

Task Force Report

**Division of Biological Sciences
Structural Review**

Cornell University

March 12, 1998

**Commissioned by:
Provost Don M. Randel**

**Appointed by:
Vice President for Academic
Programs, Planning and Budgeting,
Ronald G. Ehrenberg**

Task Force Report
Division of Biological Sciences Structural Review

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FOREWORD

This is the Report of a Task Force commissioned by Provost Don M. Randel and appointed by Professor Ronald G. Ehrenberg, Vice President for Academic Programs, Planning, and Budgeting, to review the structure of the Division of Biological Sciences at Cornell University. The membership of the Task Force and their backgrounds are given at the beginning of the document.

In conducting the review, the Task Force was asked to consider a number of models for restructuring the Division as well as a large number of questions and issues confronting the Division and biology at Cornell University. We were also asked to address the future of biology at Cornell as a basis for our recommendations and we made intellectual considerations central to our discussions about structure. We accepted the task of producing a set of directions for the future as necessary, but we also tried not to approach the task in a presumptuous manner. We assume that the Provost will continue to seek the views of groups more broadly representative of the biological sciences community at Cornell.

The approach of the Task Force was open, participatory and forward-looking. The panel worked hard to identify the major concerns of the faculty, students, staff, and administrators. The information on which the Task Force based its assessments and conclusions was gathered in a number of ways. We visited with the faculty of each of the Division Sections; we met as a group with the concerned Deans and Directors. Subsets of the Task Force met with a representative group of lecturers, with the staff in the Advising Center, with undergraduate students. We visited with many biological sciences departments outside the Division and invited all concerned units outside the Division to comment in writing (most did). After distributing the initial draft of the report to the faculty in the Division, we sought their views in two well-attended open meetings and through a survey distributed to every member of the Division faculty. A complete list of persons and units contacted is provided in the Appendix V. In addition, the Task Force met at least twice a week for most of the semester to discuss the information we were gathering and to consider in detail the problems we found and the most effective means of addressing those problems.

The Task Force had access to a large array of documents and data. A complete list of documents furnished to the Task Force is shown in Appendix IV.

We hope that this report will be useful and will serve the long-term interests of the biological sciences at Cornell University.

Biddy Martin
Associate Dean
College of Arts and Sciences

Ronnie Coffman
Associate Dean for Research
College of Agriculture & Life Sciences

Task Force Membership

Co-Chairs:

Ronnie Coffman
Associate Dean for Research
College of Agriculture and Life Sciences
245 Roberts
wrc2@cornell.edu
5-2554

Biddy Martin
Associate Dean, Arts & Sciences
194 Goldwin Smith
cam18@cornell.edu
5-4147

Andrew Bass, Chair
Neurobiology and Behavior
W239 Seeley Mudd
4-4372
ahb3@cornell.edu

Richard Harrison, Chair
Ecology and Systematics
E145a Corson Hall
4-4201
rgh4@cornell.edu

Charles Walcott
Professor, Neurobiology and Behavior
W255 Mudd Hall
4-4382
cw38@cornell.edu

Dominick Paolillo, Chair
Plant Biology
228 Plant Science
5-2073
djp4@cornell.edu

Antonie (Tonie) Blackler, Chair
Genetics and Development
101 Biotech
4-4800
awb3@cornell.edu

Valley Stewart, Chair
Microbiology
W326 Wing Hall
5-2416
vjs2@cornell.edu

William Crepet, Chair
L.H. Bailey Hortorium
462b Mann Library Building
5-2131
wlc1@cornell.edu

Bik Tye
Professor
Biochemistry, Molecular and Cell Biology
325 Biotech
5-2445
bt16@cornell.edu

Steve Ealick, Chair
Biochemistry, Molecular and Cell Biology
207 Biotech
5-2427
see3@cornell.edu

John Wootton, Chair
Vet Physiology
T8-025 Vet Research Tower
3-3854
jfw1@cornell.edu

Tom Eisner
Professor
Neurobiology and Behavior
W347 Seeley Mudd
5-4464
te14@cornell.edu

Staff Support:
Maureen Updike
Senior Administrator
Academic Programs
436 Day Hall
5-4395
mou1@cornell.edu

Nelson Hairston
Professor, Ecology & Systematics
Corson Hall
4-4231
ngh1@cornell.edu

EXECUTIVE SUMMARY

The Task Force for the Structural Review of the Biological Sciences was commissioned by Provost Don M. Randel and appointed by Ronald G. Ehrenberg, Vice President for Academic Programs, Planning, and Budgeting in the summer of 1997. We were asked to assess the strengths and weaknesses of the current Division structure, to consider alternative administrative forms, and to make recommendations about how to meet the administrative, educational, and research needs of the biological sciences at Cornell. In order to determine the source of the problems that had been identified in the workings of the Division, we met with the Division faculty, section by section. We then continued our discussions about structure throughout the fall semester and into January.

The Task Force was guided by a set of questions drawn up by the Division Executive Committee and forwarded to us by Vice President Ehrenberg. In Section I of our report, we have provided the description that was requested of the current structure of the Division, its history and functions, its administrative organization, its role in the coordination of undergraduate and graduate education, and its impact on research. Section I concludes with an evaluation of the current structure with regard to administration, education, and research. The Task Force found that the Division works well for the organization of undergraduate teaching, for the encouragement of undergraduate research opportunities, for the promotion of outreach initiatives, for the visibility of major areas in basic biology, and, to some extent, for faculty recruiting and retention. However, the Division has not worked well in several key areas: 1) promoting interaction among faculty and integrating non-Division basic biologists or other basic scientists into Division programs, 2) reallocating resources, such as vacant faculty lines, according to clear priorities about the kinds of research that need to be emphasized at any given time, 3) advocating faculty needs, promoting faculty research and scholarship, and exploiting new opportunities, such as relations with the Cornell Medical College, and 4) creating excellence in key fields in the biological sciences by providing vision, identifying new directions, and sustaining the flexibility required to move in those new directions.

The Division's failures are related in part to the complexity of Cornell's administrative structures and reporting relationships. Changes in research in the biological sciences have shifted the ground underneath the Division structure. Funding constraints, pressures from college deans, and the Director's lack of direct access to college resources have all contributed to the Division's difficulties. Over time, sections which were intended to have permeable boundaries that would permit change, growth, and collaboration, have become departments which compete with one another for resources, seek support from the Director of the Division and from the college deans. Lines of communication are confused and confusing and decisions about what should be emphasized and supported are made *ad hoc*. The result — no clear or consistently successful mechanisms for setting priorities and promoting excellence in basic biology. Whereas fragmentation, uncoordinated undergraduate majors, and lack of structure posed the greatest problems thirty years ago, insularity from basic scientists outside the Division, confusing reporting relationships, and entrenchment may represent the challenges we have to address today at a structural level. Overall, the basic biological sciences, which this Task Force and its chairs consider to be the critical science of the future and the key to Cornell's continued excellence as an institution, suffer from serious funding shortages for facilities and technical expertise, from uneven quality among its faculty, from a lack of distinction and poor rankings in some of the most important research areas, from the perception of a leadership vacuum, and from confusion about the balance of levels in areas of biology.

Section II provides an explanation of alternatives to the current structure and the reasons why neither a separate college nor a strengthened Division will solve the problems identified above. There was very little support for creating a College of Biological Sciences in the strict sense. On the other hand, we heard significant sentiment for a strengthened Division with a Director who controlled more resources — resources such as faculty lines that are now located in the colleges. With authority and resources located in the same place, it would be possible to achieve greater administrative simplicity. However, because of the diversity of areas and initiatives, because of the disagreements about the numbers and quality of faculty across different levels and sections of biology, because of the exciting new research areas that transcend Division boundaries, we conclude that strengthening the Division would require a level of cooperation and a unity of purpose that would serve to increase the insularity of basic biology at a time when basic biology has opened up onto a range of related disciplinary fields; insularity, then, will continue to dilute the force of research initiatives and collaborations that cross current Division boundaries. Though we strive for greater administrative simplicity, we also aim to open the faculty in basic biology to the full range of basic biological research on this campus and deans of the relevant colleges and healthy competition among strong departments in basic biology as well as between those basic biology units and other departments in the colleges. We expect that some key areas which have not flourished under the Division will have a greater opportunity for advancement.

To achieve openness, innovation, flexibility, and direct access for the faculty to deans, all without sacrificing a coherent curriculum or the visibility of basic biology, we recommend that:

- 1) The Division be eliminated and the sections reconfigured into departments which will have direct access to deans. Chairs of departments become advocates to the deans for their sub-disciplines within biology and the chairs of all the departments in basic biology become an advocacy group for the basic biological sciences.
- 2) The undergraduate major and the Behrman Advising Center be maintained and administered by a Director of Undergraduate Biology who will control and allocate teaching assistantships for the introductory courses required for the major. He/she will work with a Curriculum Committee composed of the Directors of Undergraduate Studies from the biology departments across campus and will report to the deans of the Colleges of Arts and Sciences and the College of Agriculture and Life Sciences as well as the office of the Provost. We recommend that this position be defined as half-time and that the discretionary and operating funds currently allocated to the Division Director be reallocated to the Office of the Director of Undergraduate Biology.
- 3) The University establish an Institute for Research in Biology that will foster quality, innovative research, bring young scientists to Cornell without increasing the total size of the faculty, and provide a platform for new funding opportunities. The Director of this Institute should be a distinguished scientist and a new appointment, and that the endowed position for the Division Director be used for this appointment.
- 4) The departments report to college deans. These departments may be based to some extent on the current sections of the Division. We recommend that there be fewer rather than more discrete units or departments of basic biology. The smaller sections or groups may well have strong arguments for maintaining their identities, both because of a history of research distinction and/or because they represent important programs of study. They may well retain those identities as subunits to be folded into larger departments or administrative units. In cases where departments are cross-college units, they should be assigned a lead (associate) dean from one college, whose responsibility it will be to seek

collaboration from the dean(s) in other colleges, and also take the lead in assisting planning and development efforts. These departments, though based in part on reconfigured sections within the Division, will also include individuals, small groups, even departments outside the Division if departmental reconfigurations outside the Division appear advantageous to individual faculty members, groups of faculty, or entire departments.

5) Final decisions about the precise configurations of departments be decided by a group to be convened by the Provost. We realize, of course, that pragmatic considerations, above all space constraints, will stand in the way of the radical reconfigurations that might best serve biology in the future. For collaboration among research scientists to flourish, proximity is vital. Questions of space have to be addressed at the highest levels of the administration.

6) One or more of the new Vice Provosts facilitate the coordination of the deans of the relevant colleges, the Director of Undergraduate Biology, and the Director of the Institute for Research in Biology.

