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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.

UNIVERSITY OF COLORADO

BOULDER, COLORADO 80302

COLLEGE OF ARTS AND SCIENCES

OFFICE OF THE DEAN

August 27, 1968

Professor David J. Rogers
Department of Biology
Hale 112

Dear Dave:

As you know, the All University Council on the Biological Sciences has submitted to me some recommendations concerning restructuring of the Department of Biology. While the Council has not yet arrived on a concensus position regarding the relationship of faculty members in Denver and Colorado Springs to the Boulder organization, it seemed appropriate to me to submit the primary recommendations to the Planning Committee of the Department of Biology for discussion and reaction. Professor Löve has passed on to me a recommendation of this Planning Committee consisting of representatives of the proposed areas in the discipline along with a representative from the old Planning Committee to constitute a committee on reorganization which would advise and assist Professor Löve in implementing the reorganization. I am pleased to concur with this suggestion, and would like to ask you to serve as the representative from the program in Population Studies on this committee.

Thanking you for your help in this matter, I am

Sincerely yours,

Bill

W.E. Briggs
Dean

jb

cc: Professor Löve
Dean Wahlstrom

ALL UNIVERSITY COUNCIL ON BIOLOGICAL SCIENCES

LLoyd Kosloff	Dept. Microbiology, Medical Center
Wilhelm R. Frisell	Dept. Biochemistry, Medical Center
Larry Morse	Dept. Biophysics, Mail Container 2661, Medical Center
Alan Brockway	Dept. of Biology, Denver Center
John de Fried	IBG Bldg., East Campus
John Elcher	Geology 133
Gene Erwin	Ekeley 263, Pharmacy
Jack Ives	INSTAAR
Edwin McConkey	PSR 1, Room 126, IDB
Horace Quick	Geography, Bugg. 102A
Fred Ramirez	Chem. Eng. EC OT 3-6
Hugo Rodeck	Museum 207
David J. Rogers	Armory 101a
Kurt Schlesinger	Psychology, Ketchum 11A
Dean Katherine Smith	Nursing, Medical Center
John Windell	Biology, Hunter 104D
Michael Yarus	Chem 327
David Greene	Anthropology, 18E Hellems
William E. Briggs	Hellems 102

MEMORANDUM

To: Professor David Rogers, Biology Department

From: R. Curtis Johnson, Chemical Engineering Department

Copy: Professor Kurt Schlesinger, Psychology Department

Subject: All-University Committee on the Biological Sciences

Date: June 5, 1968

After attending the last three meetings of the All-University Committee on the Biological Sciences, I thought I would put down a few comments for the consideration of your five-man committee which is in the process of writing some revisions. It is difficult in the larger committee to get the floor long enough to make a case and it is hard to say some of these things without appearing to be a total s.o.b. when actually that is not the intention. On the other hand, to avoid certain of the facts that seem self-evident to us outsiders is to avoid getting down to the real issues of the case. Therefore, it seems wise that we put down some terse thoughts that might be helpful in the considerations of your committee.

Regardless of the arguments which are made pro and con, I think there are two statements which need to be made which sum up the situation, both of these statements having been made by various people during the last six hours of meetings.

1) The main reason the biologists on this campus wish to separate from each other is that they can not live with each other.

2) The main reason that you (meaning all the biologists present) have reacted unfavorably to the idea of retaining a department is that each of your divisions would not have equal administrative rank with cellular, molecular and developmental biology.

It is not easy to make these statements to some of you gentlemen who are relatively new and have had nothing to do with the development of the animosities which exist within the department and yet on whose backs fall the monkey of pulling this thing out of the fire and making the science of biology a meaningful one on this campus. I do not envy you your position in trying to do this.

I would like to suggest that this procedure is one which should be allowed: there must be someplace within the Biology Department a man who possesses these particular attributes: 1) everybody likes him, 2) he has good administrative potential, and 3) he hasn't been here long enough to take sides. I would suggest that a man like this be asked to serve an

interim period for about three years as a departmental administrator. There is no implication in this, and this should be clearly stated to him, that there will be any permanent administrative job, at least at this time, for him here. He is being asked to step in to handle details of reorganization while this reorganization is going on.

I would then divide the department into the three areas that you have recommended but as sub-sections of the department, as is done successfully in psychology and in chemistry. The department constitution would be scrapped. Each group could operate as it wished in giving instructions to a leader that it appoints.

The group leaders of each of these three groups and the departmental administrator form the committee for dealing with the administration of the university, for the allocation of resources into the sections of the department, and the evaluation and hiring of new personnel.

I would encourage you, at the same time you are mapping this out, to supply us with the budget information which we have asked for. It seems incredible that a group this large would make the proposals for sweeping reorganization without coming forth with the exact budget figures. I do not mean that you have to come up with a figure for every sheet of paper you use. What we're concerned with is, is it going to cost twice as much to run the three departments or a department with three sub-sections than it does to run the department without these? (My guess is that it wouldn't cost that much more but I would have to see figures if I were in the position of the people having to decide on the budget.)

There are two advantages to this. One is that if you have to produce figures this means that you really have thought about budgets (and far too few professors do think about budgets). And second, as I pointed out at a recent meeting, I think the function of this committee is to furnish the university with a good biology program. We have good biologists here. Just because they can't get along with each other doesn't mean they aren't good. We are honestly desirous of being as helpful as possible but we have to have the facts in order to be helpful. One way in which we can be helpful is to help you scream at the administration and say that the funds which you have been supplied are totally inadequate for the purposes to which they are to be applied and therefore we feel that more funds should be allocated to your departments. Unless we have these figures, however, we have no basis of comparison with the figures in other departments and we can not honestly say whether you're being financially mistreated or not, even though we believe you when you say that you are.

I would also want to examine further the Kozloff committee's recommendations regarding the School of Life Sciences because I think this is a viable recommendation which should be followed very closely and prepared for as an administrative entity that may come into existence in the future. You may as well prepare your department to slip right into that and perhaps at that point to break into separate departments if this is what is still desired as of the time the new college would take shape.

There are several points in the Kozloff report and I have not had time to examine the recent bulletins to see if there's any change in these. These are not necessarily items for consideration by the committee, but I would like to make these comments. It seems incredible to me that any biology program would be considered good if the students did not go through at least differential equations and did not carry chemistry at least through the sophomore year, that is, organic. It also seems incredible that one can presume to be a good biologist without being a good statistician and I do not notice statistics courses being required. Also, one can not be a good scientist of any kind at this point without being quite competent in the use of computers and I do not see computer courses in the required list of courses. Even though my last biology was taken (would you believe 30 years ago), in high school and consequently I can not speak with much authority regarding modern biology, I still find it difficult to conceive that one can be a decent biologist without having a heavy dose of mathematics, computers, statistics and organic chemistry.

I hope that some of these ideas may be of some use to you. Again I want to assure you that most of us are interested in seeing that you do have a good biology program and we want to help you but we feel a strong responsibility to the university in that any recommendations that we make must be in the best interests of the university. We hope that these can be made and that results can be achieved without hurting any one individual or any group within biology, but I suppose, to be realistic, if we have to make a choice between doing what is best for the university (meaning, at least to me, what is best for the students in the university) as opposed to what is best for certain members of faculties of biology, then I suppose the faculty will have to suffer. I think with a little patience we can make almost everybody reasonably happy and that's about the best one can hope for.

TO: Professor David Rogers, Biology

FROM: R. Curtis Johnson, Chemical Engineering

CC: Kurt Schlesinger, Psychology

SUBJ: AUCBS

Date: July 11, 1968

I am now back in town and find myself even more crowded than before, so I'm afraid I cannot really do justice to responding to your memorandum of June 10. I indicated to you on June 21 that I had received (and appreciate your writing) this memorandum, and that I hoped to give it some concentrated thought after I had returned to town from a trip.

Somehow, I still am not convinced of the case that you wish to present -- that the departments as proposed are essential. I am in no position to say that the subdivision of biology is sensible or not, and that is not my point. My question is still whether these should represent three departments reporting to the Dean, or three semi-autonomous subdivisions reporting to a head or chairman who then reports to the Dean. There is some problem with being further down the administrative ladder; on the other hand, it would appear better to me to have the three semi-autonomous subgroups reporting to a man who had some understanding of biology, and who was concerned with only those three subgroups rather than reporting to the Dean who has 20 or 30 departments reporting to him and who does not have the background in biology.

I am not sure whether the divisiveness which you refer to has been "started by those who have pulled out" or by other people. In other words, Molecular and Cellular biology was apparently formed when it was evident that the Biology Department as constituted at the time of the NIH proposal could not possibly compete for NIH funds, whereas a new group could. As far as I know, there were some biologists and some nonbiologists in the committee that made this proposal, and did it successfully. I am not familiar enough with the backgrounds or the legal or administrative structures of the other groups, such as Artic and Alpine Research, Developmental Biology, and Behavioral Genetics in order to comment on why these have been formed as they have been.

I still feel that the strongest case will come when you react opposite to what you have stated at the bottom of page 2. In other words, even though the development of a Life Sciences School might be "beyond our charge", I still feel that it might be the function of this committee, or at least the wisest move, to make some recommendations in this regard. I do agree strongly with you at the top of page 3 where you say, "If you look carefully into the record, you will find this to be our central difficulty -- administrators who do not wish to administrate". (I attach a reprint of a little letter to the editor entitled "Managers Are No Good", that stirred up at least some minor interest, and does express some of my opinions in this regard.)

Professor David Rogers, Biology July 11, 1968

I am also in basic agreement with you in regard to your comments on curriculum -- namely that flexibility is very important. In particular, I would point out that I try to see to it that no two of our chemical engineers are on the same program. Whether this happens or not, I don't know, but each man is advised individually, his interests and abilities are evaluated, and we then tailor a specific program to this man, at times throwing out so-called sacred courses. So I'm all in favor of a flexible program.

I am concerned with your comments about organic chemistry, and I see the logic to your statement that the type of organic that is taught may not be applicable to biology. I think it is unfortunate if, as I recall, the biochemistry courses offered later required organic chemistry as a prerequisite. Is it possible that we should have a more elementary organic chemistry that was directed toward biology rather than toward, say, petroleum chemistry? I don't know -- I'm just tossing this out as a possibility. Some of our troops have had trouble in the biochemistry courses. In fact, one of our graduate students, a top-notch man, ended up with a D in biochemistry, which shook us up considerably. On the other hand, we have a strong need for this so we don't know what to do.

I gather from your last paragraph on page 3, continued on page 4, that you weren't too happy with my meddling around with the program; I can say only that I asked the questions I did concerning mathematics, chemistry, computers and statistics because I felt they had to be asked. The best person to find loopholes in a program is often one who is relatively unfamiliar with it, and therefore unbiased by a knowledge of can't or shouldn't be done. Regarding your statement that perhaps we couldn't have a decent engineer until he's had biology, both general and ecological, I would resent someone telling me this had to be done; however, in this particular case I agree with this statement, and we're trying our best to get more of our engineers into these courses. Actually, we're making major use of the bioengineering course taught by Igor Gamow, but I am interested in finding an ecology course, since this, in particular, will give our men a better appreciation of the problems they create or solve by the design of proper waste-disposal systems associated with chemical facilities. We're also trying to make decent citizens out of our students and this is a difficult problem at times with tough curriculum plus the four-year limitation.

I'm not sure that I've added too much to the exhange of correspondence and information here. I'm sorry that I don't have the time to study it in more detail now. I am looking forward to the recommendations which come out of the five-man subcommittee, because I think the representation is broad enough and at the same time the committee is small enough that maybe something will get done. We're still on your side if we can just define it.

R. Curtis Johnson

Professor David Rogers, Biology July 11, 1968

P. S. As I recall, from reading a proposal to the NSF for additional computing facilities on this campus, you are quite active in that area. Your vita, if I am correct, showed your obtaining a Ph.D. from Washington University in 1951. That's the year I finished mine from Penn State and went to Washington University to teach in chemical engineering.

RCJ

RCJ/gf

Dave Rogers

LETTERS

MANAGERS are no good: managers are NO GOOD

DEAR SIR:

Perhaps the intent of this communication is best expressed by a slight adjustment of the title, using a good old four-letter word first as an adjective, then as an adverb. We really should call this "Damn Managers Are No Good; Managers Are No Damn Good."

Take any good, well-respected, reasonably successful technical or professional man. Suppose you engage him in conversation and suggest to him that, because he is so successful and has gone through a rigorous educational program and holds down a tough job, he must be pretty bright. Therefore he should without any difficulty be able to out-fiddle Heifetz, out-slug Cassius, or out-drive Parnelli. This man being, as we said, reasonably bright, would immediately say that he is not trained or experienced as a violinist or fighter or a racer, and it is ridiculous to suggest that he should be able to compete with these professionals on their own terms and territory. Now take any one of these supposedly bright chaps and suggest to him that, because he is *not* trained and *not* experienced in the area of management, he would of course *not* be a good manager, and he will be immediately insulted. Of course he is capable of managing anything that somebody asks him to manage! After all, it's just a matter of common sense. (These are the same people who are known to look down upon the professions of psychology as common sense and philosophy as nonsense.)

