

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Department of Agronomy and
Plant Genetics
College of Agriculture*

*411 Borlaug Hall
1991 Buford Circle
St. Paul, MN 55108-6026
612-625-7773
Fax: 612-625-1268*

February 2, 1996

To: Deans' Biological Sciences Policy Council

From: Ronald L. Phillips, Chair, Biological Sciences Enhancement Committee, Phase I

RZP

Members: Dwight Anderson (Oral Sciences - Dental School), Judy Berman (Plant Biology - CBS), Tom Hays (Genetics and Cell Biology - CBS), Horace Loh (Pharmacology - Medical School), Larry McKay (Food Science & Nutrition - COAFES), David Tilman (Ecology, Evolution, & Behavior - CBS), Clare Woodward (Biochemistry - CBS), and Chris Wylie (Pediatrics - Medical School)

Re: Phase I report

Attached is the report of our committee addressing the Deans' Council charge to define the core of biology at the University of Minnesota, to make the case for any recommended change in the conduct of biological sciences at the University (Twin Cities), to give our existing impressions of basic biological sciences at the U of M, to define the boundaries for future considerations of change, and to address issues in regard to public relations, visibility, infrastructure, and the reward system. The committee considered all of these issues and the report is a consensus opinion reflecting on these issues, either directly or indirectly.

The committee considers the review process that has been initiated by the Deans' Council as an important opportunity for the faculty to provide input on how to enhance the focus on the biological sciences at the University. Although we embrace the idea that much of the success of our programs depends on the inner striving of individual faculty, staff, and students to contribute to society's needs, we also believe that changes in attitude and organizational structure can significantly enhance our research, teaching, and service in the biological sciences. Much of agriculture and medicine now depend on the basic biological sciences, thus making imperative the need for coordination.

The committee met six times for a total of 18 hours in group discussion. Several previous documents were reviewed, including the National Research Council Report on Postgraduate Programs, the Speaks' Report, the Cluster Planning of Curriculum and Teaching in the Biological Sciences Report, the CBS Mission and Approved Goals Statement, and several others.

Our report focuses on two major issues: 1) a commitment to unification ("looking at biology as a whole"), and 2) a commitment to quality. We recognized early that the current College of Biological Sciences has about 90 faculty whereas most reports indicate that there are at least 1200 biologists at the University. In a time of limited resources, and without a bright prospect for reversing the trend, the committee readily concluded that the luxury of more or less independent decisions by the various colleges with biologists on their faculty is no longer an option. Therefore, unification in the decision-making process is essential to maximize our resources in the future. Because the decisions will be even more consequential than in the past, we believe the faculty must be expected to assume the key role in initiating new directions and in assuring quality. The report addresses these central issues and recommends a unit of Basic Biological Sciences which builds on the current CBS.

Issues of quality were central to our discussions and surfaced in regard to focus, productivity, interactions, expectations, visibility, and physical proximity issues. We call for an expanded role of faculty in advising the administration on these aspects.

We hope the perspectives and visions provided in this brief report will be useful in guiding you in taking the next steps in this important assessment on how to maximize the contributions of the University's biological sciences to the State of Minnesota and beyond. Our committee is available to meet with the Deans' Council whenever appropriate.



UNIVERSITY OF MINNESOTA

Twin Cities Campus

**Report of the Biological Sciences Enhancement Committee Phase I:
Perceptions and Scope of Biological Sciences at the University of Minnesota**

This committee was asked to report our perceptions of the *core* biology programs at the University of Minnesota, Twin Cities, and to delineate the scope of units which should be included in any efforts to reorganize biology.

Our perception of core biology research and teaching is that there are many positive features. However, there are the following serious problems which would be addressed by a university-wide unification of basic biology.

1. The University suffers from the lack of a cohesive, University-wide overview that reflects the broad interests of basic biology. The lack of a coordinated effort has resulted in unnecessary competition between units involved in research and teaching of basic biological sciences. This affects allocation of resources as well as establishment of policies that guide development of important areas of basic biology. The result has been a proliferation of areas of biology research and a duplication of efforts in biology teaching.
2. The University has a large number of faculty whose research programs in basic biology are highly respected. However, our reputation in many research disciplines is considerably diminished by dispersion of individual scientists in these disciplines among a number of departments, colleges and campuses. These disciplines are often the very ones that individual colleges are trying to enhance or develop, but in an uncoordinated fashion. The physical distance between individuals working in the same disciplines, and the lack of administrative coordination between their academic units, imposes a competitive disadvantage in relation to biological sciences research programs at other universities. Graduate programs, collaborative research and grant applications, undergraduate teaching, and faculty recruitment are disadvantaged by this dispersion in many instances.
3. The University has had problems retaining and attracting exceptional faculty. A number of important, visible positions have been filled by internal promotions, instead of bringing in new scientists with outstanding reputations to enhance our visibility. In addition there is variability across the Biological Sciences in the standards used for the granting of tenure.
4. The University has created incentives for colleges to proliferate biology courses that compete for the same student population and involve a duplication of faculty efforts. Responsibility Centered Management, as it relates to teaching efforts, may stimulate similar unhealthy competition between units within the University. Students often are attracted to programs that appear to have reduced requirements. Thus the system could provide incentives to departments and programs to attract more students by relaxing their standards. Such systems will contribute to duplication of effort and will defeat efforts to improve quality.

With these problems in view, we recommend that *core* biology at the University of Minnesota be unified to achieve the following **Goals**:

1) **Create a single unit of Basic Biological Sciences responsible for teaching and research of basic biology.** This should eliminate duplicative efforts in basic biological sciences by ensuring that resource allocation, hiring decisions, and planning are carried out in a coordinated fashion that benefits the University-wide interest in basic biology. This unit should provide a simpler administrative structure that facilitates interdisciplinary research efforts and the emergence of new areas of research expertise, while supporting areas of research strength. The unit should enhance the current excellent biology teaching infrastructure so that it supports those with primary responsibility for developing and implementing the professional, graduate and undergraduate foundation curriculum in basic biology.

2) **Facilitate the physical regrouping of biologists with common interests and research technologies to optimize existing and potential collaborations.** Under any reorganization plan, faculty should be grouped to build critical mass in current research strengths which explore common concepts and utilize related technologies. This would maximize research and teaching interactions and thereby increase the visibility of important programmatic areas already present within the University community. Any physical reorganization should start with proposals from the faculty and should result in positive change for individual faculty members.

3) **Establish a common culture of high expectations of quality and productivity in the new single unit of Basic Biological Sciences.** The administration should provide greater leadership by stimulating and rewarding quality, facilitating faculty development, and ensuring that the atmosphere, environment and infrastructure facilitates a high level of effective effort in scholarly research and teaching. Graduate and post doctoral students represent an essential part of the scientific engine that drives scholarly output. Enhanced recruitment procedures and reduced University impediments (e.g. escalating fringe benefit costs) should be explored.

4) **Recruit and retain outstanding faculty who have international reputations.** Renowned department heads and rising stars should be recruited to lead in new areas and to emphasize quality; a result would be to increase the visibility of the institution in cutting edge disciplines. A special recruitment, retention and awards committee should be established for these purposes.

5) **Create a feeling of community amongst all biologists at the University.** The unification of basic biologists should be a first step in the rejuvenation of biology. We should take this opportunity to sponsor efforts that bring basic biologists together on a regular basis. Examples would be: a major pan-biology lecture series featuring prominent biologists; an annual series of lectures on a topic of emerging significance by a distinguished biologist given at a level for all biology students and faculty; and a public lecture series on biology topics of general interest.

6) **Move forward expeditiously.** The unification of biology should not be delayed by years of discussion, followed by years of refurbishment or building. If external perceptions about our research quality are to improve within the next five years, then changes need to be implemented soon. Once a clear commitment to unify biology is made, physical relocation could precede the final administrative restructuring process.

The proposed reallocation of physical space in the AHC offers a unique opportunity for change. The new biomedical sciences building has created a large amount of space on the Minneapolis Campus. The proposed merger between the University Hospital and the Fairview System will generate another large unit of available space in Minneapolis. We strongly recommend that the utilization of this space should be considered within the context of the unification of biology.

7) **Form a Biological Sciences Coordination Council composed of elected faculty.** Faculty should be involved in overseeing the present and future directions of Biological Sciences. The Council should be responsible for eliminating and avoiding redundancy of efforts in curriculum planning and forward strategic planning as well as evaluating tenure cases to ensure that tenure standards are consistently maintained across the basic biological sciences. Deans, department heads and other administrators would be expected to be responsive to the advice of this council.

8) **Improve our communication of biological science to the general public** by dedicating resources for the continuation and enhancement of a unified outreach program. The sustainability of biological sciences efforts depends on providing education on various aspects of biology and on effective transfer of technology and its implications.

Scope of Unification

Unification of the basic biological sciences requires that a new unit be established that contains basic biologists with interests that span the range from molecular to cellular to organismal to ecosystem biology. Only a single unit that spans the full breadth of basic biology can assure the level of coordination, high standards and long-term flexibility that is needed to attain and sustain nationally/internationally recognized strengths in the biological sciences. The faculty of this unit would determine the scope, direction, and content of the discipline of biology, including undergraduate foundation courses in biology, graduate education in the basic biological sciences, and planning of resource allocation, hiring, and future directions for basic biology on both campuses. The teaching responsibilities of this unit would include undergraduate foundation courses in basic biology, graduate programs in biology, and basic biology courses that meet the needs of AHC, COAFES, Natural Resources, CLA, and other units.

At the present time, the core faculty in biology are dispersed among more than 35 departments in more than six colleges on two campuses that report to three different Provosts. The following is a partial list of departments or programs that contain basic biologists:

Agronomy and Plant Genetics (Agriculture, Food, & Environmental Sciences)
Animal Science (Agriculture, Food, & Environmental Sciences)
Bell Museum of Natural History (Natural Resources)
Biochemistry (Biological Sciences)
Biochemistry (Medical School)
Biological Process Technology Institute (Biological Sciences)
Biomedical Engineering (Medical School)
Cell Biology and Neuroanatomy (Medical School)
Chemistry (Institute of Technology)
Earth Sciences, School of (Inst. of Technology)
Ecology, Evolution and Behavior (Biological Sciences)
Electron Microscopy, Laboratory of (Biological Sciences)
Entomology (Agriculture, Food, & Environmental Sciences)
Fisheries & Wildlife (Natural Resources)
Forest Resources (Natural Resources)
Food Science and Nutrition (COAFES and College of Human Ecology)
Genetics and Cell Biology (Biological Sciences)
Horticultural Science (Agriculture, Food, & Environmental Sciences)
Human Genetics (Medical School)

Laboratory Medicine and Pathology (Medical School)
Landscape Arboretum (Horticultural Science)
Limnological Research Center (Earth Sciences)
Microbiology and Immunology (Medical School)
Neurology (Medical School)
Oral Sciences (Dentistry)
Other clinical departments with biological research faculty
Pediatrics (Medical School)
Pharmacology (Medical School)
Physiology (Medical School)
Plant Biology (Agriculture, Food, & Environmental Sciences and College of Biological Sciences)
Plant Pathology (Agriculture, Food, & Environmental Sciences)
Plant Molecular Genetics Institute (Biological Sciences and Agriculture, Food & Environmental Sciences)
Saint Anthony Falls Hydraulic Laboratory (Civil Engineering)
Soil Science (Agriculture, Food, & Environmental Sciences)
Veterinary Medicine (Academic Health Center)
Water Resources Research Center (Natural Resources)

The unification of biology should encompass basic core biologists in these and additional departments on both campuses. These departments range from programs that contain only one or two basic biologists to ones in which all faculty are basic biologists. Essentially all faculty in the current CBS units (Biochemistry, Ecology, Evolution and Behavior, Genetics and Cell Biology, Plant Biology, and other CBS institutes and programs) are basic biologists, as are most faculty in the basic science units of the Medical School (Biochemistry, Cell Biology and Neuroanatomy, Microbiology and Immunology, Pharmacology, and Physiology), and as are a large number of faculty in some COAFES departments (Agronomy and Plant Genetics, Entomology, Fisheries and Wildlife, Forest Resources, Horticultural Sciences, Plant Pathology, and Plant Biology). Basic biologists in these programs are the faculty who should be most involved in planning the unification of biology, but the unification should also consider and include basic biologists from other programs, including, but not limited to, those listed above.

In establishing this new unit in biology it is critical that its faculty span the range from molecular to cellular to organismal to ecosystem biology. It will be necessary, within this range, for faculty to be organized into areas of focus. These foci should be sufficiently large to minimize administrative costs yet sufficiently cohesive to provide areas in which we can further develop nationally recognized programs. For these areas of focus to be effective, it is desirable that members of a given area of focus be housed near each other, such as in adjacent laboratories in the same building, and not be spread across two campuses as at the present time.

Conclusion

Unification should generate a new feeling of community amongst all biologists by encouraging communication across this large group of faculty. This sense of common purpose and contribution would improve the effectiveness of University-wide efforts. New approaches that provide win-win solutions will be needed to accomplish this very important goal.

6/15

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Office of the Dean
College of Biological Sciences123 Snyder Hall
1475 Gortnar Avenue
St. Paul, MN 55108-1095
612-624-2244
Fax: 612-624-2785

June 14, 1995

Memo To: Provosts Gene Allen, Bill Brody, and Phil Shively

From: Mark Brenner, Frank Cerra, Mike Martin, and P. T. Magee
The Biological Sciences Policy Council

Prior to our meeting on the 15th of June, we would like to share our thoughts on biology at the University and its possible reorganization.

It's clear that there are both strengths (e.g. high external funding, excellent departments and graduate programs) and possible problems (failure to recruit the best graduate students, duplication in faculty expertise in different units) in biology here. Some of the issues involved in biology were addressed in the reports (attached) of three *ad hoc* committees formed as part of cluster planning in the fall and winter of the past year. Some of the same issues have been addressed in the reports of several faculty task forces over the past 10 years. (These are also attached.)

The present discussions seem to have been triggered by two things: a sense that we aren't sufficiently recognized for our quality in biology, given the number of resources we put into it, and the view that the appropriate response, whatever the problem, is to reorganize. We have no wish to exclude reorganization as a possible outcome of an analysis of biology, but we would suggest that it is premature to talk about reorganization until we have a clear idea of what we want to achieve in biology.

We therefore feel that the discussion of biology ought to proceed as follows:

- (1) We should have a discussion of the goals of the University of Minnesota in the area of biology. What are the productivity measures we want to achieve? What are the benchmarks? It is important that instruction be included along with research productivity in this analysis.
- (2) Having established goals, measures, and benchmarks, we need to decide how closely we approximate them. In what areas do we achieve our goals and our benchmarks? In what areas do we fall short?
- (3) Once we have agreed on criteria and upon ways we meet or fall short of our goals, we should discuss the measures we needed to improve our performance. Reorganization should be neither presumed nor excluded as an approach to achieving our goals.

To Allen, Brody, and Shively
June 14, 1995
Page 2

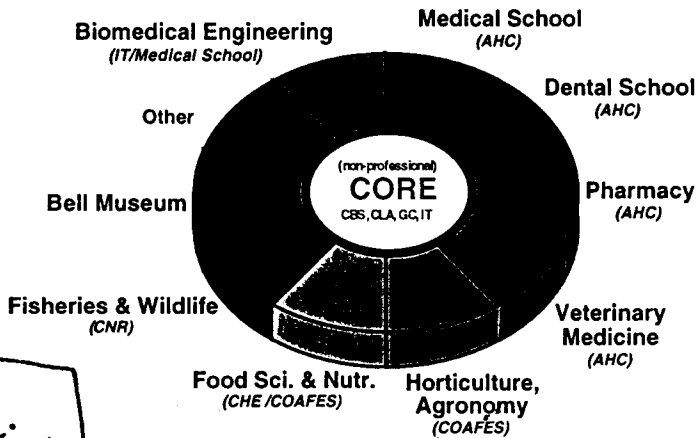
As we carry on this discussion, we should be aware of the context in which we exist: The faculty have been buffeted by five consecutive years of retrenchment. A major reorganization at the Provostal level has just been carried out, and for two of the Provosts the offices are not yet fully staffed. The University will have to change to a semester system by 1999, a change that will require a great deal of faculty time. Finally, reorganization is expensive, in terms of faculty time and energy. It ought not to be undertaken lightly.

We recommend that the first step be to establish goals and benchmarks for biology at the University. One possible approach might be to charge a faculty task force to do this. The same task force could evaluate how well the University is achieving those goals and meeting those benchmarks. When this information is in hand, we can discuss what's needed to improve our performance. If reorganization is required, we can then undertake it with specific objectives in mind.

ju

Enclosures

Relationships of Some of the Professional Units
to the Core Disciplines
in the Biological Sciences at the U of M



Biol. Sci
INFRA
TEACHING
LOADS
COMP.
Geography

\$1B unfunded depreciation

Structural deficits
No control of HR costs

Need for Mgt. / IT infrastructure investment

Notes:

Gene Allen

- New Collegiate Model
 - Consolidate colleges + depts.
 - Centralize services
- "INSTITUTE" Model
 - 3. Reduce # colleges by 50%
 - 3. Current IT structure is the Model

Major Budgetary Issues -

CBS Health Sciences Biol. Research

Intellectual Community → - INDIVID. ENTRI
- TEAMS
- groups centrally managed

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Office of the Dean
College of Biological Sciences*

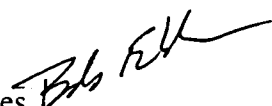
*123 Snyder Hall
1475 Gortner Avenue
St. Paul, MN 55108-1095
612-624-2244
Fax: 612-624-2785*

December 21, 1995

Memo To: Faculty in the Biological Sciences

From: Biological Sciences Policy Council

Robert Elde, Chair and Dean, College of Biological Sciences
Mark Brenner, Acting Vice President and Dean, Graduate School
Frank Cerra, Dean, Medical School
Richard Elzay, Dean, Dental School
Michael Martin, Dean, College of Agricultural, Food and Environmental Sciences
Harry Orr, Special Advisor to the Dean, Medical School
Norma Allewell, Vice Provost, Arts, Sciences and Engineering (ex officio)



Subject: Committee to Review Perceptions of the Biological Sciences

In response to concerns about the perceived decline in the impact of our institutional efforts in the core disciplines of biology, we have appointed a committee whose task will be to review the validity of these perceptions. This committee will be chaired by Regent's Professor Ronald Phillips (Agronomy & Plant Genetics; College of Agricultural, Food & Environmental Sciences) and will include the following members:

Dwight Anderson	Professor, Oral Sciences, Dental School
Judith Berman	Asst. Professor, Plant Biology, College of Biological Sciences
Tom Hays	Assoc. Professor, Genetics and Cell Biology, College of Biological Sciences
Horace Loh	Professor & Head, Pharmacology, Medical School
Larry Mackay	Professor, Food Science and Nutrition, College of Agricultural, Food and Environmental Sciences
David Tilman	Professor, Ecology, Evolution and Behavior, College of Biological Sciences
Clare Woodward	Professor, Biochemistry, College of Biological Sciences
Chris Wylie	Professor, Pediatrics, Medical School and Center for Developmental Biology

We are asking this committee to address two broad questions. First, what are the boundaries that define the core disciplines of biology at the Twin Cities Campus? Second, is the perceived quality of the core of biology valid, and if so, what are the elements that contribute to this perception? The report of the committee will be due on February 1, 1996.