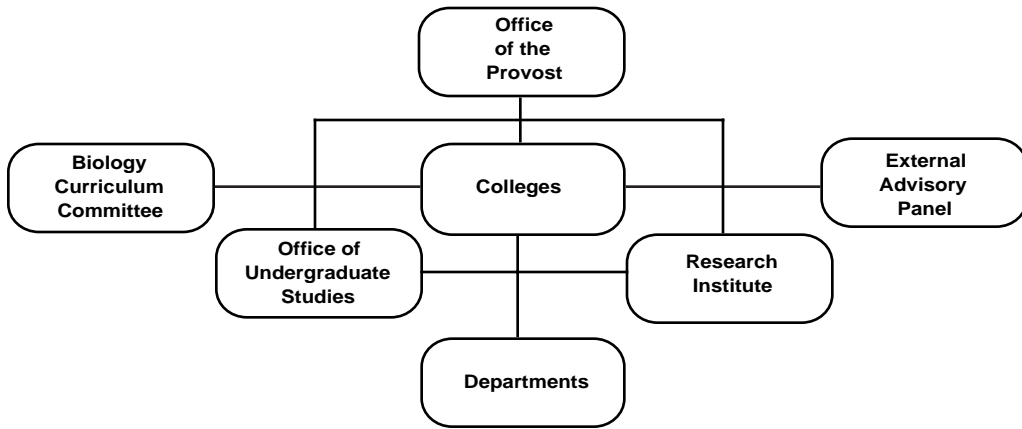
7) The Provost, Vice Provost, the college deans, the Director of Undergraduate Biology, and Director of the Institute for Research in Biology be advised by an External Committee, composed of distinguished scientists and donors from outside Cornell.

8) Ten distinguished young scientists be appointed over the next three years, possibly as pre-fills.

9) Any attempts to identify or set priorities for investment focus on the importance of fundamental intellectual questions rather than on techniques. All major technical innovations have historically originated from the discoveries of basic researchers engaged in the pursuit of fundamental questions.

We believe that these recommendations, if implemented, will ensure concentration of efforts in specific areas and improve quality while also providing mechanisms for coordinating different and potentially competing interests. Although we strive for administrative simplicity in the day-to-day operation of departments, we do not shy away from creating new structures where they will serve to promote excellence in research and teaching in the biological sciences.

Cornell Biology



SECTION I

A. Introduction

This Task Force was commissioned in the summer of 1997 by Provost Don M. Randel and appointed by Professor Ronald G. Ehrenberg, Vice President for Academic Programs, Planning and Budgeting. The structural review of the Division was commissioned in response to requests from the Division of Biological Sciences section chairs, most of whom argued (directly to the Deans and the Provost) that there were serious problems with the functioning of the Division. The section chairs suggested that Ronnie Coffman, Associate Dean for Research in the College of Agriculture and Life Sciences, and Bidy Martin, Associate Dean of the College of Arts and Sciences, be asked to head the Task Force. Vice President Ehrenberg agreed and appointed Coffman and Martin co-chairs. In addition to the section chairs, Ehrenberg appointed three faculty members, one each from the three largest sections in the Division — Neurobiology and Behavior, Ecology and Systematics, and Biochemistry, Molecular and Cell Biology.

The Division of Biological Sciences was created in 1964 to provide a proper environment at Cornell for research and teaching in basic biology, which was scattered at the time across five colleges and had only a small, though excellent base (Zoology) in the College of Arts & Sciences, the traditional home of basic sciences. Today, thirty years after its inception, the Division of Biological Sciences has accomplished a great deal. In some ways, Basic Biology has thrived on the Cornell Ithaca campus. The number of faculty positions within the Division has grown from 47 to 100 and these 100 faculty lines are located in two different colleges — Agriculture and Life Sciences and Arts and Sciences. A large number (1,308) of undergraduates currently major in the biological sciences (533 in the College of Agriculture and Life Sciences and 775 in the College of Arts and Sciences). If we add in the total number of pre-majors, the total number rises to 1753. The undergraduate major remains the largest major at Cornell and Biological Sciences majors represent a significant percentage of all undergraduates in both the College of Arts and Sciences and the College of Agriculture and Life Sciences.

Although there have been many successes, the Division has not been without problems. There is substantial variation in the perceived quality of the programs and in the investment that Cornell has made in the diverse disciplines. Currently, our greatest strengths are in organismal biology. Many of our problems have become more evident and more troublesome in recent years, as boundaries between basic and applied biology have become less distinct and as resources have become more limiting.

B. History

The Division of Biological Sciences at Cornell University was established on July 1, 1964, by action of the Board of Trustees, on the recommendation of University President James A. Perkins. The idea for the Division was a direct result of a review of biological sciences at Cornell by an external committee, chaired by Robert S. Morison.

The primary reason for creating a separate administrative structure for the biological sciences was articulated in the final report of the Morison Committee, namely, to rectify decentralization in the administration of biology, decentralization which had developed for historical reasons during the 1950's and 1960's. Some areas of biology were located completely within the College of Arts and Sciences while others belonged to the College of Agriculture. The committee identified two problematic tendencies, the tendency, on the one

hand, for the study of biology in the College of Agriculture to be valued “primarily for its immediate contribution to the solution of practical problems in Agriculture.” On the other hand, in the College of Arts and Sciences, where, in the words of the Morison Report, “one might have supposed that biology would be valued, at least in part, for the contribution it might make to the understanding of life in general, the only department devoted exclusively to biology [was] Zoology, where the emphasis appears to be largely on the preparation of students for medicine.” The report concludes that fragmentation and lack of support for basic biology “has not proven well adapted to the development of a well-balanced and appropriately integrated plan for research and teaching in the more basic aspects of biology.” The Morison Committee viewed the establishment of a “school or college” of biological sciences as an “opportunity to experiment with a new form of relationship between private and state interests in Cornell.” In direct response to these challenges, the Division of Biological Sciences was formed. For a more detailed history and context for the work of this Task Force, see Appendix 1.

C. Administrative Structure Of The Division

The Division of Biological Sciences is currently headed by a Director who reports to the Provost. The Director works with the chairs of the sections to represent the interests of the Division faculty to the various deans and to the Provost. The chairs of the sections and the Associate Director form the Executive Committee; until recently, two additional members of the committee were elected at-large from the Division faculty. The Executive Committee offers a forum to discuss Division-wide concerns. An Advisory Council was also appointed to advise the Director and Division on long-range planning.

Since the sections contain faculty supported by both the College of Agriculture and Life Sciences and the College of Arts and Sciences, the sections necessarily rely on both Colleges for resources. Originally, the Director was meant to coordinate administrative decisions with the college deans and Provost. However, chairs have built direct relationships with the colleges independent of the Division Administration.

Duties of the Director

1. Recruits the chairs of the sections
2. Mediates with the colleges and the Provost for budgets
3. Helps to recruit faculty
4. Reviews promotions and appointments
5. Acts as a general spokesman for biology on campus
6. Serves on various administrative boards
7. Develops programs and assists in fund raising
8. Helps establish and maintain common facilities and shops
9. Organizes and supports the Divisional undergraduate biology curriculum and advising
10. Appoints the Associate Director

Duties of the Associate Director

1. Directs the Office of Academic Affairs and supervises the Behrman Biology Center
2. Coordinates undergraduate advising, undergraduate research, the honors program, and other special undergraduate programs
3. Supervises Hughes Program Coordinator
4. *Ex officio* member of Division Curriculum Committee
5. Appoints chair of Curriculum Committee

Role of the Executive Committee

The Executive Committee advises the Director on faculty recruitment and the allocation of positions to sections, retention of faculty, undergraduate academic affairs, research directions, the appointment of joint and adjunct faculty, and other divisional issues.

Role of the Advisory Council

An Advisory Council is appointed to advise the Division administration on long-range planning and development in all aspects of the program, including research, teaching, and cooperative ventures with industry. The Council is comprised of 8-10 Cornell alumni and friends from business, industry, and academia, with a demonstrated interest and commitment to biological sciences, who will provide an outside perspective to Division activities and programming.

D. Resources Of The Division Of Biological Sciences:

Division Facilities and Personnel:

Office of the Director - Biotech Building
Assistant to the Director
Administrative Aide

Office of Academic Affairs — Stimson Hall
Associate Director of the Division
Executive Staff Assistant
Administrative Aide

The Behrman Biology Center (Advising and Student Services):
Associate Director of the Division
Assistant Director for Student Services
Student Advisors
Hughes University Research Program

Institute for Biology Teachers

Central Services — Instrumentation, Development, and Repairs
Mechanical Support Staff
Computer Support Staff

Building Managers/Coordinators
Corson Mudd Building Coordinator
Biotech Building Coordinator

Vital undergraduate teaching/research programs have been associated with the Division (including Explorations); these have been initiatives of Peter Bruns and they are funded by a Hughes grant to him.

Operational Funds:

Operational funds include personnel salaries and benefit, 2% grant overhead returned to the Sections, and operating expenses that are not part of salaries.

Discretionary Funds:

The Director of the Division of Biological Sciences also has discretionary funds which are provided annually by the Provost and College of Agriculture and Life Sciences. There are also discretionary funds available in the form of accrued interest on various endowments, gifts, a reserves account, two challenge funds (for teaching — Appel Fund; and teaching equipment — Atkins Challenge).

E. Undergraduate Teaching

Thirty years ago the curricula of the various majors associated with biological disciplines were enormously varied in content and quality. The promise of a coherent and focused curriculum for the basic biological sciences — in the form of a single major — proved attractive to the majority of the faculty in the emerging Division.

The biology major, largely crafted through the action of the Division faculty, laid stress on a fundamental background in General and Organic Chemistry, Physics, Mathematics, and Introductory Biology. This foundation was then supplemented with core courses in the disciplines of genetics and biochemistry in recognition of the changing emphases in biological study. These core courses were then capped by courses in a “concentration” of the student’s choice, most of which the students elected. Most concentrations represented the disciplinary emphases of the initial faculty groupings — the sections — of the new Division. A Curriculum Committee was established to oversee the curriculum in general and to implement changes in the concentration offerings, in particular. Changes in the foundation and core courses were to be undertaken only through the action and accord of the entire Division faculty. In the course of the 30+ years of Division history, the faculty met but once to debate the structure of the major, — ratifying the selection of fundamental and core courses, adding a core course in Evolution, and requiring a consistent 14 hours of course credits in each of the concentrations. Concentrations were renamed “programs of study.”

The day-to-day administration of the curriculum has been invested in the Office of the Associate Director for the Biological Sciences, which also administers the advising functions of the undergraduate major and acts as a source for career counseling, summer internships, fellowship advice and information.

All biology majors are required to take 4 courses: freshmen who score lower than 5 on the Advanced Placement biology test take either Bio 101-104 or 105-106, which are year long introductory courses. The remaining three courses, a semester each of genetics, biochemistry and evolutionary biology are then followed by additional courses in particular programs of study. These programs of study, with the exception of the most popular option, General Biology, are supervised by individual sections.