In these apparently contradictory statements there is a dilemma with serious consequences which threaten many an otherwise successful operation. Now that I am back in teaching I am frequently asked "What did you learn in industry?" One of my answers, given only half facetiously, is that, if I learned any one thing, it was how *not* to run a business. If pinned down for more details I can point out that I worked for one of the most forward-looking, advanced, and stimulating organizations of its type at its time, a tremendous technical success, and even bigger financial flop. Why? The answer to those of us who were involved is fairly clear and simple. The management of our company equated, per se, the technical accomplishments or ability of individuals to managerial ability. Never once did they recognize the necessity for training and psychological conditioning that is essential to a good business operation. Never once were promising young management personnel singled out and given special training to prepare them for advanced management. Never was a good example set by a manager up the line for those below him to emulate. The result is well predicted. The company went out of the particular business, and other companies, far less proficient in the technical aspects, but much more management-oriented, took over the sales, the men, and the ideas from my company. Combining this technical talent with already-present managerial ability, they are carrying on successfully.

The first half of the title is a statement which I have heard many times. The word manager carries a sad connotation with many technical men. They refuse to admit it as an honorable profession. They scorn the people who enter it seriously. They do everything possible to get around the rules and regulations laid down by management. They avoid cooperation whenever possible and contribute to the early demise of a company which would otherwise be destined for both financial and technical success.

The second half of the title is a sheer statement of fact. Because of the placement, in responsible management positions, of people who have obvious intelligence and technical ability and expecting them to function as businessmen, we do indeed end up with a bunch of intelligent boobs trying to make decisions for which they are totally unqualified, and in reality they are "no damn good."

The possible impact of these attitudes and situations is serious, indeed, on our whole approach to American business, and in fact on our entire national economy. The men who are failures in management at a particular company very frequently end up in a floundering management at another company, and some of them move from company to company spreading disaster like Typhoid Mary.

The people on the outside tend to think life within the university is serene; the intellectual capacities of the faculty transcend all petty differences; the native intelligence and abilities of those chosen to lead will overcome all financial, business, and organizational obstacles. It just ain't so. As one runs into his colleagues across the country and compares notes on situations which exist, one comes to realize that much university administration is a well-concealed fiasco and that management in the university is little better than, say, that of the aerospace industry (which, from conversations and direct observation, rates very well at the bottom of the league, managementwise). The interesting thing is that the same attitudes which are prevalent among the professional men in industry are also prevalent, and perhaps even stronger in the university. A brilliant professor with 248 publications and a reputation as an outstanding lecturer is made a department chairman or dean. Only later, after the department finances are completely ruined, the appointments are loused up, and the files are a complete shambles, do people come to realize that this man couldn't figure his way out of a grocery store without the help of his six-year-old son. The situation, in general, exists, whether in political science, or music, or medicine, or engineering. The man selected is in many ways supposed to be a figurehead. He is supposed to maintain his scholastic rating among his peers across the country and perhaps put in an incidental hour or so, maybe on a Sunday afternoon, keeping the affairs of the department or college or division squared away and running like a watch . . . like one with wooden wheels, maybe.

The time has come for a clear realization that management is an important and honorable function in its own right. People who choose to be managers do so, recognizing that they may have to make many unfortunate (from the viewpoint of others) decisions. They have to be the front man for an organization which may not be working as smoothly as it should. They have to pass on to their troops the word that the budget has just been cut and somebody has to go. They have to maintain order and discipline. They must see ahead and plan. They must interpret the feelings of their people to the administration and the desires of the administration to their people. They must, whether they like it or not, know something about financial affairs. They must know something about the psychology of handling people. They must know what their market is, whether it is for products or students or reports or what have you, and they must see that their organization produces this product at the lowest cost and must deliver it when it is needed. These responsibilities are not to be taken lightly. Even the smallest subunits of a university or a business may very well operate on a quarter of a million dollars a year—a quarter of a million dollars of state funds, federal funds, private industry funds, donations from hopeful alumni, deposits of customers—other people's money. Managers are, or are supposed to be, responsible. Many have the desire, the sincere wish, to produce. Very few of their superiors seem to recognize the necessity that this desire must be coupled with knowledge and understanding. Until it is, managers will be damned, just because they are managers, and because they are in fact no good.

R. CURTIS JOHNSON

Boulder, Colo.

1st Draft.

Report of the Committee on Formulation of
Recommendations to Dean Briggs

The AUCBS recommends the following reorganizational scheme for the present department of biology.

There should be one over-all department of biology, with three well-differentiated, semi-autonomous disciplinary groups (committees, areas, or divisions, but in this document hereinafter referred to as groups) as follows:

(1) Population Studies, dealing with theoretical and mathematical approaches to populations and evolutionary problems;

(2) Organismic Biology, dealing with descriptive, comparative and experimental studies of organisms, with the main emphasis on physiological and morphological approaches;

(3) Environmental Biology, dealing with interactions between organisms and their environments, including field, distributional, taxonomic, and experimental studies.

There should be, as well, a core program, with a director who is, ex-officio, a member of the executive committee.

The administration of the three groups and the core program should be by an over-all chairman and an executive committee of three, one chosen to represent each of the three disciplinary groups. The member of each group chosen for the executive committee should be designated as Associate Chairman. Each associate chairman should be elected by the members of the groups, and should have a tenure of four years.

The functions, duties and rights of the three groups and the core program should be those established in the plans already submitted by the groups. Each of the three groups should be free to select its own FTE's, subject to approval by the executive committee, the chairman, and the dean.

The requirements and influence of individuals of the three groups is made known to the whole department by voice in their individual groups, through the associate chairman of the group. Budgetary requests will be formulated by each of the groups, and be approved through the same channels as the FTE selection, with the chairman formulating the over-all budget for the department.

The chairman of the department should not be a voting member of any of the groups. In administrative matters of the executive committee, the chairman should have a vote, and his vote should break any tie.

The AUCBS recommends that the department abrogate its present standing rules and establish new rules which will provide a more flexible document for administration.

Further the council recommends that the Dean immediately authorize three new FTE's for the department, and that the designation and assignment to the groups be made by the executive committee and chairman of the department.

end of recommendation

Note to Committee Members

I think the above statements reflect the sense of our meeting Tuesday afternoon. I do not agree with the set-up for the chairman. I think such an arrangement puts him in academic no-man's-land, an unenviable position. Duties defined as above will make it very difficult to attract a candidate of any stature. Because of the desire to maintain the single administrative unit, this situation arises.

It seems to me valid, therefore, to have an alternative to the above recommendations, which offers the Dean some room for choice. The alternative

I would like to offer is the original plan made by the planning committee which you have seen. That plan was designed with the problems of the chairman in mind. It offers a solution to the difficulties we encountered when considering the chairman's position as a biologist himself. It also has the flexibility which we considered desirable, particularly with regard to the addition of new biological efforts on campus. That plan recognizes the existence of the new MCD department, giving it a role to play in curricular activities, which the one above does not.

I hope we can consider this alternative at our next session.

Another item which I trust that we can agree upon in committee, to be included as recommendations by the full council, concerns the size of the budget for the department. As the saying goes, money isn't everything, but the next thing to it is very far away. An infusion of funds to allow the biologists an opportunity to improve their teaching and research will go a long way towards solution to many of our problems. The budgeted sums for the department are pitifully small. The equipment is antiquated, and space is not adequate for the work. If some words can be said about these matters, I think we'll all be pleased.

Report of the Committee on Formulation of

Recommendations to Dean Briggs

The AUCOBS recommends the following reorganizational scheme for the present department of biology.

There should be established within the Department of Biology three well-differentiated, semi-autonomous disciplinary divisions:

1) Population Studies, dealing with theoretical and mathematical approaches to populations and evolutionary problems;

2) Organismic Biology, dealing with descriptive, comparative and experimental studies of organisms, with the main emphasis on physiological and morphological approaches;

3) Environmental Biology, dealing with interactions between organisms and their environments, including field, distributional, taxonomic, and experimental studies.

The administration of the department should be by an ~~over-all~~ chairman and an executive committee of three, one chosen to represent each of the three disciplinary divisions. In all decisions of the executive committee, the chairman ~~has a~~ vote, ~~and his vote breaks any tie~~. The member of each division chosen for the executive committee should be designated as ~~Associate~~ Division Chairman. ~~"Associate~~ Each chairman" should be elected by the members of his division, and should have a tenure of four years.

Each of the three divisions should be free to select its own faculty and staff, establish its own curriculum, and formulate its own budget, subject only to approval by the executive committee, the chairman, and the dean. The requirements and influence of individuals of the three divisions are made known to the whole department by voice in their individual divisions, through the "associate chairman" of the division.

The AUCOBS recommends that the department abrogate its present standing rules and that the new chairman and executive committee establish new rules consistent with the new organization of the department.

We turn now to some problems raised by the above recommendations.

The Chairman: ~~(To attract a person who will be capable of fulfilling his many responsibilities, a~~ A high level of support will have to be guaranteed. An attractive salary (by itself) is probably not sufficient, and must be

augmented by other items, such as specifically budgeted support for his own research interests, including some staff and faculty appointments.

Support for the Department: In addition to support of his personal needs, the chairman must be vigorously supported for the development of the whole department. Actual guidelines concerning amounts of support cannot be specified herein, nor should they be. It will be necessary for the ~~incoming~~ chairman, working with the executive committee, to develop specific and detailed proposals.

We specify other areas of critical importance:

Concrete plans for the renovation of the physics building to accomodate the biology department should be initiated immediately. It must be recognized that Federal money will probably not be available, and that State funds must be allocated for this purpose. Included with the building renovation should be allowances for modern equipment.

Further the council recognizes that there will have to be additions to the faculty and to implement this, the council recommends that the Dean immediately authorize additions of three or more new FTE's for the department ~~in addition to the new chairman~~; and that the designation and assignment to the divisions be made by the executive committee and chairman of the department.

The Core Program: The prospect of several independent departments of biological science makes very pointed the need for a coherent program of undergraduate courses ("core"), comprehending all the biological sciences. Therefore, we recommend that AUCOBS consider the appointment of a director, who will be responsible for reconciling and correlating the needs of the various disciplines.

Center Relationships: These recommendations have not been specifically addressed to the problems arising concerning the relationships of the centers to both departments (Biology and the Molecular-Cellular-Developmental). ~~Because~~ New rules relating to these problems will have to be established to accomodate the administration of the centers, ~~we recommend that AUCOBS consider the most suitable arrangements separately.~~ Add sentence.

Report of the Committee on Formulation of

Recommendations to Dean Briggs

2nd Draft

The AUCBS recommends the following reorganizational scheme for the present department of biology.

There should be one over-all department of biology, with three well-differentiated, semi-autonomous disciplinary divisions, as follows:

(1) Population Studies, dealing with theoretical and mathematical approaches to populations and evolutionary problems;

(2) Organismic Biology, dealing with descriptive, comparative and experimental studies of organisms, with the main emphasis on physiological and morphological approaches;

(3) Environmental Biology, dealing with interactions between organisms and their environments, including field, distributional, taxonomic, and experimental studies.

There should be, as well, a core program, with a director who is, ex-officio, a member of the executive committee.

The administration of the three divisions and the core program should be by an over-all chairman and an executive committee of three, one chosen to represent each of the three disciplinary divisions. In all decisions of the executive committee, the chairman should have a vote, and his vote should break any tie. The member of each division chosen for the executive committee should be designated as Associate Chairman. Each associate chairman should be elected by the members of the divisions, and should have a tenure of four years.

Each of the three divisions should be free to select its own FTE's, establish its own curriculum, and formulate its own budget, subject to approval by the executive committee, the chairman, and the dean. The requirements and

influence of individuals of the three divisions is made known to the whole department by voice in their individual divisions, through the associate chairman of the division.

The AUCBS recommends that the department abrogate its present standing rules and establish new rules which will provide a more flexible document for administration.

The Chairman: To attract a person who will be capable of fulfilling his many responsibilities, a high level of support will have to be guaranteed. A high salary (by itself) is probably not sufficient, and must be augmented by other items, such as budgeted support for his own research interests, including some staff and faculty appointments for his research assistants, technicians, etc.

Support for the Department: It is absolutely essential that the other members of the existing faculty be given considerable additional support, not just the incoming chairman. If nothing is done for members of long standing, whose work equally merits support, then the appointment of an outstanding chairman will surely not serve the purposes of this recommendation. Actual guidelines concerning amounts of support cannot be specified herein, nor should they be. It will be necessary for the incoming chairman, working with the executive committee, to develop specific and detailed budgets.