We will provide the committee with background information that includes the reports of several past studies of the biological sciences on the Twin Cities Campus. However, we are not asking the present committee to summarize the past studies. Similarly, we are not asking the present committee to provide a plan for action. If called for, such a plan will be developed during an ensuing phase by a widely representative committee and subcommittees.

c: President Hasselmo
Provosts Allen, Brody and Shively

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Department of Agronomy and
Plant Genetics
College of Agriculture*

*411 Borlaug Hall
1991 Buford Circle
St. Paul, MN 55108-6026
612-625-7773
Fax: 612-625-1268*

February 2, 1996

To: Deans' Biological Sciences Policy Council

From: Ronald L. Phillips, Chair, Biological Sciences Enhancement Committee, Phase I

RLP

Members: Dwight Anderson (Oral Sciences - Dental School), Judy Berman (Plant Biology - CBS), Tom Hays (Genetics and Cell Biology - CBS), Horace Loh (Pharmacology - Medical School), Larry McKay (Food Science & Nutrition - COAFES), David Tilman (Ecology, Evolution, & Behavior - CBS), Clare Woodward (Biochemistry - CBS), and Chris Wylie (Pediatrics - Medical School)

Re: Phase I report

Attached is the report of our committee addressing the Deans' Council charge to define the core of biology at the University of Minnesota, to make the case for any recommended change in the conduct of biological sciences at the University (Twin Cities), to give our existing impressions of basic biological sciences at the U of M, to define the boundaries for future considerations of change, and to address issues in regard to public relations, visibility, infrastructure, and the reward system. The committee considered all of these issues and the report is a consensus opinion reflecting on these issues, either directly or indirectly.

The committee considers the review process that has been initiated by the Deans' Council as an important opportunity for the faculty to provide input on how to enhance the focus on the biological sciences at the University. Although we embrace the idea that much of the success of our programs depends on the inner striving of individual faculty, staff, and students to contribute to society's needs, we also believe that changes in attitude and organizational structure can significantly enhance our research, teaching, and service in the biological sciences. Much of agriculture and medicine now depend on the basic biological sciences, thus making imperative the need for coordination.

The committee met six times for a total of 18 hours in group discussion. Several previous documents were reviewed, including the National Research Council Report on Postgraduate Programs, the Speaks' Report, the Cluster Planning of Curriculum and Teaching in the Biological Sciences Report, the CBS Mission and Approved Goals Statement, and several others.

Our report focuses on two major issues: 1) a commitment to unification ("looking at biology as a whole"), and 2) a commitment to quality. We recognized early that the current College of Biological Sciences has about 90 faculty whereas most reports indicate that there are at least 1200 biologists at the University. In a time of limited resources, and without a bright prospect for reversing the trend, the committee readily concluded that the luxury of more or less independent decisions by the various colleges with biologists on their faculty is no longer an option. Therefore, unification in the decision-making process is essential to maximize our resources in the future. Because the decisions will be even more consequential than in the past, we believe the faculty must be expected to assume the key role in initiating new directions and in assuring quality. The report addresses these central issues and recommends a unit of Basic Biological Sciences which builds on the current CBS.

Issues of quality were central to our discussions and surfaced in regard to focus, productivity, interactions, expectations, visibility, and physical proximity issues. We call for an expanded role of faculty in advising the administration on these aspects.

We hope the perspectives and visions provided in this brief report will be useful in guiding you in taking the next steps in this important assessment on how to maximize the contributions of the University's biological sciences to the State of Minnesota and beyond. Our committee is available to meet with the Deans' Council whenever appropriate.

**Report of the Biological Sciences Enhancement Committee Phase I:
Perceptions and Scope of Biological Sciences at the University of Minnesota**

This committee was asked to report our perceptions of the *core* biology programs at the University of Minnesota, Twin Cities, and to delineate the scope of units which should be included in any efforts to reorganize biology.

Our perception of core biology research and teaching is that there are many positive features. However, there are the following serious problems which would be addressed by a university-wide unification of basic biology.

1. The University suffers from the lack of a cohesive, University-wide overview that reflects the broad interests of basic biology. The lack of a coordinated effort has resulted in unnecessary competition between units involved in research and teaching of basic biological sciences. This affects allocation of resources as well as establishment of policies that guide development of important areas of basic biology. The result has been a proliferation of areas of biology research and a duplication of efforts in biology teaching.
2. The University has a large number of faculty whose research programs in basic biology are highly respected. However, our reputation in many research disciplines is considerably diminished by dispersion of individual scientists in these disciplines among a number of departments, colleges and campuses. These disciplines are often the very ones that individual colleges are trying to enhance or develop, but in an uncoordinated fashion. The physical distance between individuals working in the same disciplines, and the lack of administrative coordination between their academic units, imposes a competitive disadvantage in relation to biological sciences research programs at other universities. Graduate programs, collaborative research and grant applications, undergraduate teaching, and faculty recruitment are disadvantaged by this dispersion in many instances.
3. The University has had problems retaining and attracting exceptional faculty. A number of important, visible positions have been filled by internal promotions, instead of bringing in new scientists with outstanding reputations to enhance our visibility. In addition there is variability across the Biological Sciences in the standards used for the granting of tenure.
4. The University has created incentives for colleges to proliferate biology courses that compete for the same student population and involve a duplication of faculty efforts. Responsibility Centered Management, as it relates to teaching efforts, may stimulate similar unhealthy competition between units within the University. Students often are attracted to programs that appear to have reduced requirements. Thus the system could provide incentives to departments and programs to attract more students by relaxing their standards. Such systems will contribute to duplication of effort and will defeat efforts to improve quality.

With these problems in view, we recommend that *core* biology at the University of Minnesota be unified to achieve the following **Goals**:

1) **Create a single unit of Basic Biological Sciences responsible for teaching and research of basic biology.** This should eliminate duplicative efforts in basic biological sciences by ensuring that resource allocation, hiring decisions, and planning are carried out in a coordinated fashion that benefits the University-wide interest in basic biology. This unit should provide a simpler administrative structure that facilitates interdisciplinary research efforts and the emergence of new areas of research expertise, while supporting areas of research strength. The unit should enhance the current excellent biology teaching infrastructure so that it supports those with primary responsibility for developing and implementing the professional, graduate and undergraduate foundation curriculum in basic biology.

2) **Facilitate the physical regrouping of biologists with common interests and research technologies to optimize existing and potential collaborations.** Under any reorganization plan, faculty should be grouped to build critical mass in current research strengths which explore common concepts and utilize related technologies. This would maximize research and teaching interactions and thereby increase the visibility of important programmatic areas already present within the University community. Any physical reorganization should start with proposals from the faculty and should result in positive change for individual faculty members.

3) **Establish a common culture of high expectations of quality and productivity in the new single unit of Basic Biological Sciences.** The administration should provide greater leadership by stimulating and rewarding quality, facilitating faculty development, and ensuring that the atmosphere, environment and infrastructure facilitates a high level of effective effort in scholarly research and teaching. Graduate and post doctoral students represent an essential part of the scientific engine that drives scholarly output. Enhanced recruitment procedures and reduced University impediments (e.g. escalating fringe benefit costs) should be explored.

4) **Recruit and retain outstanding faculty who have international reputations.** Renowned department heads and rising stars should be recruited to lead in new areas and to emphasize quality; a result would be to increase the visibility of the institution in cutting edge disciplines. A special recruitment, retention and awards committee should be established for these purposes.

5) **Create a feeling of community amongst all biologists at the University.** The unification of basic biologists should be a first step in the rejuvenation of biology. We should take this opportunity to sponsor efforts that bring basic biologists together on a regular basis. Examples would be: a major pan-biology lecture series featuring prominent biologists; an annual series of lectures on a topic of emerging significance by a distinguished biologist given at a level for all biology students and faculty; and a public lecture series on biology topics of general interest.

6) **Move forward expeditiously.** The unification of biology should not be delayed by years of discussion, followed by years of refurbishment or building. If external perceptions about our research quality are to improve within the next five years, then changes need to be implemented soon. Once a clear commitment to unify biology is made, physical relocation could precede the final administrative restructuring process.

The proposed reallocation of physical space in the AHC offers a unique opportunity for change. The new biomedical sciences building has created a large amount of space on the Minneapolis Campus. The proposed merger between the University Hospital and the Fairview System will generate another large unit of available space in Minneapolis. We strongly recommend that the utilization of this space should be considered within the context of the unification of biology.

7) **Form a Biological Sciences Coordination Council composed of elected faculty.** Faculty should be involved in overseeing the present and future directions of Biological Sciences. The Council should be responsible for eliminating and avoiding redundancy of efforts in curriculum planning and forward strategic planning as well as evaluating tenure cases to ensure that tenure standards are consistently maintained across the basic biological sciences. Deans, department heads and other administrators would be expected to be responsive to the advice of this council.

8) **Improve our communication of biological science to the general public** by dedicating resources for the continuation and enhancement of a unified outreach program. The sustainability of biological sciences efforts depends on providing education on various aspects of biology and on effective transfer of technology and its implications.

Scope of Unification

Unification of the basic biological sciences requires that a new unit be established that contains basic biologists with interests that span the range from molecular to cellular to organismal to ecosystem biology. Only a single unit that spans the full breadth of basic biology can assure the level of coordination, high standards and long-term flexibility that is needed to attain and sustain nationally/internationally recognized strengths in the biological sciences. The faculty of this unit would determine the scope, direction, and content of the discipline of biology, including undergraduate foundation courses in biology, graduate education in the basic biological sciences, and planning of resource allocation, hiring, and future directions for basic biology on both campuses. The teaching responsibilities of this unit would include undergraduate foundation courses in basic biology, graduate programs in biology, and basic biology courses that meet the needs of AHC, COAFES, Natural Resources, CLA, and other units.

At the present time, the core faculty in biology are dispersed among more than 35 departments in more than six colleges on two campuses that report to three different Provosts. The following is a partial list of departments or programs that contain basic biologists:

Agronomy and Plant Genetics (Agriculture, Food, & Environmental Sciences)
Animal Science (Agriculture, Food, & Environmental Sciences)
Bell Museum of Natural History (Natural Resources)
Biochemistry (Biological Sciences)
Biochemistry (Medical School)
Biological Process Technology Institute (Biological Sciences)
Biomedical Engineering (Medical School)
Cell Biology and Neuroanatomy (Medical School)
Chemistry (Institute of Technology)
Earth Sciences, School of (Inst. of Technology)
Ecology, Evolution and Behavior (Biological Sciences)
Electron Microscopy, Laboratory of (Biological Sciences)
Entomology (Agriculture, Food, & Environmental Sciences)
Fisheries & Wildlife (Natural Resources)
Forest Resources (Natural Resources)
Food Science and Nutrition (COAFES and College of Human Ecology)
Genetics and Cell Biology (Biological Sciences)
Horticultural Science (Agriculture, Food, & Environmental Sciences)
Human Genetics (Medical School)

Laboratory Medicine and Pathology (Medical School)
Landscape Arboretum (Horticultural Science)
Limnological Research Center (Earth Sciences)
Microbiology and Immunology (Medical School)
Neurology (Medical School)
Oral Sciences (Dentistry)
Other clinical departments with biological research faculty
Pediatrics (Medical School)
Pharmacology (Medical School)
Physiology (Medical School)
Plant Biology (Agriculture, Food, & Environmental Sciences and College of Biological Sciences)
Plant Pathology (Agriculture, Food, & Environmental Sciences)
Plant Molecular Genetics Institute (Biological Sciences and Agriculture, Food & Environmental Sciences)
Saint Anthony Falls Hydraulic Laboratory (Civil Engineering)
Soil Science (Agriculture, Food, & Environmental Sciences)
Veterinary Medicine (Academic Health Center)
Water Resources Research Center (Natural Resources)

The unification of biology should encompass basic core biologists in these and additional departments on both campuses. These departments range from programs that contain only one or two basic biologists to ones in which all faculty are basic biologists. Essentially all faculty in the current CBS units (Biochemistry, Ecology, Evolution and Behavior, Genetics and Cell Biology, Plant Biology, and other CBS institutes and programs) are basic biologists, as are most faculty in the basic science units of the Medical School (Biochemistry, Cell Biology and Neuroanatomy, Microbiology and Immunology, Pharmacology, and Physiology), and as are a large number of faculty in some COAFES departments (Agronomy and Plant Genetics, Entomology, Fisheries and Wildlife, Forest Resources, Horticultural Sciences, Plant Pathology, and Plant Biology). Basic biologists in these programs are the faculty who should be most involved in planning the unification of biology, but the unification should also consider and include basic biologists from other programs, including, but not limited to, those listed above.

In establishing this new unit in biology it is critical that its faculty span the range from molecular to cellular to organismal to ecosystem biology. It will be necessary, within this range, for faculty to be organized into areas of focus. These foci should be sufficiently large to minimize administrative costs yet sufficiently cohesive to provide areas in which we can further develop nationally recognized programs. For these areas of focus to be effective, it is desirable that members of a given area of focus be housed near each other, such as in adjacent laboratories in the same building, and not be spread across two campuses as at the present time.

Conclusion

Unification should generate a new feeling of community amongst all biologists by encouraging communication across this large group of faculty. This sense of common purpose and contribution would improve the effectiveness of University-wide efforts. New approaches that provide win-win solutions will be needed to accomplish this very important goal.

960226

Draft: Key Components to Enhancing Undergraduate Programs in the Biological Sciences,
as Identified by the BSPC

RE: Biological Sciences Undergraduate Programs

Per our discussion of February 19, here's what I believe we discussed. Addressing issues related to biological sciences may be best handled in increments. Thus, reforms in the way we offer undergraduate education is worthy of immediate attention. Here is a conceptual framework for a new approach to undergraduate programs in biological sciences at the University of Minnesota.

- We will develop a single corridor into biological science at the University and it will be through the College of Biological Sciences (CBS).
- CBS will be responsible for coordinating the offering of all core or foundation biology coursework.
- Each college with programs which rest on this foundation will assign (contribute, allocate) a prorated share of teaching effort (in FTE's) to the core teaching effort. Faculty lines will remain in their home college.
- Only "master teachers" will teach in the core. These will be our best and will be recognized and rewarded for this distinction. A limited number of faculty will be designated "master teachers" and we will request funds for special stipends for each (say \$3,000 per year).
- All core courses be approved by a program coordinating committee based on pre-established criteria (much as CLE courses are).
- We will advertise and recruit for this program as the singular platform for biology here.
- After discussions with administrators and faculty and appropriate adjustments, we will appoint a small implementation taskforce. This taskforce will begin restructuring the curriculum in a way consistent with the above framework and in the context of semester conversion.

MVM:kd

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Office of the Dean
College of Biological Sciences*

*123 Snyder Hall
1475 Gortner Avenue
St. Paul, MN 55108-1095
612-624-2244
Fax: 612-624-2785*

June 19, 1996

Memo To: Interested Faculty and Staff

From: Robert Elde, Dean, College of Biological Sciences, and
Chair, Biological Sciences Policy Council



Subject: Draft for Reorganization of the Biological Sciences

Attached is the draft prepared by the deans of the Biological Sciences Policy Council* entitled "A Plan to Reorganize the Biological Sciences at the University of Minnesota." We invite your comments and criticism. Faculty and staff in the College of Biological Sciences have read an earlier version of this draft. The present document has been modified in part in response to the comments from CBS. We now seek your comments, as members of the community of biologists at the University of Minnesota, to frame the discussions that are needed in order to develop a more complete and final proposal.

Points four (research in core disciplines) and five (administrative structure) of "Part II: Proposed Solutions" are the least developed at this point and will be the primary focus of a retreat of the BSPC and the Provosts in early July. The Council is particularly interested in comments regarding these sections. You are encouraged to respond to this draft individually or with groups of colleagues to me via e-mail (belde@biosci.cbs.umn.edu) by June 30th.

* Members of BSPC: Robert Elde (Chair), Frank Cerra, Michael Martin, Mark Brenner, Richard Elzay, Norma Allewell (ex-officio), Harry Orr (ex-officio).

A Plan to Reorganize the Biological Sciences at the University of Minnesota

Part I: Statement of the Problem

The development of modern biology has been one of the great success stories of the twentieth century. Public concerns about issues such as health, population, food supplies, quality of life and the environment have resulted in an unprecedented public investment which continues to this day, despite downturns in funding in all other areas. Interdisciplinary research and simultaneous advances in the physical sciences and engineering have generated new approaches and new questions. Many age old questions have been answered and new discoveries have changed our understanding of our bodies and minds, our awareness of our environment and the practice of medicine and agriculture forever. Most important, the intellectual framework of biology has undergone radical restructuring so that it is now based on levels of organization rather than taxonomy.

Although there are many biologists at the University of Minnesota, the organization of biology here has not kept pace with these changes. One of the great themes in the development of twentieth century biology has been the unification of previously distinct fields. However, biology at the University is dispersed across the three provostal units, many departments and an even larger number of graduate programs. As a result, our collective efforts lack intensity, policy decisions frequently do not make use of the collective wisdom of the biological community and redundancy at every level dissipates our financial resources.

The effects of this disorganization are manifold. Because biology does not have a high profile at the university, the number of undergraduates majoring in biological disciplines lags far behind the national average. Although the economy of Minnesota depends heavily on health care, agriculture, natural resources, we are not generating the number of sophisticated graduates in biology required to bring these industries into the twenty-first century. We recruit relatively few outstanding graduate students and as a result we are not as successful as we should be in competing for training grants. Although we continue to attract strong junior faculty, we have a great deal of difficulty in recruiting and retaining outstanding senior faculty. Only three biologists are members of the National Academy. Our faculty compete well for individual research grants, but we do not fare as well collectively. Our average ranking in the core disciplines in the biological sciences in the recent report (1993 study, published in 1995) from the National Research Council (NRC) was 36. We receive no institutional support from the prestigious Howard Hughes Medical Institute and federal support for multi-investigator research programs as opposed to projects of individual investigators is modest. This will become increasingly problematic since federal policy appears to be shifting towards increased support of multi-investigator programs.

The Core Disciplines in Biology:

One of the fundamental problems in the organization of biology at the University of Minnesota is the failure to distinguish at the policy-making level the core disciplines of biology from the professional disciplines or "applied" biology. The core disciplines deal with fundamental questions of mechanism at the molecular, cellular, genetic, organismal, ecological and evolutionary level.

Questions at the molecular level include:

- How do biological molecules recognize and interact with each other?
- How do enzymes catalyze reactions?
- How is light used in photosynthesis?
- How are electrical potentials generated across cellular membranes?

Questions at the cellular level include:

- How do cells recognize each other?
- How do cells move?
- How do cells divide?
- How do materials enter and leave cells?
- How are these processes controlled?
- How are nerve impulses transmitted?

Questions at the genetic level include:

- How is genetic information encoded?
- How is genetic information transmitted from parents to offspring?
- How is genetic information expressed in an individual?
- How is the expression of genetic information regulated?

Questions at the organismal or systems level include:

- How do genes control the development of an organism?
- How do hormones act?
- How does the immune system work?
- How is movement initiated and controlled?
- How do we (and other organisms) see?
- How do we feel pain?
- How do size and shape of organisms relate to their other life history characteristics?
- How does behavior affect life history evolution?

Questions at the ecological level include:

- How do physical and biological factors interact in shaping an ecological community?
- How does diversity benefit an ecological community?
- How does an ecological community adapt to environmental changes?
- How do behavioral interactions influence population and community dynamics?

Questions at the evolutionary level include:

- How do new species originate?
- How do existing species avoid extinction?
- How do the mechanisms of evolution shape the patterns and processes of all biological systems?
- How do phylogenies reflect environmental and biogeographic histories of the earth's biota?
- How does knowledge of phylogenies make possible an understanding of evolutionary processes?

Note that all of these questions begin with "how". The core disciplines of biology are concerned with general principles and the "rules" that govern the operation of biological systems. The great advances in biology in this century have resulted from the tremendous progress that has been made in being able to frame and address these questions. Since all biological systems obey these "rules", this new understanding has in turn had enormous impact on how we develop public health policy, diagnose and treat disease, develop new varieties of plants and animals in agriculture and evaluate and manage our environment. The core biological sciences are the engine that drives development in all of the applied biological sciences.

