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The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

BIOLOGY DEPARTMENT

ACADEMIC PLAN

COLLEGE OF ARTS AND SCIENCES

UNIVERSITY OF COLORADO

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1972-73

ACADEMIC PLAN

FOR

DEPARTMENT OF BIOLOGY

BY

CHARLES NORRIS
JOHN BUSHNELL
JOHN WINDELL
DAVE ROGERS

COLLEGE OF ARTS AND SCIENCES
UNIVERSITY OF COLORADO

1967-68

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CONTENTS

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INTRODUCTION

The well-documented Report of the All-University Life Sciences Committee (June, 1966) concluded "that the current biology program at the University of Colorado is desperately inadequate". A major corrective proposal of the Committee majority was the formation of a Department of Molecular and Cellular Biology in parallel with the present Department of Biology. Now that the creation of a Department of Cellular, Molecular and Developmental Biology is in the process of being realized, it becomes extremely urgent, in the interests of the future development of biological science in the Rocky Mountain area, to institute a broader organizational framework than that considered by the All-University Life Science Committee. It is inevitable that any plan of reorganization must be inter-departmental. However, a prime prerequisite of any such blue-print is a unifying core. Because of the situation as it exists presently on campus, the Biology faculty has selected a plan or organization largely drawn along conceptual lines. The categories selected are as follows:

1) environmental biology
2) organismic biology
3) population studies biology

These categories would be properly coordinated with the Department of Cellular, Molecular and Developmental Biology by an administrative structure yet determined. The faculty of the present Biology Department proposes that each of the four categories be incorporated into separate departments but unified

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by an integrated core program (see below) and by an All-University Council on the Biological Sciences.

While the present Department of Biology has voted overwhelmingly in favor of separating into three parallel Departments, organized in quite modern approaches, there is a possibility that the University Administration will not accept the proposal. In the latter case, one might guess that the Department would go along as it has in the past. We are sure that this is not the case; we are convinced that the Department of Biology will never be the same again after the intensive study and self-conscious analysis which its faculty personnel have been going through during the last year. The programs of instruction and hope-for research pathways have not yet been completely laid out; indeed, it is impossible to produce detailed route-maps. Nevertheless, the overall guidelines are clear, and during the coming five years there will be marked changes. The Department faculty are firmly convinced that there must be more attention to modern aspects of biology, while at the same time, there must be no abandonment of the valuable aspects of more traditional biology. All members of the faculty accept this premise.

Whether there is a split or not, the patterns of environmental biology, organismic biology, and population studies respectively proposed by the three suggested Departments will be developed, and we are convinced that there will be appreciable increases in the student enrollments in several areas as a result. Biology is such a vast field of knowledge, and is growing at such a rapid rate that it is impossible for any student or member of the faculty to be effective in all areas. Furthermore, the needs

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of students for education in the ancillary fields of science vary considerably. Thus, for a person who wishes to specialize in some aspect of physiology, there must be strong backgrounds in chemistry, physics, and mathematics, and that person cannot neglect probing into geology or geography. On the other hand, a person whose interests lie in ecology will likely require less in chemistry and mathematics, and more in geology and geography. By initiating separate Departments or (less desirably) separate programs in the three areas, designated above, it will be possible to provide for effective undergraduate and graduate education and research. The old distinctions between zoology and botany are now much less significant; more important are the distinctions between the kinds of approach we make to the studies of living things. Should the Department retain its identity as a single Department, the faculty of each group within the Department will be given much more autonomy in its activities, correlated with the development of programs. We believe that the patterns which are presented below should hold, regardless of whether there are three Departments or semi-autonomous programs within a single Department.

In addition to the acceptance of the principle that one may develop specializations in different kinds of biology, the Faculty of the Department has accepted the principle that all kinds of biologists must have some common base from which to develop their own special interests. Thus we have accepted the principle of a core curriculum, which will be required of all kinds of biology majors (including, we hope, the new Department of Cellular, Molecular, and Developmental Biology). We also

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recognize the importance of at least a part of that core for students who are majors in other sciences, and we recognize that we must continue to present certain courses which will be necessary for students in specialized professional curricula. In our planning we have attempted to take these responsibilities into account.

A set of factors which we have not been able to take into account has been imposed on us. The establishment of a Department of Cellular and Molecular Biology (to which Developmental Biology will be added) has complicated the picture, especially because we do not know the directions which the Department will take, and cannot know until it is a truly operating Department. We have hopes that we will be able to work closely with that Department. We hope that the personnel of that Department will accept the principle of a core curriculum and will work with us to make that core curriculum effective, satisfying the needs of upper division students in that Department. But inevitably there are areas within the field of biology which cross Department lines, and it will be difficult at first to determine the Department or program into which a given course should fit. Futhermore, there are certain courses currently taught, which will be retained in the future, which are appropriate to one of the proposed Departments but which are currently taught by someone in a different proposed Department. This is presently inevitable because while a person's teaching obligations may be one kind of thing at the undergraduate level, his graduate teaching and research interests may lie some other place. In the future, as present members of the Faculty leave the University

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or retire, or as their teaching obligations change, it will be possible by judicious recruitment of faculty personnel, to produce more effective aligments.

Prospects for departmental major enrollments in 1972-73.

According to the IBM print-out sheets recently received in the Department Office, there are presently 288 undergraduates who have declared their intentions to major in some aspect of biology, as follows: freshmen - 79; sophomores - 69; juniors - 86; and seniors - 54. While there is little doubt that some of the future possible majors in biology will be taken by the Department of Cellular, Molecular and Developmental Biology, we are convinced that there will be some of the majors of that Department drawn from chemistry, psychology, and perhaps physics. We anticipate that we will have at least 250 majors in the Department at the undergraduate level, even with the new Department. If the 250 were to be distributed evenly between the three groups, each new Department would have approximately 80 majors. How, in actuality, they will distribute themselves is problematical. We are guessing, based on the way students currently orient themselves, that there will be heavier enrollments in the Departments of Environmental Biology and Organismic Biology than in the Department of Population studies. Tentatively we might suggest about 90 for each of the first two and 70 for the last.

At the graduate level we currently have 72 students enrolled, the majority of whom are doctoral candidates. If the experience of having the new Institute for Developmental Biology, and the Institute for Behavioral Genetics rise _de novo_ signifies

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anything, as will the new Department of Cellular, Molecular and Developmental Biology, there should not be any great impact on our enrollment. We never have attracted many students whose interests lay in those fields, and we shall not be doing so in the future. Rather, with the development of new Departments, we believe it is safe to assume appreciable increase, provided we have space, facilities and staff to attract them. We suggest that our graduate student enrollment in 1972-73 will total approximately 100, with approximately even distribution between the three proposed Departments. If any one group grows more rapidly than the others, it will likely be the environmental group. However, all three will be generating proposals for graduate training programs, designed to attract promising doctoral candidates.

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BIOLOGY DEPARTMENT ACADEMIC PLANNING

		FTE	
Professor	Askell Löve, Chairman	1.00	
"	David Rogers	.30	(.50 1708-48; .20 1708-13)
"	Robert Gregg	1.00	
"	Edwin Helwig	1.00	
"	Charles Norris, Assoc. Chm.	1.00	
"	John Marr	.50	(.50 1966-01, IAAR)
"	Erik Bonde	1.00	
"	Robert Pennak	1.00	
"	Olwen Williams	1.00	
	Biological Science Curriculum Study Group		
"	William Mayer	0.00	
"	Glen Peterson	0.00	
"	Jack Carter	0.00	(Leaving, 1968)
Assoc. Prof.	Wells Shulls	1.00	
" "	Sam Shushan	1.00	
" "	John Windell	1.00	
" "	Paul Winston	1.00	
" "	William Segal	1.00	
" "	John Bushnell	1.00	
Asst. Prof.	James L. Smith	1.00	
" "	Bruce Criley	1.00	
" "	David Norris	1.00	
" "	John Emlen	1.00	(to be replaced)
" "	William Moir	1.00	
" "	Kapoor, Brij M	0.00	
		18.80	

New Additions for 1968-69

Professor	Hobart Smith	1.00	
"	David Crumpacker	1.00	(Dr. Helwig's replacement)

Retires During Next 5 Years

Professor Edwin Helwig

Professor-adjoint	J. P. Hannon	0.00	(Fitzsimons)
" "	Estalla Leopold	0.00	(U.S. Geol. Survey)
" "	Louis B. Martin	0.00	(Denver Bot. Garden)

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THE PLANNING PARAMETERS

		1967-68 Current	1972-73 Parameters: Minimal Departmental Projection	1972-73 Parameters: OIR Projection
Student Credit Hour Production				
Academic Year SCH	LD	7,243	8,009	7,861
	UD	3,401	3,937	4,591
	GRAD	505	825	690
	TOTAL	11,149	12,771	13,142
Full Time Equivalent Positions				
University Accounts				
Instruction				
	1708 - 01 - 1 (Fac)	18.80		26.80
	1708 - 01 - 2 (TA)	9.00		11.20
	1708 - 01 - 3 (Staff)	9.42		11.50
Research				
(Löve)	1708 - 37 - 1	1.00	1.00	- 0 -
(Rogers)	1708 - 48 - 3	6.00	6.00	- 0 -
(Segal)	1708 - 36 - 1	1.00	1.00	- 0 -

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Personnel Requirements for 1972-73

BASIC PLAN

Departmental Budget (OIR Projection)

1708 - 01 - 1	26.8 FTE
1708 - 01 - 2	11.2 FTE
1708 - 01 - 3	11.5 FTE

Sponsored Positions

Code 3	8.0 FTE

OPTIMAL PLAN

Departmental Budget

1708 - 01 - 1	36.8 FTE
1708 - 01 - 2	18.0 FTE
1708 - 01 - 3	18.5 FTE

Sponsored Positions

Code 3	16.0 FTE

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SPACE REQUIREMENTS

	Hours/week	
	Fall	Spring
Classrooms		
30 students	33	40
50 students	10	4
100 students	7	4
200 students	9	8
400 students	0	0
750 students (General Biology)	3	3
Seminar Rooms		
20 students	12	12
30 students	10	10
Teaching Laboratories		
Lower Division Lab	181	
Upper Division Lab	167	
Independent study (or undergr. research)	48	
Independent study (grad. research)	48	
Grad Lab	41	
M A Thesis (30 @ 8 hr)	240	
Ph D Thesis (20 @ 15 hr)	300	