There are four introductory biology courses: (1) BioG 101-104, a course designed for biology majors, is administered by the Section of Neurobiology and Behavior; (2) BioG 107-108 is the summer school version of 101-104 and is also administered by Section of Neurobiology and Behavior; (3) BioG 105-106, an individualized instruction approach to biology, is administered by the Section of Physiology; (4) BioG 109-110, designed for non-majors, is administered by the Section of Plant Biology. Each of these courses also has a laboratory component. Faculty for these courses were hired specifically to teach them by the Division and assigned to individual Sections. Teaching assistants for the Introductory Biology courses are assigned by the senior lecturers in these courses.

These teaching assistants are graduate students who come from a range of sections/departments in and outside of the Division (see Appendix 2).

The upper-level required courses are the responsibility of particular sections: the Section of Ecology and Systematics is responsible for teaching Evolutionary Biology; the Section of Biochemistry, Cell and Molecular Biology is responsible for the two Biochemistry courses from which students may choose, and the Section of Genetics and Development for Genetics (see Appendix 2). In addition to taking required courses, undergraduates may elect to be involved in research. Biology 499 is the research course and one in which a substantial number of students participate; many use it to participate in the biology honors program. The honors program is supervised by a Division faculty committee.

F. Graduate Teaching

All graduate degree programs in biology at Cornell in Ithaca are administered by the Graduate School under the provisions of the Code of Legislation of the Graduate Faculty. Further, according to the Code of Legislation the program of each graduate student is developed independently by the student and his/her Special Committee following standards to be defined voluntarily and established through informal discussions between those individuals representing their various subjects.

The Division has relatively little direct impact upon graduate education. The effectiveness of graduate programs depends on the quality and reputation of the faculty, which is the key to attracting research funding and outstanding graduate applicants. In scope and quality, graduate course offerings reflect the interests and expertise of the faculty members who teach them and the facilities and resources that are made available for their instruction. The Faculty Handbook of Cornell University describes "academic divisions [as] administrative units established to integrate teaching, academic guidance, research, and extension programs that either are a concern of more than one college or school or fall outside the purview of individual colleges and schools. In cases of the first type (e.g. the case of the Division of Biological Sciences), the Director of the Division works with the deans of the concerned colleges or schools in determining budgets as well as faculty appointments and promotions." For this reason the Division administration has an obvious indirect impact on graduate course offerings to the extent that it attracts faculty and financial resources.

In addition, graduate as well as undergraduate course offerings must now be reviewed and approved by the Curriculum Committee of the Division in order to be designated as Biological Science courses and to gain the consequent visibility. Whereas the Division plays a substantial role in the integration of teaching and the academic guidance of undergraduate majors, it does not have an equivalent direct impact on graduate studies. The Division structure does help coordinate teaching assistantships, i.e., allocations and assignments, and teaching assistantships form a substantial part of the financial supportive base for graduate students in biology. During the recent period of severe budgetary constraints in the statutory colleges, which led to the withdrawal of funding for Cornell pre-doctoral fellowships, the Division Director helped negotiate the redistribution of residual, endowed fellowship support for biology among those graduate fields with faculty appointments in the College of Arts and Sciences.

Graduate student support comes from a variety of sources, including teaching assistantships, research assistantships (derived from the College of Agriculture and Life Sciences), fellowships (both internal and external), training grants, and individual research

grants. Outstanding graduate applicants in the biological sciences often bring external fellowship support, thus expanding the total financial support base for a program. The proportion of support from each of these sources varies dramatically among sections/fields (see Appendix 3). Financial support of graduate students is critical to our ability to attract first-rate candidates to our graduate training programs. This support is also important to our teaching and research efforts. Senior faculty argue that the quality of graduate students has improved over time, but Cornell does not compete well with peer institutions in aid for graduate students, and additional sources must be identified.

Under the current structure, the Director has provided modest but very useful support for graduate student recruitment, for advertising graduate programs, for graduate courses that require resources beyond those associated with the classroom experience, and for students who have wished to participate in educational experiences outside Cornell.

G. Research

Research in the eight sections of the Division is focused on a broad array of fundamental problems in biology at the levels of atoms, molecules, cells, organisms, populations, communities, and ecosystems; in addition, many faculty carry out research that contributes practical solutions to problems in agriculture, medicine, and the environment. The diversity of research within the Division translates into differences in culture among the different sections and corresponding differences in the peer groups with which comparisons can and should be made.

Basic research in biology at the Cornell campus extends beyond the Division of Biological Sciences. Interactions between biologists inside and outside the Division is fostered by Graduate Fields. Graduate Fields in which Division members are actively involved and the numbers of faculty and students associated with these fields are listed in the Table 1. The growing number of biologists outside of the Division engaged in basic research has led some to question the utility of a Division that is not inclusive of more of the basic biologists on campus.

Table 1

Graduate Fields extend beyond the Division Field	Faculty	Students
Biochemistry, Molecular & Cell Biology	40	75
Biophysics	21	7
Ecology & Evolutionary Biol.	42	61
Genetics & Development	28	35
Microbiology	19	23
Neurobiology & Behavior	30	34
Physiology	42	21
Plant Biology	41	52
Zoology	19	4

Whereas basic biology is under the umbrella of an independent structure called the Division, the Division is not financially independent of the colleges which control faculty lines. Of ninety-seven faculty in the Division, thirty four hold appointments in the College of Arts and Sciences and sixty-three in the College of Agriculture and Life Sciences. The College of Agriculture and Life Sciences has the largest portion of the financial

responsibility for the Division. Three of the eight sections (Bailey Hortorium, Microbiology and Physiology) have faculty appointments solely in the College of Agriculture and Life Sciences. Thus basic science departments exist in whole or in part within a college that has a clear mandate to fulfill certain "missions" for the State of New York. This situation has the potential to create conflicts if research in the basic Life Sciences is not viewed as central to the mission of the College of Agriculture and Life Sciences. This conflict may be most severe in the Sections of Biochemistry, Molecular and Cell Biology, Genetics and Development, and Neurobiology and Behavior, which obtain significant research funding from the National Institutes of Health, an agency committed to support research in biomedical sciences, which is not part of the mission of the College of Agriculture and Life Sciences. Other areas outside these sections are similarly burdened (e.g., Evolutionary Biology). The perceived pressures by the College of Agriculture and Life Sciences deans to make basic research relevant to the mission of the College of Agriculture and Life Sciences have left many basic biologists feeling alienated.

Basic research is motivated by a desire to increase our knowledge and discover fundamental principles in a particular discipline; obviously, this does not preclude future applications that are not immediately apparent. Basic research can be distinguished from intentionally applied research by virtue of the fact that its goals are not immediately instrumental. Invariably, fundamental principles, once understood, have long-range and broad-based applications. There are few modern-day technologies that did not evolve from fundamental principles of basic sciences. For example, two technologies that have revolutionized biology in the past two decades, namely, DNA sequencing and Polymerase Chain Reaction, both evolved from efforts to unravel the secrets of how genetic material is duplicated. This scholarly pursuit led to the study of a class of enzymes called DNA polymerases that make complementary replicas of template DNA strands. Modifications of these reactions led to DNA sequencing and PCR technologies, which are now standard molecular biology tools widely applied in medicine, agriculture, environmental science, and forensic science. There are, of course, many other such examples.

While it is clear that we have come a long way in the past 30 years, it is also important to compare ourselves with biologists at other institutions and, in turn, evaluate whether the current organization of biology helps or hampers further success. Success in the sciences is best measured by peer scientists. The most sophisticated assessment of research-doctorate programs is the report published by the National Research Council. Although in many ways the NRC report can be misleading, it has value in recording outside opinions. It certainly influences the recruitment of undergraduates, graduates, and even faculty to Cornell. Table 2 shows the number of programs surveyed by NRC under each of the broadly defined fields. It includes the ranking of Cornell in each of these fields and the graduate fields about which information was provided by Cornell University in this survey. Ecology and Evolutionary Biology at Cornell fares best in this survey, ranking in the top 4 of the programs evaluated. The graduate fields of Ecology and Evolutionary Biology, Plant Biology and Zoology, with a total of about 100 faculty members, were included in this group. Biochemistry, Molecular and Cell Biology (22), Physiology (31), and Neurobiology and Behavior (24) fared less well, perhaps because the peer programs include those in medical schools as well as universities associated with medical schools. Genetics and Development, under the category of Molecular and General Genetics, ranked twenty-third. Microbiology was erroneously placed in the category of Cellular and Developmental Biology; its ranking is therefore invalid.

Table 2
National ranking of research doctorate programs in biology

NRC Program Category	No. of Programs surveyed	Cornell* ranking	Cornell Graduate Fields Ranked
Biochemistry and Molecular Biology	194	22/17.5	Biochemistry, Molecular and Cell Biology
Cellular and Developmental Biology	179	35.5/23	Microbiology
Physiology	140	31/16	Physiology
Ecology, and Evolutionary Biology	129	4/3	Ecology, Evolution and Behavior, Plant Biology, Zoology
Molecular and General Genetics	103	23/16	Genetics and Development,
Neurosciences	102	24/18	Neurobiology and Behavior

*The first/second numbers give the ranks of faculty quality/effectiveness of research doctorate program.

Another measure of the reputation and visibility of Cornell biologists is their membership in the National Academy of Sciences or their recognition by high profile awards such as the Howard Hughes Medical Investigator Awards. Only a very few Biologists in the Division enjoy such honors. In particular, the Cornell Ithaca campus does not have a single recipient of the HHMI award. This lack of visibility could be a true measure of our relative standing with our peers. However, interactions with our peers who enjoy these honors also suggest that Cornell biologists may lack the political machinery or organization to promote the visibility they deserve. Theoretically, the Division could have taken a leadership role in promoting more actively the visibility of Biology at Cornell. Larger Departments with political clout routinely nominate their stars to various high-profile awards. This kind of activity is taken more seriously by our competing institutions.

A more practical measure of the relative standing of our research programs is our successes in competing for external funding. By this measure, we have outstanding biologists whose research programs rank highly in each of their respective fields.

SECTION II

ISSUES FACING THE DIVISION

At our initial series of meetings and in our visits with the individual sections and with groups outside the Division, the members of the Task Force discovered that there was widespread discontent with the leadership of the Division. However, faculty also acknowledged that some Division programs, especially those related to undergraduate education, have been very successful. Some faculty members argued that the Division structure made the Director's job impossible. Others suggested that new and different leadership would solve the problems in the Division.

Over the past decade, the Division has contributed to advancements in undergraduate teaching and support of faculty research. Successful undergraduate programs include the Behrman Biology Center, the Hughes Scholars Program, and Explorations. Throughout the period, there has been an increase in undergraduate participation in research and in the number of honors degrees. At the same time, several new endowed chairs have accrued to the Division, representing different areas within biology. The Division has also helped to promote several new research programs. Finally, the Division has helped establish successful outreach programs, the Cornell Institute for Biology Teachers, which has involved training for over one hundred and seventy high school teachers, primarily from New York.