Because the University of Minnesota is a land grant institution, founded to meet the immediate needs of the state as perceived by its citizenry and their elected representatives, the development of applied biology has been emphasized. We have invested heavily in the professional disciplines in the schools of human and veterinary medicine, dentistry, nursing, pharmacy, public health, agriculture and natural resources. Development of the core biological disciplines has not kept pace. Yet they are critical in determining our national and international

reputation; our ability to recruit outstanding undergraduates, graduate students, postdoctoral fellows and faculty members; and to keep the applied biological sciences at the cutting edge.

The Speaks Report:

The last major examination of the organization of biology on the Twins Cities campus was in 1985, when the Speaks committee, comprised of 14 faculty from departments ranging from Nursing and Communication Disorders through Biochemistry and Ecology and Behavioral Biology to Animal Sciences and Forest Resources, was charged with "evaluating the potential of research and graduate training in biological/life sciences at the university" and recommended several "mechanisms for helping us achieve this potential".

This committee identified four major problems: national rankings, number of high quality applicants to many graduate programs, faculty morale and the number of "stars" in the biological/life sciences. These are still considered to be the major problems today.

The Speaks committee made two broad general recommendations:

1. Faculty and administrators must develop clearly defined goals for the biological/life sciences.
2. The University should explore ways to promote recognition of the excellence that currently exists within the community of scientists in the biological/life sciences.

This committee also made many specific recommendations about mechanisms to improve and motivate the faculty, support for graduate students and graduate programs, direct support for research and equipping teaching laboratories. Many of these recommendations required new investments and only three have been carried out. Teaching laboratories are better equipped, the Dean of the Graduate School is now also Vice President for Research, and, for better or worse, we still have two Biochemistry departments.

The conclusions of this committee concerning the organization of the biological sciences are of particular interest. They are summarized below:

1. Basic biology requires strong core units in a college that is administratively outside the IAFHE (now COAFES) and the Health Sciences.
2. In addition, research and education in basic biology should continue within the IAFHE, Health Sciences, IT and other units.
3. The strengthening of basic biology should not be at the special expense of applied biology.
4. The basic biology core must include a strong unit in biochemistry.
5. A much higher level of consistent interaction between the physical and biological sciences must be achieved.
6. Strength in basic biology must be maintained on both the St. Paul and Minneapolis campus.
7. The system must have increased flexibility to facilitate the initiation, early growth and--when appropriate--the disappearance of innovative research enterprise.
8. Communication among administrators and faculty in the biological/life sciences should be fostered.
9. Recognition of the importance of research should be incorporated into the University's administration.

10. The important role of the IAFHE, Health Sciences, and CBS in providing professional training and outreach to the state and nation should be recognized and supported.

In a sense, the development of biology on the Twin Cities campus in the intervening ten years has basically been consistent with, if not driven by, these recommendations. There is strong basic biology in CBS, the Academic Health Center, COAFES and IT. Applied biology has flourished across the campus. However, the lack of integration of the basic biological units, and the lack of communication at the policy level between basic and applied units has resulted in the whole being less than the sum of its parts. Furthermore, the duplication of core biology in several units is much more difficult to justify in a time of diminishing resources at every level than it was in 1985, when the noose was just beginning to tighten.

The Phillips Committee:

In the fall of 1995, the three Provosts directed the Biological Science Policy Committee, comprised of the Deans of COAFES, CBS, the Medical School, the Graduate School and the Dental School (representing the Applied Health Sciences), to re-examine the organization of biology. As a first step, the Council appointed a committee of nine eminent scientists, three from the Academic Health Center, four from the College of Biological Sciences and two from COAFES, to define the core of biology at the University of Minnesota, give its impression of the basic biological sciences on the Twin Cities campus, make the case for any recommended changes, define the boundaries for future considerations of change and address issues in public relations, visibility, infrastructure and the reward system.

This committee identified four problems:

1. The lack of a cohesive University-wide overview that reflects the broad interests of biology that results in duplication and unproductive competition at the levels of both teaching and research.
2. Dispersion of faculty across administrative units and campuses disadvantages us at every level.
3. Many efforts at recruiting and retaining exceptional faculty fail.
4. The inadvertent development of incentives to duplicate courses, particularly RCM, threatens to increase course duplication and diminish quality.

The report emphasized the need for a commitment to unification, particularly in making policy decisions, and a commitment to quality in several areas--focus, productivity, interactions, expectations, visibility and physical proximity.

It made the following specific recommendations:

1. Create a single unit of Basic Biological Sciences responsible for teaching and research of basic biology.
2. Facilitate the physical regrouping of biologists with common interests and research technologies to optimize existing and potential collaborations.
3. Establish a common culture of high expectations of quality and productivity in the new single unit of Basic Biological Sciences.
4. Recruit and retain outstanding faculty who have international reputations.
5. Create a feeling of community amongst all biologists at the University.
6. Move forward expeditiously.

7. Form a Biological Sciences Coordination Council composed of elected faculty.
8. Improve our communication of biological science to the general public.

The committee also pointed out that the faculty in biology are dispersed among more than 35 departments in more than six colleges on two campuses reporting to three different provosts. It recommended the organization of faculty in the core disciplines into areas of focus, with members of a given area of focus located in physical proximity.

There are many common themes in the Speaks and Phillips Report. Both reports make a clear distinction between basic and applied biology and emphasize the dependence of applied biology on basic biology. Both recognize the tension in supporting both basic and applied biology adequately. Both recognize the need for a strong unit dedicated to basic biology. Both recognize the two campus problem; however, while the Speaks committee compromised by recommending that strength in basic biology be maintained in both Minneapolis and St. Paul, the Phillips report advocates judicious grouping of biologists with common interests in the same physical location.

Other Institutions:

In thinking about how biology should be organized at the University of Minnesota, it is instructive to examine institutions that are ranked more highly. The rankings of the top 20 institutions in seven of the core biological sciences from the 1995 National Research Council study are listed in Table 1 (appendix). Public institutions are shown in bold.

The major public institutions that we would like to emulate in the core biological sciences clearly include the University of California at Berkeley, San Francisco, San Diego, and Los Angeles; University of Wisconsin at Madison; University of Washington at Seattle; University of Illinois at Champaign-Urbana; and University of Michigan at Ann Arbor. Institutions whose rankings have improved dramatically since the 1983 NRC review also warrant attention; these include the University of California at San Francisco, University of Colorado, Washington University and University of Texas Southwestern Medical Center.

Which medical schools might we use as models? Of the many ratings, one of the most relevant to the core biological sciences is the list of medical schools recently awarded one of the new series of institutional grants from the Howard Hughes Medical Institute that are designed to strengthen core disciplines in the basic sciences. (See Table 2, appendix)

Note that a number of public institutions are ranked in the top twenty in the NRC rankings and also received HHMI institutional grants; for example, the Universities of California at Los Angeles, Washington, Wisconsin, Colorado, Iowa and North Carolina. Clearly, at these institutions there is a synergy between excellence in the biological sciences disciplines and excellence in medical education. Further, the University of California at Berkeley is not a medical school and yet, through other Hughes programs has 6 HHMI Investigators and is also highly ranked in biological science disciplines by the NRC.

How do these institutions differ from the University of Minnesota? Some are larger universities, with proportionally larger investments to make in biology. For example, the WARF fund at the University of Wisconsin generates millions of dollars of revenue each year that are used to support faculty research in biology. When excellence is achieved at smaller institutions, for example, the Universities of North Carolina and Iowa, the institution has generally made a disproportionate investment in the fields in which it has achieved excellence. Reorganization is often the key to success; for example, Berkeley underwent major reorganization in biology, during a period when biology at Minnesota has been relatively stagnant. Others such as University of

California at San Francisco, Washington University and the University of Washington at Seattle have been in a period of rapid growth and have benefited from extensive funding from the Howard Hughes Medical Institute and strong ties to industry - Genentech at the University of California at San Francisco and Microsoft at the University of Washington. Both mechanisms have allowed these institutions to respond to the changing nature of biology. For some, improved rankings correlate with the presence of Nobel prize winners; for example, the University of California at San Francisco, University of Colorado and University of Texas Southwestern Medical Center. Frequently, the presence of a Nobel prize winner has provided justification for the highly visible development of a specific field (or vice versa).

Many of these institutions invested in key fields much earlier than the University of Minnesota. Frequently, development in a new field was linked to the development of an Institute which provided a scientific focus as well as a focus for fund-raising. For example, critical hires in the central approaches of structural biology, macromolecular X-ray crystallography and nuclear magnetic resonance spectroscopy, were made in the late 1960s and early 1970s, respectively, in many institutions, while the corresponding hires were not made in Minnesota until the early 1980s and late 1980s, respectively. Similarly, in the early 1980s, when many institutions were building up molecular biology, Minnesota spent its efforts wrangling over administrative structure and hired less than a dozen people in a field that has become the foundation for virtually all subsequent developments. Neurobiology and immunology have experienced similar delays.

Few of these institutions encompass the breadth of mission on a single campus that exists on the Twin Cities Campus. Within the California system, UCSF is the focus for biomedical research while agriculture is concentrated at Davis. Similarly, in Washington, North Carolina and Michigan, agriculture is localized in the state university system, rather than in the flagship universities. In contrast the biologists on the Twin Cities campus have several separate missions - undergraduate, graduate, and professional education; biomedical, agricultural and natural resources research. One obvious lesson is that we may need to decide where we want to excel and stop trying to be good at everything.

In addition, the four mile separation between the Minneapolis and St. Paul portions of the Twin Cities campus creates a difficult organizational problem that continually generates barriers to communication, interaction, and synergy and hence is a prescription for redundancy. It also separates the St. Paul faculty from most of the undergraduate student body as well as the General Biology teaching laboratories.

Many top-ranking institutions have developed "umbrella" graduate programs that provide broad training to entering students and allow the student to defer the decision on specialization until they have acquired a broad perspective. Most institutions that have instituted these programs report a dramatic increase in the quality of applicants and matriculants. These programs are most advantageous to institutions that are trying to develop strong programs in emerging disciplines such as the neurosciences and developmental biology which combine the approaches of more established disciplines.

In many of the top-ranking institutions, the most distinguished scientists teach both undergraduates and graduate students. For example, at the University of Michigan, the Department of Biological Sciences, organized administratively through the Medical School, is responsible for all undergraduate and graduate education at Michigan. This is true here for Ecology, Evolution and Behavior, our highest ranked department in the biological sciences. However, in other areas, such as Biochemistry and Cell Biology, there has been a differentiation of mission, with faculty in the medical school teaching only graduate students and professional students in the health sciences, while faculty in the College of Biological Sciences are solely responsible for undergraduate education and have varying involvement in teaching graduate

courses. This differentiation may hurt the institution in several ways: our undergraduates are exposed to only a small fraction of the total number of outstanding biologists on campus; the faculty and graduate students in the College of Biological Sciences can be cut off to some extent from the mainstream of research and graduate education in biology; and faculty in the Medical School do not experience the rewards of undergraduate education. In many of the more highly ranked institutions, biology is one of the most popular undergraduate majors.

Future Prospects:

Minnesota's NRC rankings generally slipped between 1983 and 1995. For example, Biochemistry was ranked 28th in 1983 while Biochemistry and Molecular Biology was ranked 39th in 1995. Arguably, one of the factors that hurt us here was the lack of a concerted institutional response to developments in Molecular Biology in the 1970s. As an institution, we need to develop administrative structures that can respond more rapidly to change, since one of the messages that emerges from the NRC rankings is that the institutions that are highly ranked in a given field are those that recognized the opportunity early. Unless changes are made, the University of Minnesota will slip further and further from the cutting edge of biology. This is something we cannot afford to do, given our institutional investment and the importance of biology intellectually, economically and socially.

The departments in which faculty in the core disciplines of biology are concentrated are aging and growing smaller, since few new hires have been made in the past ten years, some outstanding younger faculty have been recruited away and there are an increasing number of retirements where faculty have not been replaced. As the reputation of the University in biology declines, the resources available for new hires will decline, as will our ability to recruit and retain outstanding faculty.

The College of Biological Sciences has already reached a critical state. The projected retrenchments over the next five years will almost preclude hiring any new faculty with College funds. During this period there will likely be at least 9 retirements, bringing the total number of faculty in the College down to 75. This is simply not a situation in which excellence in either teaching or research can be sustained in a field that is changing as rapidly as biology.

Prospects in the Medical School for the core disciplines in biology are also uncertain. The pressure of increased competition and declining revenues has forced an emphasis on research with more direct clinical applications rather than fundamental mechanistic studies. As in the College of Biological Sciences, faculty with these interests are declining in numbers and increasing in age and feel badly torn between their allegiance to their discipline and the obvious need to move in the direction that the Medical School appears to be moving. Some would also like to have more contact with students within a disciplinary context than is possible at present. Since excellence in medical education is generally coupled with disciplinary excellence, as the recent HHMI awards illustrate, resolving these tensions would strengthen both the Medical School and the disciplines.

Part II. Proposed Solutions

1. Overall approach

The overall goal of the reorganization of the biological sciences is to increase the quality of the disciplines that represent the core of biology. At present, and with few exceptions, the core disciplines are too weak to be nationally competitive. This is due, in part, to a failure of the University to designate responsibility for the disciplines as currently recognized. Major new disciplines within the core of biology have arisen over the past three decades (i.e., molecular biology, cell biology, neurobiology). They arose, not surprisingly, because leading research universities canonized them as disciplines and new scientific societies were born and now thrive. During this thirty year period, the University of Minnesota failed at an institutional level to support adequately these now mature disciplines. The University chose to pretend that previously important departmental structures could embrace the newly emerging disciplines. However, some faculty who were convinced by the excitement of the new disciplines desperately sought a foothold here at the University of Minnesota and found that our Graduate School was willing in some instances to support what had become *bona fide* disciplines at other institutions as "interdisciplinary" graduate programs here at Minnesota. Although the support of the Graduate School was warmly received, its financial resources and influence were not sufficient to grow and protect the new disciplines. In contrast, substantial support was generated for the new disciplines in the biological sciences at our competing institutions.

The overall approach for the reorganization of biology is to reduce the barriers that currently prevent realization of our potential as a community of biologists. Further, we propose discrete mechanisms, each of which requires further examination and shaping prior to implementation, that will lead to the unification of the faculty into entities that can deliver significantly greater quality to our teaching, research and outreach.

For the purposes of this discussion, the non-professional, core disciplines of biology include the following:

animal biology	general biology
behavioral biology	genetics
biochemistry	microbiology
cell biology	molecular biology
developmental biology	neurobiology
ecology	physiology
evolutionary biology	plant biology

2. Undergraduate education in the core disciplines of biology

At present, undergraduate education in biology is confusing to potential and matriculated students because of the myriad of entry points and the plethora of courses with similar titles. Second, the University of Minnesota Twin Cities is not regarded as an institution that provides a high quality undergraduate education in biology by potential students and their families. If they are seeking a high quality education at a Big Ten institution they are likely to enroll at either Madison or Ann Arbor. The University of Minnesota is simply not viewed as a national contender in high quality undergraduate education in biology - a fault that is exemplified by the few non-residents that we attract to our programs. Of the state residents that we do attract, too few of them decide to major in a biological discipline. This situation is pitiful, given that the State of Minnesota, with its

“10,000” lakes and outdoor-oriented populace, probably inspires more budding biologists per capita than any other state. We seem to either export that enthusiasm to our competitors or drown it in our institutional confusion. This is unfortunate because CBS has distinguished itself in different aspects of undergraduate education in biology, for example, in General (introductory) Biology and with its programs for under-represented students. Interestingly, the institutions in the NRC’s roster of highly-regarded *graduate* programs in the biological disciplines turn out to be institutions that are also magnets that attract *undergraduate* students into biology (or, *vice versa*).

The following measures are proposed to strengthen the curriculum for undergraduates. The expected outcome is to increase the profile for the University of Minnesota as a major research university with a focus of high quality instruction and research opportunities in core disciplines in biology as well as an unusually comprehensive access to the professional disciplines in biology.

- A. A single corridor into the undergraduate curriculum in biological sciences will be developed. This corridor will be the College of Biological Sciences (CBS), and therefore CBS will become a freshman admitting college. Other colleges presently admitting freshman who then track into majors in the professional disciplines of biology will no longer admit these freshmen.
- B. Courses in the core disciplines that are fundamental and prerequisites for courses in the core and the professional disciplines in biology (typically 1000- and 3000-level) will be coordinated and offered by CBS. As a group, these courses will be referred to as “Fundamentals in Biology” followed by further descriptors (i.e., Fundamentals in Biology: Biochemistry 1234).
- C. The aforementioned courses will be organized and taught by a group of “Master Professors in Biology” that will be drawn from the faculty of CBS as well as faculty from all other colleges offering degrees in the professional disciplines of biology. This faculty will be selected for their prior accomplishments in scholarship and teaching, and will therefore be mid-career and senior faculty. The distinction of Master Professor will carry an augmentation to salary in the amount of \$3000 annually (or, an equivalent sum available for discretionary research spending by the Master Professor).
- D. Each college with programs that rely upon the Fundamentals in Biology courses will assign a prorated share of FTEs for inclusion in the group of Master Professors in Biology. Prorating will be based upon the number of students predicted to flow through the courses in the Fundamentals in Biology. Faculty appointments will remain within their home college. Participation in the Master Professors program by each college will ensure that the curriculum meets the needs of students who will track into each of those colleges.
- E. The present undergraduate majors in the non-professional core disciplines of biology (i.e., Biology, Biochemistry, Ecology, Evolution & Behavior, Genetics and Cell Biology, Microbiology, Physiology, Plant Biology) will be expanded to include Human Biology and Neurobiology. The curriculum in Human Biology will focus on those aspects of biology that interface with the social sciences (i.e., psychology, child development, sociology, geography) and the human condition (i.e., philosophy, medicine). The curriculum in Neurobiology has been developed by a committee chaired by Professor Richard Poppele.
- F. The teaching facilities for General Biology, currently housed within Kolthoff Hall (principally occupied by the Department of Chemistry), will be relocated to be within the community of biologists on the Minneapolis portion of the Twin Cities Campus.
- G. A major outpost of the present Office of Student Services (CBS) will be created within the community of biologists on the Minneapolis portion of the Twin Cities Campus.

H. A unified and vigorous recruiting program for prospective undergraduate students in both the professional and non-professional disciplines of biology will be developed. In particular, emphasis will be placed on the central role played by the Master Professors for the Fundamentals in Biology courses.

3A. Graduate education in the core disciplines (doctoral training)

Graduate education at major research universities is the most important activity in perpetuating and advancing the core disciplines through the scholarship of graduate students and the faculty. However, many of the core disciplines in biology at the University of Minnesota suffer by mistakenly being considered "interdisciplinary" while others have not received attention commensurate with our competition for reasons outlined above in Part I. The goal of reorganization of graduate programs in the core disciplines of biology is to *bring clarity to the leading disciplines in the core of biology* in a manner such that they can be recognized as such by prospective students, and so that they can be nurtured by a faculty and administration committed to excellence and achievement.

The configuration of graduate programs at the University of Minnesota reflects to a large extent, the historical, departmental structure of the professional disciplines of biology as well as varied attempts to codify the disciplines that emerged in the core of biology during the last three decades. As such, the list of graduate programs is long (38 programs in the Biological Sciences Policy and Review Council) as well as confusing in names of programs and in the claims of intellectual coverage. Intellectually, biology is unifying at an unprecedented rate in part because genomic analysis has revealed key relationships between simple and complex organisms. Organizationally, biology is unifying at competing universities. Thus, it is imperative that consolidation of graduate programs in the biological sciences at the University of Minnesota occurs, and that the basis for such unification be rational. The following approach brings about clustering of graduate programs where the basis for clustering is a core knowledge deemed to be common to the involved programs. A further principle for unification is a broadening of the core curriculum for students in a given program, so that their background will be sufficient to allow for flexibility in career options upon completion of the graduate degree.