Research Laboratories	No. of Units
Graduate research	100
Postdoctoral research	10
Undergraduate research	25
Technician research	--
Faculty research	33.8

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Public Service Facilities	No. of Units	a.s.f.
1.		
2.		
3.		
4.		
Offices		
Code 1		
Chairman	3	600
Faculty	37	4416
Code 2	47	2820
Code 3	19	2220

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INSTRUCTION Planning Unit: Biology Form APF-1

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
LOWER DIVISION										
General Biology										
Biol. 101-4	Fall	Lec-3 Lab-3	Fac TA	750	750 40	1 20	Classrm Lab	3 60	3000	
	Spring	Lec-3 Lab-3	Fac TA	100	120 40	1 3	Classrm Lab	3 9	400	
	SS-1									
Biol. 102-4	Fall	Lec-3 Lab-3	Fac TA	100	120 40	1 3	Classrm Lab	3 9	400	
	Spring	Lec-3 Lab-3	Fac TA	700	700 40	1 19	Classrm Lab	3 57	2800	
	SS-2									
Introduction to Human Anatomy										
Zool. 219-3	Fall	Lec-2 Lab-3	Fac TA	80	175 24	1 4	Classrm Lab	2 12	240	
Biology of Microorganisms										
Bact. 201-3	Fall	Lec-2 Lab-2	Fac TA	35	185 25	1 2	Classrm Lab	2 4	105	
	Spring	Lec-2 Lab-2	Fac TA	90	175 25	1 4	Classrm Lab	2 8	270	

12

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13

INSTRUCTION Planning Unit: **Biology** Form APF-1

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
Principles of Ecology										
Biol. 241-2	Fall	Lec-2	Fac	100	175	1	Classrm	2	200	
	Spring	Lec-2	Fac	100	175	1	"	2	200	
Field Botany										
Bot. 231-3	Fall	Lec-2 Lab-3	Fac TA	30	50 24	1 2	" Lab	2 6	90	
	SS-1									
Field Zoology										
Zool. 232-3	Spring	Lec-2 Lab-6	Fac TA	40	20 20	1 2	Classrm Lab	2 12	120	
	SS-2									
Introduction to Entomology										
Zool. 212-4	Fall	Lec-2 Lab-6	Fac TA	8	20 20	1 1	Classrm Lab	2 6	64	(alt. yrs)
Parasitology										
Zool. 211-3	Spring	Lec-2 Lab-3	Fac TA	40	24 24	2 2	Classrm Lab	4 6	120	

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is intended to replace the present biology, botany and zoology majors minimal requirements. It will insure that, regardless of the area in which a student decides to specialize he will have the appropriate background. Our plan is to develop and initiate the core program with present and immediately foreseeable resources, allowing for healthy progress toward something better, and for modification as the course of biology itself changes.

The following forms the basic philosophy for the core curriculum:

1. The curriculum must provide a high degree of excellence for undergraduate instruction in biological sciences.
2. Biological scientists need a solid core of knowledge of basic biological science, physical science, and mathematics.
3. The core curriculum is intended for all biology majors irrespective of their professional goals, including professional secondary school teaching. It is designed for the average student as well as the top student.
4. The core curriculum consists of specified courses in the freshman and sophomore years with considerable flexibility in the junior and senior years to permit education for a specific biological goal.

ANTICIPATED PERSONNEL, CLASS AND CURRICULAR CHANGES

Anticipated changes that will further effect parameters projection for the future involve the following areas:

1) General Biology regular and trailer sections necessitate the addition of one FTE, to be rostered in an appropriate department.

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BASIC PLAN - LOWER DIVISION

BACKGROUND

The lower division curriculum of the Biology Department has had continual revision. During the last three years it has become clear that the beginning general biology program required extensive alteration. This is because many entering students have had Biological Sciences Curriculum Study (BSCS) (50%), high school chemistry (90%), high school physics (50%), an advanced high school biology course (22%), and the fact that needed revisions were not possible within the framework of the traditional course. A committee consisting of several professors, including the course instructors directly involved, has studied the matter and proposed various improvements that were subsequently initiated. A completely revised laboratory program was an essential part of this change, and a great deal of work is being done on this program. In this we have drawn on our own experience, the experience of a number of other instituations, recommendations from the Commission on Undergraduate Education in Biological Sciences (CUEBS), and consultation with members of the BSCS staff (now members of our Biology Department faculty).

Additional plans are now in progress for the development of a "core curriculum" in biology. The term "core curriculum" as used here refers to that body of knowledge essential for all students of biology, regardless of their future professional aims. The core curriculum is thought of as a series of courses which would be needed by and required of all students in biology. It

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is intended to replace the present biology, botany and zoology majors minimal requirements. It will insure that, regardless of the area in which a student decides to specialize he will have the appropriate background. Our plan is to develop and initiate the core program with present and immediately foreseeable resources, allowing for healthy progress toward something better, and for modification as the course of biology itself changes.

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Justification: General Biology (B-101, B-102) is the largest course in the department and one of the largest in the entire College of Arts and Sciences. No enrollment drop is anticipated in the course as a result of changes in the science requirement by the College of Arts and Sciences. It is imperative, nevertheless, that both semesters of general biology be taught each semester. Hence, not less than four FTE's (instead of the present three) must be assigned to the course if quality of instruction is to be maintained at a high degree of excellence. Each of the four FTE's is to be in complete charge of one regular or trailer section during each academic year. Each instructor will be free during the alternate semester to teach advanced courses and maintain an ongoing research program.

2) Organization, administration and initiation of a core program requires 3 FTE's for the seond level.

Justification: The core program at the sophomore level will be structured with some essentially new courses that are not currently considered in the available parameters. Depending on faculty action, it is anticipated that not less than two (and not more than three) lower division courses must be added to initiate the core program. The primary responsibility of the requested FTE's would be to a specific core course. However, the department would seek not only an inspired teacher for e a ch position but a competent investigator that would also offer upper division and graduate courses in a specialty area and, would be rostered in a separate department.

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CORE CURRICULUM SPACE REQUIREMENTS

Instructional Laboratories for General Biology		
Teaching Laboratories		4725
3 x 35 x 45 = 4725 a.s.f.		
Preparation and Storage Laboratory (auxiliary)		
30% of 4725 auxiliary space		<u>1417</u>
	Total	6142
Instructional Laboratories for Second Level Core Curriculum		
Teaching Laboratories		
Principles of Ecology (new) estimated number of sections	4	
Principles of Genetics (new) Could use Population Studies Lab estimated number of sections	4	
Principles of Physiology (new) Could use Organismic Physiology Lab estimated number of sections	4	
Principles of Development (new) estimated number of sections	<u>4</u>	
2 x 30 x 45 = 2700 a.s.f. + 30% auxiliary		3510
Greenhouse Facility for Entire Core Program		<u>1800</u>
		11452

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61

INSTRUCTION Planning Unit: Biology Form APF-1

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
UPPER DIVISION										
Genetics										
Biol. 351-3	Fall	Lec-3	Fac	150	300	1	Classrm	3	450	
	Spring	Lec-3	Fac	150	300	1	"	3	450	
	SS-1									
Cell Physiology										
Biol. 421-4	Fall	Lec-3 Lab-3	Fac TA	40	40 20	1 2	" Lab	3 6	160	
Vertebrate Physiology										
Zool. 421-3	Spring	Lec-2 Lab-3	Fac TA	20	20 20	1 1	Classrm Lab	2 3	60	
Essentials of Animal Physiology										
Zool. 322-3	Spring	Lec-2 Lab-3	Fac TA	200	200 24	1 9	Classrm Lab	2 27	600	
	SS-2									
Classification of Flowering Plants										
Bot. 431-4	Spring	Lec-3 Lab-2	Fac	12	15	1	Classrm	3	48	

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INS UCTION Planning Unit: Biology Form APF-1

OURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENRCLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
Comp. Vert. Anatomy and Embryology										
Zool. 313-5	Fall	Lec-3 Lab-6	Fac TA	200	200 24	1 9	Classrm Lab	3 54	1000	
Introduction to Biostatistics										
Bot. 431-3	Spring									(alt. yrs)
Plant Ecology										
Bot. 441-4	Fall	Lec-3 Lab-4	Fac TA	15	24 24	1 1	Classrm Lab	3 4	60	
	SS-1									
Ornithology										
Zool. 432-3	Spring	Lec-2 Lab-3	Fac Fac	25	25 25	1 1	Classrm Lab	2 3	75	
Invertebrate Zoology										
Zool. 411-5	Fall	Lec-3 Lab-6	Fac TA	35	40 24	1 2	Classrm Lab	3 12	175	
Animal Ecology										
Zool. 441-4	Fall	Lec-3 Lab-2	Fac TA	30	30 30	1 1	Classrm Lab	3 2	120	
	SS-2									

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INSTRUCTION Planning Unit: Biology Form APF-1

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
Plant Physiology										
Bot. 421-4	Fall	Lec-2 Lab-6	Fac TA	15	16 16	1 1	Classrm Lab	2 6	60	
	SS-1									
Pathogenic Bacteria										
Bact. 436-4	Fall	Lec-3 Lab-4	Fac TA	80	125 25	1 4	Classrm Lab	3 16	320	
Morphology of Non-Vascular Plants										
Bot. 311-4	Fall	Lec-3 Lab-3	Fac TA	20	30 24	1 1	Classrm Lab	3 3	80	
Morphology of Vascular Plants										
Bot. 312-3	Spring	Lec-2 Lab-3	Fac TA	20	30 24	1 1	Classrm Lab	2 3	60	(alt. yrs)
Mycology										
Bot. 421-3	Fall	Lec-2 Lab-3	Fac Fac	10	10 10	1 1	Classrm Lab	2 3	30	(alt. yrs)
Insect Taxonomy										
Zool. 431-4	Fall	Lec-2 Lab-6	Fac Fac	6	12 12	1 1	Classrm Lab	2 6	24	(alt. yrs)