We may specify some of the areas of critical importance. Concrete plans for the renovation of the physics building to accomodate the biology department should be initiated immediately. It must be recognized that Federal money will probably not be available, and that State funds must be allocated for this purpose. Included with the building renovation should be allowances for modern equipment.

Further the council recommends that the Dean immediately authorize three new FTE's for the department, and that the designation and assignment to the groups be made by the executive committee and chairman of the department.

ALL UNIVERSITY COUNCIL ON BIOLOGICAL SCIENCES

	LLoyd Kosloff	Dept. Microbiology, Medical Center
	Wilhelm R. Frisell	Dept. Biochemistry, Medical Center
394 8442	Larry Morse	Dept. Biophysics, Mail Container 2661, Medical Center
	Alan Brockway	Dept. of Biology, Denver Center
	John de Fries	IBG Bldg., East Campus
	John Eicher	Geology 133
	Gene Erwin	Ekeley 263, Pharmacy
	Jack Ives	INSTAAR
7743	Edwin McConkey	PSR 1, Room 126, IDB
	Horace Quick	Geography, Gugg. 102A
	Fred Ramirez	Chem. Eng. EC OT 3-6
Curt Johnson	Hugo Rodeck	Museum 207
	David J. Rogers	Armory 101a
7446	Kurt Schlesinger (chrmn)	Psychology, Ketchum 11A
	Dean Katherine Smith	Nursing, Medical Center
6095	John Windell	Biology, Hunter 104D
	Michael Yarus	Chem 327
6929	David Greene	Anthropology, 18E Hellems
	William E. Briggs	Hellems 102

Subcommittee on Formulation of recommendations to Dean Briggs

TO: The members of AUCOBS

FROM: Alan P. Brockway

SUBJECT: Recommendations relative to the Centers.

In developing the attached recommendations I have tried to provide autonomy for the Centers in the development of curricula and the handling of FTE's, while also trying to establish a formal relationship between the Biologists at the Centers and those on the Boulder Campus. It is anticipated that this will provide a formal mechanism whereby coordination and co-operation in the development of curricula in Biology at Boulder and at the Centers will be encouraged. Although many of the problems at each Center are unique, there are many aspects which must concern both the Centers and the Boulder campus, e.g., development of degree requirements. Hence we must be cognizant of and have a voice in the activities at Boulder as they must in our activities. This is necessitated since many of our students take courses offered on the Boulder campus unavailable at the Centers. At the same time we can develop curricula for the types of students we have.

I have suggested that concurrent appointments be available since the personnel at the Centers are active in one formal area or another and will have (or already have) undergraduate or graduate students. This will provide a mechanism to have a formal say in the development and revision of degree requirements which will affect the program of the faculty. Further a formal alliance with colleagues in ones specialty will serve to help us recruit top-caliber personnel.

This plan does leave unresolved any formal relationship between the Center Divisions and the Department of Molecular, Cellular and Developmental Biology. I feel that some formal participation in the activities of this department should be developed, especially where we will undoubtedly have both undergraduate and graduate students in these areas. This is probably something that should be developed with Keith Porter and not something that the AUCOBS can decide at this point.

The AUCOBS recommends that the sections of the Department of Biology at the Colorado Springs Center and the Denver Center each be made semi-autonomous divisions of the Department of Biology with the same rights as the Divisions of Population Studies, Organismic Biology and Environmental Biology.

The AUCOBS further recommends that the members of these Center Divisions may have, when mutually desireable, concurrent appointments (the nature of which to be determined by the division involved) in one of the three Boulder Divisions.

The AUCOBS further recommends that consideration be given to the relationships between these two Center Divisions and the Department of Molecular, Cellular and Developmental Biology with respect especially to curriculum development.

UNIVERSITY OF COLORADO

BOULDER, COLORADO 80302

INSTITUTE FOR BEHAVIORAL GENETICS

July 17, 1968

Dean William E. Briggs
College of Arts and Sciences
Hellems 102
Campus

Dear Dean Briggs:

At its last meeting on June 16, 1968, the All University Council of the Biological Sciences unanimously adopted the enclosed set of recommendations for the reorganization and strengthening of the Biology Department. It is our belief that the adoption of these recommendations would provide an administrative framework which would allow this department to function more efficiently and to grow into a fine department--a course of events of great benefit to the college and the University.

We respectfully submit these recommendations to you.

Sincerely yours,

Kurt Schlesinger

Kurt Schlesinger
Chairman, AUCOBS

Enc.

KS/nl

Recommendation of the All University Council of the Biological Sciences:

The All University Council of the Biological Sciences recommends the following reorganizational scheme for the Department of Biology.

There should be established within the Department of Biology three well-differentiated, semi-autonomous disciplinary divisions:

1) Population Studies, dealing with theoretical and mathematical approaches to populations and evolutionary problems;

2) Organismic Biology, dealing with descriptive, comparative and experimental studies of organisms, with the main emphasis on physiological and morphological approaches;

3) Environmental Biology, dealing with interactions between organisms and their environments, including field, distributional, taxonomic, and experimental studies.

The administration of the department should be by an executive committee comprised of a Department Chairman and three Division Chairmen, one chosen to represent each of the three disciplinary divisions. In all decisions of the executive committee, the Division Chairmen and the Department Chairman shall each have one vote. In case of a tie, the Department Chairman's vote shall be decisive. Each Division Chairman should be elected by the members of his division and should have a tenure of four years.

Each of the three divisions should be free to select its own faculty and staff, establish its own curriculum, and formulate its own budget, subject only to approval by the executive committee, the Department Chairman, and the Dean. The requirements and influence of individuals of the three divisions are made known to the whole department by voice in their individual divisions, through the Division Chairmen of the divisions.

The AUCOBS recommends that the department abrogate its present standing rules and that the Department Chairman and the executive committee establish new rules consistent with the new organization of the department.

We turn now to some problems raised by the above recommendations.

The Chairman: The three Division Chairmen shall constitute the Search Committee of the Biology Department and shall be charged to seek out and recommend the best qualified individual as Chairman for the Department of Biology. This Search Committee shall seek the advice and consent of the AUCOBS in its selection. A high level of support for the Chairman will have to be guaranteed. An attractive salary (by itself) is probably not sufficient, and must be augmented by other items, such as specifically budgeted support for his own research interests, including some staff and faculty appointments.

Support for the Department: In addition to support of his personal needs, the Chairman must be vigorously supported for the development of the whole department. Actual guidelines concerning amounts of support cannot be specified herein, nor should they be. It will be necessary for the Department Chairman, working with the executive committee, to develop specific and detailed proposals.

We specify other areas of critical importance:

Concrete plans for the renovation of the physics building to accomodate the biology department should be initiated immediately.. It must be recognized that Federal money will probably not be available, and that State funds must be allocated for this purpose. Included with the building renovation should be allowances for modern equipment.

Further, the council recognizes that there will have to be additions to the faculty, and to implement this the council recommends that the Dean immediately authorize additions of three or more new FTE's for the department, and that the

designation and assignment to the divisions be made by the executive committee and the Department Chairman.

The Core Program: The prospect of several independent departments of biological science makes very pointed the need for a coherent program of undergraduate courses ("core"), comprehending all the biological sciences. Therefore, we recommend that AUCOBS consider the appointment of a director who will be responsible for reconciling and correlating the needs of the various discfplines.

Center Relationships: These recommendations have not been specifically addressed to the problems arising concerning the relationships of the centers to both departments (Biology and the Molecular-Cellular-Developmental). New rules relating to these problems will have to be established to accomodate the administration of the centers. The AUCOBS is continuing its examination of the relationships of the Denver and Colorado Springs Centers to the Department of Biology and the Department of Molecular-Cellular-Developmental Biology.

RELATIONSHIPS OF THE DENVER AND COLORADO SPRINGS CENTERS
TO THE DEPARTMENT OF MOLECULAR, CELLULAR AND DEVELOPMENTAL BIOLOGY
AND THE DEPARTMENT OF BIOLOGY

1. Faculty:

The Biology faculty at the centers shall be, as individuals, regular members of either the Department of Molecular, Cellular and Developmental Biology or the Department of Biology. Appointments, promotions and tenure shall be initiated by the Center Biology faculty and processed in accordance with the established procedures of the appropriate department.

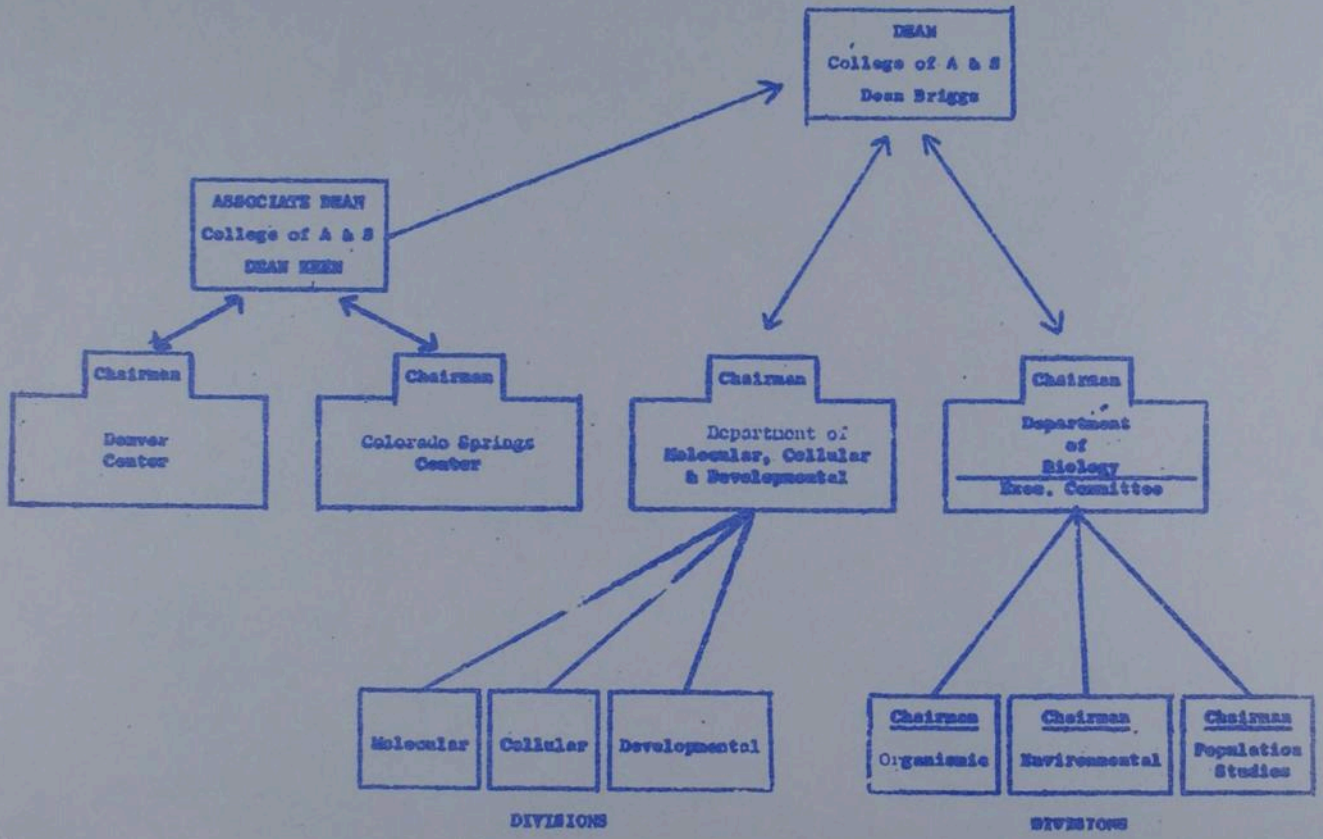
2. Center Programs:

Programs, including curriculum matters, FTE utilization, etc., will be developed by each Center Biology faculty with the advice and counsel of the chairmen of the two Boulder Departments.

3. Center Chairmen:

The chairmen of each Center Biology faculty shall be appointed upon the recommendation of each Center Biology faculty in consultation with the chairmen of the two Boulder Departments.

BIOLOGICAL SCIENCES AT THE UNIVERSITY OF COLORADO



Recommendation of the All University Council of the Biological Sciences:

The All University Council of the Biological Sciences recommends the following interim reorganizational scheme for the Department of Biology.

2 yrs min trial

There should be established within the Department of Biology three well-differentiated, semi-autonomous disciplinary divisions: (or programs) with

1) Population Studies, dealing with theoretical and mathematical approaches to populations and evolutionary problems;

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October 4, 1968

MEMO TO: Members of the All University Council on the Biological Sciences

FROM: Kurt Schlesinger, Chairman

There will be a meeting of the Council on Tuesday, October 15, 1968, at 2:30 p.m. in the Business Building, Room 209.

The attached material will be covered at the meeting.