Cornell faces a series of challenges in both teaching and research as a result of the rapidly changing nature of the basic biological sciences. Although the undergraduate Biological Sciences major continues to attract large numbers of students, there is persistent concern and tension over the requirements of the major, the teaching of Introductory Biology, and the quality and relevance of the required Division courses. The Division Curriculum Committee has not been proactive, and little time has been devoted to thinking about major curricular reforms. In spite of the Division structure, there is surprisingly little formal interaction among faculty across sections and little consultation on important matters of hiring and retention. For the most part, the sections operate as though they were departments, competing for resources within the Division and dealing directly with deans when additional resources are needed. A number of faculty now regard the Division as an extra, unnecessary layer between the sections (which are the functional units) and the deans, who control resources. There is widespread discontent with leadership of the Division, but the cause of the problem is unclear. Some faculty members have argued that the problem is structural, that no one could do an effective job given the limited resources available to the current Division Director. The sections vary greatly in size and scope, but there has been little discussion about whether the current configurations make sense given the dramatic changes in biology over the past two decades.

Although the Division is the primary home for "basic biology" on the Ithaca campus, basic biologists are found in increasing numbers in other units, especially in the College of Agriculture and Life Sciences and the College of Veterinary Medicine. Moreover, departments in the physical sciences have a growing interest in a number of areas within biology (e.g., computational and structural biology). Some biologists in the mission-oriented departments within the College of Agriculture and Life Sciences would like to participate more in teaching basic biology courses; they also desire greater freedom to supervise research projects carried out by undergraduate biology majors. While opportunities do exist for all biologists to participate in the biology curriculum and to supervise undergraduate research, it can be difficult in practice and non-Division biologists feel excluded from these activities.. Division faculty believe that the basic biology

curriculum should be coordinated by a cohesive group in order to maintain uniform standards. More importantly, basic biology teaching is directly linked to faculty lines, which are needed to maintain critical mass in fundamental areas of research. Given that the College of Agriculture and Life Sciences program reviews were unwilling to recommend increased investments in the research mission of certain existing units within the Division, there is concern that the College of Agriculture and Life Sciences does not value the need for sections or departments of basic biology. The deans of College of Agriculture and Life Sciences have argued, however, that the College held the Division relatively harmless, in spite of a major retrenchment in the College as a whole. A number of faculty members continue to contend that the Division has not been held completely harmless and, moreover, that holding resources constant over a long period of time should biology at other institutions.

The future structure of basic biology at Cornell needs to recognize the legitimate interests of faculty outside the current Division. At the same time, it is essential that Cornell maintain strong basic biology units that are not constrained by the "applied" missions of the College of Agriculture and Life Sciences and the College of Veterinary Medicine. To this end, we have carefully examined the current structure of the Division, its strengths and weaknesses with respect to both teaching and research, and its relationships to other biologists on campus.

Reports from faculty outside the Division, in particular, biology departments in the College of Agriculture and Life Sciences, but also in the Division of Nutrition and the College of Veterinary Medicine supported the retention of a single biology major, but lamented the exclusion of non-Division basic biologists from teaching programs, especially from BioSci 499. Some faculty expressed a certain indifference to the Division structure and pointed out that a great deal of cutting-edge research and collaboration in basic biology is underway outside of the Division.

At least two departments in the College of Arts and Sciences suggested that new configurations of the Division sections into departments would permit faculty to institutionalize the overlap between basic biological research in specific areas in the Division and outside it. Several reports submitted by departments outside the Division emphasized what they perceived to be a problem with the quality of basic biology and concerns about the ways in which it has "fallen behind" in certain areas relative to other universities where new areas which are under- or unrepresented at Cornell are already standard.

Faculty in the Division have voiced a range of concerns about the current Division structure and administration. Below, we reproduce a list of the criticisms we heard in our meetings with the individual sections. We have organized them into three areas: administration, teaching, and basic biological research.

A. Administration:

1. The Division faculty has not met as a group over the past ten years.
2. The Executive Board or Advisory Committee, which was conceived as a group of eminent scientists and potential donors from outside Cornell who would help define research futures and educational goals, has met only rarely over the last ten years.

3. Surprisingly little interaction has occurred among faculty across the various sections in the Division and the faculty members are unfamiliar with one another and with each other's work.
4. The Executive Committee of the Division, which is made up of the section chairs, the Associate Director, and the Director has been called "dysfunctional" because of a widespread view that substantive issues have not been addressed in a deliberate way.
5. The sections operate as departments, competing for resources within the Division, seeking support from deans without working through the Executive Committee or Director, and thinking primarily in terms of the good of their individual units.
6. The flexibility and fluidity envisioned by the Morison Committee for the formation and reformation of sections have never been realized. On the contrary, sections resist reorganization and possible integration.
7. Little or no official discussion has taken place among basic biologists about the strengths and future directions of research in biology as a whole. The walls between and among sections and the tradition of protecting section interests make it imperative to find ways to help faculty members and administrators transcend narrow interests and consider the good of biology as a whole.
8. The absence of mechanisms and procedures for interaction and cooperation among basic biologists in the Division has resulted in a gap between what the faculty members feel they need and what they perceive to be the Director's priorities and goals.
9. Many faculty members do not think they have had a strong advocate or spokesperson who could represent their interests and needs to the central administration or to the Cornell Development Office.
10. Some faculty members feel strongly that no Division Director can adequately represent the interests of basic biologists, given the enormous complexity of basic biological research and the collaborations required now among biologists, engineers, chemists, physicists, mathematicians, cognitive scientists, etc.

B. Teaching

1. The Curriculum Committee of the Division has not found time or developed the kind of agreement required for effective curricular planning.
2. Specific faculty members or lecturers in particular sections have assumed responsibility for developing, staffing, and running each of the introductory biology courses. There is no procedure in place for the review of course content or for planning the future of these courses, when and if current course leaders give up responsibility. While the faculty currently in charge of the elementary biology courses have a track record of fulfilling their assigned responsibilities, and are dedicated to quality instruction, tensions remain about the design of the courses and the teaching assistantships or resources that accrue to the sections that have been assigned responsibility for them. This tension arises in part because the courses required for the major are not actively reviewed and/or run collaboratively by the Division Executive or curriculum committees.
3. Disagreement exists about the requirements for the General Biology major and no obvious, effective means exists for discussing such disagreement.

4. A perceived class-size problem exists for undergraduate students who wish to major in Biology. They take primarily, if not exclusively, large lecture courses during their first two years at Cornell.

C. Faculty Research

1. Some faculty members feel enormous anxiety about, and opposition to, the priorities set by the Dean of the College of Agriculture and Life Sciences and what they perceive to be pressures exerted on them to make their work “relevant” to applied missions. Furthermore, they do not feel that the Division has provided adequate protection from, or concerted opposition to these priorities. They seek clarification about the goals of the different colleges.

2. Faculty members lament what they perceive to be the lack of investment on the part of the College of Arts and Sciences in the future of biological research.

3. Faculty members have not been able to determine what the priorities of the College of Veterinary Medicine are or how involved their faculty might be in undergraduate teaching.

4. Some faculty members are demoralized by the National Research Council rankings.

5. Faculty members are demoralized by the sense that administrators do not appear to feel responsible for the future of biology at Cornell or understand the need to support it with funds for faculty and for facilities. Some faculty members worry that the insularity of the Division has let deans off the hook in this regard.

6. Faculty members worry that the financial commitments to the Cornell Medical College will have a detrimental effect on basic biology at Cornell-Ithaca.

7. Faculty members worry about the means by which central administrators make decisions about where to invest major funds. The “Research Futures Task Force Report,” which was published while this Task Force was meeting with the Division faculty, created uncertainty and concern about how faculty input is solicited and treated.

SECTION III

RELATIONSHIP OF THE DIVISION TO THE CORNELL UNIVERSITY MEDICAL COLLEGE

The Cornell University Medical College has announced plans to reinvigorate basic biological sciences at the College. The plans call for raising hundreds of millions of dollars in funding and hiring approximately thirty new faculty members. The importance of basic biology to the Medical College is obvious and the Task Force recognizes the need for these investments in the New York City campus.

Announcement of the Medical College plan comes at a time when the Task Force is evaluating needs for basic biology at the Ithaca campus. Clearly these two initiatives are interrelated and it is important to identify structures that minimize overlapping functions and maximize the effect of the total investment.

Cooperation between the two campuses is possible in both instruction and research. Neurobiology and Behavior has conducted a successful course in Clinical Aspects of Neurobiology jointly with the Medical College on three occasions. Faculty at both campuses might participate in joint teaching activities that broaden the curriculum and improve the overall quality of instruction. In addition, the biomedical emphasis in New York City and the traditional strength of the basic sciences in Ithaca provide many opportunities for research collaborations. Both the Medical College and the Ithaca campus offer unique research facilities and programs that generally are untapped by the other campus. The bridging of research and instruction offers further opportunities for training of both undergraduate and graduate students. Key to increasing the interaction between the two campuses is a structure that facilitates communication at both the faculty and administrative levels.

Although interactions between the Ithaca and New York City campuses sometimes occur on an individual basis, currently no structure exists, beyond the central administration, to encourage and facilitate more widespread collaborations. As it exists, the Division of Biological Sciences, in its role of coordinating curriculum, offers the potential for facilitating joint instructional initiatives. However, in the area of research, such activities have traditionally been focused within the sections and departments which serve as the most likely points of contact with the Medical College.

One of the priorities for the biological sciences should be to explore mechanisms, such as distance learning technology, to facilitate cooperation between the two campuses in the area of instruction. In the area of research collaborations, the proposed research institute serves as a central focal point for biological research on the Ithaca campus. The research institute should have as one of its goals to promote research collaboration, including sharing of unique resources, between the two campuses.

In summary, the Task Force understands the needs of the Medical College to invest in the area of basic biological sciences. In some cases, it may be appropriate for the Ithaca and Medical College campuses to support similar capabilities on the separate sites. However in other cases, it may be possible for each campus to benefit from resources, both in terms of staff and facilities, available at the other and thereby maximize the total investment. We believe that the proposed new structure on the Ithaca campus will facilitate the achievement of this goal by providing a mechanism by which the two campuses can interact more closely in the area of the basic biological sciences.

SECTION IV

ANALYSIS OF ALTERNATIVE STRUCTURES

Three structures were considered to be possible means of addressing the perceived problems. In each case we focused on the advantages and disadvantages for basic biology at Cornell. The three models we considered were: I. retain or slightly modify current Division structure; II. strengthen the role of the Division by putting resources and control in the hands of the Director, perhaps by making the Division a college; III. strengthen the roles of sections by making them departments. For each of these models, we considered how sections/departments should be configured and how to administer undergraduate education most effectively.