- 2 -

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INSTRUCTION Planning Unit: Biology Form APF-1

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
Plant Ecology										
Bot. 411-4	Spring									
Recent Advances in Population Genetics										
Biol. 451-3	Spring	Lec-3	Fac	12	15	1	Classrm	3	36	
Advanced Comparative Anatomy										
Zool. 416-4	Spring	Lec-2 Lab-6	Fac TA	24	24 24	1 1	" Lab	2 6	96	
Aquatic Invertebrate Zoology										
Zool. 445-3	SS-1									
Independent Study In Biology										
Biol. 491-2	Fall	Conf-.5	Fac	4	1	-	Lab	.5	8	
Biol. 492-2	Spring	Conf-.5	Fac	4	1	-	Lab	.5	8	
Independent Study in Botany										
Bot. 491-2	Fall	Conf-.5	Fac	2	1	-	Lab	.5	4	
Bot. 492-2	Spring	Conf-.5	Fac	2	1	-	Lab	.5	4	
Independent Study in Bacteriology										
Bact. 491-2	Fall	Conf-.5	Fac	2	1	-	Lab	.5	4	
Bact. 492-2	Spring	Conf-.5	Fac	2	1	-	Lab	.5	4	

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1	2	3	4	5	6	7	8	9	10	11
Independent Study in Zoology										
Zool. 491-2	Fall	Conf-.5	Fac	4	1	-	Lab	.5	8	
Zool. 492-2	Spring	Conf-.5	Fac	4	1	-	Lab	.5	8	
UPPER DIVISION TOTALS										
	Fall			613		34		144	2503	
	Spring			475		21		63	1449	
	Total			1088		55		207	3952	

23

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INSTRUCTION Planning Unit: Biology Form APF-1

29

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
History of Biology										
Hiol. 501-3	Fall	Lec-3	Fac	16	20	1	Classrm	3	48	(alt. yrs)
Comparative Animal Physiology										
Zool. 522-3	Spring	Lec-2 Lab-4	Fac Fac	20	24 12	1 2	" Lab	2 8	60	(alt. yrs)
Comparative Neurophysiology										
Zool. 625-2	Spring									(alt. yrs)
Ichthyology										
Zool. 547-3	Spring									(alt. yrs)
Microbial Physiology										
Bact. 520-4	Spring	Lec-2 Lab-4	Fac Fac	12	12 12	1 1	Classrm Lab	2 4	48	
Biology Fish Populations										
Zool. 548-3	Spring	Lec-3	Fac	10	20	1	Classrm	3	30	(alt. yrs)
Experimental Embryology										
Zool. 561-4	Spring	Lec-2 Lab-6	Fac Fac	20	20 10	1 2	" Lab	2 12	80	

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INSTRUCTION Planning Unit: Biology Form APF-1

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
Comparative Endocrinology										
Zool. 528-2	Spring	Lec-2	Fac	30	40	1	Classrm	2	60	(alt. yrs)
Endocrinology										
Zool. 623-2	Fall	Lec-2	Fac	12	12	1	"	2	24	(alt. yrs)
Antibiotics										
Bact. 530-3	Spring									(alt. yrs)
Population Dynamics										
Zool. 543-3	Fall									(alt. yrs)
Birds of the World										
Zool. 531-2	Fall	Lec-2 Lab-2	Fac Fac	10	10 10	1 1	" Lab	2 2	20	(alt. yrs)
Behavioral Ecology										
Zool. 544-2	Spring									(alt. yrs)
Theoretical Ecology										
Zool. 581-2	Fall	Lec-2	Fac	9	9	1	Classrm	2	18	(alt. yrs)
Peripatetic Biology										
Biol. 502-2	Spring									(alt. yrs)

26

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27

INSTRUCTION Planning Unit: Biology Form APF-1

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
Benthic and Aufwuchs Ecology										
Biol. 549-3	Spring									(alt. yrs)
Plant Cytology										
Bot. 552-3	Fall									(alt. yrs)
Stream Biology										
Zool. 641-2	Fall									(alt. yrs)
Limnology										
Zool. 642-3	Fall	Lec-3 Lab-4	Fac Fac	6	6 6	1 1	Classrm Lab	3 4	18	(alt. yrs)
Analysis and Preparation Papers in Biology										
Biol. 671-2	Spring	Lec-2	Fac	12	25	1	Classrm	2	24	
Recent Advances Animal Ecology										
Zool. 546-3	Spring	Lec-3	Fac	20	30	1	"	3	60	
Environmental Bacteriology										
Bact. 541-3	Spring	Lec-3	Fac	15	50	1	"	3	45	
Plant Biosystematics										
Bot. 551-2	Spring									(alt. yrs)

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INSTRUCTION Planning Unit: Biology Form APF-1

82

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
Dynamics of Mt. Ecosystems										
Bot. 545-3	Fall									(alt. yrs)
Comparative Animal Physiology										
Zool. 521-3	Fall									(alt. yrs)
Advanced Topics in Population Genetics										
Biol. 552-3	Fall	Lec-3	Fac	12	12	1	Classrm	3	36	(alt. yrs)
Advanced Topics in Bacterial Physiology										
Bact. 681-2	Fall									(alt. yrs)
Advanced Laboratory in Bacterial Physiology										
Bact. 682-2	Fall	Lab-2	Fac	6	20	1	Lab	2	12	(alt. yrs)
Algology										
Bot. 514-3	Fall	Lec-3 Lab-3	Fac Fac	10	20 10	1 1	Classrm Lab	3 3	30	(alt. yrs)
Independent Study in Botany										
Bot. 691-2	Fall	Conf-.5	Fac	3	1	-	"	.5	6	
Bot. 692-2	Spring	Conf-.5	Fac	3	1	-	"	.5	6	

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62

INSTRUCTION Planning Unit: Biology Form APF-1

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL -MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
<u>Independent Study in Biology</u>										
Biol. 691-2	Fall	Conf-.5	Fac	3	1	-	Lab	.5	6	
Biol. 692-2	Spring	Conf-.5	Fac	3	1	-	"	.5	6	
<u>Independent Study in Bacteriology</u>										
Bact. 691-2	Fall	Conf-.5	Fac	3	1	-	"	.5	6	
Bact. 692-2	Spring	Conf-.5	Fac	3	1	-	"	.5	6	
<u>Independent Study in Zoology</u>										
Zool 691-2	Fall	Conf-.5	Fac	3	1	-	"	.5	6	
Zool 692-2	Spring	Conf-.5	Fac	3	1	-	"	.5	6	
<u>Master's Thesis</u>										
Biol. 700-4	Fall	Conf-1.5	Fac	1	1	-	Office	1.5	4	
	Spring	Conf-1.5	Fac	1	1	-	"	1.5	4	
Bot. 700-4	Fall	Conf-1.5	Fac	1	1	-	"	1.5	4	
	Spring	Conf-1.5	Fac	1	1	-	"	1.5	4	
Zool. 700-4	Fall	Conf-1.5	Fac	1	1	-	"	1.5	4	
	Spring	Conf-1.5	Fac	1	1	-	"	1.5	4	

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30

COURSE TITLE AND CREDIT VALUE	TERM	METHOD AND HRS/WK	TAUGHT BY	COURSE ENROLL-MENT	MAXIMUM SECTION SIZE	SEC-TIONS	TYPE OF SPACE	TOTAL HRS/WK	TOTAL STUDENT CREDITS	BEGINNING YEAR
1	2	3	4	5	6	7	8	9	10	11
Doctor's Thesis										
Bot. 800-0	Fall	Conf-1.5	Fac	12	1	-	Office	18	--	
	Spring	Conf-1.5	Fac	12	1	-	"	18	--	
Zool. 800-0	Fall	Conf-1.5	Fac	12	1	-	"	18	--	
	Spring	Conf-1.5	Fac	12	1	-	"	18	--	
Biology Journal Club										
Biol. 601-.5	Fall	Lec-1	Fac	42	7	6	Seminar	6	21	
	Spring	Lec-1	Fac	42	7	6	"	6	21	
GRADUATE TOTALS										
	Fall			172		19		84.5	303	
	Spring			240		24		107.5	526	
	TOTAL			412		43		192.0	829	

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SUMMARY STATEMENTS:

The following exerpts are taken from the ALL-UNIVERSITY LIFE SCIENCES COMMITTEE REPORT, June, 1966.

"President Smiley has aptly described biology as the hub of a university program in the physical and social sciences. It is no less important for the medical sciences. The success of all the scientific disciplines depends to a considerable degree on strength in biology. Such departments as psychology, anthropology, sociology, pharmacology, chemistry, and physics require excellence in biological instruction at both the undergraduate and graduate levels in order to achieve the proper training of their students. Professors in these various departments are dependent upon the biological faculty for cross-fertilization of ideas. As a result, so long as the biology department remains as weak as it is at present on this campus, all of these departments will find it increasingly difficult to compete for first-class faculty." (Page 1)

"One immediate concern that biology is focused on is the environmental problems that technology and a growing populace have created. Is it not necessary for the students of today to learn as much as possible of the biological world they live in if they are to become the truly educated leaders of tomorrow?" (Page 2)

"The University of Colorado ranks 17th out of 17 in absolute numbers of biological sciences faculty." (Page 7)

"If the University of Colorado were to attempt to reach the average on this scale, it would have 79 additional faculty for a total of 99 in the biological sciences." (Page 7)

"This Committee specifically recommends that: "The number of biologists on the Boulder campus be increased to 50-60 as soon as possible." (Page 9)

"At the 20,000 student level projected for about 1971, the faculty in biological sciences would be 80. This is far from the current 20 faculty members and the 39 faculty members that are projected in the current plans of the University for 1971. In plain words, current plans at the University of Colorado fail to project the life sciences to be even minimally acceptable on a national level." (Page 9)

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In light of the above statements and planning by the Department the following comments are offered.