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TO THE DEPARTMENT OF MOLECULAR, CELLULAR AND DEVELOPMENTAL BIOLOGY
AND THE DEPARTMENT OF BIOLOGY

1. Faculty:

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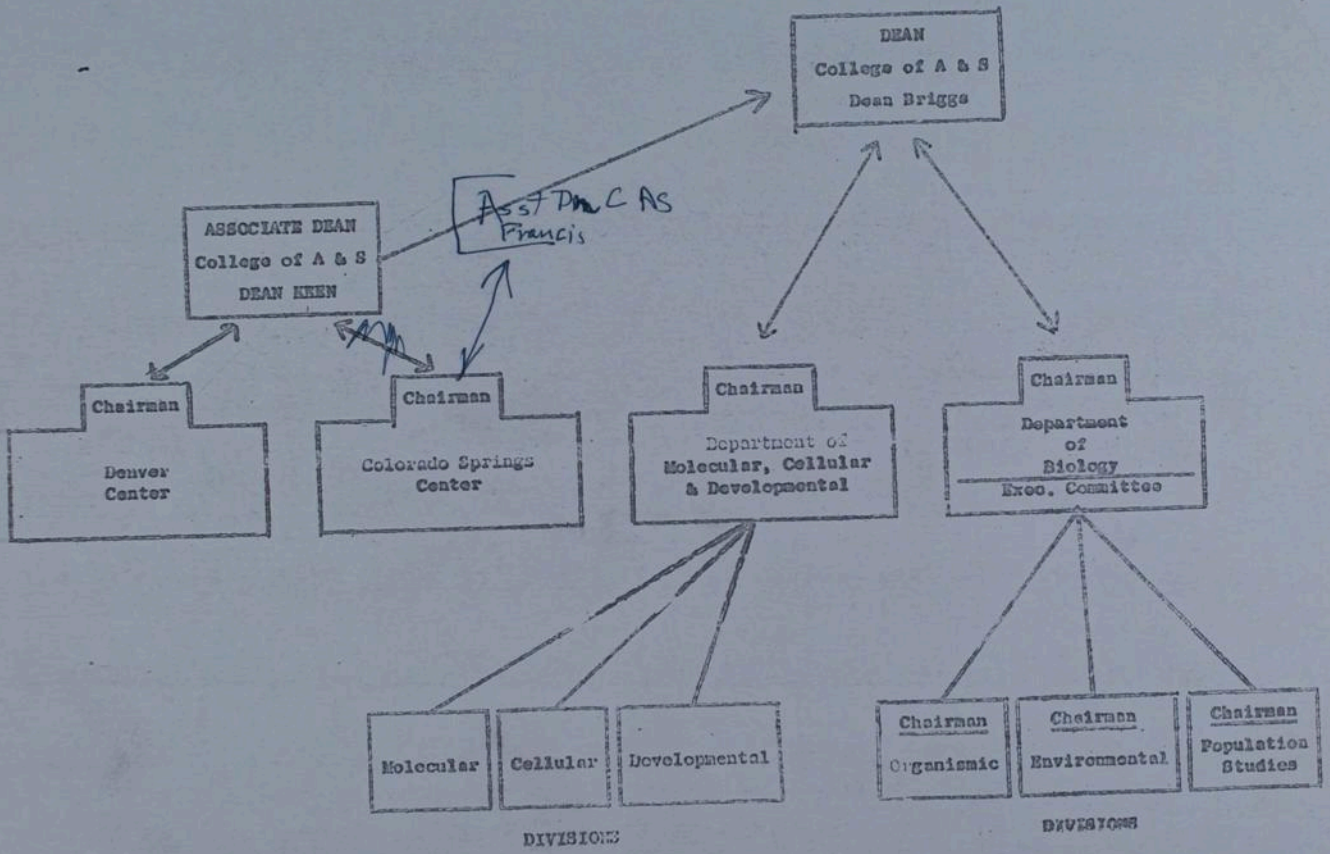
BIOLOGICAL SCIENCES AT THE UNIVERSITY OF COLORADO



To: R. Curtis Johnson, Chemical Engineering

From: Dave Rogers, Biology

Copy: Kurt Schlesinger, Psychology

Subject: AUCBS

Date: June 10

I appreciate your long and useful memo of June 5, and feel certain tha from what was said in the meeting of the AUCBS you would indeed come to the conclusions which you have reached. And in essence, tthe subcommittee agrees with your proposal. But as you pointed out in your memo, one does not get a chance to get across in a logical way one' own full ideas, and that certainly has been the case in this committee, where we began arguing against something before there was any chance to present anything about the proposals. Since much of the information about budgets, etc., already resides in the hands of Dean Briggs, we had thought that he would have placed the information before the committee members.

But rather than going into the omissions, let me give you some background for the present state of affairs which I have learned since coming to this institution last July. First of all, I am in agreement with you about the need for a unified approach to biology, and felt that it was a pity that we had to consider a program which looks like divisiveness at this stage of the game. There was for a long time, a very considerable effort on the part of the members of the biology department to keep the various parts of the field together. However, division began outside of the department, fostered by others than members of the department. Quite some time back, the Institute for Arctic and Alpine Research was developed, then an Institute for Developmental Biology and following this an Institute for Behavioral Genetics was developed. Biochemistry is outside the Department, as well as molecular

genetics, over which there is no control in the biology department. All of these, which were seemingly formed because of need to focus attention on some area, now contain people who teach biology, have joint appointments in biology, or are in some other way connected to the department, but their allegiance is elsewhere, and their programs grow, depending on their success in gaining larger budgets from the graduate school, and from outside grants. The latest development was the formation of a Department of Cellular and Molecular Biology, again formed by influences outside the department, to attract funds from the NIH.

The point is that we have already divided biology on this campus. I would gladly recommend that all biology be put back under one umbrella, one department, if I was so naive as to think that those that pulled out would agree to come back together again. But you are well aware that there is no chance to pull these various organizational structures back into the department. Therefore, if we follow the pattern which is already established on this campus, we must follow the plan which was submitted to this committee and to Dean Briggs. This the only logical approach.

So I suggest to you that the reasons you listed as main are not main at all. ~~The only~~ Most people who are against the division are those outside, who moved outside, and are not central to the argument. To know this is true, please note the people who are doing the arguing. They are the ones who started the process of division on campus. And it is they, not we, who fear equal voting rights.

With regard to the Kozloff committee recommendations, we cannot concern ourselves with the development of a "Life Sciences" school because that is beyond our charge. If the full committee, which is supposedly advisory, wishes to make such a recommendation, we will have the same problems that we

have had right along, namely, an administration at the higher levels not ready to tackle it. If you look carefully into the record, you will find this to be our central difficulty - administrators who do not wish to administrate.

With regard to your comments on curriculum, let me make the following observations: (1) the variations in kinds of biological endeavor are far greater than in chemistry, physics, or engineering; (2) to insist that all biologists take the same chemistry, physics, and math as you have stated, is to ignore some other curricular requirements which are just as critical; (3) we cannot be so inflexible in our requirements that we do injustice to certain types of biology; and (4) we have far greater numbers of requirements in other sciences than do chemistry, physics, or engineering.

Let me say that, when applicable, we require some of the courses you have listed, but we do not have one-track curricula. Also, much of the chemistry offerings are not useful to biologists; for example, much of organic chemistry is hydrocarbon and synthetic chemistry with examples from the petroleum industry, not applicable to biology. In mathematics, to say that we must have differential equations is simply not to understand that biological problems may be of a sort that are not amenable to solution by such efforts, and we need to point our students to other types of math which have only just now been added to the offerings of the math departments across the country. We are stuck with inflexible curricula in other departments, and we say that other departments, such as chemistry and math, need to modify their approaches if we are to derive benefit from them.

I could make a suggestion to you in engineering, saying that you cannot possibly be a decent engineeringless you have had biology, both general and ecological, but I am sure that you would resent my intrusion on your prerogatives for such decision making. Let us therefore assume that we as biologists

(over)

are not willing to have our students leave this institution without a satisfactory grounding in the sciences appropriate to their needs. But as you pointed out, you are not as well acquainted with biological needs as I am, and you must depend on someone's judgement in the field as to those needs.

Your memo closes with a paragraph which I much appreciate. And I can only agree that we want to do what is best for the university. I trust that you will now see that what we have proposed has an identical objective, and is not, as assumed, based on personal prejudices of individuals in the department.

May 22, 1968

MEMO TO: Members of the All University Council on the Biological Sciences

FROM : Kurt Schlesinger, Chairman

Meeting: All University Council on the Biological Sciences

Date: May 28, 1968 (Tuesday)

Time: 2 PM

Place: UMC 155

END OF MEMO

A copy of the Academic Plan for the Department of Biology is available in Hellems 102 if you wish to review it.

Some Thoughts on the Status of the Biology Department

TO: The Members of the All University Council on the Biological Sciences

FROM: Michael Yarus, Biochemistry Division Representative, AUCOBS.

DATE: May 28, 1968

A stronger, broader program in the biological sciences is needed at the University of Colorado; this will require the provision of additional faculty, the renovation of obsolete space, and perhaps the construction of new laboratories. Depth in currently active areas should be acquired and I, for one, would like to see expansion into the relatively neglected areas of physiology and genetics. The problem before this Council, as I interpret it, is to conceive the means by which the Department of Biology may efficiently develop using available resources. Would it speed its own development by disintegration into three pieces? I don't think so.

I have read the literature describing Biology's proposed schism, looking for the substantive reasons which would justify the establishment of, not one, but two, or three new academic departments, with all that implies about the demands of these departments on the resources of the University of Colorado. I have not found these reasons. The citation of the universities which have divided biology, for instance, could be countered by the citation of a far larger number of "progressive institutions" which apparently feel that the future of biology lies in fusion of disciplines, not in continuing fission. In fact, a great deal of weight is put on just this sort of fusion of interests in the biology proposal itself, in the many references to the possible productivity of liasons with Federal agencies, IAAR, and so on. However, it is quite possible that outside agencies would find co-operation with a larger, more widely competent academic Biology Department just as appealing, if not more so. Furthermore, the lines of division proposed in the circulated literature are indistinct, indeed. Do people interested in the dynamics of populations of organisms (population studies) really belong in a separate department from those interested in the interactions of organisms with factors in their environment (environmental biology), including interaction with other organisms? Would it be an efficient use of our means to establish a new Department of Organismic Biology which states its purpose as the study of "Metabolic, Homeostatic, Developmental, and Neural Mechanisms", when we have just acquired a Department of Cellular, Molecular, and Developmental Biology and an Institute of Behavioral Genetics, whose programs already lie in this area? I don't think so.

Lastly, I cannot resist observing that, during the discussions of the status of a new Division of Cellular and Molecular Biology, the Department of Biology itself argued that "formation of additional departments in biology.. would be divisive, and, since all biology is intellectually related, it would not be a natural division." (cited in the report of the All-University Life Sciences Committee, p. 21, June, 1966).

In addition to the proposal for its own tripartition, the Biology Planning Committee (pg. 2 of their circulated report) suggests the formation of a Council on Biology, composed of the chairmen of the three new departments, their counterpart from the Department of Cellular, Molecular, and Developmental Biology, and one other person to be selected. The Council on Biology would "...be concerned with overall coordination of curricula, financial policy, building planning, and space utilization..." The formation of a new Council on Biology on the basis of the assumed division seems to

me an atrocity based on an error. It short-circuits many functions of this present Council, while disenfranchising many of us who certainly are also concerned about "...coordination of curricula, financial policy, building planning, and space utilization...". Incidentally, because of the planned distribution of voting power it arrogates control of all biological sciences to the members of the present Biology Department. I find it hard to believe that this proposal is serious, promising, as it does, to spread the very divisions which have hindered the Department of Biology outward to all biological sciences at C.U. In any case, I urge rejection of the whole plan.

If I can summarize the feeling I derive from considering the evidence, including statements of members of the Department of Biology, the Biology Department Academic Plan 1972-73, and the All-University Life Sciences Committee Report of June, 1966, I would say that the present department is so divided along personal and political lines that its parts cannot work together; that indeed, it prefers to pulverize itself rather than to continue to try to do so. I argue against the formation of new departments. On the other hand, I should like very much, as we all would, to have a strong Biology Department here. Therefore, I phrase the problem in the following way: A method of allowing the Department of Biology a period of unified, concerted development is needed, along with the resources it needs during this period to strengthen its program. What follows are three suggestions for concentrating the executive power in the Department, so that Biology at C.U. may evolve rapidly within its present exoskeleton.