The following programs that contain elements of the core disciplines in biology will be asked to consider seriously the option of clustering:

Cellular, Molecular and Biomedical Sciences

- Biochemistry, Molecular Biology and Biophysics
- Cell & Integrative Physiology
- Microbiology, Immunology and Molecular Pathology
- Molecular, Cellular, Developmental Biology & Genetics
- Neuroscience
- Pharmacology
- Plant Biological Sciences

Plant Sciences

- Agronomy
- Horticulture
- Plant Breeding
- Plant Pathology
- Plant Biological Sciences

Environmental Sciences

Conservation Biology
Ecology
Fisheries
Wildlife Conservation
Zoology

One potential model for the clustering of graduate programs is appended to this report ("Proposal: Formation of the Graduate Program in BioMedical Sciences").

3B. Graduate education in the core disciplines (Professional Masters in Biology program)

A further opportunity and responsibility for the community of biologists at the University of Minnesota is to provide options for "lifelong" learning. Some years ago graduate education was a sequential process, with the Master's degree usually or often preceding the Ph.D. During the last two decades in the core disciplines of biology, the number of traditional Master's degrees awarded has fallen dramatically while the number of Ph.D. degrees has risen. With few exceptions, the traditional Master's degree in core disciplines of biology has disappeared. We seek to address a clear need in this area.

A significant trend in American higher education has been the return to the universities of students who obtained BA/BS degrees some years previously. These students have typically been employed in technical positions in industry or have been teachers at the K-12 level and from their work experience and station in life have found renewed energy for academic pursuits. At present, the core disciplines in biology at the University of Minnesota have little to offer these individuals. We propose the creation of a Professional Masters in Biology Program which will offer terminal Masters degrees in some of the fields of biology. This program will be administered by the College of Biological Sciences and will involve faculty from several of the biologically-oriented colleges.

The final two portions of the proposal for the reorganization of the biological sciences have not yet been thoroughly explored by the deans of the Biological Sciences Policy Council. Only a preamble is given for each. These items will be the focus of a retreat of these deans, the purpose of which will be to arrive at a consensus concerning these matters. They will then be made available for discussion and comment prior to formulating final recommendations. In the meantime, faculty are encouraged to caucus, develop position papers on these matters and forward these ideas to the deans.

4*. Recognition and reconfiguration of research foci in the core disciplines in the biological sciences

It is recognized by the deans that the intensity and quality of research in the core disciplines in biology are enhanced dramatically by the physical and intellectual environment in which the studies are conducted. Thus, physical relocation of individuals and groups of faculty (both within and between campuses) should be explored. It would be helpful for faculty who see the value of regrouping to express their interest.

5*. Administrative streamlining necessary to accomplish and sustain the above.

It is recognized by the deans that the core disciplines in the biological sciences can be adequately supported in these times of limited and possibly dwindling resources only by the unification of faculty into single, discipline-based departments. The deans remain open to all suggestions on these matters.

TABLE 1

Biochemistry & Molecular Biology

1	Univ. of CA-San Francisco
2	Massachusetts Inst. of Tech.
2	Stanford University
4	Univ. of California-Berkeley
5	Harvard University
6	Yale University
7	California Institute Technology
8	Univ. of Wisconsin-Madison
9	Univ. of California-San Diego
10	Johns Hopkins University
10	Columbia University
12	University of Colorado
13	Washington University
14	Univ. of California-Los Angeles
15	Duke University
16	University of Pennsylvania
17	Brandeis University
18	University of Washington
19	Baylor College of Medicine
20	U of TX-Southwestern Med. Ctr.
39	University of Minnesota

Physiology

1	Yale University
2	Univ. of California-San Diego
3	University of Pennsylvania
4	Univ. of California-Los Angeles
5	Univ. of CA-San Francisco
5	Baylor College of Medicine
7	University of Washington
7	Stanford University
9	University of Virginia
9	Columbia University
11	University of Chicago
12	University of Iowa
13	California Institute Technology
14	New York University
15	University of Michigan
15	Vanderbilt University
17	Albert Einstein College of Med.
18	Mayo Graduate School
19	John Hopkins University
20	U of Illinois Urbana-Champaign
20	Univ. of Alabama-Birmingham
72	University of Minnesota

Neurosciences

1	Univ. of California-San Diego
2	Yale University
3	Harvard University
4	Univ. of CA-San Francisco
5	Stanford University
6	Columbia University
7	Johns Hopkins University
8	Washington University
9	Univ. of California-Berkeley
10	California Institute Technology
10	University of Pennsylvania
12	University of Washington
13	Rockefeller University
14	Massachusetts Inst. of Tech.
15	Univ. of California-Los Angeles
16	Duke University
16	Case Western Reserve Univ.
18	University of Michigan
19	Baylor College of Medicine
19	Brandeis University
34	University of Minnesota

Molecular and General Genetics

1	Massachusetts Inst. of Tech.
2	Univ. of CA-San Francisco
3	Harvard University
4	California Institute Technology
5	Stanford University
6	Univ. of California-San Diego
7	Univ. of Wisconsin-Madison
8	Yale University
9	Johns Hopkins University
10	Univ. of California-Berkeley
11	University of Chicago
12	Columbia University
13	University of Utah
14	Baylor College of Medicine
15	Duke University
16	Washington University
17	University of Washington
18	U of TX-Southwestern Med Ctr.
19	University of Pennsylvania
20	U of NC--Chapel Hill
34	University of Minnesota

Ecology, Evolution & Behavior

- 1 Stanford University
- 1 University of Chicago
- 3 Duke University
- 4 Cornell University
- 5 Univ. of California-Davis
- 6 Princeton University
- 7 University of Washington
- 8 Univ. of California-Berkeley
- 9 Univ. of Wisconsin-Madison
- 10 State U of NY-Stony Brook
- 10 Univ. of Texas at Austin
- 12 University of Michigan
- 13 Washington University
- 14 University of Pennsylvania
- 15 University of Minnesota
- 16 University of Georgia
- 17 Yale University
- 18 Univ. of California-Los Angeles
- 18 Univ. of California-San Diego
- 20 Univ. of CA-Santa Barbara

Pharmacology

- 1 Yale University
- 2 U of TX-Southwestern Med Ctr
- 3 Univ of California - San Diego
- 4 Johns Hopkins University
- 5 Duke University
- 6 Vanderbilt University
- 7 Harvard University
- 8 U of NC-Chapel Hill¹
- 9 University of Washington
- 9 University of Pennsylvania
- 11 Massachusetts Inst of Tech
- 12 Univ of Wisconsin-Madison
- 13 University of Michigan
- 14 New York University
- 15 Emory University
- 16 U of NC-Chapel Hill²
- 17 Stanford University
- 17 University of Colorado
- 19 University of Rochester
- 19 University of Iowa
- 21 University of Minnesota

Cell & Developmental Biology

- 1 Massachusetts Inst. of Tech.
- 2 Rockefeller University
- 3 Univ. of CA-San Francisco
- 4 California Institute Technology
- 5 Harvard University
- 6 Stanford University
- 7 Univ. of California-San Diego
- 8 University of Washington
- 9 Washington University
- 10 Yale University
- 11 Princeton University
- 11 Stanford University
- 13 Univ. of California-Berkeley
- 14 Duke University
- 15 University of Chicago
- 16 Univ. of Wisconsin-Madison
- 17 Univ. of California-Los Angeles
- 18 U of TX-Southwestern Med Ctr.
- 19 Columbia University
- 20 John Hopkins University
- 37 University of Minnesota

¹ School of Arts and Sciences

² Interdisciplinary with the Schools of
Medicine, Pharmacology, and Public Health

TABLE 2

**30 Medical Schools Receiving 5-Year Awards from HHMI
to Enhance Basic Sciences (Annual Amounts)**

\$3,600,000

Columbia University College of Physicians and Surgeons

\$3,400,000

John Hopkins University School of Medicine

Stanford University School of Medicine

\$3,000,000

Albert Einstein College of Medicine

Univ. of California, Los Angeles, School of Medicine

Washington University School of Medicine

\$2,800,000

Univ. of New Mexico School of Medicine

Univ. of Washington School of Medicine

Univ. of Wisconsin Medical School

\$2,600,000

Univ. of California, San Diego, School of Medicine

Univ. of Chicago Pritaker School of Medicine

\$2,400,000

Case Western Reserve Univ. School of Medicine

Univ. of Alabama School of Medicine

Univ. of Colorado School of Medicine

Univ. of Iowa College of Medicine

Univ. of North Carolina, Chapel Hill, School of Medicine

Univ. of Utah School of Medicine

Univ. of Vermont College of Medicine

Vanderbilt University School of Medicine

\$2,400,000

Duke University School of Medicine

Harvard Medical School

Northwestern University Medical School

Oregon Health Sciences Univ. School of Medicine

Univ. of Florida College of Medicine

Univ. of Massachusetts School of Medicine

Univ. of Pennsylvania School of Medicine

Univ. of Southern California School of Medicine

Univ. of Texas Medical School at San Antonio

PROPOSAL:

Formation of the Graduate Program in BioMedical Sciences

leading to a Ph.D. degree in any of the following disciplines:

Biochemistry, Molecular Biology & Biophysics
Cell & Integrative Physiology
Microbiology, Immunology and Molecular Pathology
Molecular, Cellular, Developmental Biology & Genetics
Neuroscience
Pharmacology

Introduction

The granting of the Ph.D. degree is central to the teaching mission of the University of Minnesota. As such, research based graduate education will continue to be the cornerstone of the research enterprise at the University. However, we must realize that the face of graduate education is rapidly changing and that our responsibilities in the educational venue leading toward the Ph.D. degree are much broader than they ever have been. Graduates in the biological sciences are being asked to enter a job market which emphasizes career skills not only at the research bench, but also in public policy, law, ethics and finance, but to name a few. While our responsibilities to train students has broadened, we are faced with the realization that the funding of biomedical sciences in this country will be at best a zero-based enterprise. Consequently, we must develop mechanisms which foster new initiatives in the biological science research with the potential to develop into long-term stable lines of financial support. Mechanisms to maximize faculty interactions which may synergize into collaborations should be identified. In order to respond to these changing parameters, the formation of a common graduate program in BioMedical Sciences is proposed. This program would provide for an integrated curriculum for the biomedical sciences which would serve to bring disparate faculty groups together. The net effect would be to train Ph.D.'s more effectively for today's climate while increasing the interactions between faculty with common research goals.

The General Outlines

The graduate program in BioMedical Sciences (BMS) would be an umbrella graduate program and single entry port for students interested in careers in the biological sciences as they apply to contemporary problems in molecular medicine. The BMS program would advertise world-wide as the entry point for students interested in research/teaching careers in the biomedical sciences. However, the BMS program would not grant a Ph.D. degree in BioMedical Sciences. Instead, this graduate program would serve to funnel students into one of several existing Ph.D. granting programs termed divisions. The BMS program would serve to coordinate the recruiting of students who would indicate which of the degree program(s) they would like to be considered for. A primary goal would be to not dismantle existing strong graduate programs but to meld the programs under a single administrative umbrella which would facilitate the identification and training of students while bringing faculty together.

To establish the BMS program, a coordinating committee comprised of department heads, directors of graduate study and elected members at-large would be formed. This would be the

primary governing body for the entire BMS program and would interface with the Graduate School on administrative matters. This committee would have oversight responsibility for all facets of the program. The BMS coordinating committee would establish numerical goals and standards for student recruitment, the method of recruitment, develop and implement policies relating to the monitoring student progress during the degree, formulate an integrated core curriculum common to all BMS students and establish criteria for selection and periodic evaluation of BMS faculty. A central tenet of the BMS proposal is that there be a common entrance standard for all Ph.D. candidates. This standard should be equivalent to the highest now in place to ensure that top-notch students are admitted and trained. For BMS to be excellent, all divisions must recruit the best students around the country. If a division cannot attract enough top students, its graduate pool should diminish rather than accept lower academic quality. What is not wanted is for the graduate pool to become the average of all programs but for the total graduate pool to become equivalent to or better than the best we have. If a particular division cannot recruit enough high-caliber students, then faculty in that program would rotate support from graduate student lines into either postdoctorals or technicians. A division would not lower its standards to attain its recruiting numbers.

Recruiting and Training of Students

The training of graduate students starts with the willingness of faculty to work hard and invest time and energy into the recruitment and training process. It is important for individual divisions to retain control of the selection of students into their discipline. The BMS program would provide administrative and organization assistance in the advertising and recruitment of students into each division. BMS responsibilities could include lodging and transportation services relating to hosting prospective students, arranging for faculty interviews and tours of the campus and Twin Cities. Divisional responsibilities would include establishment of recruitment goals, the selection of students and identification and assignment of individual recruiters for each prospective student. Ultimate responsibility for the recruitment process would rest with the division. It is anticipated that the BMS program would admit between 60-75 students annually. The establishment of the BMS program does not preclude other groups from independently recruiting students to Minnesota. For example, training and center grants would still continue to advertise for their particular focus. However, such recruitment methods should indicate that interested students should apply via the BMS entry port.

An additional difference between our current method of training and BMS would be in the teaching and laboratory rotation requirements of BMS graduate students. All BMS students would perform laboratory rotations during their fall semester. Rotation projects would be less intense and would last only 3-4 weeks in any individual laboratory. This would allow 3-4 rotations per semester, perhaps as many as 8 during the year. The purpose of the rotations would be for the student to gather some knowledge about a particular lab, perhaps assisting a current postdoctoral or graduate student. The rotations would not have performance in the laboratory, insofar as accomplishing a research project, as a primary goal. With far less emphasis and time on the rotation project, first year graduate students would have time to perform their teaching duties. The goal would be to have all student complete their teaching requirements during the first year, prior to joining a research laboratory and beginning thesis research. Research grants would therefore not be penalized by having students leaving during the second and third year to perform teaching duties. This would translate into increased productivity by students who are supported by training grants and individual investigator-initiated grants.

Along with performing their teaching duties, all BMS students would take a common core curriculum consisting of 4 semester-long courses to be completed during the first year. These core courses would be:

Fall Semester:	Biochemistry and Biomolecular Structure Molecular Cell Biology and Genetics
Spring Semester:	Regulatory Biology, Microbiology and Molecular Immunology Developmental Biology and Neuroscience

5/8/96

Identification of instructors from the BMS faculty for the core series would be determined by the coordinating committee. At the end of the first year, students may opt to change divisions (degree programs) depending upon their laboratory rotations and classroom experiences. In the second year, each division would augment the core with specialty courses to develop a more in-depth curriculum in any particular area. Alternatively, students may take a combination of courses establishing a broadly based foundation in basic biology. In addition, the basic sciences core would be augmented with lectures from clinical faculty to provide a perspective on contemporary issues in molecular medicine. Once admitted into BMS, a graduate student may rotate in any laboratory in the program and enter any laboratory. A correlate to this is that any student may transfer within the BMS program without being administratively burdened. This should be simple if BMS uses a common entrance standard and students take a common core curriculum. The BMS program may also consider establishing mini-courses in order to train students broadly in career path choices. Topics for mini-courses could be scientific ethics, legal aspects of biological sciences research, biology and public policy, financial and accounting management, and career counseling. In addition, all BMS should have some common teaching experiences to acquaint them with the organization of the classroom.

Faculty could be a member of only a single division or multiple divisions. The Ph.D. degree that a student receives would be dependent upon a declaration of intent at the end of the first year in the program. The preliminary written and oral exams would be defined by the BMS coordinating committee. Annual student progress reviews would be handled uniformly across the BMS program and organized by the administrative committee. In addition, all graduate students in a particular division would have an equivalent teaching responsibility. The BMS coordinating committee would facilitate coordination between divisions to ensure that graduate students teaching experience is similar between divisions.

Mechanisms of Support for Students in BMS

All financial support for students in their first academic year in the BMS program would come from a common pool. Funding of students from a common pool eliminates the parochial nature of "ownership" of students and eliminates DGS's having to bargain each year with different academic units for support money. Options for support include funding by the Graduate School, by CBS or by the Medical School. Alternatively, some combination of funds may be used to support the program. The Graduate School would be asked to provide funds for recruiting and administration of the Program. The objective of this financial arrangement would be to ensure that students are not the financial "property" of a particular division or department and therefore are not administratively "locked". Boundaries between divisions should be transparent, leading to a community of graduate students. In the second and subsequent years of graduate training, students would be supported by any combination of historical methods, individual research grants, fellowships, training or center grants or private scholarships.

5/8/96

Summary

It is important to reiterate that the BMS program would strive not to be the numerical average of all divisions but a mechanism for raising the collective whole based upon increased interaction between faculty and students and the ability to attract high-quality Ph.D. candidates. The advantages for the student would be:

- A broadly-trained educational experience with the ability to enter a wide variety of laboratories without administrative penalty.
- A common core curriculum.
- Administrative procedures for recruiting and student monitoring that would streamline the graduate process.
- Teaching in the first year to allow 100% effort in the research laboratory during the second and subsequent years.
- Increased number of rotations to allow students more possible choices for a thesis advisor

The advantages for the faculty are numerous, they include:

- Reduction in administrative and recruiting overlap between different graduate programs
- Ability to attract and recruit high-quality graduate students
- Dissociation of financial ties to students and their first year training, elimination of parochialism in graduate training
- Common core curriculum to more effectively educate students
- Increased interaction between faculty leading to program project/center/training grants
- Elimination of graduate students being supported on research grants while performing teaching duties
- Reduction in budgetary pressures on departments for first year student support

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Office of the Dean
College of Biological Sciences

Biological Sciences, College of

1475 Gortner Avenue
St. Paul, MN 55108-1095
612-624-2244
Fax: 612-624-2785

TO: Frank Cerna

ORGANIZATION: Provost, AHC

TELEFAX NUMBER: 6-2111

FROM: Bob Elders

No. of pages (including cover): 3

COMMENTS:

Agenda for the August 1st
BSPC Retreat.

This fax transmission is intended for the use of the individual or office noted above, and may contain information that is private, confidential, and exempt from disclosure under law. If you received this transmission in error, please notify the sender or operator immediately by telephone.

If there is a problem receiving this FAX, please call 612-624-2244.

Tentative Retreat Agenda 1 August 1996

Proposals for the Biological Sciences at the University of Minnesota for Consideration by Provosts, BSPC Deans, Members of the Phillips Committee and Advisors to Deans

8:00 Arrival, Introductions and Instructions

The morning's activities will draw upon previous efforts and the knowledge of the members of the Phillips Committee to explore assumptions, identify key issues, and move toward a common understanding of goals and desired outcomes.

8:15 Background Leading Up to This Retreat

Bob Elde will brief the group on previous decisions and actions related to today's work and will summarize the reactions and input received from interested parties.

8:45 Assumptions and Key Issues

- add to the list supplied by Bob
- identify (additional) implications arising from the assumptions
- what are the key issues (to be considered this afternoon)
- what do the assumptions suggest about how to tackle the key issues
- what additional considerations should guide decision making

10:00 Break**10:15 Structures Which Should Guide Implementation**

- Biological Sciences Coordination Council - role and responsibilities?
- advisory panel of experts drawn nationally?
- Biological Sciences Policy Council
- timeline for implementation

11:00 Sensitivities and Risks

- what might cause the greatest concerns among faculty, staff, students and other stakeholders
- what are the risks
 - what might derail this effort
 - what are the significant but manageable risks
- what steps/strategies should be taken to manage and/or lessen risks

Noon Lunch

(with appropriate thanks to members of the Phillips Committee before they depart!)

1:00 Decision Making Procedures

How does this group wish to make decisions?