A. Option I: Retain the Division As It Is

The Division of Biological Sciences was designed to incorporate the diversity within the biological sciences in an administratively manageable unit. It has the advantage of being a single hierarchical structure that includes a large number, though not all of our basic biologists. It also includes and has unambiguous control over the apparatus necessary for maintaining the undergraduate biology major. It provides a structure that, in theory, should promote faculty interactions among scientists with divergent approaches to biology (within and outside of the Division) and interactions between biologists and other scientists. Importantly, the structure was designed to allow flexibility by placing faculty lines under the control of the Division Director and freeing them of parochial departmental constraints.

In the section of this document entitled “Issues Facing the Division,” we have summarized the achievements and current problems with this model. Many of the problems can be traced to two major concerns about the current Division structure. First, the Director does not have ultimate control over faculty lines or the resources essential for teaching and research in the biological sciences. The result has been an intermediate layer of administration that impedes communication between section faculty and deans. Second, the Division creates an artificial barrier around basic biologists within the Division.

B. Option II: Strengthen Division/College

This model is founded on the principle that the biological sciences represent a coherent intellectual enterprise. It involves creating a College of Biological Sciences or a strengthened Division which would have direct control of resources that currently belong to the Colleges of Arts and Sciences and Agriculture and Life Sciences. Faculty lines, administrative positions, and operating budgets for the basic biological sciences would be under the control of a Dean or a strong Director to whom department/section chairs would report. The potential appeal of such a model would depend on the resources given to the new College. Enthusiasm would be proportional to the number of faculty lines moved into the College, opportunities to fill new positions, and levels of funding for teaching, research, facilities, and administration.

There are several long term advantages of the College model. In this scenario, the biological sciences would have strong representation in the University administration, and the Dean of Biological Sciences would be a highly visible advocate for basic biology at Cornell, both within the University and outside. Basic biology would remain a coherent

discipline within the University — and the Dean could potentially catalyze strong interactions among the diverse units within the biological sciences. Moreover, departments (or their chairs) would have direct access to a dean who controlled positions and resources, thereby eliminating some of the current problems associated with having a relatively weak Division Director.

However, there are also numerous disadvantages to the college model. The addition of yet another college within the University would almost certainly add to the complexity and confusion that results from having so many independent units. The college would require considerable new infrastructure, including a substantial number of administrative positions and possibly an independent office to deal with admissions. At a time when the University is attempting to consolidate and streamline administrative structures, it seems undesirable to increase administrative complexity. It is also unclear how full status as a college could be achieved if funding for biological sciences were to come, as it does now, partly from endowed college funds and partly from statutory college funds. Furthermore, the existence of a College of Biological Sciences would increase the isolation among basic biologists in the new college and elsewhere on campus, and would amplify the barriers between the basic biology units and their colleagues in the physical sciences and in the more mission-oriented departments in the College of Agriculture and Life Sciences and the College of Veterinary Medicine. Membership in a new college would be a very difficult issue to resolve. It is also not clear that a Dean of Biological Sciences could ever effectively build consensus among competing units (departments) or represent accurately or forcefully the full range of disciplines currently housed within the Division. Because the resources for basic biological sciences would be very clearly circumscribed, competition among departments might actually increase if it became evident that access to these resources represented a zero-sum game.

C. Option III: Strengthen Sections/Departments

The first two models take the standpoint that biology is a single enterprise that should be included in one larger structure. In this third model, we acknowledge that modern biology has expanded to overlap with other sciences and that enclosing all of biology within a single structure would inhibit its growth and development.

In this option, we consider strengthening sections to become independent departments. Each department would include various related sub-disciplines. This arrangement would maintain a broad representation of biology and at the same time, build up the critical mass necessary for flexibility and strength. Each department would have a home in the college that best represents its mission, or, would span two or more colleges. In the latter case, each department would be assigned a “lead” dean. Department chairs, who serve as advocates for their departments, would have direct access to the dean(s) of their respective colleges. In fact, this model is no different from that adopted by most universities that have both a college of arts and sciences and a college of medicine where basic biology is conducted in more than one college. The advantages of such a model include direct access to resources for teaching and research and the elimination of the barrier between biologists outside and inside the division. This reorganization would result in a new set of synergistic interactions among scientists with similar interests. Such a model might have significant consequences on the undergraduate biology major. Given the success and size of the existing undergraduate major, we propose to retain a coordinated undergraduate curriculum and student services. In this model, the executive structure of the Division would be dismantled, but the offices and services of the Associate Director for Academic Affairs would be maintained and strengthened.

SECTION V

RECOMMENDATIONS

A. Introduction

The problems in the Division cannot be reduced to problematic leadership. One alternative would be to provide the Director with more power, discretion, and control over resources and their distribution and use. However, as outlined elsewhere in this report, there are significant disadvantages to such a course. Strengthening the director's position also requires that the walls between sections be lowered and that the boundaries be made more permeable so that the good of basic biology as a whole could be addressed in a serious way by both faculty and by the Director. This Task Force reached no consensus on the proposition that strengthening the Director would solve the problems we had identified or assure greater distinction for basic biology at Cornell. We propose, instead, a hybrid structure which combines the most successful features of the Division with new structures that promise to foster innovation and excellence. The conclusions on which we reached substantial agreement are formulated in the following recommendations.

- Eliminate the Division in favor of independent departments. This will simplify administrative structures and provide more direct communication between disciplinary units and the deans who control resources.
- Retain the single major in Biological Sciences and create a structure that will support curriculum coordination and advising. We feel that it is essential to maintain a single, coherent, well-organized curriculum in basic biological sciences.
- Establish an Institute for Research in Biological Sciences to promote innovative research initiatives, foster collaborative research and attract new sources of funding.

B. Administration

We recommend that one or more of the new Vice Provost positions be devoted specifically to biology and that responsibilities include facilitating coordination among the various college deans, the Director of Undergraduate Biology and the Research Institute.

C. Configuration of Departments

In the absence of a Division and in order to protect and foster basic research in biology, we recommend that there be several strong departments, strong enough to meet teaching and research needs, to administer resources efficiently, and to compete effectively at the college level. Reconfigurations of the faculty into departments should not result in a reduction of faculty lines from the 100 lines currently housed in the Division. Furthermore, we recommend the commitment of additional positions even if these positions or new faculty are conceived as pre-fills against retirements.

These departments may be based to some extent on the current sections of the Division. We recommend that there be fewer rather than more discrete units or departments of basic biology. Final decisions about the precise configurations of departments go beyond the scope of this Task Force's charge. We recommend, however,

that the Provost convene a group of scientists and administrators to consider possible reconfigurations as soon as possible. We realize, of course, that pragmatic considerations, above all space constraints, will stand in the way of the radical reconfigurations that might best serve biology in the future. Questions of space, too, have to be addressed at the highest levels of the administration.

The smaller sections or groups may well have strong arguments for maintaining their identities, both because of a history of research distinction and/or because they represent important programs of study. They may well retain those identities as subunits to be folded into larger departments or administrative units. In cases where departments are cross-college units, they should be assigned a lead dean from one college whose responsibility it will be to seek collaboration from the dean(s) in other colleges, but also to take the lead in assisting planning and development efforts. For cross-college departments the lead dean should rotate every three years. These departments, though based in part on reconfigured sections within the Division, will also include individuals, small groups, even departments outside the Division if departmental reconfigurations outside the Division appear advantageous to individual faculty members, groups of faculty, or entire departments.

Putting aside pragmatic considerations such as space, location, and personalities, and considering only *what would make sense intellectually*, the majority of the voting members of the Task Force supported the following proposals.

D. New Configurations:

1. Create a department of Molecular and Cell Biology, largely recruited from the faculty in Genetics and Development, Biochemistry and Molecular Biology, and Microbiology.
2. Make enough appointments in Microbiology to allow it to operate as a free-standing unit or divide the remaining members of the Section of Microbiology among other units.
3. Make the Section of Ecology and Systematics an autonomous department, but change its name to Ecology and Evolutionary Biology. Integrate some members from the Section of Microbiology.
4. Make the Section of Neurobiology and Behavior an autonomous department, but change its name to Neurosciences and Behavior. Open the unit to some neuropsychologists.
4. Make the Section of Plant Biology and the Bailey Hortorium part of the proposed Plant Sciences umbrella group in the College of Agriculture and Life Sciences.
5. Make the Physiologists part of Systems Biology in the College of Veterinary Medicine.
6. Create a department which links some elements of the disciplines of chemistry, biophysics, and structural biology. This proposed department represents a departure from traditional alignments by establishing links between the biological and the physical sciences.

E. Undergraduate Curriculum and Teaching

1. The Task Force strongly recommends that the University retain a single, coordinated biology curriculum and major.
2. The Director of Undergraduate Biology will be a distinguished, tenured member of the Cornell faculty, recognized for achievements in both research and teaching. He/She will be nominated by the Directors of Undergraduate Studies in the biology departments and appointed by the Office of the Provost in consultation with the relevant college deans, to whom he/she should report directly.
3. The Director of Undergraduate Biology will be responsible for coordinating and directing the biology major and the advising system. He or she will be assisted by a biology curriculum committee composed of the Directors of Undergraduate Studies in each of the biology departments. The Director of Undergraduate Studies for each department will be appointed by the department chair and will serve either a three- or five-year term. The Curriculum Committee will also include non-voting representatives from departments in any of the colleges with significant interests and concerns about the intersections of basic biology with other areas. These representatives will be chosen by the Director and approved by the members of the Curriculum Committee.
4. The Curriculum Committee and the Director will make decisions regarding core courses for the major, about staffing, and requirements. Curriculum changes must also meet the approval of the curriculum committee in the colleges of Agriculture and Life Sciences and Arts and Sciences. College approval will be required before the curriculum requirements are adopted and published. The Director and the Curriculum Committee will have the authority to determine whether a course fulfills the requirements of the major, to evaluate course quality, and to insist that necessary changes be made when courses are not up to par. The Director will act in all such matters only with the approval (majority vote) of the voting members of the curriculum committee.
5. The staff who now allocate the teaching assistantships for introductory courses will report to the Director of Undergraduate Biology and their recommendations will be subject to the Director's approval.
6. We do not propose changes in the routine administration of the courses required for the major if the current administration of those courses is deemed effective and efficient.
7. The associate deans of the colleges and their curriculum committees will accept new proposals and revisions only when forwarded by the Director of Undergraduate Biology. In order to ensure that the needs of the undergraduate curriculum are met, the Director of Undergraduate Biology will act as a consultant to department chairs and to the deans of the colleges on questions of hiring in biology.
8. The Director will oversee the operation of all programs associated with undergraduate research activities, for example, the Hughes, the Honors program, and BioG 499 (independent research).
9. The Director of Undergraduate Biology will oversee the process of evaluating all courses and instruction in the Biological Sciences with the assistance of the departmental Directors of Undergraduate Studies. For this reason the Director should be consulted by the college deans in all tenure and promotion decisions.