1. The OIR projection parameters provide no mechanism for strengthening biological teaching and research. They are based on mere extrapolation of present weaknesses. If anything, they will produce greater weakening because they assume no increase in overall strengths and secondly, do not provide for growth in specialized fields and programs.
2. The basic plan that has been produced in this report is academically inadequate and thus undesirable. If the calculated Code I, II, and III projections are not met and the projected increase in enrollment occurs, the teaching load of faculty and assistants will increase over the present load figures.
3. The basic plan will not permit the initiation of a core program although we are thoroughly convinced of its academic desirability.
4. Present projections do not allow for adequate improvement of our existing lower, upper and graduate programs. It may be necessary to eliminate trailer sections in general biology. In other courses limitations may need to be set on the number of students per lecture section and the number of laboratory sections offered. Other courses may need to be offered once each year instead of each semester.
5. An interdepartmental program, designed for the professional training of secondary school and junior college teachers cannot be planned.

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6. Finally, even with the development and projected number of FTE's in Cellular, Molecular and Developmental Biology, the total number of biologists on this campus will be far below the standards which should be achieved.

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Computation of 1 FTE teaching load was based upon the following rationale:

Each full-time FTE is expected to present two courses in one year, as well as advising approximately four graduate students on thesis and supervising undergraduate and graduate Independent Studies. Each faculty member is expected to present both undergraduate and graduate courses. Such a program as this will provide that all faculty members will have time to contribute to the research productivity of the Department.

A number of our courses have multiple sections of laboratory. When this is the case, the careful planning, coordination, and supervision of such laboratories constitutes a difficult and time consuming job, and persons responsible for such activities must be given help and credit for such activities, to the extent of having lower teaching loads or lower expectations in research productivity.

In the following pages are to be found programs of academic planning for the three departments which are proposed.

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DEPARTMENT OF POPULATION STUDIES

CURRICULUM

Since most of the courses of the old Department of Biology are not designed for the objectives of the new Department of Population Studies, most of the courses of the new Department will have to be designed as new. However, during its first year of existence the following old courses will be transferred to the new Department, though later they may need to be replaced or modified: Genetics (Biol. 351), Quantitative Genetics (Biol. 412), Taximetrics (Biol. 531), Modern Theories of Evolution (Biol. 651), Plant Biosystematics (Bot. 551), Plant Cytology (Bot. 681), Behavorial Genetics (Zool. 410, 432), and Behavioral Ecology (Zool. 544). We visualize the need for new courses in various approaches to genetics and cytology, genetic biogeography and palynology, theoretical ecology, biostatistics, biomathematics, etc. at the undergraduate and graduate levels. At least some of these courses (such as biomathematics ought to be offered during the first year of existence of the new Department.

Students who want to specialize in Population Studies at the undergraduate level will be required to complete the two-year core program in biology before entering. In addition, they will be required to take certain courses in mathematics, and in other physical and biological fields which are pertinent to understanding of their approach to population studies. The upper level teaching in this Department will stress active participation in research work and give the students opportunities to gain depth

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and breath in the subject. All upper level students will, also, be required to take part in Departmental seminars, which will replace present journal clubs for training graduate students in presentation of problems and papers. In addition, department colloquia will take the place of the present seminars as occasions for additional education of the students through special lectures by faculty and invited lecturers.

PERSONNEL

Faculty

The Department of Population Studies will commence with the following faculty: David W. Crumparker, Brij M. Kapoor, Estella Leopold (professor-adjoint), Askell Löve, and David J. Rogers. In addition, John Rattenbury of the University of New Zealand will teach a course in evolution during next fall, as a Visiting Professor. We expect other joint appointments from various members of the Institute for Behavioral Genetics, the University Museum, and the Institute for Arctic and Alpine Research.

Although the new Department can function and reach a certain degree of excellence with the available faculty, it is evident that new faculty will be needed to make the course offerings meet the minimum requirement of a modern Department reaching for the highest goals in teaching and research in its field.

Three faculty appointments are needed to continue the present work of one of the strongest elements in the present population studies groups, now designated as the taximetrics laboratory. These positions are: theoretical systematist, biomathematician, and programmer. These positions are presently filled by staff

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members working on grant funds under Rogers, but at the same time are participating in the educational program of the University, team-teaching in Biology 531, Taximetrics. These staff members should be appointed to faculty status though they may continue to be paid (at least 50%) from outside grants. We also anticipate the need for the following FTE's in the next five years:

1. Population biologist - theoretical, interested in models of populations, with strong mathematical background.

2. Statistician - strong training in mathematics and statistics, preferably with some formal degree in biology.

3. Biomathematician - background and training in combinatorial mathematics, with interest in biological problems as a stimulus for investigating useful mathematical procedures.

4. Evolutionary biochemist - interested in basic molecular structures (protein polymorphism, for example) as they influence and produce useful models of populations.

5. Population biologist - interested in the study of populations using radiotelemetry.

6. Population biologist - interest in the micrometeorological problems of populations.

These last six positions are listed in a descending order of immediate needs. That is, we need the first three of these positions for next year's operations, in order to meet our commitments to the whole field of biology. The next three positions are vital to continued work, but any one of the three could be brought on in any order, depending upon the availability of candidates and concurrence of the existing faculty.

Staff Needs

Since the faculty of the Department of Population Studies will be productive, its need for secretarial help will be greater.

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Dr. David Rogers has a secretary paid from his grant, and the Department would not need more than two skilled secretaries the first year. One technician, to take care of living plants and animals, is needed to begin with but other supporting staff will likely be needed when the Department has come into full action. Some such personnel will undoubtedly be paid by outside funds.

As to graduate student support, we assume that the present number of Teaching Assistants of the Department of Biology will be divided between the new Departments, according to the needs for course instruction and the core program. Additional graduate students will be supported through individual or training grants, and by aid of University funds in general competition.

SPACE

Space for the Department of Population Studies will have to be outside the Hale Building, since the two other new Departments will need all of the space now occupied by the present Faculty in Hale. We propose that the space which Biology now has on loan from the Institute for Arctic and Alpine Research in the Armory be transferred to the Department of Population Studies. In addition we request that the second floor, presently used by the Department of Dance be remodelled for the needs (offices, lecture rooms, laboratories, and room for graduate students) of the Department of Population Studies and the Institute for Arctic and Alpine Research. This will provide sufficient space for the work and growth of the new Department temporarily until space becomes available in the planned Life Sciences Building. The New

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Department and the Institute for Arctic and Alpine Research can be expected to cooperate very closely in several investigations and use the same facilities; and so it would be very appropriate to have both located in the same building on the campus.

<u>Space Requirements: Estimated Needs for Next Five Years</u>

1. Laboratory

a.	Teaching		
	Principles of Genetics	1350	square feet
	Quantitative and Population Genetics	450	"
	Behavioral Genetics	450	"
	Plant Cytology and Biosystematics	450	"
	Preparation lab for all genetics	810	"
	Taximetrics and Documentation	900	"
	Evolutionary Biochemistry	600	"
	Auxiliary Space	450	"
b.	Research Laboratories		
	1 for each FTE, 14	1540	"
	Grad. Student, 30	1950	"
	Research Assoc., 10	1150	"
	Auxiliary Space	1856	"
c.	Herbarium Space	675	"
d.	Data Processing Equipment Room	600	"
e.	Instrument Room	400	"
f.	Greenhouse and growth chambers	1800	"
g.	Animal Rooms (small mammals and insect growth chambers includes cage washing)	1000	"
h.	Auxiliary Space	1490	"

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2. Classroom Facilities

   a. Lecture room (with demonstration facilities and storeroom) for 200 students

   b. 3 small Classrooms (30 students)

   c. 1 Seminar Room (30 places, conferences and faculty meetings)

3. Office Space

14 Faculty offices @ 120 a.s.f. each	1680
1 Chairman's office	200
1 Admin. Assistant's office	65
2 Secretaries' offices	150
10 Research Associates offices	1200
14 Graduate Students offices, @65 a.s.f. each	910

CURRICULUM

Undergraduate	Graduate
Principles of Genetics*	Taximetrics*
Quantitative Genetics*	Plant Biosystematics*
Behavioral Genetics*	Plant Cytology*
Molecular Genetics*	Modern Theories of Evolution*
Population Genetics*	Theoretical Population Biology*
Genetic Biogeography*	Palynology
Biostatistics	Mathematical Modeling of Biological Systems (Joint with Organismic)
Finite Biomathematics	Evolutionary Biochemistry

*Courses now offered. The remaining named courses are merely suggestive, and depend upon the FTEs who will join us.

No mention is made of cross-disciplinary work at this time, but appropriate departments on campus will be consulted before any

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decision on new curricula. For example, population studies should include demographic studies, now in the Department of Sociology.

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DEPARTMENT OF ENVIRONMENTAL BIOLOGY

CURRICULUM

Most biological sub-disciplines have distinctive areas of endeavor and rather definite parameters which set them off clearly from adjacent sub-disciplines. Accordingly, we can define the teaching, curriculum and research areas of Environmental Biology as follows:

A. Environmental biology is concerned with the interrelationships of organisms and environment as manifested by natural cycles (growth, longevity, blooms), rhythms, community development, community structure, intraspecific relations, interspecific relations, geographical distribution, and migrations.

B. It is concerned with these phenomena under natural conditions as well as under experimental conditions in the field and laboratory. These studies may be primarily radiobiological, environmental physiological, energy flow, etc. oriented. The proposed Department will give some special stress to studies best described as physiological ecology - a sub-discipline of recent emphasis in environmental studies, which has acquired its greatest definition and elan in the past few years.

C. It is concerned with the description, determination, and measurement of environmental conditions.

D. It is concerned with adaptations and reactions of organisms to factors of the environment.

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E. It is concerned with man's use and misuse of the ecosystems of the world, as well as with man's peculiar position as an interacting organism.