To improve Biology and make it more unified, new positions will be needed, no matter what scheme is adopted. Perhaps if the University agrees, IO F.T.E. might be provided in the next three years. In addition, one might anticipate about five vacancies from retirement and so on. These 15 positions would be filled, and other decisions bearing on the development of the Department would be made by one of the three following agencies:

Proposal A: A meritocracy, composed of the current personnel of the Department is given executive power for, let us say, five years. At this time, the Department votes democratically whether to change its executive structure. The meritocracy is constituted by giving additional voting power to those members who contribute most to the Department. For example, the following arbitrary, but defensible formula might be used: All faculty have one vote: in addition, one additional vote is allowed for each scientific paper accepted for publication in the preceeding two years, plus one vote for each $10,000. (or other figure) research grant money received, in the current year plus one vote for each acceptable Ph.D. thesis arising from the faculty member's work within the preceeding two years. The aggregate voting power wielded by any person under this scheme would be the result of three relatively independent judgements of his effectiveness as a scientist; the first by his colleagues on editorial review boards, the second by the granting agencies, and the third by younger scholars. While having its practical and aesthetic drawbacks, this plan has the appealing feature of awarding power to those who have worked well in the present Department.

Proposal B: A new Director is recruited by the combined efforts of the current Department and AUCOBS, and is given exclusive responsibility for improving the Department, along with the authority to carry out his plans. He directs the allocation of new resources, makes appointments, and so forth. At the end of five years, the Department votes democratically to change its organization or not. In the meantime, the hypothetical Director reports to AUCOBS, which keeps the University informed of progress.

Finally, I should state explicitly that I see no reason why the Department of Biology should not reorganize itself along any lines it chooses, whatever form its executive finally takes. This reorganization is assumed in the final suggestion.

Proposal C: The Department, by a means internally decided, divides into three areas, each of which elects its own spokesman. The divisional spokesmen, concert with a newly recruited director, who would be acceptable to these three and to AUCOBS, administer the re-organized Department. Deadlocks are broken, if they occur by AUCOBS.

I hope these suggestions can serve as starting points for the discussion of acceptable alternatives to the multiplication of existing departments.

Respectfully,

Michael Yarus, Chemistry Dept.
Ext. 6095 or 6929
Chemistry 327

6/18/68 JUN 19 1968

BIOLOGY DEPARTMENT

1967-68 Expenditures

CODE 1	(faculty)	$233,350. 18.80 FTE
CODE 2	(Assistants)	55,209.
CODE 3	(Staff)	49,805. 9.42 FTE
CODE 4	(Hourly Wages)	3,063.
CODE 5	(Supplies & Expenses)	44,257.
CODE 8	(Equipment)	18,600.

1966-67 Expenditures

CODE 1	(Faculty	201,450. 18.50 FTE
CODE 2	(Assistants)	61,384.
CODE 3	(Staff)	43,940. 8.75 FTE
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*It is possible that these figures can be obtained from the departmental Statement of Accounts for the FY 1965-66.

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May 2, 1968

MEMO TO: Members of the All University Council on the Biological Sciences.

FROM: W. E. Briggs, Dean, College of Arts and Sciences.

There will be a meeting of the Council on Tuesday, May 14, 1968 at 2 PM in the University Memorial Center, Room 159A.

The following material will be discussed:

Based on a proposal by the Planning Committee of the Department of Biology, the voting Faculty of the Department hereby formally recommends:

1. That the following three new Departments be established as a replacement for the present Department of Biology, as soon as possible:

   a. Department of Population Studies
   b. Department of Organismic Biology
   c. Department of Environmental Biology

2. That these Departments, and the Department of Cellular, Developmental and Molecular Biology be kept separate only at the upper and graduate levels, whereas all students planning to study any kind of biology at this University be required to complete a Biology Core Program of two years before formally entering any of the four Departments.

3. That the present sections of the Department of Biology at the Centers in Denver and Colorado Springs be made autonomous Departments of Biology, though their Faculty should be given an opportunity of joint appointment in a department of their choice in Boulder.

The Planning Committee and the Department of Biology also are in favor of that a Council on Biology be established to supervise and assist on problems of common interest to all the Boulder Departments. Final decision on this ought, however, to wait until the establishment of the new Departments has been completed, since its organization and responsibilities need to be discussed in closer detail.

INTRODUCTION

The balance between change and stability in the biological sciences at the University of Colorado must be weighed carefully, and this committee has attempted to be certain that any recommended changes be meritorious, and not taken for some whim or fancy. The strength of our present efforts must not be dissipated, and at the same time we must allow for the orderly modifications which will be necessary to meet the new challenges of our science. The Department of Biology has long had a strong direction in environmental biology, and this area is now in a national and international upsurge. Maintenance of vitality in this area is imperative. Likewise, efforts in morphological and physiological biology have had a useful and significant history in the Department. These areas should be placed in a more favorable light, with their activities being appreciated fully, and challenged to new growth. Aided by new tools and new directions, these areas have the potentiality for continued effective contributions to teaching and additions to knowledge. Everything possible must be done to encourage the achievement of such potentiality. Perhaps the newest area of development in biology on the Boulder campus has yet to be defined precisely, and its boundaries are not fully established. This area, variously called quantitative, or theoretical, or mathematical, with the words ecology, genetics, or systematics, or evolution appended, now has a sufficient number of interested investigators on the faculty to be considered as requiring its own identity.

The need for new emphasis on lower levels of biological organization has already been recognized and the major outline of its functions delineated in the establishment of the Department of Cellular, Molecular, and Developmental Biology within the College of Arts and Sciences.

The desire to accomplish modifications with the greatest economy and orderly transfer from present status to new administrative structure, has been another goal of this committee. The recommendations have attempted to indicate how we may approach the modifications without being unrealistic in development of a new organizational pattern. Unless we can achieve the changes recommended below without a major investment in new staff and administrative positions, we cannot expect approval of changes by the Administration of the University.

Above all, the committee has been cognizant of the necessity to meet the objectives of the University in its requirements to train professional biologists, to help in

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the production of new knowledge through research, and to contribute to the educational programs of the University. The organizational changes recommended are designed with these objectives in mind.

ORGANIZATION

The committee proposes that from the present Department, three Departments be formed, thus, in essence adding only two to the existent number of Departments. These three are: (1) Organismic Biology, (2) Environmental Biology, and (3) Population Studies. The overall organization of biologists would include, with the three Departments listed above, the Department of Cellular, Molecular, and Developmental Biology on the Boulder campus, with the Denver and Colorado Springs Center faculties being independent of the Boulder groups as far as curricula and administrative activities are concerned. However, the members of the biological faculties of the Centers could be given joint appointments in the Boulder Departments, should they so desire. In addition to the curricular offerings of the Departments, there must be a core program, developed along well-coordinated interdepartmental lines. The Chairmen of the four Departments, plus the Director of the Core Program (ex officio) would form a Council on Biology for the Boulder campus. This Council would be concerned with overall coordination of curricula, financial policy, building planning and space utilization, and administration of interdepartmental activities, facilities, and staff personnel.

Suggested definitions of the Departments and their disciplinary content are given as follows:

(1) Organismic. Descriptive, comparative, and experimental studies of organisms, with the main emphasis on physiological and morphological approaches.

(2) Environmental. Interactions between organisms and their environments, including field, distributional, taxonomic, and experimental studies.

(3) Population studies. Theoretical and mathematical approaches to populations and evolutionary problems.

These Departments are thought of as being organized in relationship to the approaches to biological knowledge and research, rather than to the taxonomic groups. The definitions given above are broad enough so that, for example, an ecologist who becomes interested in an adaptive physiology problem would feel no pressure to change Departments. And yet, should circumstances develop where persons on one faculty feel that their work would better fit into another Department, machinery

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should be provided to consider such a move.

In addition to the several Departments, which are the curricular agencies, there are several institutes and the Museum, which are engaged in biological research and whose staffs are contributing to the biological teaching and curriculum development. These should remain autonomous, ~~but when their personnel have joint appointments in the regular Departments, they then have representation in the affairs which pertain to their interests~~. Such entities should not become degree-granting units and should not establish curricula outside the Departments.

There are two ways in which the efforts and activities of the Departments will be coordinated: a Council on Biology, and a Core Program.

The Council on Biology would be composed of the Chairman of each of the four Departments plus the Director of the Core Program (ex officio). This group of persons would elect one of its own membership to serve as Chairman of the Council on a rotating basis. The Council would be concerned with problems of significance to all of the Departments. As examples, we suggest the following: establishment of curricular patterns involving prevention of course duplication; purvue over courses which might be offered for credit in all Departments; establishment of priorities in the addition of staff; development of curricula for teacher training at the undergraduate and master's degree levels; general development of and administration of common facilities, such as stockroom, instrument shop, greenhouses and graphics laboratory; planning and utilization of space and facilities; and establishment of overall fiscal policies for the Departments so that none will be short-changed. It must also have authority for some preliminary screening of graduate students and helping the undecided graduate students to find the right niche.

The Core Program is thought of as a series of courses which would be required of all majors in the Departments involved, it would be so developed to satisfy the needs of the Departments at the basic level. It should also insure that, regardless of the area into which a student decides to major, he will have the appropriate background. All Departments would contribute teaching personnel, both in regular Faculty and in Teaching Assistants. The Core Program will have to be developed on the basis of what we now have, with provision for healthy progress toward something much better, and allowance for modification as the course of biology itself changes.

The Director of the Core Program must be a regularly appointed faculty member in one of the four Departments.

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In addition to the basic Core Program, there should be other interdepartmentally authorized courses at the advanced undergraduate and graduate levels. We might envisage a Senior Honors Seminar as one such course. At the graduate level courses in biomathematics, instrumentation, history of biology, philosophy of biology, etc., would fall in such a category. The Council on Biology would be expected to encourage any such developments which would tend to increase the effectiveness of curricula and research.

DEPARTMENT AND CURRICULUM DEVELOPMENT

The members of the present Department must choose their Departmental affiliation on the basis of their teaching and research interests. When such a choice has been made, they are not necessarily "stuck" to that Department indefinitely, but could choose to be considered for transfer to another Department. No official choice will be required by any faculty member until the Administration has approved this proposal in principle.

Thereafter, the persons who have selected membership in a particular Department should start to construct their curriculum and establish their own basis of organization. It is likely that one member of each group could be selected as a temporary Chairman during the changeover period. Committees could be selected to work on problems which will be faced by the Departments. But the major prerogatives for the members should lie within the membership of the Departments, and not be dictated by outside interests. The new Departments would be informal units in the old Department of Biology during the time of transition, probably a year or year-and-a-half. During this time the old Department would be phased out, and additions to staff would involve only the new units. Once the Departments are actually authorized, then a more formal pattern for each can be established quickly and the Council can start its operations. Further, it would be expected that in the establishment of balance in the development of the Departments, the Council would provide a major coordinating voice, and would insure that all Departments be allowed to grow in such a manner as to insure that biology as a whole is well-represented

The Planning Committee should serve as a focus for continued planning, organization, and advice until it can be supplanted by the Council.

In conclusion, this committee has attempted to give the widest possible latitude for orderly growth of a vital, growing science. We must insure that the tradi-

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tionally valid areas of biology are sustained while at the same time we encourage effective proliferation into other areas, some of which have yet to be defined. We must insure these activities both in the research programs and curricular offerings of the Departments. What is needed now is the support and active participation of the members of the present Department of Biology faculty in the development of plans for the future.

Askell Löve
Glen Peterson
David Rogers
Phyllis Schultz
Paul Winston
Charles Norris (ex officio)

DEPARTMENT OF POPULATION STUDIES

AIMS

1. To give breadth and depth to student's understandings of the biological aspects of populations.
2. To investigate interactions of organisms within and between populations.
3. To investigate inheritance patterns of organisms on the population level.
4. To develop predictive models for synthesizing information about populations.
5. To make evolutionary analyses of populations.
6. To carry through from theoretical developments to practical applications of knowledge gained.

STATEMENT OF PURPOSE

Population studies require the broadest approach possible to produce full understanding. They require a restructuring of certain efforts within the fields of biology, psychology and sociology. Problems in the area have been recognized by individuals for some time, but these problems were of such extreme complexity that they were not amenable to analysis under the structures of previously strong disciplinary divisions. Concepts of populations exist in biological, psychological and sociological terms each with some elements in common with the other disciplines. For example, behavioral psychologists are now making intensive studies of the genetic basis of behavior, an area much investigated by biological geneticists. Similarly, sociologists are investigating the effects of environmental influences on human populations, in studies not too different in concept from those of biologists whose interests lead them to study influences of environment on bacterial populations. Likewise, psychologists are beginning to discover that a logical, hierarchical framework for their discussions of different populations must be modelled on similar hierarchical structures imposed on organisms by biologists. These examples indicate that certain psychologists, sociologists and biologists are working in one problem area, and all have the primary objective of understanding populations of living organisms, man being the major concern.

It behooves us, then, to establish within a departmental framework, a common meeting ground which will allow much greater freedom to cross disciplinary boundaries than has heretofore existed. We intend that this department focus on populations, without regard for the traditional separations, merging the various types of thinking in a more productive manner. This type of endeavor, therefore, leans heavily on theoretical and mathematical modelling, whereby it can be easily discovered what thinking processes can be generally applied to populations, including man.

Formation of such a department as outlined would result in one of the country's outstanding population study groups.