F. The Institute for Research in Biology

We recommend the formation of an Institute for Research in the Biology which will serve to foster new and innovative directions in research and will attract substantial outside funding for biologists across the university. The Institute will provide a strategic focus for biology at Cornell and will be set up to attract new resources to biology. In order to provide a platform for new funding possibilities, the Institute will have to be given intellectual focus from the outset; over time, it should provide the flexibility to pursue new research directions. The Institute will bring together faculty from all parts of Cornell and serve as a nucleating point for new research collaborations and directions. In addition, it should provide unique research opportunities for both undergraduate and graduate students and will sponsor campus-wide colloquia and short topical courses in relevant areas. The Institute will assist the college deans and the Provost with financial support for start-up for new faculty appointments and its director will work with individual departments to ensure that research and instructional needs are met. Specific issues regarding the Institute are addressed in detail below.

1. **Director.** The Director of the Institute for Research in Biology will be appointed by the Provost and will answer administratively to the Office of the Provost. The Director will be a high-profile scientist with an established record of innovation in the biological sciences. The Director should be able to interact with all biologists at Cornell, including basic biological scientists, applied biological scientists, physical scientists, computational scientists, engineers and others. The Director will be responsible for establishing the mission of the Institute. The Director will also share responsibility for faculty lines associated with the Institute (see below). These faculty lines will reside in academic departments and the director will be responsible for identifying the appropriate department and coordinating recruitment and appointments with the appropriate department chair. The Director will be expected to mount major fund-raising initiatives that will bring new resources for biological research to the Ithaca campus.

2. **Oversight Committee.** An external Oversight Committee will be appointed by the Provost with input from the Director, deans and faculty. The Oversight Committee will be comprised of high profile scientists from both academic and industrial communities as well as lay people devoted to the support of the biological sciences. The members of the Oversight Committee will receive a stipend for their services and their appointment must be approved by the Provost and the faculty Advisory Committee. The Oversight Committee will meet two times per year to provide advice to the Director in setting scientific directions and in fund raising goals.

3. **Advisory Committee.** An internal Advisory Committee will be selected jointly by the Director and the Provost to achieve a balanced representation of biology at Cornell. This committee will include the Director of Undergraduate Biology. The committee will be advisory to the Director by providing input on various internal issues including departmental needs, instruction and research support. The committee will meet regularly with the Director to ensure that the Institute for Research in Biology addresses the needs of the Cornell faculty.

4. **Society of Fellows.** Non-faculty scientists at Cornell are eligible for membership in the Institute's Society of Fellow's program. This program is aimed at providing recognition to young scientists at the beginning of their independent careers.¹ These primarily junior

¹ For a detailed description of one possible model, please request a copy of the "Draft Proposal for the Establishment of the Society of Biology Fellows," proposed by Professors Hairston, Kempthues, Seeley and Sherman, and submitted by Professor Paul Sherman to the Division Director on April 4, 1997.

level appointments will be made to promising young scientists whose careers are beginning to take off. Each of these appointments will be for a fixed term and will provide a limited amount of research laboratory space and other resources. These positions should be viewed as an training period for postdoctoral fellows who will either go on to faculty position at other institutions or, in exceptional cases, be retained as permanent Cornell faculty members. The salary for these positions will be provided by a combination of hard and soft funds.

5. **New Faculty Appointments.** The Institute for Research in Biology Director will provide advice to the deans about strategic appointments and the Institute will offer financial assistance in the form of set-up costs for faculty appointments in strategic areas of the biological sciences. The Director, together with the appropriate department chair, will be responsible for identifying startup costs, space and other items associated with new faculty hires in the biological sciences. Initially, the Institute will help support a total of five faculty appointments. Each faculty appointment supported by the Institute will reside in an academic department.

6. **Research Support Facilities.** The Institute for Research in Biology will oversee and coordinate some research services that are critical to scientists in the biological sciences. Currently, most of these services are provided by individual units and many services are either lacking important capabilities or are completely absent. By providing a central coordinating unit, significant efficiencies in providing services can be achieved. The support facilities will be funded through cost recovery, Institute funds and other Cornell funding sources.

7. **Space.** Initially the Institute for Research in Biology will be housed in existing Cornell space which will be reallocated to the Director. One possibility is within the Biotechnology Building. A small amount of space will become available if the Division of Biological Sciences is dissolved and it may be possible to generate additional space within the building for Institute faculty. In the long term, if the Institute achieves the expected success, additional space may be required. A new building, which could house a variety of interdisciplinary research teams as well as core facilities and administrative staff, should be planned in the future.

8. **Funding opportunities.** The Institute for Research in Biology offers new opportunities for funding the basic biological sciences. Cornell occupies a unique position with strengths in both basic and applied biological sciences. In many cases, these strengths have gone untapped or been underutilized in fund raising efforts. The Director will be expected to assist in fund raising from private donors, foundations and government agencies. In addition, the Director will explore opportunities that exist within the private sector, including the pharmaceutical and biotechnology industries.

SECTION VI

EMERGING RESEARCH DIRECTIONS

Basic biology, like all basic areas of science, involves the discovery of fundamental unknowns. By its nature, the future of basic biological research cannot be outlined in specific terms. In general, we must continually develop our capacity to relate between genotype, phenotype and environment. Reduction to the molecular level in biology has been enormously successful. As the genomes of diverse organisms are sequenced, we must maintain our ability to relate that information to the phenotypes at the molecular, structural, developmental, physiological, behavioral, and ecological levels. Furthermore, we must support our capacity to explore the processes that have produced the diversity of genotypes and phenotypes present on earth. This means we must invest in a balanced way in genomics, in phenotypic expression within cells, organisms and populations, and in the roles that organisms play in ecosystems. Because we cannot afford to invest in everything, we must develop administrative structures and mechanisms that will allow us to identify and support essential components of these areas in an objective manner. The Task Force agreed on several areas important to the future of biology where Cornell has a potential comparative advantage.

We propose that ten new faculty positions be filled in the basic biological sciences, five of which would be supported with funds raised by the Institute for Research. We have identified five emerging research directions:

1. Protein Structure. Three-dimensional structural information derived from x-ray crystallographic studies has revolutionized our understanding of the biological sciences. Knowledge of protein structures has influenced areas ranging from virology and immunology to DNA/protein interactions and enzymology. The power of x-ray crystallography is greatly facilitated by utilization of synchrotron radiation and Cornell is home to the Cornell High Energy Synchrotron Source (CHESS), one of only four synchrotron x-ray sources in the United States. The powerful x-ray beams produced by synchrotron sources are considered critical for challenging x-ray crystallographic studies and scientists worldwide compete for access to facilities such as CHESS. Consequently, Cornell is uniquely positioned to make important contributions in emerging research areas such as structural studies of integral membrane proteins and studies of macromolecular assemblies. To date, only a handful of such structures have been analyzed and tens of thousands of these important macromolecules remain to be studied. By combining existing strengths in the basic biological sciences and physical sciences, and with unique facilities such as CHESS with connection to industrial funding, Cornell can secure its position as a world leader in the field of structural biology. Relevant disciplines at Cornell would include all areas of the molecular biological sciences plus chemistry, physics and pharmacology. CHESS and structural biology provides an important interface with the Medical College and the pharmaceutical and biotechnology industries. Structural biology will also play a critical role in the development of functional genomics.

2. Cell Cycle Regulation. The precise duplication, partitioning and expression of genetic material during each cell division is achieved by an orderly progression of events that are regulated by a series of protein kinases. Key cellular mechanisms that are targets of regulation by these kinases include DNA replication, transcription, signal transduction, protein degradation and chromosome segregation. Already, the study of cell cycle regulation of key cellular processes has uncovered new principles in cell biology: checkpoints, kinase cascades, and targeted protein degradation, to name a few. Investment in this area of research will not only answer fundamental questions about the control of cell

proliferation but will have important implications in cell differentiation, animal and plant development, and cancer biology. Existing programs of research in Biochemistry, Molecular and Cell Biology, Genetics and Development, Pathology, and Pharmacology make this an attractive area for future investment.

3. Computational and Cognitive Neuroscience. Two of the greatest challenges in the neurosciences in the next century are to (1) quantify the activity of single neurons and neuronal circuits to describe behaviors and determine whether we can take a quantitative approach to understanding the representation or encoding of sensory and motor signals in the nervous system at multiple structural levels including systems, circuits, and the biophysics of single neurons; and (2) understand the mechanisms underlying higher mental functions of what we have come to view as "the mind," identifying a neural basis for the ability of animals to attend, identify and respond to complex stimuli. These emerging areas will be represented by individuals who generate computer simulations of neuronal circuits and single neurons and test those simulations in "real" preparations, and by those who study neural mechanisms of, for example, sensory perception, complex movement, self-awareness, anxiety, and language. These areas present the potential for strong interactions in both teaching and research across a broad range of organismal and cellular biologists and outside of the biological with colleagues in psychology, cognitive studies, computer science, engineering, mathematics, physiology, pharmacology, nutritional sciences, and physics.

4. Genomics. Fundamental DNA sequences will soon be known for most major types of organisms. As a result a major challenge in biology will be to organize and analyze large amounts of information. A significant portion of biological research will shift from a reductionist focus to a synthetic approach with the potential to produce basic discoveries in biology during the next three decades at a rate that will likely exceed that in any other single discipline. Having the complete genomic sequences available for humans and for several model species will permit an extended comparative analysis which, at an initial level, will yield a valuable evolutionary perspective of phyletic relationships. We may expect insight into bacterial phylogeny, relationships among the lower Metazoan phyla and plants, the systematics of major insect orders, and relationships among human populations. Basic information about the rate and extent of genetic change, the extent of gene duplication and intragenomic migration will also emerge. Comparisons among model systems provides the opportunity to understand developmental pathways, physiological processes, behavioral expression, and other characters that can then be dissected with the use of mutations. For example, genomics will provide a pathway into a more complex understanding of mechanisms of disease resistance in plants, gene detection and gene therapy. Genomics will be of importance to all areas of biology and related sciences.

5. Computational and Theoretical Ecology. Major questions being addressed in ecology look at the impact of temporal and spatial heterogeneity on ecological levels of organizations. These include: (1) the nature of adaptations within populations (how is adaptation manifested when the environment varies), (2) the regulation of population size (are fluctuations in populations caused by external forcing or driven by internal dynamics such as chaos), (3) behaviour of communities and ecosystems when organisms and elements move across boundaries between different habitats (a growing field called "landscape ecology"), and (4) how patterns of element dispersal and deposition influence global ecological patterns. Questions at each scale are addressed using a combination of formal mathematical and computational approaches interacting with experimentation and data on natural systems. Fundamental ecological processes depend upon the properties of organisms and their abilities to persist in particular habitats. These characteristics are in part the product of their evolutionary history and hence their genetic composition. They also depend critically upon ecological relationships with other organisms in the

environment, with non-biological components of the environment, and with how these have been modified by human activity. Ecological understanding requires an integration of all other biological levels of understanding from molecular, to cellular, to organismal, to population, community and biogeochemical dynamics. The complexity of this integration requires theoretical and computational advances in combination with empirical approaches. Cornell's long-established international reputation for leadership in these areas cuts across a wide array of disciplines and administrative structures from Ecology and Systematics, to Entomology, Natural Resources, Microbiology, and the Boyce Thompson Institute. It continues to build through on-going collaborative programs in mathematical biology, biogeochemistry, conservation biology, human accelerated environmental change, and through the increasing activity of the Center for the Environment.