1:15 Specific Proposals

- modifications to the proposals already presented
- additional proposals
- discussion and clarification
- likes and dislikes --> combination and modification of proposals

2:15 Mini-Break (10 minutes)**2:25 Review or Reach Decisions****2:45 Outcomes and Indicators**

1. Outcomes are those results which confirm achievement of specific goals
 - what are you going to look for in 5 - 10 years
 - how will you measure them; who will be responsible for doing it
 - what baseline data need to be collected now
2. Indicators are interim results which suggest whether to "stay the course" or implement mid-course corrections
 - what indicators will you look for before July 1997
 - what indicators will you look for in the first year; second year, etc.
 - what baseline information needs to be collected now

3:15 Wrap Up

- review decisions
- identify issues still needing attention
- review assignments (if any)

3:30 Dismissal

[Throughout the day we will attempt to capture definitions and themes to be incorporated in the record of decisions and recommendations from the retreat.]

July 30, 1996

Memo

To: Provosts, BSPC Deans and ex officio members, Members of the Phillips Committee and Advisors to Deans

From: Bob Elde

Subject: Reading material for retreat

I have developed the following document that contains Proposals for Action, some thoughts on implementation and a list of some assumptions that underlie the proposals. These proposals have been informed by the deliberations that have been occurring over the past nine months and by reactions to the Draft for Discussion that have been brought to my attention. As can be seen from the enclosed agenda, I will review those reactions at the beginning of the retreat. A copy of the previously circulated "Draft for Discussion" is also included.

I am collecting thoughts under the following categories: Risks, Sensitivities, Measurable Outcomes, Definitions and Other Considerations. These will be distributed at the outset of the retreat, and I hope that our discussions will make this lists more comprehensive.

The Patricia Kovel-Jarboe will serve as facilitator for our discussions. I look forward to a productive day!

enclosures (Agenda, Draft for Discussion)

Proposals for Discussion and Action

Retreat of the Provosts, BSPC Deans, Members of the Phillips Committee and Advisors to Deans

August 1, 1996

Goal: Promote intensity and national recognition in instruction, scholarship and outreach in the core disciplines in the biological sciences at the University of Minnesota.

Preface: It is presumed that the initiatives concerning undergraduate education and clustering of graduate programs will be enacted as previously discussed and as articulated in the "Document for Discussion" that has been circulated. The following proposals are intended to build beyond those agreements.

Proposal 1: New Departments and Administrative Structure

1a. Create single, university-wide departments based upon the contemporary, core disciplines in biology.

Particulars:

- A. Each of these new departments will be responsible for instruction (undergraduate, graduate and professional), scholarship and for guiding the future of the discipline.
- B. Departments must be functionally efficient units (i.e. ratio of faculty to support staff). The current assumption is that a department must include approximately 25 faculty and not exceed 40 faculty to meet this criterion.
- C. Because of "B", some departments will represent more than one discipline. The inclusion of more than one discipline must be intellectually justified and reflected in the name of the department. However, the name of a single discipline will appear only once in the list of departments.
- D. A preliminary menu of departmental choices will be created as an outcome of a 2-day local symposium for which faculty will be requested to propose structures and intellectual foci for a newly configured department. From this, the BSPC deans will select the proposals for which consensus seems greatest, and use these as a menu of proposed departments.
- E. Faculty in basic and professional disciplines of biology will be asked to choose a preferred departmental home. Choices not receiving the threshold number required for departmental status (25 faculty) will be eliminated or combined by the BSPC. If necessary, a second round of menu choices will be presented to the faculty.
- F. Given the wide range of biology, it may be prudent to cluster departments into divisions that would further strengthen biology by such alliances. Two or three divisions (ranging from reductionist to integrative in approach) can be imagined, although names for these entities require further definition and negotiation. Moreover, the profile of discipline-based departments must be established in conjunction with discussions of divisions.

1b. These departments that represent the core disciplines in biology will, at the outset as well as in the future, be jointly "owned" by the colleges in which the appointments of faculty originated. Faculty lines will be attributed to their collegiate home. Thus, department heads will report to the deans whose colleges made the investments. The lead dean for reporting will be the dean of CBS, or its successor.

Proposal 2: Spatially arrange research laboratories so as to create greater intensity of scholarship. Clustering of research laboratories will be based upon either programmatic foci or needs for shared instrumentation.

Short term particulars: Unify developmental biology on the Minneapolis campus (rationale: currently recruiting and building faculty in this rapidly emerging area: avoid multiple moves). Unify faculty in structural biology and physical biochemistry on the Minneapolis campus (shared equipment needs). Unify some components of microbiology and establish a focus in limnology on the St. Paul campus.

Long-term particulars: Determined by faculty choices from the menu of departments since foci for scholarship for each department will be identified in this process.

Proposal 3: Create consolidated, new facilities for state-of-the-art instruction in core and professional disciplines in biology on both Minneapolis and St. Paul campuses. These facilities should be positioned so that instruction occurs in the same vicinity as research, thereby maximizing the contact that students might have with faculty and their research operations.

Proposal 4: Install video conferencing and collaboration technology on the desktop of all faculty in the core disciplines of biology and in major conference and seminar rooms in order to address some of the problems caused by the canyon between the campuses of Minneapolis and St. Paul. Extension of this technology to UMD and the coordinate campuses will maximize educational, scholarship and outreach activities system-wide.

Proposal 5: The clustering of graduate programs, as previously proposed, will be accompanied by a consolidation of identified resources that will sustain the core activities of the clusters.

Implementation

Soon after adoption of the principles of change that will be implemented, a consulting panel of faculty and administrators from other institutions should be engaged. The purpose of this panel will be to provide advice to the implementation process. Thus, the panel should be chosen from members of institutions that have reorganized their programs in biology, such as Berkeley, Davis, Madison and others.

In total, the changes proposed are wide-ranging. Because of this, they must be staged over a period of three years. An assessment should be made of the changes that should be implemented on July 1, 1997 and in each of the next two years. It is noteworthy that the conversion to semesters becomes effective in FY 1999-2000, and the staging of changes in biology should be prioritized so as to meet this deadline.

Assumptions

1. We are not the only university that is concerned about our national stature. That is, our competitors are not static, but are also trying to make the smartest moves. Therefore, our moves cannot be timid.
2. We are not the only university that is forced to "rightsize" or "downsize".
3. We are the only university with all possible professional disciplines in the biological sciences in the midst of a core university on a "single campus" that is not, in fact, a single campus. Therefore, new arrangements must be made that recognize ranked priorities.
4. Excellence in core disciplines is possible if and only if there is a newly-minted focus on the core disciplines *per se*.
5. Strength in the core disciplines is the only platform that will sustain quality in applied disciplines over the long term.
6. Strength in the core disciplines can only occur with focus and control of quality. Opportunities to exert control over these variables will be infrequent. Vigilance and the following measures are needed to maximize those opportunities:
 - a. Reduce the number of departments by unification
 - b. One source of new faculty will be the retirement of present faculty members. Lines within the newly created departments that will likely be freed by retirements within the next seven years should be identified. Further, those lines (in whole or in part) should be designated as being retrenched, reallocated or returned to the department. Return of lines to the new departments should empower the faculty to steer their disciplines into the future.
 - c. A second source of new faculty will be through specialized research centers that arise from time to time in the professional disciplines of biology. It should be required that the directors of these centers contact dean(s) and department heads of the core discipline based departments when considering recruitment and appointing of new faculty who will need a discipline-based appointment home. Faculty from those departments must actively participate in the search process. The "flags of convenience" practice for appointment homes must be ended.
7. Allegiance by the faculty to a department is strong. Capitalize upon this intrinsic allegiance to help traverse the canyon between the Minneapolis - St. Paul campuses. That is, a single department with a distinctive scholarly focus on each campus is likely to be a stronger arrangement than smaller, nearly duplicated departments on each campus.
8. Technology must be used judiciously to help alleviate the Minneapolis - St. Paul gap. Dissemination of video collaboration and conferencing technology as proposed above will provide some relief.
9. Transportation and reciprocal parking between the biological communities on each of the two campuses must be improved.
10. Some of the decisions concerning the configuration of the disciplines are rather straightforward, whereas others are more complex. Judgment will be required on the margins, particularly where the core and professional disciplinary boundaries are blurred.

A Plan to Reorganize the Biological Sciences at the University of Minnesota

Part I: Statement of the Problem

The development of modern biology has been one of the great success stories of the twentieth century. Public concerns about issues such as health, population, food supplies, quality of life and the environment have resulted in an unprecedented public investment which continues to this day, despite downturns in funding in all other areas. Interdisciplinary research and simultaneous advances in the physical sciences and engineering have generated new approaches and new questions. Many age old questions have been answered and new discoveries have changed our understanding of our bodies and minds, our awareness of our environment and the practice of medicine and agriculture forever. Most important, the intellectual framework of biology has undergone radical restructuring so that it is now based on levels of organization rather than taxonomy.

Although there are many biologists at the University of Minnesota, the organization of biology here has not kept pace with these changes. One of the great themes in the development of twentieth century biology has been the unification of previously distinct fields. However, biology at the University is dispersed across the three provostal units, many departments and an even larger number of graduate programs. As a result, our collective efforts lack intensity, policy decisions frequently do not make use of the collective wisdom of the biological community and redundancy at every level dissipates our financial resources.

The effects of this disorganization are manifold. Because biology does not have a high profile at the university, the number of undergraduates majoring in biological disciplines lags far behind the national average. Although the economy of Minnesota depends heavily on health care, agriculture, natural resources, we are not generating the number of sophisticated graduates in biology required to bring these industries into the twenty-first century. We recruit relatively few outstanding graduate students and as a result we are not as successful as we should be in competing for training grants. Although we continue to attract strong junior faculty, we have a great deal of difficulty in recruiting and retaining outstanding senior faculty. Only three biologists are members of the National Academy. Our faculty compete well for individual research grants, but we do not fare as well collectively. Our average ranking in the core disciplines in the biological sciences in the recent report (1993 study, published in 1995) from the National Research Council (NRC) was 36. We receive no institutional support from the prestigious Howard Hughes Medical Institute and federal support for multi-investigator research programs as opposed to projects of individual investigators is modest. This will become increasingly problematic since federal policy appears to be shifting towards increased support of multi-investigator programs.

The Core Disciplines in Biology:

One of the fundamental problems in the organization of biology at the University of Minnesota is the failure to distinguish at the policy-making level the core disciplines of biology from the professional disciplines or "applied" biology. The core disciplines deal with fundamental questions of mechanism at the molecular, cellular, genetic, organismal, ecological and evolutionary level.

Questions at the molecular level include:

- How do biological molecules recognize and interact with each other?
- How do enzymes catalyze reactions?
- How is light used in photosynthesis?
- How are electrical potentials generated across cellular membranes?

Questions at the cellular level include:

- How do cells recognize each other?
- How do cells move?
- How do cells divide?
- How do materials enter and leave cells?
- How are these processes controlled?
- How are nerve impulses transmitted?

Questions at the genetic level include:

- How is genetic information encoded?
- How is genetic information transmitted from parents to offspring?
- How is genetic information expressed in an individual?
- How is the expression of genetic information regulated?

Questions at the organismal or systems level include:

- How do genes control the development of an organism?
- How do hormones act?
- How does the immune system work?
- How is movement initiated and controlled?
- How do we (and other organisms) see?
- How do we feel pain?
- How do size and shape of organisms relate to their other life history characteristics?
- How does behavior affect life history evolution?

Questions at the ecological level include:

- How do physical and biological factors interact in shaping an ecological community?
- How does diversity benefit an ecological community?
- How does an ecological community adapt to environmental changes?
- How do behavioral interactions influence population and community dynamics?

Questions at the evolutionary level include:

- How do new species originate?
- How do existing species avoid extinction?
- How do the mechanisms of evolution shape the patterns and processes of all biological systems?
- How do phylogenies reflect environmental and biogeographic histories of the earth's biota?
- How does knowledge of phylogenies make possible an understanding of evolutionary processes?

Note that all of these questions begin with "how". The core disciplines of biology are concerned with general principles and the "rules" that govern the operation of biological systems. The great advances in biology in this century have resulted from the tremendous progress that has been made in being able to frame and address these questions. Since all biological systems obey these "rules", this new understanding has in turn had enormous impact on how we develop public health policy, diagnose and treat disease, develop new varieties of plants and animals in agriculture and evaluate and manage our environment. The core biological sciences are the engine that drives development in all of the applied biological sciences.

Because the University of Minnesota is a land grant institution, founded to meet the immediate needs of the state as perceived by its citizenry and their elected representatives, the development of applied biology has been emphasized. We have invested heavily in the professional disciplines in the schools of human and veterinary medicine, dentistry, nursing, pharmacy, public health, agriculture and natural resources. Development of the core biological disciplines has not kept pace. Yet they are critical in determining our national and international

reputation; our ability to recruit outstanding undergraduates, graduate students, postdoctoral fellows and faculty members; and to keep the applied biological sciences at the cutting edge.

The Speaks Report:

The last major examination of the organization of biology on the Twins Cities campus was in 1985, when the Speaks committee, comprised of 14 faculty from departments ranging from Nursing and Communication Disorders through Biochemistry and Ecology and Behavioral Biology to Animal Sciences and Forest Resources, was charged with "evaluating the potential of research and graduate training in biological/life sciences at the university" and recommended several "mechanisms for helping us achieve this potential".

This committee identified four major problems: national rankings, number of high quality applicants to many graduate programs, faculty morale and the number of "stars" in the biological/life sciences. These are still considered to be the major problems today.

The Speaks committee made two broad general recommendations:

1. Faculty and administrators must develop clearly defined goals for the biological/life sciences.
2. The University should explore ways to promote recognition of the excellence that currently exists within the community of scientists in the biological/life sciences.

This committee also made many specific recommendations about mechanisms to improve and motivate the faculty, support for graduate students and graduate programs, direct support for research and equipping teaching laboratories. Many of these recommendations required new investments and only three have been carried out. Teaching laboratories are better equipped, the Dean of the Graduate School is now also Vice President for Research, and, for better or worse, we still have two Biochemistry departments.

The conclusions of this committee concerning the organization of the biological sciences are of particular interest. They are summarized below:

1. Basic biology requires strong core units in a college that is administratively outside the IAFHE (now COAFES) and the Health Sciences.
2. In addition, research and education in basic biology should continue within the IAFHE, Health Sciences, IT and other units.
3. The strengthening of basic biology should not be at the special expense of applied biology.
4. The basic biology core must include a strong unit in biochemistry.
5. A much higher level of consistent interaction between the physical and biological sciences must be achieved.
6. Strength in basic biology must be maintained on both the St. Paul and Minneapolis campus.
7. The system must have increased flexibility to facilitate the initiation, early growth and--when appropriate--the disappearance of innovative research enterprise.
8. Communication among administrators and faculty in the biological/life sciences should be fostered.
9. Recognition of the importance of research should be incorporated into the University's administration.

10. The important role of the IAFHE, Health Sciences, and CBS in providing professional training and outreach to the state and nation should be recognized and supported.

In a sense, the development of biology on the Twin Cities campus in the intervening ten years has basically been consistent with, if not driven by, these recommendations. There is strong basic biology in CBS, the Academic Health Center, COAFES and IT. Applied biology has flourished across the campus. However, the lack of integration of the basic biological units, and the lack of communication at the policy level between basic and applied units has resulted in the whole being less than the sum of its parts. Furthermore, the duplication of core biology in several units is much more difficult to justify in a time of diminishing resources at every level than it was in 1985, when the noose was just beginning to tighten.

The Phillips Committee:

In the fall of 1995, the three Provosts directed the Biological Science Policy Committee, comprised of the Deans of COAFES, CBS, the Medical School, the Graduate School and the Dental School (representing the Applied Health Sciences), to re-examine the organization of biology. As a first step, the Council appointed a committee of nine eminent scientists, three from the Academic Health Center, four from the College of Biological Sciences and two from COAFES, to define the core of biology at the University of Minnesota, give its impression of the basic biological sciences on the Twin Cities campus, make the case for any recommended changes, define the boundaries for future considerations of change and address issues in public relations, visibility, infrastructure and the reward system.

This committee identified four problems:

1. The lack of a cohesive University-wide overview that reflects the broad interests of biology that results in duplication and unproductive competition at the levels of both teaching and research.
2. Dispersion of faculty across administrative units and campuses disadvantages us at every level.
3. Many efforts at recruiting and retaining exceptional faculty fail.
4. The inadvertent development of incentives to duplicate courses, particularly RCM, threatens to increase course duplication and diminish quality.

The report emphasized the need for a commitment to unification, particularly in making policy decisions, and a commitment to quality in several areas--focus, productivity, interactions, expectations, visibility and physical proximity.

It made the following specific recommendations:

1. Create a single unit of Basic Biological Sciences responsible for teaching and research of basic biology.
2. Facilitate the physical regrouping of biologists with common interests and research technologies to optimize existing and potential collaborations.
3. Establish a common culture of high expectations of quality and productivity in the new single unit of Basic Biological Sciences.
4. Recruit and retain outstanding faculty who have international reputations.
5. Create a feeling of community amongst all biologists at the University.
6. Move forward expeditiously.

7. Form a Biological Sciences Coordination Council composed of elected faculty.
8. Improve our communication of biological science to the general public.

The committee also pointed out that the faculty in biology are dispersed among more than 35 departments in more than six colleges on two campuses reporting to three different provosts. It recommended the organization of faculty in the core disciplines into areas of focus, with members of a given area of focus located in physical proximity.

There are many common themes in the Speaks and Phillips Report. Both reports make a clear distinction between basic and applied biology and emphasize the dependence of applied biology on basic biology. Both recognize the tension in supporting both basic and applied biology adequately. Both recognize the need for a strong unit dedicated to basic biology. Both recognize the two campus problem; however, while the Speaks committee compromised by recommending that strength in basic biology be maintained in both Minneapolis and St. Paul, the Phillips report advocates judicious grouping of biologists with common interests in the same physical location.

Other Institutions:

In thinking about how biology should be organized at the University of Minnesota, it is instructive to examine institutions that are ranked more highly. The rankings of the top 20 institutions in seven of the core biological sciences from the 1995 National Research Council study are listed in Table 1 (appendix). Public institutions are shown in bold.

The major public institutions that we would like to emulate in the core biological sciences clearly include the University of California at Berkeley, San Francisco, San Diego, and Los Angeles; University of Wisconsin at Madison; University of Washington at Seattle; University of Illinois at Champaign-Urbana; and University of Michigan at Ann Arbor. Institutions whose rankings have improved dramatically since the 1983 NRC review also warrant attention; these include the University of California at San Francisco, University of Colorado, Washington University and University of Texas Southwestern Medical Center.

Which medical schools might we use as models? Of the many ratings, one of the most relevant to the core biological sciences is the list of medical schools recently awarded one of the new series of institutional grants from the Howard Hughes Medical Institute that are designed to strengthen core disciplines in the basic sciences. (See Table 2, appendix)

Note that a number of public institutions are ranked in the top twenty in the NRC rankings and also received HHMI institutional grants; for example, the Universities of California at Los Angeles, Washington, Wisconsin, Colorado, Iowa and North Carolina. Clearly, at these institutions there is a synergy between excellence in the biological sciences disciplines and excellence in medical education. Further, the University of California at Berkeley is not a medical school and yet, through other Hughes programs has 6 HHMI Investigators and is also highly ranked in biological science disciplines by the NRC.

How do these institutions differ from the University of Minnesota? Some are larger universities, with proportionally larger investments to make in biology. For example, the WARF fund at the University of Wisconsin generates millions of dollars of revenue each year that are used to support faculty research in biology. When excellence is achieved at smaller institutions, for example, the Universities of North Carolina and Iowa, the institution has generally made a disproportionate investment in the fields in which it has achieved excellence. Reorganization is often the key to success; for example, Berkeley underwent major reorganization in biology, during a period when biology at Minnesota has been relatively stagnant. Others such as University of

California at San Francisco, Washington University and the University of Washington at Seattle have been in a period of rapid growth and have benefited from extensive funding from the Howard Hughes Medical Institute and strong ties to industry - Genentech at the University of California at San Francisco and Microsoft at the University of Washington. Both mechanisms have allowed these institutions to respond to the changing nature of biology. For some, improved rankings correlate with the presence of Nobel prize winners; for example, the University of California at San Francisco, University of Colorado and University of Texas Southwestern Medical Center. Frequently, the presence of a Nobel prize winner has provided justification for the highly visible development of a specific field (or vice versa).