Revised 23 April 1968

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), Behavioral 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 the 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 course 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 their 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 and breadth 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. Crumpacker, 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 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 - interested 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 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 considerably more productive than the present Department of Biology (average publications per year and person in 1967: 6.5, as compared to 1.9 of the present Department and 1.0 for the other members of the present faculty), its need for secretarial help will be greater. Since David Rogers has a secretary paid from his grant, 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 the graduate student support, we assume that the present number of Teaching Assistants of the Department of Biology will be evenly divided between the new Departments, which then will furnish the core course with its needs of Teaching Assistants. 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, laboratories, lecture room, and rooms 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 Department and INSTAAR 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.

Space Requirements: Estimated Needs for the Next Five Years

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	
One for each FTE, 14	1540
Grad. Student, 30	1950
Research Assoc., 10	1150
Auxiliary Space	1855
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
2. Classroom Facilities	
a. Lecture room (with demonstration facilities storeroom) for 200 students	
b. Three small Classrooms (30 students)	
c. One Seminar Room (30 places, conferences and faculty meeting.)	
3. Office Space	
14 Faculty offices @ 120 s.s.f. each	1680
One Chairman's Office	200
One Admin. Assistant's Office	65
2 Secretaries' Offices	150
10 Research Associates Offices	1200
14 Graduate Student Offices	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 Modelling 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 of cross-disciplinary work is made at this time, but appropriate departments on campus will be consulted before any decision on new curricula. For example, population studies should include demographic studies, now in the Department of Sociology.

Proposals for the establishment of a Department of Organismic Biology

The Department of Organismic Biology will be concerned primarily with the attributes of organisms as individuals. The overriding reason for such an approach lies in the fact that the study of the organism and its parts, and development and functions thereof forms a coherent whole in which the integrated interests of the faculty and students will provide a stimulating and effective environment of teaching and research. The organism is more than an arithmetic sum of its cellular and molecular components, and at the same time is a structured and functioning unit, so that it is essential that the concerns, experimental and observational designs, and instrumentation be somewhat different from those of the other Departments in the biology group. It is because there would be distinct academic advantages to biology as a whole, if provision is made for such an organization, that we urge its acceptance.

The attributes of organisms with which the Department will concern itself are as follows:

1. Metabolic mechanisms for the obtaining, transport, and utilization of materials and energy for sustenance, growth, and specialized activities of the individual, together with mechanisms for removal of wastes.

2. Homeostatic mechanisms, which enable the organism to maintain relative constancy in internal states while there may be alterations in the environmental conditions.

3. Chemical and neural response mechanisms by which organisms respond to environmental changes in patterned fashion, often designated as behavioral responses.

4. Developmental mechanisms, especially those which occur at more advanced stages, in which there are interactions between developmental processes as they occur in incipient organs.

In all of the areas which have been indicated above, there will be a major emphasis on the comparative aspects of those attributes, as they relate to adaptations, while at the same time there will be continued attention to the features which are common to all animals and plants, as they have evolved during the history of life on the earth.

Undergraduate teaching program

All undergraduate majors in the Department of Organismic Biology will be expected to complete the Core Program in Biology. This program will be designed to prepare students in all of the Departments of the biology group for advanced work, and all Departments will participate in the presentation of the Program. The faculty of the Department of Organismic Biology will contribute significantly in this effort. After the completion of the core program, majors will elect courses in the Department of Organismic Biology and in other Departments of the biology group, as well as courses in other Departments of the College. The courses elected must form a coherent and meaningful pattern, and the student's program must be based on advice and approval of an advisor in the Department.

Nevertheless, there will be enough freedom of choice for a student so that he will be able to probe fairly deeply into some particular aspect of organismic biology. A program of independent study will be developed, enabling the superior students to engage in guided research, starting in the junior year and becoming a major segment of the senior year's program.

The Department of Organismic Biology will present necessary service courses, for students who are engaged in professional degree programs. Some of these service courses will also be elected by students who desire broad training preparatory to careers in secondary school teaching, and to those who are majors in other Departments, especially those in the biology group.

Graduate Program

Graduate students in the Department of Organismic Biology will be expected to select courses which will provide them with a thorough grounding in some aspect of Organismic Biology, as well as such courses in other Departments which will increase the effectiveness of their programs. The graduate student will be expected to engage in investigative activities which will result in a contribution to biological knowledge, in the form of a dissertation. Emphasis will be placed on candidacy for the doctorate.

Because a major proportion of the graduate students in the Department will enter the profession of teaching in colleges and universities, all candidates will be expected to have experience in teaching. The Department will be expected to contribute graduate students to the pool of teaching assistants for the Core Program, as well as having teaching assistants for its own program.

As the faculty and research space and facilities increase, there will be programs for post-doctoral programs, which will greatly increase the effectiveness of the undergraduate and graduate research programs. Training grants for predoctoral graduate students will be sought.

The Department will seek active cooperation with other Departments in the biology group, as well as appropriate Departments throughout the University, such as the Department of Aerospace Engineering, the Department of Psychology, and the Departments of Anatomy and Physiology of the School of Medicine. In addition, the Department will seek to cooperate with other units in the University, such as the Museum, the Institute for Arctic and Alpine Research, and the Institute for Behavioral Genetics, when it is possible to establish joint efforts. Finally, the Department will continue what has been started this year in terms of cooperation with non-University agencies in the area. The start has been made with the group at Fitzsimons Hospital, headed by Professor-Adjoint J. P. Hannon, and we shall seek to establish relationships with the state and federal fish and wildlife services, and with the biological group at the Martin Company. By such efforts, and with expanded opportunities for specialized facilities, it is expected that the graduate and faculty research programs will be greatly augmented. In all such efforts the focus will be on the organism's adaptive mechanisms, especially to rigorous environmental stresses.

All the Departments in the Biology group will likely become involved more

significantly in providing advanced training for secondary school teachers and community college (junior college) teachers. This Department will strive to provide as much help as possible for such efforts, working with the Faculty of School of Education. We also anticipate increasing our effectiveness in this area because the Director of the BSCS, Professor William Mayer, will be a member of this Department.

Courses for the Department of Organismic Biology (* suggested new courses)

A. Undergraduate

1. Essentials of Animal Physiology - now given - mostly as a service course

2. Introduction to Human Anatomy - now given as service course

3. Comparative Vertebrate Anatomy and Embryology - should be continued, especially for those who will not be specializing in animal morphology.

*4. Comparative Vertebrate Morphology - should be developed as a full-year new course, combining anatomy, embryology and microanatomy. Only for those specializing in morphology. Will require additional staffing.

5. Invertebrate Zoology - currently taught by member of Environmental biology group. In time, new staff will be needed.

*6. Invertebrate Morphology, Embryology, and Microanatomy - should be developed in parallel with No. 4, above. Will need staff eventually.

7. Introduction to Entomology - should be continued. Now taught by member of Environmental Biology Department.

8. Cell Physiology - should be continued. Now taught by member of Organismic Biology Department. Might be set up as team-taught with members of Cellular & Molecular Department, or taken over by that group.

9. Comparative Vertebrate Physiology - as now taught, or increased to 4 hours.

10. Comparative Invertebrate Physiology - should be developed at undergraduate level, incorporating much of what is now in the graduate course, and be taught by person who now teaches that course. Level changed.

*11. Insect Physiology - should be developd as a new course, in parallel with 9 and 10 above. New staff necessary.

12. Plant Morphology - two semesters, as at present. The teaching of this course is now shared between a member of this Department and one in the Environmental Biology Department.

13. Plant Physiology - should be continued, and perhaps expanded. Now taught by a member of the Environmental Biology Department, and probably will be continued.

14. Plant Embryology - should be regularly presented. Now taught by a member of the Population Studies Department.

15. Independent Study - Research projects to be carried out by undergraduates. Candidates will start their work in association with more advanced graduate students during the junior year, and by senior year will be able effectively to work on a project of their own.

B. Graduate

There will have to be considerable attention to realignment of the patterns of the graduate curriculum. However, we can suggest a few of the courses, some of which are being offered currently, and others of which are projected.

1. Experimental embryology of vertebrates - as now taught

*2. Experimental embryology of invertebrates - should be developed

*3. Experimental analysis of plant differentiation - new - staff needed

4. Advanced Plant physiology - as now taught or expanded. Now given by member of Environmental Biology Department.

5. Endocrinology - should be developed as a laboratory course at 500 level. Might well be followed by an advanced endocrinology course.

6. Neurophysiology - should be developed as with No. 5, above. Might be established more strongly by collaboration with Department of Psychology, Department of Chemistry (I. Wilson), and Aerospace Engineering.

*7. Physiology of Altitude - new course

*8. Physiology of Arid Lands - new course

*9. A series of courses involving effects of environmental stresses in animals and plants - new courses

(NOTE: the Fitzsimons group, as well as regular resident faculty would be excellent for this.)

10. Algology - as now taught

11. Mycology - as now taught

*12. Advanced courses in vertebrate and invertebrate comparative anatomy and embryology - new courses

In addition, members of this Department would be able to offer courses or help with team teaching in courses which could be used for all of the Departments in the Biology group. Suggestions for these are:

History of Biology - now taught by member of this Department

Instrumentation - as one- semester course, with stress on electronics, has been taught by a member of this Department. Should be expanded and team taught.

*Mathematical modelling of biological systems. New course, which could involve people from several Departments, including Aerospace Engineering, Population Studies, and Behavioral Genetics.

Staffing:

It is obvious from the curricular suggestions above that the Department of Organismic Biology, if it is to achieve such goals as have been indicated, would have to grow. While it will be possible to make some modest beginnings with the advent of Professor Hobart Smith next year, and with Professor-Adjoint Hannon and Professor Mayer being able to participate more fully, there will still be severe restrictions until more staff is added. We might suggest that one FTE per year be added, over a span of five years, and then a reevaluation prepared to determine the future. In the additions of staff, there should be an attempt to balance additions between well-established senior scientists and those who have recently finished doctorate or post-doctorate programs. It will be necessary to be opportunistic in recruitment, so that instead of saying: "This year we must recruit a _____ kind of biologist," we will say: "This year we will recruit the best kind of person we can find in the field of _____ or _____ or _____, so that over a period of years we will be able to fill the essential spots in the Department.

The scope of organismic biology as we have defined it is still so broad that no Department could achieve complete coverage. Thus in our recruitment of faculty, the Department will attempt to restrict its research interests, and thus the graduate teaching and research programs, to those aspects which appear to be the most feasible for achievement of success. The following appear to us to be the aspects which have the greatest promise:

1. Adaptive mechanisms by which organisms are able to maintain themselves as individuals in the face of rigorous environmental stresses.

2. Integrative mechanisms, both chemical and neural, which maintain coordinated functions of the organism as a whole.

3. Integrative mechanisms which provide for coordinated patterns of development during the differentiation of organs.

Budget:

It is obvious that faculty salary budgets would have to increase, in proportion to the numbers added and the increments that normally come with effective service in teaching and research. But over and above the salary budgets for faculty, there will have to be major expenditures for teaching and research equipment. This Department will attempt diligently to secure as much in the way of financial aid for the purchase to teaching and research equipment as possible from federal sources, and it may be possible to get some help from private sources. But the University will also have to provide support. The instrumentation which

is absolutely essential for effective work in physiology, for example, is expensive. We will have to have extensive purchases of sophisticated teaching and research equipment in this area. Likewise, the space necessary to house personnel and equipment, if it is to be effective in teaching and research, will have to be expanded greatly. A less prominent but necessary part of the total budget will be for supplies and expenses, which are showing rapid increases in cost.

Organization of a Department of Environmental Biology

The broad area of the biological sciences is currently burgeoning and proliferating to a marked degree, perhaps more rapidly than any other field of knowledge. In retrospect, we now think of the period between 1915 and 1940 as the period of major advances in chemistry, from 1940 to 1960 as the generation of major advances in physics. We are now in the early stages of the Era of Biology, - a period which is being marked by many major fundamental and applied biological concepts. The growth of the biological sciences may perhaps be illustrated by a single example: Biological Abstracts published 14,500 abstracts for the year 1926. The total for 1967 was 125,000! (These figures do not include medical and medical-related publications.) Biological Abstracts now covers more than 7,400 biological periodicals, - a fantastic avalanche of information in the life sciences. Some of us who are interested in broad areas of biology must try to keep up with significant contributions in more than 100 technical journals.

Although there is much to be said for the close and cooperative coordination of Lower Division Biology coursework in the form of a Core Curriculum, the large, growing campuses are becoming increasingly aware of the inadvisability of trying to keep all biologists in a single large and heterogeneous department at the Upper Division and Graduate levels. As a result, there is a rapidly growing country-wide movement to reorganize biologists into several or many functionally substantive departments, often as a separate college, school, or division of a university. Indeed, on many campuses where a reorganization has not already been effected, such plans are being considered for the near future. Following are examples representing various parts of the United States:

The new University of California campus at Irvine has a Division of Biological Sciences with four departments organized on a functional biology basis.