ACKNOWLEDGMENTS

The members of the Task Force wish to express their sincere appreciation to Provost Don M. Randel for commissioning this report, to Professor Ronald G. Ehrenberg, who appointed the Task Force and provided support through the Office of the Vice President for Academic Programs, Planning and Budgeting. We owe a special debt to Maureen O. Updike, Senior Administrator in the Office for Academic Programs, Planning and Budgeting, who provided the concrete support services that made this review possible. We thank President Emeriti Dale Corson and Frank Rhodes, Provost Emeritus W. Keith Kennedy, and Dean Emeritus David Call for their valuable time and wisdom. Peter Bruns and Harry Stinson generously shared their expertise and their ideas about Division structure. Special thanks are due the faculty and staff as well as deans and directors of all the colleges concerned for their full and frank cooperation throughout the review. We are grateful to the Office of the Dean, College of Agriculture and Life Sciences, for extensive use of the dean's conference room and to Professor Don Rakow, Director of Cornell Plantations, for the use of facilities during our retreat.

APPENDIX I

ORIGIN, MANDATE, AND ROLE OF THE DIVISION

In the late 1950's it became clear to a group of Cornell biologists that the University was in danger of losing its eminence in certain areas of the biological sciences. Furthermore, they believed that there was a very real danger that new areas of extreme importance would never fully develop at Cornell. Several committees considered these issues in the early 1960's and in 1961 a "Biology Coordinating Committee" broadly representing biology on campus recommended to President Deane Malott that a Division of Biological Sciences be created to coordinate existing resources in biology on campus. They suggested that the Head of this Division be a biologist responsible to the President of the University. President Malott declined to accept these recommendations and received two additional faculty reports suggesting reorganizations of biology in 1962 and 1963. President Malott left the implementation of plans to reorganize biology to his successor, President James Perkins, who took office on July 1, 1963. On October 23, 1963, an outside committee of distinguished biologists was appointed by President Perkins to review the biology program at Cornell and to make recommendations concerning future developments in the field. The committee submitted BIOLOGY AT CORNELL, Report of the Special Committee. This report would become the rationale for establishing the Division of Biological Sciences at Cornell. The Special Committee was chaired by Dr. Robert S. Morison and included such distinguished scientists as Boris Ephrussi and Marcus M. Rhoades. The "Morison Committee," consistent with previous internal analyses, found several serious problems in the organization of biology at Cornell. Their perspectives on these shortcomings and their consequent recommendations were based on a set of premises that they emphasized in their report. Foremost among these premises was a commitment to the integrity and significance of the discipline of basic biology. They argued that:

Biology at Cornell must be seen as a body of knowledge worth pursuing for its own sake and not merely as a series of adjuncts to the raising of larger crops, the improvement of industrial processes, or the training of premedical students. This is not to deprecate the importance of the biological sciences in all these respects. We do wish to emphasize, however, the transcendent importance of biological research and teaching in relation to the University's primary mission of understanding the nature, both of the universe in which man finds himself and of the quality of his own being. (The Morison Report)

The Morison Committee emphasized several features of biology at Cornell which are worth summarizing here because of the degree to which some still hold. The report noted that biology at Cornell was surprisingly diffuse, perhaps the historical result of an unusually decentralized university structure. They also noted with surprise that the College of Arts and Sciences had tacitly given over certain important areas of biology to the College of Agriculture (e.g. Botany and Biochemistry). They speculated that this "handing over" was partly due to the better vigor and quality of those sciences in Agriculture at the time and partly due to the fact that funds to support these subdisciplines were not equally available to the two colleges. Circumstances at the time favored the College of Agriculture. The committee members observed that "the quality of basic research in the Agricultural College has been so high in the past that it has supplanted work of a similar nature in other schools of the University." However, they also lamented that there were only "two exceptions to the general rule [in the Agriculture College] of providing for basic science only as a handmaiden to some specialized applied area." They named the Departments of

Biochemistry and Botany as the exceptions. Within Agriculture, a strong emphasis on applications and on state funding had significant influence on the developmental trajectory of any branch of basic biology represented in the College. The resulting “structure” of basic biology was fragmented, decentralized, and diffuse.

The Morison Committee focused on the implications of this situation for basic biology. Different elements of the biological sciences were controlled by individual departments, “none of which had the strengthening or integrity of basic biology as a strong goal.” Such fragmentation and lack of coordination had detrimental effects on the quality of research and on the quality of undergraduate and graduate education. The committee members were particularly concerned about the lack of a coherent undergraduate program in the biological sciences. It was not easy, for example, for students in the College of Arts and Sciences to familiarize themselves with the full range of biology courses available. They were also distressed about the narrow and often inbred focus of graduate training, the disappointing quality of many of the graduate students, and the lax procedures for decision-making in hiring, promotion and tenure, with a consequent bias toward Cornellians. Indeed they regarded reforms in promotion, tenure, and recruitment (particularly recruitment and senior appointment procedures), as among the most significant recommendations they could make to the President.

In summary, the Morison Committee related the problems in Cornell biology to decentralization and diffuse authority with divergent pressures on the subunits of biology which negatively affected its integrity, quality, and potential to develop with advances in science. Such circumstances would not allow for the development of important new research areas in the biological sciences. The committee emphasized the deleterious effects on molecular biology and cognitive studies. As an antidote to the conditions they found, they suggested a formal structure for biology that would provide focus, coherence, flexibility, and quality control. They wanted basic biology to be nested within one hierarchical structure, one that would allow central management of the quality, breadth, and direction of basic biology. Consequently, the Morison Committee suggested an organizational change “in order to give basic biology the place it deserves in the University and to ensure its future health,” and suggested that “biology must be represented as an entity in its own right whether it is called a department, a division, a school, a college, or an institute.”

The committee made “no apology for recommending independent status for biology at a high level in the University structure.” They were concerned, however, “that any changes in administrative structure do the least possible damage to existing excellencies in biology, isolated though these....be from one another.” And they were especially worried about the effect on the College of Agriculture “where the high quality of much of the basic work done in several departments of this great institution has played a most important role in its high reputation throughout the world.” At the same time, they noted that “some of our consultants expressed serious worry over the possibility that the present pattern of support for biology in the College of Agriculture is inadequate for modern conditions, and that it may lose some of its international standing if it does not encourage biological work on a far broader basis than in the past.” They were equally concerned about the effects on the College of Veterinary Medicine, but felt that any damage done by reorganization would be minimal because “biology (in the College of Veterinary Medicine) is already represented by strong departments at the basic level.”

The report of the Morison Committee was distributed by then Provost, President Emeritus Dale Corson, to all members of the University Faculty. After a period of “lively” discussion, in December of the same year President Perkins announced his general agreement with the Morison Committee Report and appointed a “President’s Committee on

the Biological Sciences” made up of Cornell faculty members charged with “defin[ing] the academic objectives of Cornell’s whole biology effort and to recommend a specific structural plan for its implementation.” The “Morison Committee Report,” and earlier reports filed by internal Cornell committees served as a starting points for their efforts. The President’s Committee was chaired by Provost Corson and made ten specific recommendations that served as the blueprint for the existing Division of Biological Sciences. The recommendations reflected the philosophy of the Morison Committee and supported integrity and self regulation in basic biology. The President’s Committee Report, often referred to as the “Corson Committee Report,” was a categorical repudiation of the diffuse condition of basic biology at the time. Like the Morison Committee, the Corson Committee recognized a need to have biology as an integral unit in order for it to develop coherently, change direction, attain or retain national leadership in certain areas, and be maintained at an acceptable level of excellence. The Corson committee deemed it unrealistic to expect numerous units representing fragments of biology to establish jointly a program of overall excellence and depth in basic biology as long as each unit or sub-unit was subject to various and often conflicting pressures.

Below we have recorded abbreviated recommendations from the Corson Committee report:

- “A Division of Biological Sciences shall be established with inter-college responsibility and authority over the basic biological sciences.”
- “The Division shall chart a course in basic biology at Cornell and keep it responsive to changing needs.”
- The Division shall prescribe the curriculum for the undergraduate major in biology. “This major shall be available to all qualified students in the University, irrespective of their affiliations.”
- “The Division shall establish and supervise the standards of its graduate students.”
- “The Division shall provide the atmosphere and resources for excellence and creativity.”
- The Division shall be comprised of basic biologists holding positions at Cornell who shall also be regular members of appropriate colleges and departments.... In addition, persons who are working in basic biology may also be included in the Division, regardless where their positions are allocated.
- The Division shall have control of all appointments and promotions in positions allocated to the Division.
- “The Division shall be under the direction of a senior administrative officer who should be an outstanding biologist.... He shall be responsible to the office of the President for the formulation and execution of Division policy.”
- “The senior administrative officer shall have an executive board comprised of distinguished faculty members representing major areas of basic biology.”

- The Division shall...recommend all measures necessary to attract and retain a distinguished faculty.... It is mandatory that a new centralized biological facility be provided without delay.at least ten new positions in biology, including newly endowed chairs, are required.”

The “Corson Committee” Report (Report of the Special Committee on Biology at Cornell) was submitted to the President in March of 1964 and was distributed to the University’s Faculty. It became the subject of extensive discussions. Discussions were either conducted by departments or by special meetings of faculty with common interests. Systematists met, for example, to discuss their concern about the fates of the various Collections. These meetings were frequently chaired by the Provost (Dale Corson) who demonstrated an extraordinary degree of involvement and dedication to the process. Finally, the University Faculty was called to a meeting and by formal vote approved the report of the Corson Committee.

The Division of Biological Sciences was established on July 1, 1964 following closely the recommendations of the Corson Committee. Dr. Robert S. Morison, Director of Biology and Medical Sciences at the Rockefeller Foundation and the Chair of the “Morison Committee,” was the Division’s first Director. Several factors were instrumental in the Division’s successful debut. Dr. Morison was well-connected with various funding agencies, and outside funds were more readily available thirty years ago than they are today. Large grants from the Ford Foundation and from the Health Sciences Advancements Award Program of the National Institute of Health allowed 20 new faculty positions to be filled. These positions were later converted to tenure track lines in the Colleges of Agriculture and Arts and Sciences. Much of the early success of the Division has been attributed to the style of Dr. Morison’s administration. He reported to and developed rapport with the Provost and President. Morison was appointed as an associate dean jointly by Arts and Sciences and Agriculture and Life Sciences. He had an excellent relationship with Frank Long, the Vice President for Research, which helped him secure funds for the new Division. In addition, Dr. Morison insisted that his office be adjacent to the Office of the Dean of the College of Agriculture, Dean Charles E. Palm, an initial opponent of the Division concept. He wanted to have proximity with Dean Palm to insure a close working relationship. From all accounts Dr. Morison established de facto parity with the Deans of the Colleges.