Many of these institutions invested in key fields much earlier than the University of Minnesota. Frequently, development in a new field was linked to the development of an Institute which provided a scientific focus as well as a focus for fund-raising. For example, critical hires in the central approaches of structural biology, macromolecular X-ray crystallography and nuclear magnetic resonance spectroscopy, were made in the late 1960s and early 1970s, respectively, in many institutions, while the corresponding hires were not made in Minnesota until the early 1980s and late 1980s, respectively. Similarly, in the early 1980s, when many institutions were building up molecular biology, Minnesota spent its efforts wrangling over administrative structure and hired less than a dozen people in a field that has become the foundation for virtually all subsequent developments. Neurobiology and immunology have experienced similar delays.

Few of these institutions encompass the breadth of mission on a single campus that exists on the Twin Cities Campus. Within the California system, UCSF is the focus for biomedical research while agriculture is concentrated at Davis. Similarly, in Washington, North Carolina and Michigan, agriculture is localized in the state university system, rather than in the flagship universities. In contrast the biologists on the Twin Cities campus have several separate missions - undergraduate, graduate, and professional education; biomedical, agricultural and natural resources research. One obvious lesson is that we may need to decide where we want to excel and stop trying to be good at everything.

In addition, the four mile separation between the Minneapolis and St. Paul portions of the Twin Cities campus creates a difficult organizational problem that continually generates barriers to communication, interaction, and synergy and hence is a prescription for redundancy. It also separates the St. Paul faculty from most of the undergraduate student body as well as the General Biology teaching laboratories.

Many top-ranking institutions have developed "umbrella" graduate programs that provide broad training to entering students and allow the student to defer the decision on specialization until they have acquired a broad perspective. Most institutions that have instituted these programs report a dramatic increase in the quality of applicants and matriculants. These programs are most advantageous to institutions that are trying to develop strong programs in emerging disciplines such as the neurosciences and developmental biology which combine the approaches of more established disciplines.

In many of the top-ranking institutions, the most distinguished scientists teach both undergraduates and graduate students. For example, at the University of Michigan, the Department of Biological Sciences, organized administratively through the Medical School, is responsible for all undergraduate and graduate education at Michigan. This is true here for Ecology, Evolution and Behavior, our highest ranked department in the biological sciences. However, in other areas, such as Biochemistry and Cell Biology, there has been a differentiation of mission, with faculty in the medical school teaching only graduate students and professional students in the health sciences, while faculty in the College of Biological Sciences are solely responsible for undergraduate education and have varying involvement in teaching graduate

courses. This differentiation may hurt the institution in several ways: our undergraduates are exposed to only a small fraction of the total number of outstanding biologists on campus; the faculty and graduate students in the College of Biological Sciences can be cut off to some extent from the mainstream of research and graduate education in biology; and faculty in the Medical School do not experience the rewards of undergraduate education. In many of the more highly ranked institutions, biology is one of the most popular undergraduate majors.

Future Prospects:

Minnesota's NRC rankings generally slipped between 1983 and 1995. For example, Biochemistry was ranked 28th in 1983 while Biochemistry and Molecular Biology was ranked 39th in 1995. Arguably, one of the factors that hurt us here was the lack of a concerted institutional response to developments in Molecular Biology in the 1970s. As an institution, we need to develop administrative structures that can respond more rapidly to change, since one of the messages that emerges from the NRC rankings is that the institutions that are highly ranked in a given field are those that recognized the opportunity early. Unless changes are made, the University of Minnesota will slip further and further from the cutting edge of biology. This is something we cannot afford to do, given our institutional investment and the importance of biology intellectually, economically and socially.

The departments in which faculty in the core disciplines of biology are concentrated are aging and growing smaller, since few new hires have been made in the past ten years, some outstanding younger faculty have been recruited away and there are an increasing number of retirements where faculty have not been replaced. As the reputation of the University in biology declines, the resources available for new hires will decline, as will our ability to recruit and retain outstanding faculty.

The College of Biological Sciences has already reached a critical state. The projected retrenchments over the next five years will almost preclude hiring any new faculty with College funds. During this period there will likely be at least 9 retirements, bringing the total number of faculty in the College down to 75. This is simply not a situation in which excellence in either teaching or research can be sustained in a field that is changing as rapidly as biology.

Prospects in the Medical School for the core disciplines in biology are also uncertain. The pressure of increased competition and declining revenues has forced an emphasis on research with more direct clinical applications rather than fundamental mechanistic studies. As in the College of Biological Sciences, faculty with these interests are declining in numbers and increasing in age and feel badly torn between their allegiance to their discipline and the obvious need to move in the direction that the Medical School appears to be moving. Some would also like to have more contact with students within a disciplinary context than is possible at present. Since excellence in medical education is generally coupled with disciplinary excellence, as the recent HHMI awards illustrate, resolving these tensions would strengthen both the Medical School and the disciplines.

Part II. Proposed Solutions

1. Overall approach

The overall goal of the reorganization of the biological sciences is to increase the quality of the disciplines that represent the core of biology. At present, and with few exceptions, the core disciplines are too weak to be nationally competitive. This is due, in part, to a failure of the University to designate responsibility for the disciplines as currently recognized. Major new disciplines within the core of biology have arisen over the past three decades (i.e., molecular biology, cell biology, neurobiology). They arose, not surprisingly, because leading research universities canonized them as disciplines and new scientific societies were born and now thrive. During this thirty year period, the University of Minnesota failed at an institutional level to support adequately these now mature disciplines. The University chose to pretend that previously important departmental structures could embrace the newly emerging disciplines. However, some faculty who were convinced by the excitement of the new disciplines desperately sought a foothold here at the University of Minnesota and found that our Graduate School was willing in some instances to support what had become *bona fide* disciplines at other institutions as "interdisciplinary" graduate programs here at Minnesota. Although the support of the Graduate School was warmly received, its financial resources and influence were not sufficient to grow and protect the new disciplines. In contrast, substantial support was generated for the new disciplines in the biological sciences at our competing institutions.

The overall approach for the reorganization of biology is to reduce the barriers that currently prevent realization of our potential as a community of biologists. Further, we propose discrete mechanisms, each of which requires further examination and shaping prior to implementation, that will lead to the unification of the faculty into entities that can deliver significantly greater quality to our teaching, research and outreach.

For the purposes of this discussion, the non-professional, core disciplines of biology include the following:

animal biology	general biology
behavioral biology	genetics
biochemistry	microbiology
cell biology	molecular biology
developmental biology	neurobiology
ecology	physiology
evolutionary biology	plant biology

2. Undergraduate education in the core disciplines of biology

At present, undergraduate education in biology is confusing to potential and matriculated students because of the myriad of entry points and the plethora of courses with similar titles. Second, the University of Minnesota Twin Cities is not regarded as an institution that provides a high quality undergraduate education in biology by potential students and their families. If they are seeking a high quality education at a Big Ten institution they are likely to enroll at either Madison or Ann Arbor. The University of Minnesota is simply not viewed as a national contender in high quality undergraduate education in biology - a fault that is exemplified by the few non-residents that we attract to our programs. Of the state residents that we do attract, too few of them decide to major in a biological discipline. This situation is pitiful, given that the State of Minnesota, with its

“10,000” lakes and outdoor-oriented populace, probably inspires more budding biologists per capita than any other state. We seem to either export that enthusiasm to our competitors or drown it in our institutional confusion. This is unfortunate because CBS has distinguished itself in different aspects of undergraduate education in biology, for example, in General (introductory) Biology and with its programs for under-represented students. Interestingly, the institutions in the NRC’s roster of highly-regarded *graduate* programs in the biological disciplines turn out to be institutions that are also magnets that attract *undergraduate* students into biology (or, *vice versa*).

The following measures are proposed to strengthen the curriculum for undergraduates. The expected outcome is to increase the profile for the University of Minnesota as a major research university with a focus of high quality instruction and research opportunities in core disciplines in biology as well as an unusually comprehensive access to the professional disciplines in biology.

- A. A single corridor into the undergraduate curriculum in biological sciences will be developed. This corridor will be the College of Biological Sciences (CBS), and therefore CBS will become a freshman admitting college. Other colleges presently admitting freshman who then track into majors in the professional disciplines of biology will no longer admit these freshmen.
- B. Courses in the core disciplines that are fundamental and prerequisites for courses in the core and the professional disciplines in biology (typically 1000- and 3000-level) will be coordinated and offered by CBS. As a group, these courses will be referred to as “Fundamentals in Biology” followed by further descriptors (i.e., Fundamentals in Biology: Biochemistry 1234).
- C. The aforementioned courses will be organized and taught by a group of “Master Professors in Biology” that will be drawn from the faculty of CBS as well as faculty from all other colleges offering degrees in the professional disciplines of biology. This faculty will be selected for their prior accomplishments in scholarship and teaching, and will therefore be mid-career and senior faculty. The distinction of Master Professor will carry an augmentation to salary in the amount of \$3000 annually (or, an equivalent sum available for discretionary research spending by the Master Professor).
- D. Each college with programs that rely upon the Fundamentals in Biology courses will assign a prorated share of FTEs for inclusion in the group of Master Professors in Biology. Prorating will be based upon the number of students predicted to flow through the courses in the Fundamentals in Biology. Faculty appointments will remain within their home college. Participation in the Master Professors program by each college will ensure that the curriculum meets the needs of students who will track into each of those colleges.
- E. The present undergraduate majors in the non-professional core disciplines of biology (i.e., Biology, Biochemistry, Ecology, Evolution & Behavior, Genetics and Cell Biology, Microbiology, Physiology, Plant Biology) will be expanded to include Human Biology and Neurobiology. The curriculum in Human Biology will focus on those aspects of biology that interface with the social sciences (i.e., psychology, child development, sociology, geography) and the human condition (i.e., philosophy, medicine). The curriculum in Neurobiology has been developed by a committee chaired by Professor Richard Poppele.
- F. The teaching facilities for General Biology, currently housed within Kolthoff Hall (principally occupied by the Department of Chemistry), will be relocated to be within the community of biologists on the Minneapolis portion of the Twin Cities Campus.
- G. A major outpost of the present Office of Student Services (CBS) will be created within the community of biologists on the Minneapolis portion of the Twin Cities Campus.

H. A unified and vigorous recruiting program for prospective undergraduate students in both the professional and non-professional disciplines of biology will be developed. In particular, emphasis will be placed on the central role played by the Master Professors for the Fundamentals in Biology courses.

3A. Graduate education in the core disciplines (doctoral training)

Graduate education at major research universities is the most important activity in perpetuating and advancing the core disciplines through the scholarship of graduate students and the faculty. However, many of the core disciplines in biology at the University of Minnesota suffer by mistakenly being considered "interdisciplinary" while others have not received attention commensurate with our competition for reasons outlined above in Part I. The goal of reorganization of graduate programs in the core disciplines of biology is to *bring clarity to the leading disciplines in the core of biology* in a manner such that they can be recognized as such by prospective students, and so that they can be nurtured by a faculty and administration committed to excellence and achievement.

The configuration of graduate programs at the University of Minnesota reflects to a large extent, the historical, departmental structure of the professional disciplines of biology as well as varied attempts to codify the disciplines that emerged in the core of biology during the last three decades. As such, the list of graduate programs is long (38 programs in the Biological Sciences Policy and Review Council) as well as confusing in names of programs and in the claims of intellectual coverage. Intellectually, biology is unifying at an unprecedented rate in part because genomic analysis has revealed key relationships between simple and complex organisms. Organizationally, biology is unifying at competing universities. Thus, it is imperative that consolidation of graduate programs in the biological sciences at the University of Minnesota occurs, and that the basis for such unification be rational. The following approach brings about clustering of graduate programs where the basis for clustering is a core knowledge deemed to be common to the involved programs. A further principle for unification is a broadening of the core curriculum for students in a given program, so that their background will be sufficient to allow for flexibility in career options upon completion of the graduate degree.

The following programs that contain elements of the core disciplines in biology will be asked to consider seriously the option of clustering:

Cellular, Molecular and Biomedical Sciences

- Biochemistry, Molecular Biology and Biophysics
- Cell & Integrative Physiology
- Microbiology, Immunology and Molecular Pathology
- Molecular, Cellular, Developmental Biology & Genetics
- Neuroscience
- Pharmacology
- Plant Biological Sciences

Plant Sciences

- Agronomy
- Horticulture
- Plant Breeding
- Plant Pathology
- Plant Biological Sciences

Environmental Sciences

Conservation Biology
Ecology
Fisheries
Wildlife Conservation
Zoology

One potential model for the clustering of graduate programs is appended to this report ("Proposal: Formation of the Graduate Program in BioMedical Sciences").

3B. Graduate education in the core disciplines (Professional Masters in Biology program)

A further opportunity and responsibility for the community of biologists at the University of Minnesota is to provide options for "lifelong" learning. Some years ago graduate education was a sequential process, with the Master's degree usually or often preceding the Ph.D. During the last two decades in the core disciplines of biology, the number of traditional Master's degrees awarded has fallen dramatically while the number of Ph.D. degrees has risen. With few exceptions, the traditional Master's degree in core disciplines of biology has disappeared. We seek to address a clear need in this area.

A significant trend in American higher education has been the return to the universities of students who obtained BA/BS degrees some years previously. These students have typically been employed in technical positions in industry or have been teachers at the K-12 level and from their work experience and station in life have found renewed energy for academic pursuits. At present, the core disciplines in biology at the University of Minnesota have little to offer these individuals. We propose the creation of a Professional Masters in Biology Program which will offer terminal Masters degrees in some of the fields of biology. This program will be administered by the College of Biological Sciences and will involve faculty from several of the biologically-oriented colleges.

The final two portions of the proposal for the reorganization of the biological sciences have not yet been thoroughly explored by the deans of the Biological Sciences Policy Council. Only a preamble is given for each. These items will be the focus of a retreat of these deans, the purpose of which will be to arrive at a consensus concerning these matters. They will then be made available for discussion and comment prior to formulating final recommendations. In the meantime, faculty are encouraged to caucus, develop position papers on these matters and forward these ideas to the deans.

4*. Recognition and reconfiguration of research foci in the core disciplines in the biological sciences

It is recognized by the deans that the intensity and quality of research in the core disciplines in biology are enhanced dramatically by the physical and intellectual environment in which the studies are conducted. Thus, physical relocation of individuals and groups of faculty (both within and between campuses) should be explored. It would be helpful for faculty who see the value of regrouping to express their interest.

5*. Administrative streamlining necessary to accomplish and sustain the above.

It is recognized by the deans that the core disciplines in the biological sciences can be adequately supported in these times of limited and possibly dwindling resources only by the unification of faculty into single, discipline-based departments. The deans remain open to all suggestions on these matters.

TABLE 1

Biochemistry & Molecular Biology

1	Univ. of CA-San Francisco
2	Massachusetts Inst. of Tech.
2	Stanford University
4	Univ. of California-Berkeley
5	Harvard University
6	Yale University
7	California Institute Technology
8	Univ. of Wisconsin-Madison
9	Univ. of California-San Diego
10	Johns Hopkins University
10	Columbia University
12	University of Colorado
13	Washington University
14	Univ. of California-Los Angeles
15	Duke University
16	University of Pennsylvania
17	Brandeis University
18	University of Washington
19	Baylor College of Medicine
20	U of TX-Southwestern Med. Ctr.
39	University of Minnesota

Physiology

1	Yale University
2	Univ. of California-San Diego
3	University of Pennsylvania
4	Univ. of California-Los Angeles
5	Univ. of CA-San Francisco
5	Baylor College of Medicine
7	University of Washington
7	Stanford University
9	University of Virginia
9	Columbia University
11	University of Chicago
12	University of Iowa
13	California Institute Technology
14	New York University
15	University of Michigan
15	Vanderbilt University
17	Albert Einstein College of Med.
18	Mayo Graduate School
19	John Hopkins University
20	U of Illinois Urbana-Champaign
20	Univ. of Alabama-Birmingham
72	University of Minnesota

Neurosciences

1	Univ. of California-San Diego
2	Yale University
3	Harvard University
4	Univ. of CA-San Francisco
5	Stanford University
6	Columbia University
7	Johns Hopkins University
8	Washington University
9	Univ. of California-Berkeley
10	California Institute Technology
10	University of Pennsylvania
12	University of Washington
13	Rockefeller University
14	Massachusetts Inst. of Tech.
15	Univ. of California-Los Angeles
16	Duke University
16	Case Western Reserve Univ.
18	University of Michigan
19	Baylor College of Medicine
19	Brandeis University
34	University of Minnesota

Molecular and General Genetics

1	Massachusetts Inst. of Tech.
2	Univ. of CA-San Francisco
3	Harvard University
4	California Institute Technology
5	Stanford University
6	Univ. of California-San Diego
7	Univ. of Wisconsin-Madison
8	Yale University
9	Johns Hopkins University
10	Univ. of California-Berkeley
11	University of Chicago
12	Columbia University
13	University of Utah
14	Baylor College of Medicine
15	Duke University
16	Washington University
17	University of Washington
18	U of TX-Southwestern Med Ctr.
19	University of Pennsylvania
20	U of NC--Chapel Hill
34	University of Minnesota

Ecology, Evolution & Behavior

- 1 Stanford University
- 1 University of Chicago
- 3 Duke University
- 4 Cornell University
- 5 Univ. of California-Davis
- 6 Princeton University
- 7 University of Washington
- 8 Univ. of California-Berkeley
- 9 Univ. of Wisconsin-Madison
- 10 State U of NY-Stony Brook
- 10 Univ. of Texas at Austin
- 12 University of Michigan
- 13 Washington University
- 14 University of Pennsylvania
- 15 University of Minnesota
- 16 University of Georgia
- 17 Yale University
- 18 Univ. of California-Los Angeles
- 18 Univ. of California-San Diego
- 20 Univ. of CA-Santa Barbara

Pharmacology

- 1 Yale University
- 2 U of TX-Southwestern Med Ctr
- 3 Univ of California - San Diego
- 4 Johns Hopkins University
- 5 Duke University
- 6 Vanderbilt University
- 7 Harvard University
- 8 U of NC-Chapel Hill¹
- 9 University of Washington
- 9 University of Pennsylvania
- 11 Massachusetts Inst of Tech
- 12 Univ of Wisconsin-Madison
- 13 University of Michigan
- 14 New York University
- 15 Emory University
- 16 U of NC-Chapel Hill²
- 17 Stanford University
- 17 University of Colorado
- 19 University of Rochester
- 19 University of Iowa
- 21 University of Minnesota

Cell & Developmental Biology

- 1 Massachusetts Inst. of Tech.
- 2 Rockefeller University
- 3 Univ. of CA-San Francisco
- 4 California Institute Technology
- 5 Harvard University
- 6 Stanford University
- 7 Univ. of California-San Diego
- 8 University of Washington
- 9 Washington University
- 10 Yale University
- 11 Princeton University
- 11 Stanford University
- 13 Univ. of California-Berkeley
- 14 Duke University
- 15 University of Chicago
- 16 Univ. of Wisconsin-Madison
- 17 Univ. of California-Los Angeles
- 18 U of TX-Southwestern Med Ctr.
- 19 Columbia University
- 20 John Hopkins University
- 37 University of Minnesota

¹ School of Arts and Sciences

² Interdisciplinary with the Schools of
Medicine, Pharmacology, and Public Health

TABLE 2

30 Medical Schools Receiving 5-Year Awards from HHMI
to Enhance Basic Sciences (Annual Amounts)

\$3,600,000

Columbia University College of Physicians and Surgeons

\$3,400,000

John Hopkins University School of Medicine

Stanford University School of Medicine

\$3,000,000

Albert Einstein College of Medicine

Univ. of California, Los Angeles, School of Medicine

Washington University School of Medicine

\$2,800,000

Univ. of New Mexico School of Medicine

Univ. of Washington School of Medicine

Univ. of Wisconsin Medical School

\$2,600,000

Univ. of California, San Diego, School of Medicine

Univ. of Chicago Pritaker School of Medicine

\$2,400,000

Case Western Reserve Univ. School of Medicine

Univ. of Alabama School of Medicine

Univ. of Colorado School of Medicine

Univ. of Iowa College of Medicine

Univ. of North Carolina, Chapel Hill, School of Medicine

Univ. of Utah School of Medicine

Univ. of Vermont College of Medicine

Vanderbilt University School of Medicine

\$2,400,000

Duke University School of Medicine

Harvard Medical School

Northwestern University Medical School

Oregon Health Sciences Univ. School of Medicine

Univ. of Florida College of Medicine

Univ. of Massachusetts School of Medicine

Univ. of Pennsylvania School of Medicine

Univ. of Southern California School of Medicine

Univ. of Texas Medical School at San Antonio

PROPOSAL:

Formation of the Graduate Program in BioMedical Sciences

leading to a Ph.D. degree in any of the following disciplines:

Biochemistry, Molecular Biology & Biophysics
Cell & Integrative Physiology
Microbiology, Immunology and Molecular Pathology
Molecular, Cellular, Developmental Biology & Genetics
Neuroscience
Pharmacology

Introduction

The granting of the Ph.D. degree is central to the teaching mission of the University of Minnesota. As such, research based graduate education will continue to be the cornerstone of the research enterprise at the University. However, we must realize that the face of graduate education is rapidly changing and that our responsibilities in the educational venue leading toward the Ph.D. degree are much broader than they ever have been. Graduates in the biological sciences are being asked to enter a job market which emphasizes career skills not only at the research bench, but also in public policy, law, ethics and finance, but to name a few. While our responsibilities to train students has broadened, we are faced with the realization that the funding of biomedical sciences in this country will be at best a zero-based enterprise. Consequently, we must develop mechanisms which foster new initiatives in the biological science research with the potential to develop into long-term stable lines of financial support. Mechanisms to maximize faculty interactions which may synergize into collaborations should be identified. In order to respond to these changing parameters, the formation of a common graduate program in BioMedical Sciences is proposed. This program would provide for an integrated curriculum for the biomedical sciences which would serve to bring disparate faculty groups together. The net effect would be to train Ph.D.'s more effectively for today's climate while increasing the interactions between faculty with common research goals.