Alternately, environmental biology is generally not <u>directly</u> concerned with such sub-disciplines as morphology, anatomy, functional activities or organ systems, genetics, molecular biology, cellular biology, developmental biology, and the description of (new) taxa per se. On the other hand, an environmental biologist usually finds that training in certain of these areas is necessary as background, just as he often requires training in chemistry, physics, or geology.

PERSONNEL

Faculty

From the standpoint of the great diversity of our biological and geographical surroundings, we are in a unique position among American universities for environmental studies. We have only to utilize more fully what we have in order to profit from our position. The University of Colorado Department of Biology provides historical support for expansion of environmental biology. If the "old" Department of Biology is known for anything, it is the area of Environmental Biology. In the past, the majority of research papers emanating from Biology have been environmental studies. The majority of graduate students are working in this area. Ten of the present Biology Faculty are members of the Ecological Society of America! Development and expansion of Environmental Biology will, by its more restrictive nature, cultivate more meaningful and viable ties with the Arctic and Alpine Institute, ESSA, NCAR,

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members of the engineering faculty (e.g., pollution oriented), and with the increasing number of environmentally-directed people in Geology and Geography. Certain of these multilateral liaisons have been investigated already, and the response has been most promising.

The Department of Environmental Biology can function and reach a certain degree of excellence with the available faculty. However, it is evident that new personnel will be needed to give course offerings to meet the minimum requirement of a modern Department striving for the highest goals in teaching and research.

The Environmental group includes eight to ten members of the present Department of Biology plus one or two associate members from the Denver and Colorado Springs centers. In the succeeding five years we should add at least six faculty members including one nationally known ecologist who would become chairman of the group.

These six positions (FTE's) are listed in a descending order of immediate needs.

1. Radiation Ecologist - interest in the physiological ecology of the rate of material cycling (eco-cycling).
2. Physiological Ecologist - interest in the range of energy flow through an ecosystem (eco-energetics).
3. Aquatic Ecologist - interest in the biology of higher rooted aquatics and the range or gradient of conditions of existance (chemicals, temperatures, height, etc.).
4. Physiological Ecologist - primarily concerned with natural cycles (growth, longevity, blooms) and rhythms.

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5. Physiological Ecologist - interest in regulation by the physical environment and by organisms (eco-regulation).

6. Trophic Ecologist - interest in food consumption efficiencies, energy flow, trophic organization of different communities and bioenergetics.

CURRICULUM

I. Required L.D. science courses to be taken outside the Life Sciences.

Chemistry (one year)
Physics (one year)
Math (one year)

II. General Biology and Other L.D. Core Curriculum courses in the Life Sciences.

III. Lower and Upper Division courses offered by members of the Department of Environmental Biology.

Principles of Ecology	Invertebrate Zoology
Animal Ecology	Ecosystems of North America
Plant Ecology	Biogeography
Field Zoology	Ornithology
Parasitology	Introduction to Biostatistics
Aquatic Invertebrate Zoology	Independent Study

<u>Courses to be offered at the Graduate Level by members of the Department of Environmental Biology</u>

Journal Club	Anal. & Prep. Papers in Biol.
Master's Thesis	Soil Development and Morph.
Doctoral Thesis	Radiation Biology*
Independent Study	Population Dynamics
Animal Geography	Biol. of Rooted Aquatic Plants*
Peripatetic Biology	Ecological Plant Physiology
Seminar in Animal Behavior	Bioenergetics*
Recent Advances in Animal Ecology	Limnology
	Biological Oceanography*
Biology of Fish Populations	Benthic and Aufuchs Ecology*
Dynamics of Mountain Ecosystems	Stream Biology

*New courses to be offered as soon as possible.

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ENVIRONMENTAL BIOLOGY SPACE REQUIREMENTS

Instructional Laboratories for Environmental Biology Courses

Ecology Laboratory

Animal Ecology

Plant Ecology

Field Ecology

Ornithology

Soil Development and Morphology

1 x 30 x 45 = 1350 a.s.f. + 30% auxilary 1725

Aquatic Biology Laboratory

Limnology

Stream Biology

Biological Oceanography

Ichthyology

Biology of Rooted Aquatic Plants

1 x 30 x 45 = 1350 a.s.f. + 30% auxiliary 1725

Invertebrate Zoology Laboratory

Invertebrate Zoology

Aquatic Invertebrate Zoology

Benthic Biology

Parasitology

1 x 30 x 45 = 1350 a.s.f. + 30% auxiliary 1725

Physiological Ecology Laboratory

Ecological Plant Physiology

Bioenergetics

Ecosystems of North America

Dynamics of Mountain Ecosystems

1 x 15 x 60 = 900 a.s.f. + 30% auxiliary 1170

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Accessory Space Requirements

Instrument Room (Balances)	400
Dark Room	400
Animal Room (Terrestrial small mammals)	500
Animal Room (Aquatic)	600
Calculator Room	400
Auxiliary Space	1500
Greenhouse	3000

Office Space

16 Faculty offices @ 120 a.s.f. each	1920
1 Chairman's office	200
2 Secretaries offices	150
12 Teaching Assistants	720
5 Research Associates	600
3 Technicians	360

Research Laboratories

<u>Faculty</u>

16 x 110 = 1760 + 40% auxiliary	2464

<u>Research Associates</u>

10 x 110 = 1100 + 40% auxiliary	1540

<u>Research Assistants</u>

10 x 110 = 1100 + 40% auxiliary	1540

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DEPARTMENT OF ORGANISMIC BIOLOGY

CURRICULUM

The Department of Organismic Biology which has been proposed will be directed in its efforts toward the development of an instructional and research program stressing the organism as an individual. It thus forms a bridge between the cellular and molecular aspects on one hand and the populations of organisms on the other. The stress will be on structure, function, and more advanced developmental processes of plants and animals. Even in this delimited area, there is such a vast amount of information, and so many significant conceptual patterns, that it will be essential to provide different kinds of courses and curricular patterns. In the Organismic Biology Department, the following is the proposed curricular pattern:

Undergraduate

Lower Division

Introduction to Human Anatomy - now given as a service course, designated as Zool. 219-3. To be continued as a service course for physical therapy, physical education, etc. majors.

Introduction to Entomology - continued as elective for new Department. Now taught as Zool. 212-4 by environmental faculty member.

Upper Division

Morphology of Non-Vascular Plants - Will be required of some majors. Presently labeled Bot. 311-4. Lectures and

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laboratories. Teaching shared between one person in organismic and one person presently in environmental groups.

Morphology of Vascular Plants - Will be required of some majors. Usually taught by someone who is currently a member of the environmental group.

NOTE: Both of these courses should properly be listed primarily in organismic biology.

Plant Physiology - Will be required by some majors in Organismic Biology. Currently taught by member of environmental biology group as Bot. 421. This is one area which we expect will be expanding more rapidly than others. Primary listing should be in organismic biology.

Plant Embryology - Should be developed at undergraduate level, and would be required of certain majors in the Department. The graduate course which has been given in the Department of Biology has been taught by a member of the proposed Population Studies group, and there has also been a course labeled Developmental Plant Anatomy previously given in the Department, and taught by a member of the proposed Environmental Biology group. This is really plant embryology under a different name.

Essentials of Animal Physiology - This course has been taught (with the word human instead of animal) for many years, and has been modified extensively over the years. It will be a required course for many of the majors in

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the Department of Organismic Biology, and in addition, is likely to be elected by majors in other Departments. Further, it has been an important course in the curricula of several professional programs. It will continue to grow, and if curricula such as pharmacy, medical technology, physical therapy, and physical education increase, this course (now Zool 322-3) will also grow, in proportion to growth in those curricula. This is, of course, an imponderable for our Department. One of the unfortunate aspects of a course such as this is the fact that often without notice and without additional financial aid, we may have a sudden increase in numbers.

Comparative Vertebrate Anatomy and Embryology - This course (Zool. 313-5) is a course which will be required of most majors in the Department of Organismic Biology, and very likely will be required by students in other Departments, as well as being elected by many others. It is taught by a member of the proposed Department of Organismic Biology. We have no doubt that there will be continually increasing demand for this course.

Invertebrate Zoology - (Zool. 411-5 its present designation) will be required of some majors in the organismic biology program. It is currently taught by a member of the proposed environmental biology group. As the years go by, that person will likely want to move out of that course and there will be need for replacement, with the replacement being rostered in the organismic biology group. The person selected would likely be an invertebrate physiologist or invertebrate embryologist.

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Advanced Comparative Anatomy of Vertebrates - This course will be initiated next year, and taught as an elective for majors in the Department. It will become a required course for some majors. It is designated as Zool. 416-4.

Cell Physiology - Presently taught by a member of the organismic group as Biol. 421-3 and to be changed to Biol. 421-4 in fall of 1968. This will be required of certain majors in the organismic biology program, even if it is taken over by the new Department of Cellular and Molecular Biology. It will be prerequisite to organismic physiology courses in the Department of organismic biology.

Comparative Vertebrate Physiology - Presently taught by a member of the organismic group, and will be continued. Designated as Zool. 421-3 and should be 4 instead of 3 credits.

Comparative Invertebrate Physiology - This course is planned for development as soon as staff is available, and will have high priority in the proposed Department of Organismic Biology. Will probably be a 4 credit course.

Independent Study program for undergraduates. The group in organismic biology is planning major expansion of opportunities for undergraduate research, as rapidly as space and equipment becomes available.

Graduate

Experimental Embryology of Vertebrates - Now presented by a member of the organismic biology group, as Zool. 561-4. It should be continued and will probably grow rapidly. How this will stand in relation to the new Department of Cellular and Molecular Biology is difficult to say.

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Experimental Embryology of Invertebrates - This course is one which is at present planned for development when staff and facilities are available. But it might go into the new Department of Cellular and Molecular Biology.

Expermental Analysis of Plant Development - Should be developed as a course in either organismic or Cellular and Molecular Biology. Will require staff and facilities.