The University of Georgia has a Division of Biological Sciences with nine departments.

The University of Indiana has a Division of Biological Sciences with five departments.

The University of North Carolina has ten biological departments.

The University of Pittsburgh has five biological departments.

Kansas State University has just reorganized the biologists into four new departments.

Utah State University has just reorganized the biologists into about eight new departments.

Cornell University has thirteen biological departments (some are agricultural) in its Division of Biological Sciences.

Penn State University has a new Division of Biological Sciences with many separate departments.

The University of Utah has five biological departments.

Last, but not least, Colorado State University has eighteen biological departments (some agricultural).

A small circle of environmental biologists at the University of Colorado has been interested for nearly two years in the establishment of a department of Environmental Biology. The recent majority decision, in the Department of Biology, to divide the present department into three substantive biological disciplines brings our hopes for separate status closer to realization and invites the present proposal.

Teaching and Research Encompassed by Environmental Biology

The life sciences, as well as chemistry, physics, psychology, geology, and geography, are all divided into major sub-discipline areas. Chemistry, for example, has areas of organic, inorganic, physical, physiological, biochemistry, radiochemistry, analytical etc. etc. with broad overlapping. In the same manner, any sub-discipline in the biological sciences overlaps other sub-disciplines. Nevertheless, 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 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 élan 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.

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 directly concerned with such sub-disciplines as morphology, anatomy, functional activites of 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 background training in chemistry, physics, or geology.

Justification

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. We need support and encouragement, but we do not require multimillion dollar laboratories. The University of Colorado Dept. of Biology provides historical support for the creation of the new Department. 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 in Environmental Biology. The majority of graduate students are working in this area. Ten of the present Biology Faculty are members of the Ecological Society of America! A separate department of Environmental Biology will, by its more restrictive nature, cultivate more meaningful and viable ties with the Arctic and Alpine Institute, ESSA, NCAR, 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 increasing numbers of environmentally involved establishments and individuals in the Boulder area and in the University argues for the wisdom of a University department of Environmental Biology and is prophetic of the growing importance of this region as an environmental center for the Nation.

We are convinced, therefore, that a Department of Environmental Biology is a most logical unit of reorganization. That this contention is part and parcel of the growing significance and world-wide awareness of environmental biology may be illustrated by the following items:

A. Editorials in newspapers, magazines, and technical journals (e.g., Science) clearly point up the coming domination of biology by environmental biology.

B. Greatly increased attention is being given to marine, fresh-water, terrestrial, and air pollution by Federal, State, and private agencies. This is fundamental environmental biology. (A Training Program in aquatic and pollution biology is currently being drawn up by several environmental biologists in the Dept. of Biology.)

C. The establishment of ESSA is an official national recognition of environmental biology. ESSA does not now cover biology per se, but does include much oceanography, and it is only a question of time (perhaps five years) before ESSA will enormously expand its activities in biological directions. Many universities are already quietly looking forward to further cooperating with ESSA when biological investigations are added to the activities of this agency.

D. The world-wide IBP, to last at least ten years, is primarily an environmental biology undertaking. Many universities are already cooperating, and several University of Colorado biologists are currently formulating plans to join this endeavor from the standpoint of the productivity of mountain terrains.

E. For many years the National Science Foundation has recognized the basic unity of environmental biology by having a large Section on Environmental Biology. In a comparable fashion, the National Institutes of Health have made a great many awards in the area of fundamental environmental biology. (One member of the present Biology faculty is currently drawing up a proposal in environmental biology to be submitted to NIH.)

F. The world-wide attention being accorded to the increasingly critical shortages of water and food by countless governmental and private organizations is basic recognition of the importance of environmental biology.

G. About 15 major U.S. universities are cooperating in a galaxie of major environmental biology research projects. The establishment of a Department of Environmental Biology at the University of Colorado would greatly enhance our chances of being asked to participate.

H. It now appears that the tradition-bound National Academy of Sciences is about to add a significant number of outstanding environmental biologists to its membership (Science, 19 Jan. 1968.)

The organization of a new Department of Environmental Biology at the University of Colorado would follow the example set at a surprising number of progressive institutions and campuses, including the following few examples:

The Environmental Biology Unit at the Du Pont Savannah River plant.

The Environmental Biology Unit of the AEC at Hanford, Washington.

The new Department of Environmental Biology at the University of California (Irvine).

The new Dept. of Environmental Sciences at the University of North Carolina.

The new Department of Environmental Biology at Kansas State University.

The new Department of Environmental Biology at Utah State University. (This Department has a separate budget line in the State Legislature's budget.)

New Environmental Biology departments on at least two outstate campuses of the University of Wisconsin.

A new and reorganized Environmental Biology Department is under strong consideration at Cornell University.

The University of Georgia has a large Environmental Biology Institute.

There is absolutely no question that the announcement of the establishment of a new Department of Environmental Biology at the University of Colorado

would attract much attention and approbation throughout the country. (Many of our colleagues will doubtless react by saying "Well, it's about time!") The Department will attract a substantial number of undergraduates and increasing numbers of graduate students. Faculty membership in such a Department should also go far toward helping us get NIH, NSF, etc. grants.

Prospectus

Faculty: In its first year of operations, the Department of Environmental Biology would include 8 to 10 members of the present Dept. of Biology plus 1 or 2 associate members from the Denver and Colorado Springs centers. Because the basic course in Animal Ecology would presumably no longer be taught (owing to the transfer of one faculty member to another department where he would not offer this course), we must have one new junior faculty member to be added to the Environmental Biology Faculty. In the succeeding six years we should add at least three new faculty members. If a group in the Environmental Biology Department is successful in its application for a training grant from the Federal Water Pollution Control Administration (now in preparation), then the salaries of two of these men would first be paid out of the grant, and then phased into the University budget.

Departmental Curriculum for an Undergraduate Major in Environmental Biology

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

Chemistry (one year)
Physics (one year)

II. General Biology — 8 credits
Other L.D. Core Curriculum courses in the Life Sciences — about 6 credits

III. Lower and Upper Division courses to be offered specifically in the Department of Environmental Biology. (The specific courses to be decided by the needs and plans of the individual students.)

Principles of Ecology
Animal Ecology
Plant Ecology
Field Zoology
Parasitology
Aquatic Invertebrate Zoology — at least 20 credits
Invertebrate Zoology
Ecosystems of North America
Biogeography
Ornithology
Introduction to Biostatistics
Independent Study

IV. Pertinent courses to be taken in other departments in Biological Sciences and in Geography and Geology.

at least 6 credits

Courses to be offered at the Graduate Level

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

(* - new courses to be offered as soon as possible.)

for the Environmental Biology Group,

19 11 69

R. W. Pennak

7 May 1968

MEMO TO: Members of the All University Council on the Biological Sciences.

FROM: David J. Rogers, Professor of Biology

This is a reworked prospectus for the Population Studies Department, made necessary by changes in potential faculty members.

Please substitute this copy for the one sent out by Dean Briggs last week.

DEPARTMENT OF POPULATION STUDIES

AIMS

1. To give breadth and depth to student's understandings of the biological aspects of populations.
2. To investigate interactions of organisms within and between populations.
3. To investigate inheritance patterns of organisms on the population level.
4. To develop predictive models for synthesizing information about populations.
5. To make evolutionary analyses of populations.
6. To carry through from theoretical developments to practical applications of knowledge gained.

STATEMENT OF PURPOSE

Population studies require the broadest approach possible to produce full understanding. They require a restructuring of certain efforts within the fields of biology, psychology and sociology. Problems in the area have been recognized by individuals for some time, but these problems were of such extreme complexity that they were not amenable to analysis under the structures of previously strong disciplinary divisions. Concepts of populations exist in biological, psychological and sociological terms each with some elements in common with the other disciplines. For example, behavioral psychologists are now making intensive studies of the genetic basis of behavior, an area much investigated by biological geneticists. Similarly, sociologists are investigating the effects of environmental influences on human populations, in studies not too different in concept from those of biologists whose interests lead them to study influences of environment on bacterial populations. Likewise, psychologists are beginning to discover that a logical, hierarchical framework for their discussions of different populations must be modelled on similar hierarchical structures imposed on organisms by biologists. These examples indicate that certain psychologists, sociologists and biologists are working in one problem area, and all have the primary objective of understanding populations of living organisms, man being the major concern.

It behooves us, then, to establish within a departmental framework, a common meeting ground which will allow much greater freedom to cross disciplinary boundaries than has heretofore existed. We intend that this department focus on populations, without regard for the traditional separations, merging the various types of thinking in a more productive manner. This type of endeavor, therefore, leans heavily on theoretical and mathematical modelling, whereby it can be easily discovered what thinking processes can be generally applied to populations, including man.

Formation of such a department as outlined would result in one of the country's outstanding population study groups.

Revised 23 April 1968

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), Behavioral 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 the 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 course 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 their 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 and breadth 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. Crumpacker, 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 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 - interested 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 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 considerably more productive than the present Department of Biology (average publications per year and person in 1967: 6.5, as compared to 1.9 of the present Department and 1.0 for the other members of the present faculty), its need for secretarial help will be greater. Since David Rogers has a secretary paid from his grant, 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 the graduate student support, we assume that the present number of Teaching Assistants of the Department of Biology will be evenly divided between the new Departments, which then will furnish the core course with its needs of Teaching Assistants. 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, laboratories, lecture room, and rooms 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 Department and INSTAAR 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.

Space Requirements: Estimated Needs for the Next Five Years

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	
One 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
2. Classroom Facilities	
a. Lecture room (with demonstration facilities storeroom) for 200 students	
b. Three small Classrooms (30 students)	
c. One Seminar Room (30 places, conferences and faculty meeting.)	
3. Office Space	
14 Faculty offices @ 120 a.s.f. each	1680
One Chairman's Office	200
One Admin. Assistant's Office	65
2 Secretaries' Offices	150
10 Research Associates Offices	1200
14 Graduate Student Offices	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 Modelling 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 of cross-disciplinary work is made at this time, but appropriate departments on campus will be consulted before any decision on new curricula. For example, population studies should include demographic studies, now in the Department of Sociology.

BASIC CORE PROGRAM
PROPOSED
FOR
ALL BIOLOGY MAJORS
AT THE
UNIVERSITY OF COLORADO

UNIVERSITY OF COLORADO

BIOLOGY DEPARTMENT

9 May, 1968

TO: Faculty of the Department of Biology

FROM: Dr. William Mayer
Dr. Jack Carter
Dr. Glen Peterson
Dr. Charles Norris
Dr. David Norris
Dr. Olwen William
Dr. J. Windell

SUBJECT: REPORT FROM THE BIOLOGY CORE CURRICULUM AD HOC COMMITTEE

GENERAL INFORMATION

1. The proposed core will involve no immediate alterations in our present curriculum.

2. This core would not be initiated before 1969-1970 academic year. This will allow time to finalize all plans and correct all bulletins.

3. Principals of Ecology and Genetics are currently being offered and would require only minor alterations. The others will be developed by teams of interested departmental faculty and/or new faculty who are specialized in each area. These teams will work in coordination with the core committee.

4. The only request of the present faculty at this time is to specify the individual topics, etc. from physics, math and chemistry that a student must know and will use in each course you now teach (form attached).

NEW ARTS & SCIENCES REQUIREMENTS: (Taken from page 5 and 6 of the most recent Arts & Sciences Bulletin)

A. COLLEGE REQUIREMENTS

The following five requirements apply to all Bachelor of Arts and Bachelor of Fine Arts students. For requirements applying to Bachelor of Science candidates, see alphabetical listing of the specific curriculum in the section on Courses and Programs.

1. Humanities
2. Natural Sciences
3. Social Sciences

In each of these three, 2 two-semester course combinations are required. Lists of courses that will satisfy the requirements will be available prior to the beginning of the fall term.

4. Foreign Language
5. Physical Education

B. MAJOR REQUIREMENTS

For the Bachelor of Arts degree, students are required to present a minimum of 30 semester hours of C grade or better, 16 of which must be in upper division courses. The grade average for all work in the major field must be at least C. Not more than 45 hours in the major department may be counted toward the 124 hours required for graduation.

SOME THOUGHTS CONCERNING REQUIREMENTS OUTSIDE THE DEPARTMENTS

The committee discussed at length the problem of required courses in addition to those taught in the various biology departments. It was agreed that each of the four departments should be free to set their specific requirements. It was felt that each department will undoubtedly require one year each of chemistry, physics and mathematics and that the students' backgrounds and interests are factors to be considered in the specific courses that should be selected. It was unanimously agreed, however, that requiring one year of each of the above is not the solution to modern biological academic training. Hence; it was recommended that:

1. The biology department faculty indicate in writing (see attached form) exactly how much chemistry and physics is used in each of their lower division (100 & 200), upper division (300 & 400) and 500 level courses.