The General Outlines

The graduate program in BioMedical Sciences (BMS) would be an umbrella graduate program and single entry port for students interested in careers in the biological sciences as they apply to contemporary problems in molecular medicine. The BMS program would advertise world-wide as the entry point for students interested in research/teaching careers in the biomedical sciences. However, the BMS program would not grant a Ph.D. degree in BioMedical Sciences. Instead, this graduate program would serve to funnel students into one of several existing Ph.D. granting programs termed divisions. The BMS program would serve to coordinate the recruiting of students who would indicate which of the degree program(s) they would like to be considered for. A primary goal would be to not dismantle existing strong graduate programs but to meld the programs under a single administrative umbrella which would facilitate the identification and training of students while bringing faculty together.

To establish the BMS program, a coordinating committee comprised of department heads, directors of graduate study and elected members at-large would be formed. This would be the

primary governing body for the entire BMS program and would interface with the Graduate School on administrative matters. This committee would have oversight responsibility for all facets of the program. The BMS coordinating committee would establish numerical goals and standards for student recruitment, the method of recruitment, develop and implement policies relating to the monitoring student progress during the degree, formulate an integrated core curriculum common to all BMS students and establish criteria for selection and periodic evaluation of BMS faculty. A central tenet of the BMS proposal is that there be a common entrance standard for all Ph.D. candidates. This standard should be equivalent to the highest now in place to ensure that top-notch students are admitted and trained. For BMS to be excellent, all divisions must recruit the best students around the country. If a division cannot attract enough top students, its graduate pool should diminish rather than accept lower academic quality. What is not wanted is for the graduate pool to become the average of all programs but for the total graduate pool to become equivalent to or better than the best we have. If a particular division cannot recruit enough high-caliber students, then faculty in that program would rotate support from graduate student lines into either postdoctorals or technicians. A division would not lower its standards to attain its recruiting numbers.

Recruiting and Training of Students

The training of graduate students starts with the willingness of faculty to work hard and invest time and energy into the recruitment and training process. It is important for individual divisions to retain control of the selection of students into their discipline. The BMS program would provide administrative and organization assistance in the advertising and recruitment of students into each division. BMS responsibilities could include lodging and transportation services relating to hosting prospective students, arranging for faculty interviews and tours of the campus and Twin Cities. Divisional responsibilities would include establishment of recruitment goals, the selection of students and identification and assignment of individual recruiters for each prospective student. Ultimate responsibility for the recruitment process would rest with the division. It is anticipated that the BMS program would admit between 60-75 students annually. The establishment of the BMS program does not preclude other groups from independently recruiting students to Minnesota. For example, training and center grants would still continue to advertise for their particular focus. However, such recruitment methods should indicate that interested students should apply via the BMS entry port.

An additional difference between our current method of training and BMS would be in the teaching and laboratory rotation requirements of BMS graduate students. All BMS students would perform laboratory rotations during their fall semester. Rotation projects would be less intense and would last only 3-4 weeks in any individual laboratory. This would allow 3-4 rotations per semester, perhaps as many as 8 during the year. The purpose of the rotations would be for the student to gather some knowledge about a particular lab, perhaps assisting a current postdoctoral or graduate student. The rotations would not have performance in the laboratory, insofar as accomplishing a research project, as a primary goal. With far less emphasis and time on the rotation project, first year graduate students would have time to perform their teaching duties. The goal would be to have all student complete their teaching requirements during the first year, prior to joining a research laboratory and beginning thesis research. Research grants would therefore not be penalized by having students leaving during the second and third year to perform teaching duties. This would translate into increased productivity by students who are supported by training grants and individual investigator-initiated grants.

Along with performing their teaching duties, all BMS students would take a common core curriculum consisting of 4 semester-long courses to be completed during the first year. These core courses would be:

Fall Semester:	Biochemistry and Biomolecular Structure Molecular Cell Biology and Genetics
Spring Semester:	Regulatory Biology, Microbiology and Molecular Immunology Developmental Biology and Neuroscience

5/8/96

Identification of instructors from the BMS faculty for the core series would be determined by the coordinating committee. At the end of the first year, students may opt to change divisions (degree programs) depending upon their laboratory rotations and classroom experiences. In the second year, each division would augment the core with specialty courses to develop a more in-depth curriculum in any particular area. Alternatively, students may take a combination of courses establishing a broadly based foundation in basic biology. In addition, the basic sciences core would be augmented with lectures from clinical faculty to provide a perspective on contemporary issues in molecular medicine. Once admitted into BMS, a graduate student may rotate in any laboratory in the program and enter any laboratory. A correlate to this is that any student may transfer within the BMS program without being administratively burdened. This should be simple if BMS uses a common entrance standard and students take a common core curriculum. The BMS program may also consider establishing mini-courses in order to train students broadly in career path choices. Topics for mini-courses could be scientific ethics, legal aspects of biological sciences research, biology and public policy, financial and accounting management, and career counseling. In addition, all BMS should have some common teaching experiences to acquaint them with the organization of the classroom.

Faculty could be a member of only a single division or multiple divisions. The Ph.D. degree that a student receives would be dependent upon a declaration of intent at the end of the first year in the program. The preliminary written and oral exams would be defined by the BMS coordinating committee. Annual student progress reviews would be handled uniformly across the BMS program and organized by the administrative committee. In addition, all graduate students in a particular division would have an equivalent teaching responsibility. The BMS coordinating committee would facilitate coordination between divisions to ensure that graduate students teaching experience is similar between divisions.

Mechanisms of Support for Students in BMS

All financial support for students in their first academic year in the BMS program would come from a common pool. Funding of students from a common pool eliminates the parochial nature of "ownership" of students and eliminates DGS's having to bargain each year with different academic units for support money. Options for support include funding by the Graduate School, by CBS or by the Medical School. Alternatively, some combination of funds may be used to support the program. The Graduate School would be asked to provide funds for recruiting and administration of the Program. The objective of this financial arrangement would be to ensure that students are not the financial "property" of a particular division or department and therefore are not administratively "locked". Boundaries between divisions should be transparent, leading to a community of graduate students. In the second and subsequent years of graduate training, students would be supported by any combination of historical methods, individual research grants, fellowships, training or center grants or private scholarships.

Summary

It is important to reiterate that the BMS program would strive not to be the numerical average of all divisions but a mechanism for raising the collective whole based upon increased interaction between faculty and students and the ability to attract high-quality Ph.D. candidates. The advantages for the student would be:

- A broadly-trained educational experience with the ability to enter a wide variety of laboratories without administrative penalty.
- A common core curriculum.
- Administrative procedures for recruiting and student monitoring that would streamline the graduate process.
- Teaching in the first year to allow 100% effort in the research laboratory during the second and subsequent years.
- Increased number of rotations to allow students more possible choices for a thesis advisor

The advantages for the faculty are numerous, they include:

- Reduction in administrative and recruiting overlap between different graduate programs
- Ability to attract and recruit high-quality graduate students
- Dissociation of financial ties to students and their first year training, elimination of parochialism in graduate training
- Common core curriculum to more effectively educate students
- Increased interaction between faculty leading to program project/center/training grants
- Elimination of graduate students being supported on research grants while performing teaching duties
- Reduction in budgetary pressures on departments for first year student support

Twin Cities Campus

Office of the Dean
College of Biological Sciences1475 Gortner Avenue
St. Paul, MN 55108
612-624-2244
Fax: 612-624-2785
RECEIVED

December 5, 1996

Memo To: Interested Deans and Department Heads

From: Robert Elde, Chair, Biological Sciences Policy Council, and
Dean, College of Biological Sciences

Subject: Reorganization of Biology

Enclosed is a copy of the first of three proposals developed by the Biological Sciences Policy Council (BSPC) with regard to reorganizing biology at the Twin Cities campus. The first proposal focuses on partnerships between the College of Biological Sciences and the Medical School. The BSPC would appreciate hearing your reactions to the proposal as well as suggestions for how the core disciplines in biology other than those listed in the schematic should be organized in order to increase the quality, reputation, and usefulness of biology to the broader community.

Therefore, please feel free to discuss this with members of your college or department. I would be eager to receive your comments by e-mail at belde@cbs.umn.edu or by fax at 624-2785. Your comments and suggestions would be especially valuable if I could receive them prior to December 13, when two Town Meetings will occur. The participation of you and your faculty in this process and these meetings is heartily encouraged. If you cannot respond prior to December 13, I would be eager to hear from you and discuss your suggestions at any time.

St. Paul Town Meeting
Friday, December 13
8:30-10:00 a.m.
B25 Classroom-Office Building

Minneapolis Town Meeting
Friday, December 13
10:30 a.m.-12:00 p.m.
2-470 PWB

ju

Enclosure

c: C. Eugene Allen, Provost, Professional Studies
✓ Frank Cerra, Provost, for the Academic Health Center
W. Phillips Shively, Provost, Arts, Sciences, & Engineering

Biological Sciences Policy Council:

Norma Allewell, Vice Provost, Arts, Sciences, & Engineering (ex officio)
Mark Brenner, Vice Pres. for Research & Dean, Graduate School
Michael Martin, Dean, College of Agricultural, Food, & Env. Sciences
Alfred Michael, Dean, Medical School
Harry Orr, Special Assistant to the Dean, Medical School (ex officio)
Alfred Sullivan, Dean, College of Natural Resources

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Office of the Dean
College of Biological Sciences

123 Snyder Hall
1475 Gortner Avenue
St. Paul, MN 55108-1095
612-624-2244
Fax: 612-624-2785

Memorandum

November 11, 1996

To: Basic Science Department Heads, Medical School
Department Heads, College of Biological Sciences

From: Alfred Michael, Interim Dean, Medical School
Robert Elde, Dean, College of Biological Sciences

Alfred Michael
Robert Elde

Subject: Next steps in reorganization

We desire feedback on the proposed reorganization of departments from you and the faculty. Thus, we are planning Town Meetings for wide discussion of these matters. The first will be in early December and will occur as a pair (one in St. Paul; one in Minneapolis). The second will be a single, joint meeting in mid-January.

Prior to the early December Town Meeting we request that you hold meeting(s) of your faculty to discuss the proposed reorganization. We would like you (or others in your departments) to send us a written summary of the concerns that arose in your discussions. Please send these summaries to each of us (e-mail, if possible) by Wednesday, December 4 so that we can be prepared to use the Town Meeting to address these issues.

It is important that we act expediently, since changes in our organization should be implemented by July 1, 1997.

Proposal

Intercollegiate Partnerships in Biology

I. College of Biological Sciences and Medical School Departments and Reporting Structure

November 11, 1996

Preamble

It is proposed to organize basic biology presently affiliated with the College of Biological Sciences (CBS) and the Medical School into a departmental-based structure which, in terms of reporting, consists of three types of departments: 1) Medical School departments, 2) CBS departments, and 3) University-wide, core departments that reside in both the Medical School and CBS. The criteria for discipline-based core departments follow. First, the disciplines included are fundamental. Each of these departments will offer undergraduate and graduate degrees. These disciplines are recognized nationally as the cornerstones and as the driving force for research in many other areas of biology, agriculture, environmental sciences, natural resources and the health sciences. Thus, in order for the University of Minnesota to advance in any of these areas, it is imperative that the fundamental disciplines be outstanding.

Second, the list of fields included recognizes that an institution can advance a given discipline if and only if a critical mass of faculty share a focus in that discipline. In spite of our size, the University of Minnesota does not have faculty clustered into the critical masses necessary to sustain important, contemporary areas in fundamental biology. A critical mass of accomplished faculty in a given discipline is able to attract the best students and offer nationally competitive degrees at the undergraduate and graduate levels of instruction. Disciplines at the University of Minnesota that are not within striking distance of such a level of achievement should not be sustained as free-standing departments. However, service-level instruction will continue to be needed from these disciplines, but the manner of delivery of such instruction will be from a source other than a discipline-based department.

Assumptions Regarding Reporting and Leadership of University-Wide Departments in Core Disciplines in Biology, and Space

Faculty who can contribute to the core disciplines in biology are scattered and fragmented by present structure. As a step toward resolving this flaw, University-Wide departments in selected core disciplines will be created. Some will be created by the merger of two or more existing departments, whereas others will be created *de novo*. The disciplinary base of these new departments should be obvious and distinct. Duplication of expertise found in other disciplines and departments should be avoided. This document focuses for the most part on those departments that will be created by the actions of the Medical School and the College of Biological Sciences. These newly created departments will report to the Deans of CBS and the Medical School.

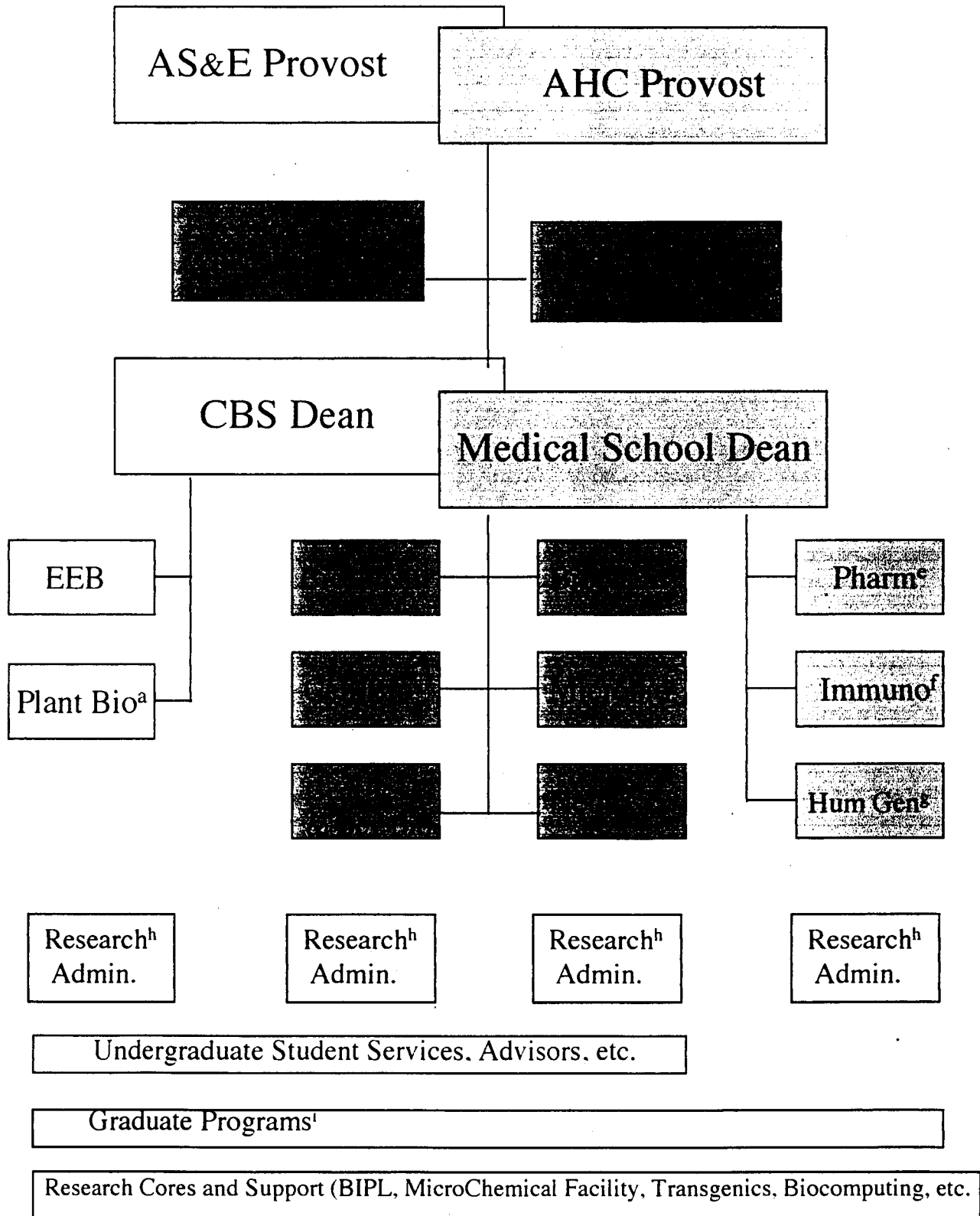
Heads of these newly created departments will need to possess leadership characteristics different than what may have been previously expected. Heads of core departments must understand the University-wide mission of their units and be prepared to report to both the CBS and Medical School Deans. Thus, it is expected that heads of these core departments will devote a substantial amount of time to administrative duties. Their performance evaluations and compensation will take this into account. Thus, leaders of these newly created departments should be sought for their scientific judgment, vision across the breadth of their discipline and ability to promote cooperation between the disciplines of the unit, and with units in the Medical School, AHC, COAFES and CNR. Indeed, a mission for each these newly created departments is to be truly university-wide, in part by demonstrating their ability to be a resource for the entire university.

Two groups will serve important advisory roles to the Provosts. The Deans who comprise the Biological Sciences Policy Council will oversee administrative matters. An elected committee (University-wide) of senior faculty (Executive Faculty Council) will oversee scientific matters.