Advanced Plant Physiology - Now taught as Bot. 521-3. It will be continued and perhaps expanded. It will grow in number of enrollees. Now taught by a member of the environmental group.

Comparative Endocrinology - This is a new course to be initiated next academic year as Zool. 528-3, and will be taught by a member of the organismic group. When facilities are developed, it will be changed to a laboratory course at the 4 credit hour designation.

Seminar in Endocrinology - Currently taught as Zool. 623-2, by a member of the organismic group. Will be continued and will likely grow significantly.

Neurophysiology - Currently taught on seminar basis as Zool. 525, by a member of the organismic biology group. With addition of facilities, laboratory activities will be developed. Should increase in enrollment.

Insect Physiology - Proposed as a new course for inclusion in the curriculum as soon as facilities and staff are available.

Courses in Physiological Responses to Environmental Stresses - Working especially with the laboratories at Fitzsimons

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General Hospital, headed by Professor-adjoint J. P. Hannon, we plan to develop courses in the overall aspects of physiological adaptations to extremes of temperature, aridity, altitude, etc.

Mammalian Physiology Laboratory - It will be necessary for us to provide research training in mammalian physiological techniques, which will provide backgrounds for the development of surgical skills necessary for animal experimentation. This will be taught as a formal laboratory course in part, and what is learned in this course will then be used in laboratory activities of some of the other courses listed above.

PERSONNEL

Present Faculty

Boulder Campus

Criley, Bruce	1.00 FTE	
Mayer, William	0.00 "	(BSCS)
Norris, Charles	1.00 "	
Norris, David	1.00 "	
Smith, Hobart	1.00 "	(beginning Fall, 1968)
Smith, James	1.00 "	
Winston, Paul	1.00 "	
	6.00 FTE	

Adjoint

Hannon, John P.

Associates from Denver Center

Brockway, Alan
Hartman, Emily
Schultz, Phyllis

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Needed Faculty (for optimal implementation of program)

Invertebrate physiologist	1.00	
Invertebrate embryologist	1.00	
Developmental plant physiologist	1.00	
Mammalian physiologist-anatomist	1.00	
Mathematician (systems modeling)	0.50	(shared with Pop. studie:
Neurophysiologist	1.00	
	5.50	

This would provide a total of 11.50 FTE's

In addition, we expect to add one or two additional Professors-adjoint.

INSTRUCTIONAL LABORATORIES

Anatomy and descriptive embryology laboratories - upper division

Comparative Vertebrate Anatomy and Embryology
Advanced Vertebrate Anatomy
Introduction to Human Anatomy

Sharing 2 laboratories

2 x 30 x 45 = 2700 a.s.f. + 30% auxiliary 3510 a.s.f.

Morphology of Plants
Plant Embryology

1 x 30 x 45 = 1350 a.s.f. + 30% auxiliary 1755 a.s.f.

Invertebrate Morphology
Introduction to Entomology

1 x 30 x 45 = 1350 a.s.f. + 30% auxiliary 1755 a.s.f.

Experimental embryology laboratories - graduate

Animal and Plant Sharing

1 x 20 x 60 = 1200 + 30% auxiliary 1560 a.s.f.

Physiology - upper division

Essentials of Animal Physiology

1 x 30 x 45 = 1350 a.s.f.

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Comparative Vertebrate Physiology
Comparative Invertebrate Physiology
Cell Physiology (may be taken over by new Department)

1 x 30 x 45 = 1350 a.s.f.

Plant Physiology and Advanced Plant Physiology

1 x 30 x 45 = 1350 a.s.f.

Total instructional for physiology (undergraduate)	4050
Auxiliary space shared 30% x 4050	1215
U.D. Physiology sub-total	5265 a.s.f.

Physiology - graduate

Advanced Animal Physiology courses, with one specially designed for mammalian

2 x 20 x 60 = 2400 + 30% auxiliary	3120
Greenhouse	1800
sub-total	18765 a.s.f.

Space for independent study

6 x 120 = 720 + 30% auxiliary	936 a.s.f.

Thesis research rooms for graduate students

12 x 120 = 1440 + 30% auxiliary	1872 a.s.f.
Total Instructional Laboratory Space	21573 a.s.f.

Faculty Studies

12.5 x 120 = 1500 a.s.f.

Chairman Office

1 x 200 = 200 a.s.f.

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Secreatries' Office Space

2 x 60 = 120 a.s.f.

Teaching Assistants

8 x 60 = 480 a.s.f.

Research Associates

10 x 120 = 1200 a.s.f.

Technicians (animal caret:kers, etc.)

3 x 120 = 360 a.s.f.

Subtotal Offices 3860 a.s.f.

Research Laboratories

Faculty (including adjoint)

14.5 x 110 = 1595 + 40% auxiliary 2233 a.s.f.

Research Associates

10 x 110 = 1100 + 40% auxiliary 1540 a.s.f.

Research Assistants

10 x 110 = 1100 + 40% auxiliary 1540 a.s.f.

Subtotal research labs 5313 a.s.f.

Special Joint use Research Facilities

Approximate 2000 a.s.f. 2000 a.s.f.

TOTAL FOR ORGANISMIC 32,746 a.s.f.

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UNIVERSITY OF COLORADO

BOULDER, COLORADO 80302

Department of Environmental,
Population and Organismic Biology

August 24, 1974

TO: EPO BIOLOGY FACULTY

FROM: ADVISING COMMITTEE (S. Shushan, Chrm., E. Bonde, O. Williams)

RE: ADVISING PROCEDURES & POLICIES

Enclosed are copies of the requirements for majors in biology as they existed under the old "Division" system. Please base your advising on these programs.

Suggested courses in CHEMISTRY, MATHEMATICS, and PHYSICS:

CHEMISTRY: Students lacking high school chemistry should take Chem. 100-2, Chem. 103-5, and Chem. 106-5.

Students with high school chemistry background should take Chem. 103-5 and Chem. 106-5.

Subsequently, organic chemistry requirements can be fulfilled by Chem. 331-4 and Chem. 332-4 (or Chem. 335-5 and Chem. 336-5)

If physical chemistry is needed, consider Chem. 346-3.

(Note: Chemistry 101-4, 102-4, and 104-4 are considered terminal courses and are not recommended for science majors. Supposedly they are not accepted by other colleges or graduate schools.)

MATHEMATICS: This requirement can be met by Math. 107-3 (algebra) (or by 1.5 years of high school algebra) and Math. 108-3 (polynomial calculus).

The sequence of Math. 110-5 (algebra and trigonometry) and Math. 130-5 (analytic geometry and calculus) will also fulfill the mathematics requirement.

PHYSICS: The biology major's requirement can be satisfied by Physics 111-4, Physics 112-4, and Physics 114-1 or by the sequence Physics 201-5 and 202-5.

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UNIVERSITY OF COLORADO

College of Arts and Sciences

PLAN B (2 areas)
PLAN C (3 areas) : For Students Entering Arts and Sciences Fall 1968 and thereafter.

FOR DISTRIBUTED MAJOR:

The distributed major consists of a total of 60 semester hours earned in - Plan B, 2 areas OR Plan C, 3 areas - all of which must be within the College of Arts and Sciences (may not include Physical Education, Education, Home Economics, Business, Engineering, etc. as one subject).

PRIMARY SUBJECT - The primary area must contain a minimum of 30 semester hours. No more than 30 hours may be required. The grade point average in the primary subject must be at least 2.0; 30 hours of work must carry grades of "C" or better; 12 hours must be in upper division courses in which grades of "C" or better have been earned.

SECONDARY SUBJECT(S) - A minimum of 30 hours distributed in one or two departments. A secondary subject shall consist of at least 12 hours in one department.

LANGUAGE COURSES - No first-year course in English (100-101) or foreign language (101-102) may be used in satisfaction of the requirements of either a primary or a secondary subject.

REQUIRED COURSES for Plan B, 2 areas OR Plan C, 3 areas in primary subject --
See attached list for the required core courses for biology undergraduate majors. Fourteen (14) core courses are required together with a program of at least 16 additional hours approved by an advisor.

Note that for Biol. 423, prerequisites include organic chemistry, physics, and calculus.

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PROPOSED CHECK SHEET FOR DISTRIBUTED MAJORS

DISTRIBUTED MAJOR IN (primary subject) Biology ______________________

(secondary subject) ______________________

(secondary subject, if applicable) ______________________

PLAN - - - - - - - - - B C (circle one)

HOURS REQUIRED UNDER PLANS B and C

		(Check if fulfilled)
PLAN B:	Primary subject (30 hours "C" or better)	______
	12 hours of upper division	______
	2.0 average	______
	Secondary subject (30 hours)	______
PLAN C:	Primary subject (30 hours "C" or better)	______
	12 hours of upper division	______
	2.0 average	______
	Secondary subjects (30 hours distributed in both)	______
	At least 12 hours in one	______

MAJOR

Required Courses or Areas in Primary Subject:

See attached list for the required core courses for biology undergraduate majors. The 30 hours in biology must include the required core courses.

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College of Arts & Sciences - Degree Requirements

In addition to the basic Arts and Sciences requirements (foreign language, humanities, etc.), candidates for the Bachelor of Arts degree must fulfill the following minimum College requirements:

I. 124 credit hours with a 2.00 GPA. (Note: Incompletes, Conditionals and Failures, of course, do not count towards the 124-hour requirement.) No more than 45 hours in the student's major area will count toward the 124-hour requirement.

II. Of the 124-hour total, 40 must be upper division (i.e., courses numbered 300 or 400 or 500).

III. The final 30 hours of work in a student's degree program must be taken in the College of Arts and Sciences at Boulder, Denver or Colorado Springs.

IV. The student must follow the requirements for his major set by the department. The general College requirements for the major are:

A. Course hours: 30-45, 30 hours of C grade or better.
B. 16 hours must be upper division.
C. Courses from other departments or C.U. colleges may substitute for required courses, but will not count in the "30 hours of C or better" or in the "16 hours upper division."
D. For students entering Fall, 1968, and thereafter, the overall GPA in the major must be 2.00, and the 16 hours U.D. must be "C" grade or better.
E. No minor is required by the College. However, the major department may require courses outside the department or college. Such courses outside the department will NOT count as part of the "30-hour" major requirement.

