, such bifurcation instabilities cannot be triggered by just any old fluctuation, but only by those that are particularly "dangerous"--that is, those that can exploit to their advantage the nonlinear relations that can trigger the instability of the existing regime.

The more complex a system is, the more numerous are the types of fluctuations that threaten its stability.

Note that this suggests that in such complex systems, regions or states of existence can arise in which a single fluctuation can lead to bifurcation and cause a discontinuous jump to a new state or order...

### Revolutionary Change (a la Kuhn)

If we take the viewpoint that most organizations...or even most fields of knowledge...are examples of such complex systems, then this view of change is remarkably similar to that of Thomas Kuhn's thesis concerning the way that knowledge changes in a field. In essence, it says that a single individual...or idea...can create dramatic change...a revolution, if you will, in the traditional way that we look at a field.

Kuhn's uses the term "paradigm" to refer to the body of knowledge...in essence, the way that one is accustomed to look at a field...accepted practices or perspectives.

In a sense, a paradigm is what the members of a community of scholars share, and conversely, a scholarly community consists of people who share a paradigm.

However, in contrast with the standard useage, a knowledge paradigm is not really a model designed for replication; rather it is an subject for further study and articulation.

Most research consists not of seeking major novelties, but rather polishing up existing paradigms...essentially mopping up -- or in GM's language, "sweating the details"...

In Kuhn's view, major progress does not occur through the gradual evolution of an existing paradigm, but rather through a revolutionary process in which an existing paradigm is replaced by a new paradigm.

The transformations of paradigms are revolutionary in nature, and the successive transition from one paradigm to another via revolution is the usual developmental pattern of mature field of knowledge.

Kuhn also observes that those who achieve the fundamental inventions of a new paradigm are usually either very young or very new to the field whose paradigm they change. These are the individuals who, being little committed by prior practice to the traditional rules of normal knowledge, are particularly likely to see that those rules no longer define a playable game and to conceive another set that can replace them.

They can make contributions of unusual importance since they haven't had the time yet to fall in the same old ruts that have trapped more experienced scholars.

An aside here: This may be one of the reasons why the perspectives of feminists, minorities, and third world scholars are of such importance to us...why they can lend a rich new vitality to our traditional forms of scholarship.

Note that just as in our earlier discussion of the nonlinear evolution of complex systems, we again see a theme in which single fluctuations...individuals or ideas...can trigger dramatic...and possibly unpredictable...change.

### **Role of Rackham:**

If our future is indeed one in which the capacity to stimulate and manage intellectual change becomes important...

And in which change is also viewed as a highly nonlinear, occasionally dramatic, and usually unpredictable process triggered by extraordinary people and their ideas...

Then, this suggests that academic institutions may well wish to think somewhat differently about how they go

about their business of teaching and research...

In this future, renewal and change will become essential  
for both the achievement and sustaining of excellence.

To get better, we must seek a culture in which  
creativity, initiative, and innovation are valued.

To stay the best, we must achieve a process of  
continual renewal.

Unfortunately, change can be threatening,  
particularly when it is forced by external  
factors in such a way that it victimizes people

But change and renewal can also empower people;  
it can give them control over their destiny

It seems critical that academic institutions not  
just respond grudgingly to change;

A university must relish and stimulate and manage a  
process of continual change and renewal if  
it is to achieve excellence and leadership.

And, once again, Rackham rides to the rescue...

1. To act as a "change agent" to stimulate  
intellectual change...to encourage paradigm  
shifts...bifurcations of the knowledge curve...  
knowledge revolutions...

2. And to provide the kind of fault-tolerant  
environment in which people are encouraged  
to take chances, to pursue bold and daring  
scholarship...

Score another one for Rackham...

Final score: Rackham 3, Schools & Colleges 0...

And I can now rest my case....

### **Concluding Remarks**

In conclusion, let me convey both my congratulations on this Golden Anniversary of Rackham... and my own conviction of the important role that Rackham has played in the intellectual life of our University.

And let me also suggest that in a future dominated by intellectual excitement, ferment, and change, Rackham will continue to play a critical role in sustaining the vitality of the scholarship and teaching of this institution.