Ideally, the faculty that comprise a department should occupy office and research space in proximity to one another. However, it must be recognized that for many reasons this will not be possible for all of the Core Biology Departments. In fact, it is anticipated that the Minnesota Ideal for some units will be to have faculty located in both St. Paul and Minneapolis.

Intercollegiate Partnerships in Biology

I. CBS and Medical School



Footnotes

- a) Plant Biology will continue joint reporting to the Deans of CBS & COAFES
- b) Biology Instruction (Faculty and P&A whose focus is on pedagogy and outreach)
 - Instruction in areas lacking discipline-based departments (e.g. Gross Anatomy, Physiology, Taxonomy)
 - Instructional Services (multi-media assistance, Instructional Labs, etc)
 - Administration of Master Professors Program (Teaching for the Fundamentals of Biology series)
 - Administration for Undergraduate Major in Biology (distinct from undergraduate majors in the core disciplines)
 - Administration of Professional Master's programs in Biology
- c) Genetics/Development: Placement of these two disciplines into a single department is scientifically warranted both generally and at the U of M. However, members of these disciplines need to provide their input.
- d) Neuroscience: Scientifically justified, and further justified and supported by responses to questionnaire by the faculty. Placement in the core is contingent upon undergraduate major (which has been proposed and awaits final approval by the EPC of CBS).
- e) Pharmacology: Refer to comments concerning departmental distinctiveness (page 1).
- f) Immunology: At this time it is unclear what is optimal, i.e.. remain as multi-departmental center or become a department. In either case, it is viewed as a Medical School/AHC enterprise. However, members of this discipline need to provide their input.
- g) Human Genetics: At this time it is unclear what is optimal, i.e.. remain as multi-departmental center or become a department. In either case, it is viewed as a Med School/AHC enterprise. However, members of this discipline need to provide their input.
- h) Research Administration: These are units that will administer grants and provide general secretarial support for groups of investigators that may be larger than a single department.
- i) Core functions of the biological Graduate Programs should be merged and simplified. In addition, responsibility for discipline-based graduate training should be aligned with departmental resources.

Twin Cities Campus

Office of the Dean
College of Biological Sciences

St. Paul, MN 55108-1093
612-624-2244
Fax: 612-624-2785

December 3, 1996

ACADEMIC HEALTH CENTER
Office of the Provost

DEC 05 1996

Memo To: C. Eugene Allen, Provost, Professional Studies
✓ Frank Cerra, Provost, Academic Health Center
W. Phillips Shively, Provost, Arts, Sciences, & Engineering and
Morse Alumni Distinguished Teaching Professor of Political Science

RECEIVED

BSPC Members:

Norma Allewell, Vice Provost, Arts, Sciences, & Engineering
Mark Brenner, Vice Pres. for Research & Dean, Graduate School
Michael Martin, Dean, College of Agricultural, Food, & Env. Sciences
Alfred Sullivan, Dean, College of Natural Resources

From: Robert Elde, Chair of the BSPC and Dean, College of Biological Sciences

Subject: Biology Reorganization: Partnership I. CBS and the Medical School

Please accept my apologies for neglecting to copy you on the distribution of the November 11, 1996, document outlining the proposed partnership between CBS and the Medical School as part of biology reorganization. It was truly an unintentional oversight. I've enclosed a copy of the document, which by now all of you have seen and received numerous reactions. As we move ahead with plans for reorganization, I will strive to keep you informed each step of the way.

ju

Enclosure

c: Alfred Michael, Dean, Medical School
Harry Orr, Special Assistant to the Dean, Medical School

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Office of the Dean
College of Biological Sciences

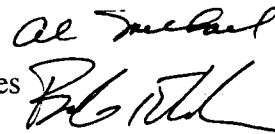
123 Snyder Hall
1475 Gortner Avenue
St. Paul, MN 55108-1095
612-624-2244
Fax: 612-624-2785

Memorandum

November 11, 1996

To: Basic Science Department Heads, Medical School
Department Heads, College of Biological Sciences

From: Alfred Michael, Interim Dean, Medical School
Robert Elde, Dean, College of Biological Sciences



Subject: Next steps in reorganization

We desire feedback on the proposed reorganization of departments from you and the faculty. Thus, we are planning Town Meetings for wide discussion of these matters. The first will be in early December and will occur as a pair (one in St. Paul; one in Minneapolis). The second will be a single, joint meeting in mid-January.

Prior to the early December Town Meeting we request that you hold meeting(s) of your faculty to discuss the proposed reorganization. We would like you (or others in your departments) to send us a written summary of the concerns that arose in your discussions. Please send these summaries to each of us (e-mail, if possible) by Wednesday, December 4 so that we can be prepared to use the Town Meeting to address these issues.

It is important that we act expediently, since changes in our organization should be implemented by July 1, 1997.

Proposal

Intercollegiate Partnerships in Biology

I. College of Biological Sciences and Medical School Departments and Reporting Structure

November 11, 1996

Preamble

It is proposed to organize basic biology presently affiliated with the College of Biological Sciences (CBS) and the Medical School into a departmental-based structure which, in terms of reporting, consists of three types of departments: 1) Medical School departments, 2) CBS departments, and 3) University-wide, core departments that reside in both the Medical School and CBS. The criteria for discipline-based core departments follow. First, the disciplines included are fundamental. Each of these departments will offer undergraduate and graduate degrees. These disciplines are recognized nationally as the cornerstones and as the driving force for research in many other areas of biology, agriculture, environmental sciences, natural resources and the health sciences. Thus, in order for the University of Minnesota to advance in any of these areas, it is imperative that the fundamental disciplines be outstanding.

Second, the list of fields included recognizes that an institution can advance a given discipline if and only if a critical mass of faculty share a focus in that discipline. In spite of our size, the University of Minnesota does not have faculty clustered into the critical masses necessary to sustain important, contemporary areas in fundamental biology. A critical mass of accomplished faculty in a given discipline is able to attract the best students and offer nationally competitive degrees at the undergraduate and graduate levels of instruction. Disciplines at the University of Minnesota that are not within striking distance of such a level of achievement should not be sustained as free-standing departments. However, service-level instruction will continue to be needed from these disciplines, but the manner of delivery of such instruction will be from a source other than a discipline-based department.

Assumptions Regarding Reporting and Leadership of University-Wide Departments in Core Disciplines in Biology, and Space

Faculty who can contribute to the core disciplines in biology are scattered and fragmented by present structure. As a step toward resolving this flaw, University-Wide departments in selected core disciplines will be created. Some will be created by the merger of two or more existing departments, whereas others will be created *de novo*. The disciplinary base of these new departments should be obvious and distinct. Duplication of expertise found in other disciplines and departments should be avoided. This document focuses for the most part on those departments that will be created by the actions of the Medical School and the College of Biological Sciences. These newly created departments will report to the Deans of CBS and the Medical School.

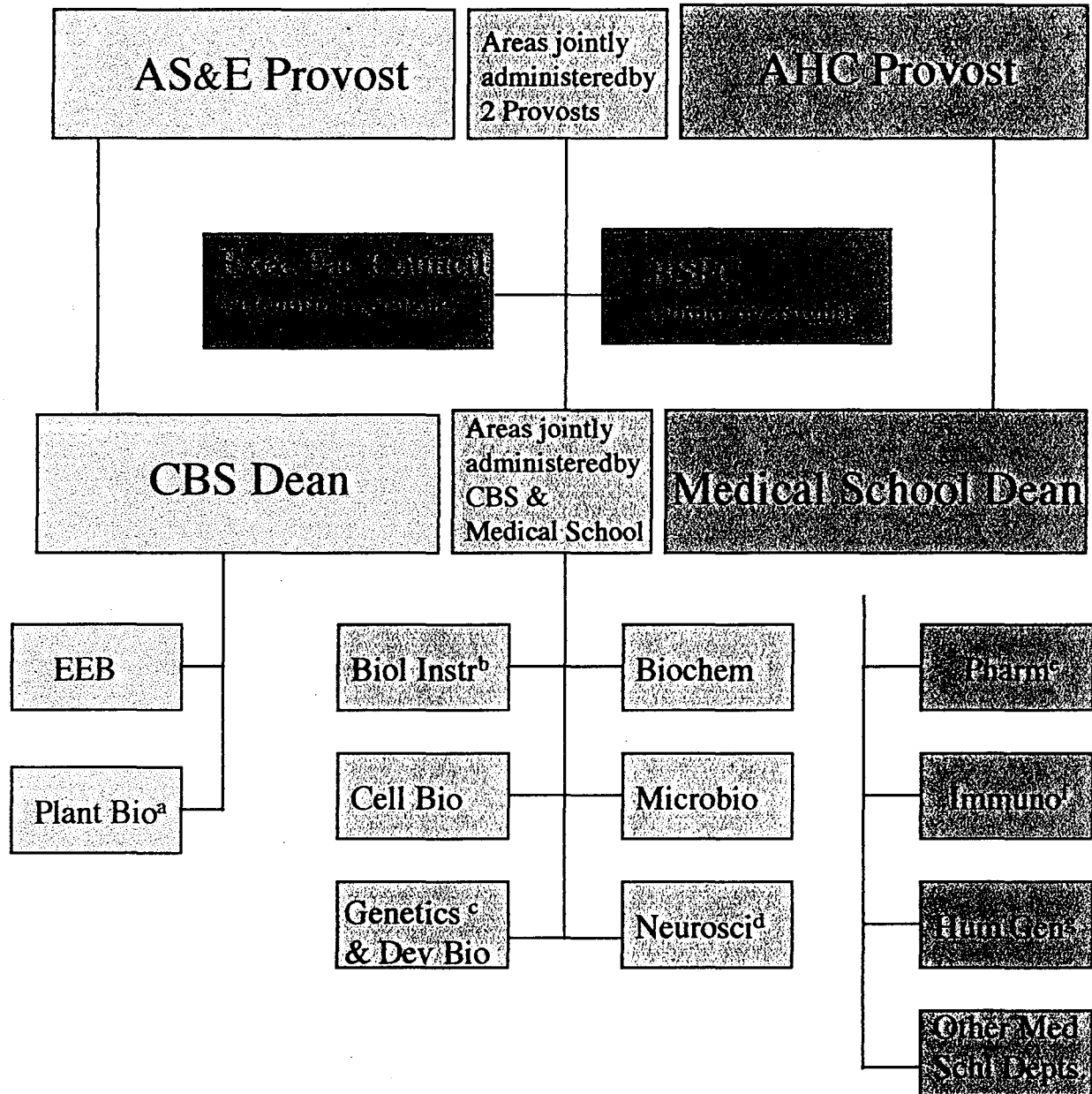
Heads of these newly created departments will need to possess leadership characteristics different than what may have been previously expected. Heads of core departments must understand the University-wide mission of their units and be prepared to report to both the CBS and Medical School Deans. Thus, it is expected that heads of these core departments will devote a substantial amount of time to administrative duties. Their performance evaluations and compensation will take this into account. Thus, leaders of these newly created departments should be sought for their scientific judgment, vision across the breadth of their discipline and ability to promote cooperation between the disciplines of the unit, and with units in the Medical School, AHC, COAFES and CNR. Indeed, a mission for each these newly created departments is to be truly university-wide, in part by demonstrating their ability to be a resource for the entire university.

Two groups will serve important advisory roles to the Provosts. The Deans who comprise the Biological Sciences Policy Council will oversee administrative matters. An elected committee (University-wide) of senior faculty (Executive Faculty Council) will oversee scientific matters.

Ideally, the faculty that comprise a department should occupy office and research space in proximity to one another. However, it must be recognized that for many reasons this will not be possible for all of the Core Biology Departments. In fact, it is anticipated that the Minnesota Ideal for some units will be to have faculty located in both St. Paul and Minneapolis.

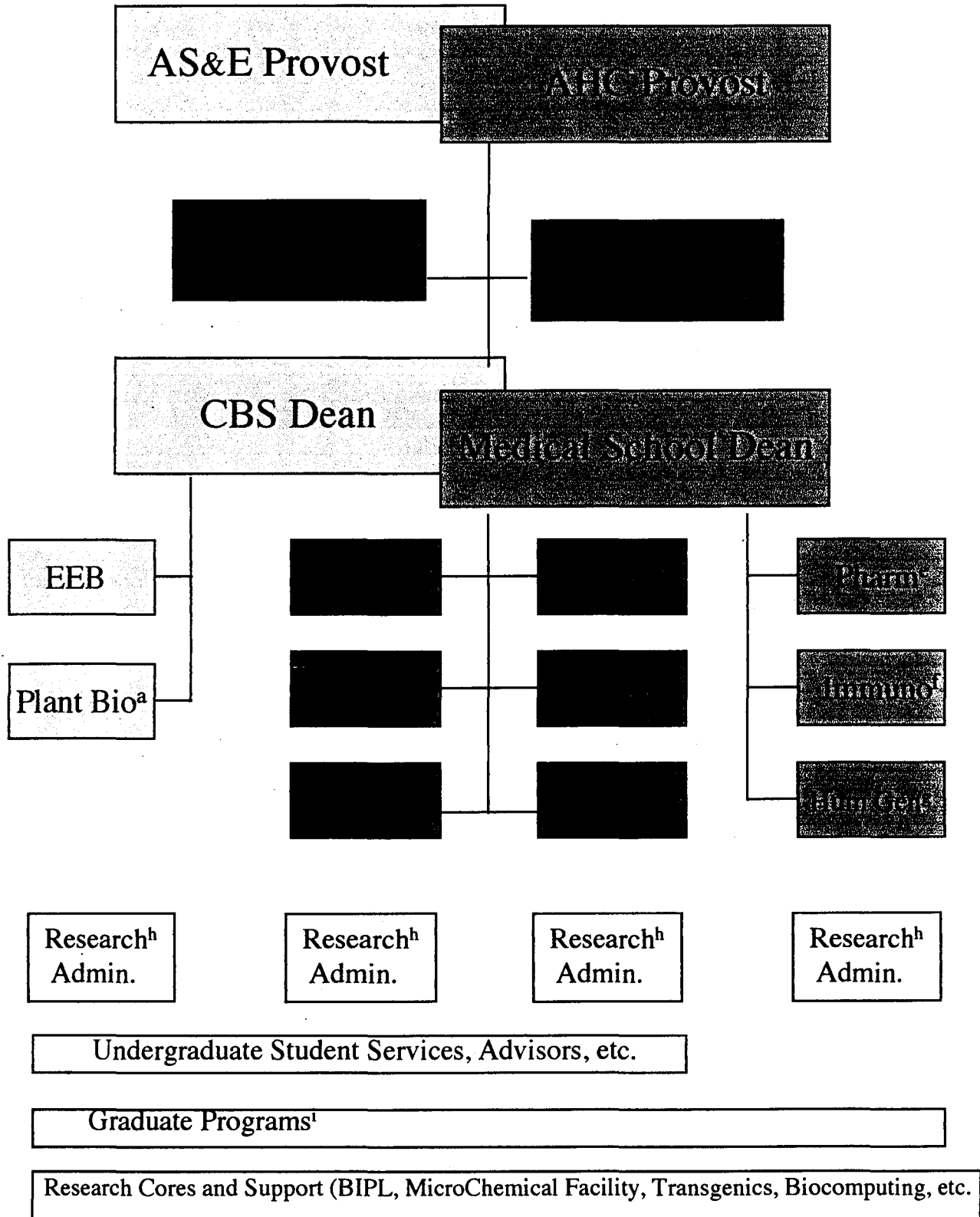
Intercollegiate Partnerships in Biology

I. CBS and Medical School



Intercollegiate Partnerships in Biology

I. CBS and Medical School



Footnotes

- a) Plant Biology will continue joint reporting to the Deans of CBS & COAFES
- b) Biology Instruction (Faculty and P&A whose focus is on pedagogy and outreach)
 - Instruction in areas lacking discipline-based departments (e.g. Gross Anatomy, Physiology, Taxonomy)
 - Instructional Services (multi-media assistance, Instructional Labs, etc)
 - Administration of Master Professors Program (Teaching for the Fundamentals of Biology series)
 - Administration for Undergraduate Major in Biology (distinct from undergraduate majors in the core disciplines)
 - Administration of Professional Master's programs in Biology
- c) Genetics/Development: Placement of these two disciplines into a single department is scientifically warranted both generally and at the U of M. However, members of these disciplines need to provide their input.
- d) Neuroscience: Scientifically justified, and further justified and supported by responses to questionnaire by the faculty. Placement in the core is contingent upon undergraduate major (which has been proposed and awaits final approval by the EPC of CBS).
- e) Pharmacology: Refer to comments concerning departmental distinctiveness (page 1).
- f) Immunology: At this time it is unclear what is optimal, i.e.. remain as multi-departmental center or become a department. In either case, it is viewed as a Medical School/AHC enterprise. However, members of this discipline need to provide their input.
- g) Human Genetics: At this time it is unclear what is optimal, i.e.. remain as multi-departmental center or become a department. In either case, it is viewed as a Med School/AHC enterprise. However, members of this discipline need to provide their input.
- h) Research Administration: These are units that will administer grants and provide general secretarial support for groups of investigators that may be larger than a single department.
- i) Core functions of the biological Graduate Programs should be merged and simplified. In addition, responsibility for discipline-based graduate training should be aligned with departmental resources.

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Office of the Dean
College of Biological Sciences

Biological Sciences, College of
1775 Summit Avenue
St. Paul, MN 55108-1095
612-624-2244
Fax: 612-624-2785

January 21, 1997

ACADEMIC HEALTH CENTER
Office of the Provost

FEB 04 1997

RECEIVED

Memo To: Named Conveners and Interested Faculty

From: Biological Sciences Policy Council
Robert Elde, Chair and Dean, CBS
Mark Brenner, Dean, Graduate School & Vice Pres. for Research
Mike Martin, Dean, COAFES
Alfred Michael, Dean, Medical School
Alfred Sullivan, Dean, CNR
Norma Allewell, Vice Provost for AS&E and Ex Officio Member
Harry Orr, Special Asst. to the Dean of the Medical School and
Ex Officio Member

Subject: Convening Discussions and Reporting

As a consequence of responses of individual departments to the proposed changes in departmental structure in the core disciplines in biology, and our reading of the Town Meetings held on December 13, we are asking that the individuals named below organize and convene *inclusive* meetings of faculty to discuss the foci and faculty that such departments would include. Our goal is to strengthen the core disciplines in biology. Reorganization must have two outcomes:

1. The core disciplines must become nationally stronger in their own right.
2. Strengthening the core disciplines must reinvigorate the "usefulness" of core biology to more applied disciplines in AHC, COAFES, and CNR.

The BSPC would like to hold open meetings the second or third week of February to hear reports of your discussions. Your report should address the following items:

- The research foci of the new department.
- The faculty who ought to be included in the new department and how those faculty should be geographically distributed.
- The way in which access to expertise in the new department will be provided to other basic biology departments (including other basic and applied departments in COAFES, CNR, and AHC); how will linkages be formed?

- Any organizational considerations which ought to be reviewed.
- The major issues that will face the newly configured department.

If there is a consensus within your group we would like the report to emphasize the points of consensus and to list the issues requiring further discussion. If there is not consensus on major issues, we would like the report to reflect the roots of the disagreements.

Suggested Conveners

Center for Biological Instruction & Outreach

John Beatty, Emily Hoover, Ed Sucoff, Doug Wangenstein

Cellular, Developmental Biology & Genetics

Ross Johnson, Paul Letourneau, Larry Schook, Chris Wylie

Biochemistry

Dave Bernlohr, Gary Gardner, John Lipscomb, Charles Louis, Howard Towle

Microbiology

Ashley Haase, Mike Sadowsky, Ken Valentas

Neurobiology

Tim Ebner, Alice Larson, Paul Letourneau, Bob Miller

Ecology, Evolution & Behavior

Affinity Group

Plant Biology

Steve Gantt, Neil Olszewski, Carroll Vance

Animal Biology/Organismal

Ira Adelman, Elmer Birney, Alan Hunter