V. The student must arrange for a statement of completion with the major department during the student's final semester.

**** ******

It is not required, but STRONGLY RECOMMENDED, that in the student's last semester junior year, or first semester senior year, he fill out a "Senior Page" order form in Hellems 152. The College Degree Requirements Office will then run a check on requirements and indicate what remaining work must be completed before the conferring of the degree. It is to be understood, however, that the final responsibility for meeting the requirements is the student's and NOT that of the Degree Requirements Office.

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UNDERGRADUATE PROGRAMS IN POPULATION STUDIES

The instructional and research programs in Population Studies focus on consideration of living things as populations. Attention is directed toward evolution, genetic, biogeographic, and theoretical biology, at all levels of complexity within the population. Of special concern are those attributes of populations which enable them effectively to maintain themselves in their specific environments. Population biology is sufficiently broad in its scope to provide the flexibility necessary to meet any student's needs and interests in that area. Interdisciplinary programs can be arranged for those students wishing to become broadly trained in several areas of knowledge, such as sociology, psychology, economics and political science.

Principal Pathways for Majors in Population Studies

The following suggested fields of specialization provide flexibility in preparation for advanced study in several fields:

1. Evolutionary biology
2. Population genetics
3. Biogeography
4. Mathematical and theoretical biology
5. Palynology (environmental history)
6. Systematic biology
7. Interdisciplinary, problem-oriented population studies

A. Courses basic for all biologists.

The Faculty specifically interested in Population Studies believe that all biologists should have a broad exposure to the various methods of studying living organisms. Therefore, the student should take courses in Environmental Studies (animal or plant (general) ecology) and in Organismic Biology (plant or animal physiology, anatomy and/or morphology).

B. Courses from other disciplines.

Depending on the student's program, certain other disciplines are essential to a well-rounded program.

1. Mathematics. College algebra and trigonometry, or equivalent. Statistics is essential for those interested in population genetics. For those interested in evolutionary and/or systematic biology, Math 272-3 (Introduction to Abstract Mathematics) is highly recommended.

2. Chemistry. One year of college chemistry, or advanced placement. Organic chemistry is recommended for all, and is required for population genetics.

3. Geology. All students interested in populations should select historical and/or physical geology.

4. Psychology. Those interested in behavior of populations should consider election of certain courses in the Department of Psychology.

5. Foreign languages. Those who wish to pursue graduate studies should elect a foreign language for which there is a significant research literature, or which will be useful in communication in large portions of the world.

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6. Computing science. All students should be familiar with computing machines and their applications in problems of populations. Depth of knowlege in this area requires special efforts to schedule appropriate types of courses, and should be done earlier in the student's career.

7. Sociology, and/or, economics.

As one example of curriculum for an undergraduate in population studies, the following list of courses would prepare the student in population genetics.

1.	General Biology (EPOB 101-102)	8 hours
2.	Principles of Ecology (EPOB 341)	3 hours
3.	Genetics (EPOB 383)	3 hours
4.	Plant Physiology (EPOB 321) OR Animal Physiology (EPOB 322)	4 hours 4 hours
5.	One course from any of the following areas: Morphology, Anatomy, Taxonomy of Plants or Animals	3 hours
6.	Population Genetics (EPOB 451/579)	3 hours
7.	Population Dynamics (EPOB 514)	3 hours
8.	Three courses from any of the following areas: Genetics, Ecology, Evolution (See catalogue for possibilities)	9 hours
9.	Biological data processing and information retrieval (Taximetrics, EPOB 573)	3 hours
10.	Mathematics through statistics (Math 482)	12 hours
11.	Chemistry through Organic (see catalogue for routes)	14 hours
12.	Populations Studies Seminar (senior year)	2 hours
	Total Biology	40 hours
	Total Mathematics	12 hours
	Total Chemistry	14 hours

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UNDERGRADUATE PROGRAMS IN ORGANISMIC BIOLOGY

The instructional and research programs in Organismic Biology focus on consideration of living things as individuals. Attention is directed toward morphological and physiological biology at all levels of complexity within the organism. Of special concern are those attributes of living things which enable them effectively to maintain themselves and to reproduce in their specific environments. Organismic biology is sufficiently broad in its scope to provide the flexibility necessary to meet any student's needs and interests in that area.

Principal Pathways for Majors in Organismic Biology

The following suggested fields of specialization provide flexibility in preparation for advanced study in several fields of biology; they can also serve as effective premedical or predental curricula.

1. Morphological biology
2. Functional biology
3. Microbial biology
4. Behavioral biology
5. Systematic biology

Below are suggested guidelines for election of courses in the listed fields.

A. Selection of courses in the core program.

All biologists should have more than elementary backgrounds in environmental biology and genetics. Therefore students should elect EPOB 383 (Genetics) and one of the field-oriented courses (EPOB 331, 332, or 341).

B. Recommended and/or required courses in other Departments.

These vary somewhat, depending on the field of specialization. Courses listed without qualifying statements are required of all students in Organismic Biology.

1. Chemistry. One year of college chemistry, or advanced placement. Organic chemistry is recommended for all, and required of those in physiological and microbial pathways.

2. Physics. One year of college physics recommended for all, and required of those in physiological and microbial pathways.

3. Mathematics. College algebra and trigonometry, or equivalent. Calculus recommended for all, and at least one semester is strongly recommended of those in physiological and microbial pathways. Statistics is strongly recommended.

4. Geology. Those interested in morphology and systematic biology should consider courses in paleontology.

5. Psychology. Those interested in animal behavior, as well as some aspects of physiology should consider election of certain courses in the Department of Psychology. Some of these are cross-listed in biology and will count directly toward the major.

6. Foreign languages. Those who wish to pursue graduate studies in biology should elect a foreign language for which there is a significant research literature, or which will be useful in communication in large portions of

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the world. In the former case, French, German, and Russian are especially important. Two years will satisfy graduate language requirements in some departments.

C. Suggested courses in field of specialization.

Specific selections should reflect pathway chosen and the kinds of organisms which are of special interest to the student. 500-level courses are open to qualified seniors with written permission of the instructor.

1. Morphological biology. Students should elect at least one physiology course (EPOB 321, 322, or 423) and bacteriology (EPOB 301). Others may be selected from the following:

EPOB 303 - Introd. to Entom.
EPOB 311 - Morph. Nonvasc. Plants
EPOB 312 - Morph. Vasc. Plants
EPOB 408 - Principles of Comp. Vert. Anat.
EPOB 409 - Lab Studies in Comp. Vert. Anat.
EPOB 411 - Invert. Zool.
EPOB 414 - Mycology
EPOB 461 - Embryology

Taxonomy courses (430 series) are especially useful for those interested in evolution.

2. Functional biology. All students should elect one or two morphology courses, selected from the list under C. 1.

a. Animal Physiology. Basically pertinent courses are:

EPOB 423 - Cell Physiology
EPOB 422 - Vertebrate Physiology

Other courses:

EPOB 321 - Essen. Plant Physiol.; Chem. 481, 482, - Biochem.
EPOB 461 - Embryology
Some 500-level course(s) in physiology, (endocrinology, neurophysiology etc.)
EPOB 443 - Animal Ecology.

b. Plant Physiology. Basically pertinent courses are:

EPOB 321 - Essentials of Plant Physiology
EPOB 551 - Adv. Plant Physiology
EPOB 423 - Cell Physiology

Other courses:

EPOB 341 - Principles of Ecology; EPOB 331 - Field Botany; EPOB 312 - Morph. Vasc. Pl., Chem. 481, 482 - Biochemistry; EPOB 441 - Plant Ecology; EPOB 430 - Classification of Flowering Plants.

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3. Microbial biology. Basically pertinent courses are:

   EPOB 301 - Biology of Microorganisms
   EPOB 423/566 - Cell Physiology
   EPOB 425 - Microbial Approaches to Environmental Problems
   EPOB 561 - Microbial Physiology

   Other courses are:

   MCDB 384 - Molecular Genetics; EPOB 311 - Morph. Nonvasc. Plants; EPOB 411/526 - Invertebrate Zoology; EPOB 302 - Parasitology; EPOB 436 - Pathogenic Microbiology; Chem. 481, 482 - Biochemistry.

4. Systematic biology. In addition to rather generally useful background courses, the student should elect courses which are primarily botanical or primarily zoological.

   Basically pertinent general courses:

   EPOB 341 - Princ. Ecol.; EPOB 383 - Genetics

   Other recommended courses:

   EPOB451/579 - Population Genetics; Chem. 481, 482 - Biochemistry; EPOB 573 - Taximetrics; C. S. 201 - Introd. Comp. Sci.; Geog. 400 - Climatology; Geol. 102 - Historical Geol.; Geol. 207 Physical Geol.; Psych. 210 - Introd. Res. Method in Psych.

   Basically pertinent courses for botany specialty:

   EPOB 311 - Morph. Nonvasc. Plants; EPOB 312 - Morph. Vasc. Plants
   EPOB 430 - Classification of Flowering Plants.

   Other courses for botany specialty:

   EPOB 331 - Field Botany; EPOB 321 - Plant Physiology; EPOB 441 - Plant Ecology; EPOB 476 - Palynology.

   Basically pertinent courses for zoology specialty:

   Either EPOB 408-409 - Principles of Comp. Vert. Anat.-Lab Studies in Comp. Vert. Anat. or EPOB 461 - Embryology

   AND

   Either EPOB 411/526 - Invert. Zool., or EPOB 303 - Introd. Entomology.

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Other courses for zoology specialty:

EPOB 322 - Ess. Animal Physiol.; EPOB 431 - Insect Taxonomy; EPOB 432 - Biol. of Amphibians and Reptiles - EPOB 433 - Herpetology Lab; EPOB 533 - Mammalogy; EPOB 434 - Ornithology; EPOB 443 - Animal Ecology; EPOB 547 - Ichthyology; Geol. 341 - Intro. to Paleontology; Geol. 447 - Paleontology of Lower Vert.; Geol. 543 - Micropaleontology.