Dramatic change in the undergraduate major was one of the most significant results of the Divisional structure. The undergraduate biology major became the administrative responsibility of the Division which instituted requirements for the biology major that were virtually the same in both Colleges. The Division of Biological Sciences was then responsible for the curriculum in the basic biological sciences at both the graduate and undergraduate levels.

The faculty of the Division was organized initially on an interim basis. Faculty members were organized into sections, Section A (basically Biochemistry), Section B (Botany, Genetics and related sub-disciplines), Section C (Zoology), and Section D (Bacteriology). By July 1965 five Sections had been established: Biochemistry and Molecular Biology; Ecology and Systematics; Genetics, Development and Physiology; Microbiology; Neurobiology and Behavior. In addition, the Laboratory of Cell Physiology, Growth and Development, headed by Professor F. C. Steward, and the Wiegand Herbarium under Professor R. T. Clausen were given independent status.

In 1971 the College of Agriculture changed its name to the College of Agriculture and Life Sciences, which many interpreted to be a reflection of its commitment to basic biology.

In 1973 the Section of Microbiology was disbanded. Three members joined the Section of Biochemistry and Molecular Biology; one went to the Section of Genetics, Development and Physiology, and five joined the Laboratory of Microbiology in the Department of Food Science. The five who joined Food Science included Eugene Delwiche, Georges Knayse, Brooks Naylor, Harry Seeley, and Paul VanDemark. Three lines remaining in Microbiology were to form the basis of a new “Cell Biology” initiative by Biochemistry — hence, the name change for that section. At the same time, the Section of Biochemistry and Molecular Biology changed its name to Biochemistry, Molecular and Cell Biology. The Section of Physiology was established in 1976 to accommodate animal physiology. The College of Veterinary Medicine provided the location as well as several faculty members and became the third College at Cornell to contribute to the Division of Biological Sciences. The number of animal physiologists and animal biologists in areas other than neuroscience has declined in the Division. An administrative decision was made to move one of the five faculty positions from Physiology to a different, larger section. Consequently, the research and graduate teaching efforts in Physiology have become less closely associated with the Division. Membership in the Graduate Field of Physiology remains robust and inclusive of faculty from many departments. The Section of Physiology is closely associated with and physically located within the Department of Physiology, which provides a total of seven joint members, and which also includes three assistant professors, all of whom have active research and graduate teaching programs, applying molecular biological techniques to the solution of physiological questions. The Section retains a very important role in the undergraduate teaching program of the Division of Biological Sciences and the faculty of the Department of Physiology, regardless of Section affiliation, all participate actively in advising or providing research opportunities for undergraduate majors in Biology.

In 1977, the Section of Genetics, Development and Physiology changed its name to Botany, Genetics and Development. Also in 1977 a Department of Microbiology was formed within the College of Agriculture and Life Sciences, by adding two new faculty lines to the five Laboratory of Microbiology faculty lines. In the same year, the L. H. Bailey Hortorium “a distinguished unit in the College of Agriculture and Life Sciences incorporated the Wiegand Herbarium, and joined the Division. The L. H. Bailey Hortorium was a Cornell institution with a considerable history and its own Director and endowment, but it had come to assume teaching and research activities similar to those of a Section. Because of its unique status, the Hortorium was not formally created as a section, although it functioned as one in most ways and its Director was a member of the Executive Committee. In 1990, the title of the Hortorium’s Director was changed to Chair and the Hortorium embarked on a more ambitious program of teaching, research and graduate student training.

In 1980 The Section of Botany, Genetics and Development split into two sections: Genetics and Development and Plant Biology. Finally in 1990, the Section of Microbiology was re-established by moving the Department of Microbiology from the College of Agriculture and Life Sciences into the Division of Biological Sciences. The new Section of Microbiology was unique in its focus on molecular, organismal, and ecological approaches to the study of prokaryotic biology.

Division Directors:

Robert S. Morison 1964-1970
Richard D. O'Brien 1970-1978
Harry T. Stinson (Interim Director) 1978-1979
Robert Barker 1979-1983
Geoffrey W. G. Sharp 1983-1987
Peter J. Bruns 1987-1997

APPENDIX II

Sources of Faculty (past & present) and Teaching Assistants
Affiliated with Major and Non-Major Courses

Course	Credits	Avg Enrol.	Faculty	# Grad TA's	TA Source	# UG TA's
101-103 Fall	4	653	Blackler Adler	23	pool	0
102-104 Spring	4	568	Blackler Adler	20	pool	0
105 Fall	4	165	Loew McFadden Goodloe	6	pool	9
106 Spring	4	165	Same	5	pool	17
109 Fall	3	415	Turgeon Eberhard Taylor McFadden Breidenback	8	Plant Biology, Ecology & Systematics	0
278 (Evolution) Fall, Spring, Summer	3-4	300	Geber Kondrashov Harrison Schulman Via	7	Ecology & Systematics	0
281 (Genetics) Fall, Spring, Summer	5	185	Goldberg Macintyre Fox	6	Genetics & Development	0
330 (Biochem AT) Fall	4	224	Wu Hinkle	3	Biochemistry	35
Spring	4	178	Wu Hinkle Karplus	3	Biochemistry	20
331 (Biochem lec) Fall	3	357	Tye Feigenson	3	Biochemistry	0
332 (Biochem lec) Spring	2	323	Tye Huffaker	3	Biochemistry	1

Notes: All data are for the last 5 years. The "pool" refers to the elementary biology TA pool. The 101 and 105 courses select their TA's from graduate students that apply. The relative departmental/sectional home of the graduate students selected from this pool is shown in the list below.

Allocation of Teaching Assistantships:

Over the period Fall 1987 through the Spring of 1998, Neurobiology and Behavior has kept track of the home sections of the TA's in Biology 101-104. TA's for 105-106 are drawn from this same pool and presumably have a similar departmental/sectional distribution. This table gives the average number of TA's per section over this period.

Neurobiology and Behavior	3.86	0.13
Ecology and Evolutionary Biology	3.50	2.38
Science Education	2.82	1.25
Entomology	2.27	0.25
Plant Biology	1.82	1.75
Zoology	1.45	0.25
Natural Resources	1.32	0.38
Toxicology	1.00	0.88

Fractional numbers from 17 other Departments or Sections.

APPENDIX III

Sources of support for graduate students affiliated with Sections or Fields in the basic biological sciences. The upper case letter in parentheses after the name of the unit signifies whether data are from Section (S) or Field (F).

	TA	Fellowship	RA/GRA	Training Grant
Biochemistry, Molecular and Cell Biology (S)	9	4	37	16
Genetics & Development	9	6	10	9
Neurobiology & Behavior (F)	14	9	3	10
Ecology & Systematics (S)	28	19	3	7
Plant Biology (S)	9	8	1	1
Microbiology (F)	7	1	14	-
Bailey Hortorium (S)	7	7	1	2
Physiology (F)	6	4	7	-

APPENDIX IV

DOCUMENTS PROVIDED TO THE TASK FORCE

Reports

Biology at Cornell — Report of the Special Committee Appointed by the President of the University, November 14, 1963.

Report of the President's Committee on Biological Sciences, March 4, 1964.

History—The Division of Biological Sciences, written by Harry Stinson, requested by Geoffrey Sharpe, July 31, 1986..

Selected excerpts from Guiding Plan for Reorganization of the Division of Biological Sciences, U of California, Davis, Summer 1992.

Report from the Committee on Introductory Biology Teaching, December 2, 1994.

Cornell University Medical College and Graduate School of Medical Sciences — Preparing for the 21st Century, January 27, 1995.

Cornell University Medical College — Strategic Plan for Research, June 14, 1996.

Proposal for the Department of Statistical Sciences, January 17, 1997.

Draft Report — Research Future Task Force, September 5, 1997

Articles

Unifying Biology: The Evolutionary Synthesis and Evolutionary Biology, Vassiliki Betty Smocovitis

APPENDIX V

MEETINGS AND PERSONS CONTACTED

Biological Science Task Force Meetings — the first meeting was on August 20 and the last on February 17, meeting 33 times and including a 2-day retreat.

Meetings with Sections of the Division of Biological Sciences.

Bailey Hortorium, September 15, 1997
Veterinary Physiology, September 15, 1997
Section of Biochemistry, Molecular and Cell Biology, September 19, 1997
Section of Plant Biology, October 2, 1997
Section of Ecology and Systematics, October 3, 1997
Section of Microbiology, October 13, 1997
Genetics and Development, October 17, 1997
Section of Neurobiology and Behavior, October 20, 1997

Affiliated departments contacted.

Letters requesting responses to specific questions from the Task Force were sent to: departments and programs with biological disciplines currently not represented by the Division; and to departments whose research and teaching are closely related to the biological sciences. Responses were received from Entomology, Plant Breeding, Animal Sciences, Microbiology and Immunology in Veterinary Medicine, Agricultural and Biological Engineering, Anthropology, Chemistry, and Psychology.

Faculty in Entomology — Bobbi Peckarsky, Bryan Danforth, Cole Gilbert, Linda Rayor, John Losey, Quentin Wheeler

Elizabeth Earle, Professor and Chair, Plant Breeding

Alan Bell, Professor and Chair, Department of Animal Science

Roger Avery, Professor and Chair, Microbiology & Immunology, Veterinary Medicine

Michael F. Walter, Professor and Chair, Department of Agricultural and Biological Engineering

Steve Sangren, Chair, Department of r

Paul Houston, Professor and Chair, Department of Chemistry

Barbara Finlay, Professor and Chair of Psychology

Robert Johnston, Professor of Psychology

In response to the Task Force letters, meetings were held with

Plant Pathology, November 3, 1997
Nutritional Sciences, December 11, 1997

Task Force meeting with Vice President Norm Scott, September 11, 1997.

Task Force meeting with Dean of the Cornell Medical College, Dr. Antonio Gotto,
September 25, 1997.

Task Force meeting with the Associate Deans responsible for Undergraduate Education on
October 9, 1997.

Lynne Abel
Jennifer Gerner
Dean Sutphin

Task Force meeting with the Director of the Division of Biological Sciences, Peter Bruns,
November 6, 1997.

Meeting with undergraduate biology majors, November 14, 1997.

Meeting with Division of Biological Sciences administrative staff, November 24, 1997.

Task Force meeting with the deans on December 2 and 11, 1997

Walter Cohen	Francille Firebaugh
John Hopcroft	Donald Smith
Phil Lewis	Robert Swieringa
Daryl Lund	

Meeting with biology lecturers, December 11, 1997.