6. Behavioral biology. Basically pertinent courses:

EPOB 322 - Essentials of Animal Physiology
EPOB 424 - Introduction to Animal Behavior
EPOB 441 - Plant Ecology
EPOB 562 - Topics in Animal Behavior

Other courses:

EPOB 443 - Animal Ecology; Psych. 410- Behavioral Genetics; Psych. 425 - Comparative Psychology; EPOB 545 Comparative Endocrinology; Psych. 405 - Physiological psychology; Psych. 438 - Adv. Animal Behavior; Psych. 439 Adv. Animal Behavior Lab.

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Rev. Jun./74

Offerings and Undergraduate Requirements for Majors in

ENVIRONMENTAL BIOLOGY

1. Required Lower Division science and mathematics courses outside the life sciences include the following:
   Mathematics (one year), or through beginning calculus
   Chemistry (one year; lab course)
   Physics (one year; lab course) - 201-202 recommended
   Geology or Geography (1 semester of either Physical Geology or Physical Geography).
   Appropriate courses: Geology 101-4 (Physical Geological Science); Geol. 207- (Physical Geology); Geol. 341-4 (Introductory Paleontology); Geol. 425-3 (Groundwater); Geol. 436-4 (Glacial Geology); Geol. 463-3 (see Geog. 463); or Geography 100-4 or 101-4 (Physical Geography); Geog. 300-3 (Environmental Quality & Human Choice); Geog. 400-3 (Climatology); Geog. 301-3 (Biogeography Geog. (also Geol. 463) 463-4 (Principles of Geomorphology).

2. General Biology (101-4 and 102-4 or 105-4 and 106-4)

3. Required core courses:

A. Genetics	(EPOB 383)	3 hours
B. Physiology (one of the following)		
(1) Essentials of Animal Physiology	(EPOB 322)	4 hours
(2) Essentials of Plant Physiology	(EPOB 321)	4 hours
C. Morphology (one of the following)		
(1) Morphology of Non-Vascular Plants	(EPOB 311)	4 hours
(2) Morphology of Vascular Plants	(EPOB 312)	4 hours
(3) Principles of Comparative Vertebrate Anatomy	(EPOB 408)	3 hours
Lab Studies in Comparative Vertebrate Anatomy	(EPOB 409)	2 hours
(4) Invertebrate Zoology	(EPOB 411)	5 hours

4. General Ecology courses:

Plant Ecology	(EPOB 441)	4 hours
Animal Ecology	(EPOB 443)	4 hours

and one of the following

(1) Recent Advances in Animal Ecology	(EPOB 515)	3 hours
(2) Dynamics of Mountain Ecosystems	(EPOB 521)	3 hours
(3) Biological Oceanogeography	(EPOB 517)	2 hours
(4) Animal Geography	(EPOB 512)	3 hours

5. One taxonomy course:

(1) Field Botany	(EPOB 331)	3 hours
(2) Animal Kingdom	(EPOB 332)	3 hours
(3) Mycology	(EPOB 414)	3 hours
(4) Classification of Flowering Plants	(EPOB 430)	4 hours
(5) Insect Taxonomy	(EPOB 431)	4 hours
(6) Biology of Amphibian & Reptiles	(EPOB 432)	3 hours
Herpetology Lab	(EPOB 433)	2 hours
(7) Mammalogy	(EPOB 533)	4 hours
(8) Ornithology	(EPOB [illegible])	[illegible] hours
(9) Algology	(EPOB 554)	3 hours
(10) Lichenology	(EPOB 555)	3 hours
(11) Plants of Colorado	(EPOB 446)	3 hours

None of the above courses may be [illegible] Pass/Fail.

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Major in BIOLOGY with EDUCATION Rev. 9/71

NOTE: This program will be given only with the 20-hours-in-education plan and is provided only for the convenience of students going into secondary school teaching.

1. Total hours required: 36-39
   Total hours upper division required: 19-25

2. Distribution of hours over the following fields or areas:

A. In the major department:

	General biology, Biol. 101-102 or scores of 4 or 5 in the Advanced Placement Test in biology, or Biol. Sci. 103-104	8	hrs
Biology 383-3	Genetics	3	hrs
Biol. 321-3 - Essentials of Plant Physiology, or Biol. 322-3 - Essentials of Animal Physiology, or Biol. 422-3 - Vertebrate Physiology, or Biol. 323-4 Cell Physiology	Physiology	3-4	hrs
Biol. 341-3 - Principles of Ecology	Ecology	3	hrs
Biol. 331-3 - Field Botany or Biol 3[illegible]-3 Field Zool.	Field Biology	3	hrs
Biol. 312-3 - Morphology of Vascular Plants.	Plant morphology	3	hrs
Biol. 313-4 - Comparative Vertebrate Anatomy, or Biol. 411-5 - Invertebrate Zoology, or Biol. 431-4 - Insect Taxonomy, or Biol. 303-4 - Intro. to Entomology, or Biol. 302-3 - Parasitology.	Animal morphology	3-5	hrs
Biol. 301-3 Biology of Microorganisms	Bacteriology	3	hrs
Biol. 400-3	Teaching of Modern Biology	3	hrs
Biology	Elective	4	hrs

B. In related fields:

Chem. 101-4, 102-4 General Chemistry, or Chem. 103-5 & 104-4 General Chemistry, or Chem. 103-5 & Chem 106-5 General Chemistry	College Chemistry	8-10	hrs
Phys. 201-5, 202-5 General Physics; or Phys. 111-4, 112-4, 114-1 Gen. Physics.	College Physics	9-10	hrs

3. Grades of "C" or better are required in 16 hours of ~~the required~~ U.D. Biology courses.

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UNDERGRADUATE MAJOR IN BIOLOGICAL SCIENCES

Department of Environmental, Population, and Organismic Biology, and

Department of Molecular, Cellular, and Developmental Biology

A. Undergraduate Degree Program in Biology

The Undergraduate Major in Biological Sciences may be obtained through the Department of Environmental, Population, and Organismic Biology (EPOB) or the Department of Molecular, Cellular, and Developmental Biology (MCDB). All three programs listed below lead to the B.A. Degree in the College of Arts and Sciences. All candidates for the B.A. are expected to fulfill the core requirements, described under section B, below; additional course work is then selected by the student, in consultation with his advisor, depending on the area of concentration in which he wishes to work. Each program has some specific requirements, as well as recommendations, which are described in separate summaries obtainable from the EPOB and MCDB offices. Alternative programs may be authorized by the Undergraduate Committee Chairman in either Department.

1. Regular Biological Sciences Major, via either EPOB or MCDB. Students must satisfy the core requirements and elect one of the following programs:

   a. EPOB - each student must complete the core program of 17 to 19 hours, including one course from each group, plus additional hours for a minimum of 30, approved by the advisor.

      (1) Environmental Biology - concentrating on the interaction between living things and their environments.

      (2) Population Studies - concentrating on such areas as population genetics, biosystematics, and evolution.

      (3) Organismic Biology - concentrating on attributes of living things as individuals, including morphological, physiological, and behavioral aspects.

   b. MCDB - each student develops a program which includes core courses of 14 to 16 hours, plus other courses for a minimum of 30 hours, in consultation with his advisor.

2. Distributed Studies, with Biological Science as primary area. Each student must satisfy the core requirements of the appropriate Department plus additional course work sufficient for a minimum of 30 hours, and appropriate courses in secondary subjects, in accordance with the Rules of the College.

3. Biological Sciences with Education (via EPOB only) - this is a special program for students planning careers in secondary school teaching, for which a summary is available from the EPOB office.

Each student is to consult with the Undergraduate Advising Coordinator of the appropriate Department, for assignment to an advisor, who will assist the student in drawing up a specific list of course requirements, and will be responsible for advising the student throughout his undergraduate career. Because there are many kinds of careers open in Biological Sciences, curricula in these areas are liberal,

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and can be drawn up in accordance with the special plans of the student. Courses from other Departments can, with the approval of the advisor, be counted toward the major. Advisor assignment changes are permitted at any time, with the Coordinator's approval.

B. Required Core Courses

All students majoring in Biological Sciences are expected to complete the courses indicated under the first three categories as early as possible in their undergraduate careers, for a total of 14 to 16 hours. In addition, students in EPOB must complete a course in category 4, for an additional 3 hours.

1. General Biology (EPOB 101 and 102 or MCDB 105 and 106 or equivalent) 8 hours

2. One of the following:

   a. Genetics (EPOB 383) 3 hours
   b. Molecular Genetics (MCDB 384) 3 hours

3. One of the following

   a. Essentials of Plant Physiology (EPOB 321) 4 hours
   b. Essentials of Animal Physiology (EPOB 322) 4 hours
   c. Cell Physiology (EPOB 423/566) 4 hours
   d. Morphology of Vascular Plants (EPOB 312) 4 hours
   e. Comparative Vertebrate Anatomy & Lab Studies in Comp. Vert. Anat. (EPOB 408-409) 5 hours
   f. Cell and Tissue Biology (MCDB 312) 4 hours
   g. Developmental Mechanisms (MCDB 362) 4 hours
   h. Embryology (MCDB 461, EPOB 461) 4 hours
   i. Invertebrate Zoology (EPOB 411) 5 hours

4. One of the following (EPOB only)

   a. Plant Ecology (EPOB 441) 4 hours
   b. Animal Ecology (EPOB 443) 4 hours
   c. Principles of Ecology (EPOB 341) 3 hours
   d. Field Botany (EPOB 331) 3 hours
   e. Animal Kingdom (EPOB 332) 3 hours

C. Courses in ancillary sciences.

Depending on the program selected, students will be required to take college level courses in other sciences, especially chemistry, physics and mathematics, with specific requirements in accordance with the Departmental program requirements. Additional information can be obtained from the office of the Department concerned.

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