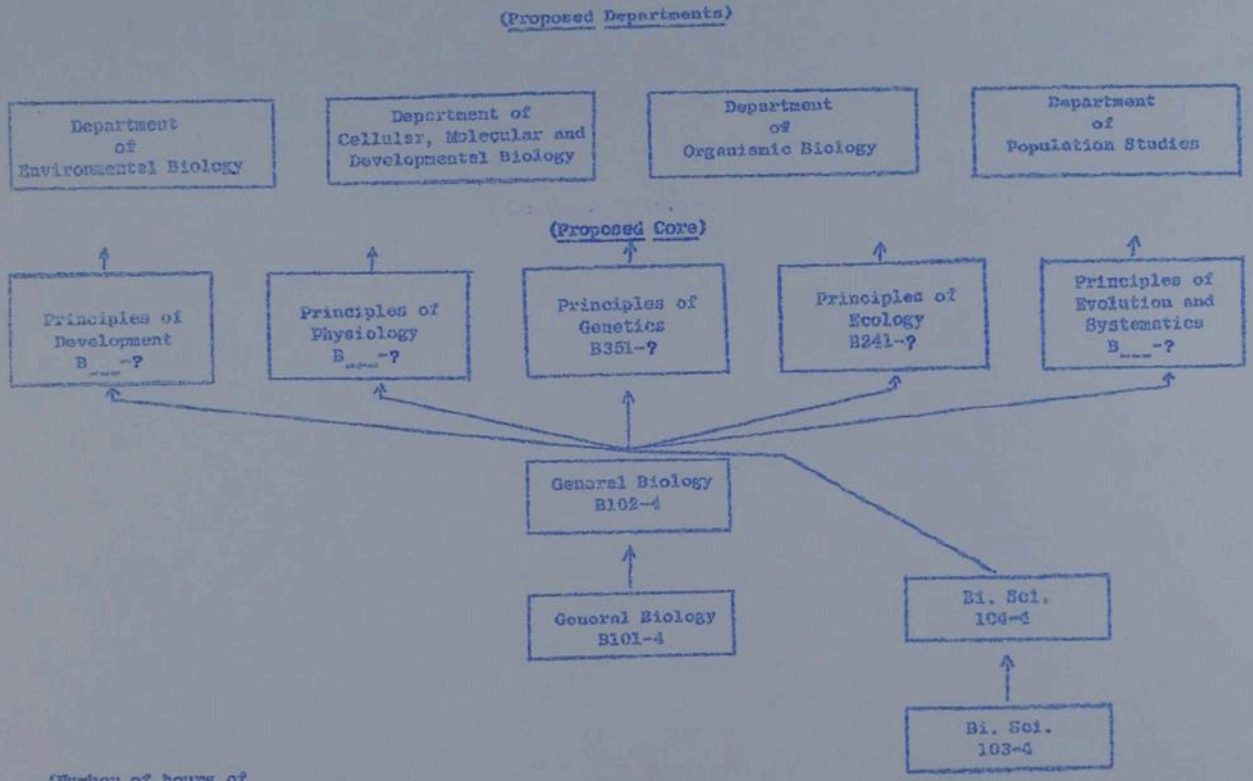
2. Once this information is compiled, negotiations will be arranged with the appropriate persons in the Chemistry and Physics Departments to discuss the needs and requirements of our students regarding biological physics and biological chemistry.

A majority of committee members felt that at the undergraduate level, the need for the students to elect a course in biostatistics may be more valuable with a one year background in mathematics than mathematics with calculus.

ADVISING SYSTEM IN BIOLOGY

Students majoring in biological science will be identified in each of the core courses (and can identify themselves to the department at any time). All names will be submitted to the Advising Coordinator, Dr. James Smith. Each of the four departments and the core program will appoint as many undergraduate student advisors as necessary. Dr. Smith will assign each student to an appropriate departmental advisor. It is recommended that students discuss their academic programs with their assigned advisor at least once during each academic year. Each advisor may keep a record of all student visits.

Proposed "CORE" Curriculum in Biology - University of Coloredo



BIOLOGY MAJOR

This major 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. Others should consider a regular major in Botany or Zoology. Required courses in the new major will be:

Biol. 101-102	General Biology, or scores of 4 or 5 on the Advanced Placement Test in Biology, or Biol. Sci. 103-104.	8 hrs.
Biol. 351	Genetics	3 hrs.
Zool. 322	Human Physiology	3 hrs.
Zool. 232	Field Zoology	3 hrs.
Bot. 231	Field Botany	3 hrs.
Bot. 311	Plant Morphology	4 hrs.

TOTAL REQUIRED HOURS: 24 hrs.

Candidates for this degree will also elect 5 additional upper division hours in Botany and/or Zoology, and will minor in Chemistry and one other field to be decided in consultation with the Biology advisor. In addition, all candidates are required to present mathematics rather than philosophy as a graduation requirement.

BOTANY MAJOR REQUIREMENTS, Department of Biology, University of Colorado

Major

General Biology (Biol. 101-102, or Biol. Sci. 103-104, or Advanced Placement in Biology, scores of 4 or 5)	8 hrs.
Genetics (Biol. 351)	3
Field Botany (Bot. 231)	3
Morphology of Non Vasc. Plants (Bot. 311)	4
Plant Physiology (Bot. 421)	4
Plant Ecology (Bot. 441)	4

First Minor

Zoology 6 hrs.
(Specific courses to be decided on consultation with Department advisor)

Second Minor

Chemistry 8-10 hrs.
(Preferably Chem. 101 or 103 or 105 and 104 or 106)

In addition to the six courses listed above, each Botany major, in consultation with his departmental advisor, should choose one of the four following sequences:

A.
College Bacteriology (Bact. 201)	4
Organic Chemistry	8

(recommended electives include Physics, Calculus, and Biochemistry)

B.
Morph. of Vasc. Plants (Bot. 312)	3
Developmental Pl. Anatomy (Bot.561)	3
Class. of Flowering Plants (Bot. 431)	4

C.
Morph. of Vasc. Plants (Bot. 312)	3
College Bacteriology (Bact. 201)	4
Algology (Bot. 411) or Bryology (Bot. 513) or Lichenology (Bot. 512)	3

D.
Ecosystems of N.A. (Bot. 442)	3
Class. of Flowering Plants (Bot. 312)	4
Morph. of Vasc. Plants (Bot. 312)	3

(recommended electives include Geomorphology, Biostatistics, and Soil Science)

General Information

Majors must take Mathematics (rather than Philosophy) as a graduation requirement.

The following are suggested electives outside the Department of Biology: Physics, Geology, Paleontology, Statistics, Calculus, Climatology, Geography, Conservation, and Radiochemistry.

German, French, and Russian are especially recommended as languages which might be selected to fulfill the language requirement for the B.A. degree. These languages have especially large scientific literatures and are particularly useful for the student who expects to go into graduate work.

A student may have no more than 45 hours in his major field to count in the 124 hours required for graduation. Sixteen of these 45 hours must be in upper division courses in the major field. Majors must have at least 30 Botany hours of "C" or better.

Botany for Distributed Majors

If Botany is the field of specialization or one of the two other fields in the distributed plan, a minimum of 30 or 12 credits, respectively, is required toward the total of 60 for all three fields. A specific program should be worked out with the Botany departmental advisor.

Distributed majors should choose their courses from the list for the major field; that is, a student with a distributed major in Botany should choose his courses from the list of six primary courses required for Botany majors, not just any Botany course listed in the Bulletin. The same applies for distributed students with a Zoology or Botany minor. There is no Biology minor.

ZOOLOGY MAJOR REQUIREMENTS, Department of Biology, University of Colorado

A. CORE COURSES FOR ALL ZOOLOGY MAJORS:

General Biology (Biol. 101-102) or Biol. Sci. 103-104	8
Genetics (Biol. 351)	3
Principles of Ecology (Biol. 241)	2
Vertebrate Comparative Anatomy & Embryology (Zool. 313)	5
Cell Physiology (Biol. 421) or Human Physiology (Zool. 322)	3-4

(All majors must have at least one year each of college chemistry and mathematics)

B. ONE OF THE FOLLOWING SEQUENCES:

I. Evolutionary Biology

Invertebrate Zoology (Zool. 411) or Parasitology (Zool. 211) or Entomology (Zool. 212)	3-5
Two courses in taxonomy	6
Departmental elective	2-5

II. Environmental Biology

Animal Ecology (Zool. 441)	4
Recent Advances in Animal Ecology (Zool. 546)	3
Taxonomy course	3
Invertebrate Zoology (Zool. 411) or Parasitology (Zool. 211) or Entomology (Zool. 212)	3-5
Departmental elective	2-5

III. Genetics

Vertebrate Physiology (Zool. 421)	3
Cell Physiology (Biol. 421) (core course)	4
Two advanced courses in genetics	5-6
Departmental elective	2-5

IV. Developmental Biology

Experimental Embryology (Zool. 561)	4
Cell Physiology (Biol. 421) (core course)	4
One course in advanced genetics	3
Departmental elective	2-5

V. Functional Biology

Vertebrate Physiology (Zool. 421)	3
Cell Physiology (Biol. 421) (core course)	4
Biochemistry or Plant Physiology (Bot. 421) and Microbial Physiology (Bact. 520)	6-8
Departmental elective	2-5

C. Two minors, as follows:
1. A minimum of 6 hours in Botany and/or Bacteriology.
2. A minimum of 6 hours in one of the following areas:
Chemistry, Geography, Geology, Physics, Psychology, Mathematics.

D. Additional electives to be decided in consultation with the advisor.

General Information

Majors must take Mathematics (rather than Philosophy) as a graduation requirement.

German, French, and Russian are especially recommended as languages which might be selected to fulfill the language requirement for the B.A. degree. These languages have especially large scientific literatures and are particularly useful for the student who expects to go into graduate work.

A student may have no more than 45 hours in his major field to count in the 124 hours required for graduation. Sixteen hours of these 45 hours must be in Upper Division courses in the major field. Majors must have at least 30 Zoology hours of "C" or better.

Zoology for Distributed Majors

If Zoology is the field of specialization or one of the two other fields in the distributed plan, a minimum of 30 or 12 credits, respectively, is required toward the total of 60 for all three fields. A specific program should be worked out with the Zoology departmental advisor.

Distributed majors should choose their courses from the list for the major field; that is, a student with a distributed major in Zoology should choose his courses from the list required for Zoology majors, for distributed students with a Zoology minor. There is no Biology minor.

1968-69

GENERAL BIOLOGY

B101 BRIEF SUMMARY OUTLINE

	Approx. Hours of Lecture
INTRODUCTION	5
Diversity	
Characteristics of Living Things	
Taxonomy	
BIOLOGY OF ORGANIC MOLECULES	5
Fats, Carbohydrates, Proteins, Amino Acids	
Enzymes	
Origin of Earth and Life	
CELLULAR BIOLOGY	10
Cell Theory	
Structure and Function	
Biophysics	
Characteristics of Energy	
Energy Transformations	
Cell Respiration	
Photosynthesis	
Cell Reproduction - Mitosis and Meiosis	
GENETIC BIOLOGY	8
Mendelian	
Biochemical (Molecular)	
DEVELOPMENTAL BIOLOGY	6
Embryology of Starfish, Chick	
Anatomy and Physiology of Human Reproduction	
Experimental Embryology	
PROTISTAN BIOLOGY	8
Bacteria, Bluegreen Algae, Algae, Protozoa, Slime Molds, Fungi, Lichens	40 hours of lecture

1968-69

GENERAL BIOLOGY

BIO2 BRIEF SUMMARY OUTLINE

	Approx. hours of lecture
INTRODUCTION	1
ORGANISMIC BIOLOGY	
ANIMAL SURVEY (Invertebrates) Porifera, Coelenterata, Platyhelminthes, Nematoda, Annelida, Arthropods, Mollusca, Echinodermata	5
ANIMAL SURVEY (Vertebrates) Chordata, Hemichordata, Urochordata, Cephalochordata, Vertebrata, Agnatha, Placodermi, Chondrichthyes, Osteichthyes, Amphibia, Reptilia, Aves, Mammalia	2
ANIMAL PHYSIOLOGY (Systems) Digestive, Heart and Circulatory, Respiratory, Excretory, Endocrine, Nervous and Muscular Homeostasis	6
PLANT SURVEY (Embryophyta) Liverworts, True Mosses, Club Mosses, Horsetails, Ferns, Gymnosperms, Angiosperms	5
PLANT PHYSIOLOGY Translocation, Transpiration, Trophisms, Phytohormones, Photoinduction	7
BEHAVIORAL BIOLOGY The Nature of Behavior, Trophisms, Taxes, and Reflexes Inheritance and Learning in Behavior Types of Learning Motivation, Types of Releasers Communication, Evolution of Behavior, Orientation Behavior	4
POPULATION AND COMMUNITY ECOLOGY The Physical Environment, The Flow of Energy and Materials, Interspecific Interactions, Populations as Units of Structure and Function, Community Change, Biogeography, Pollution	7
EVOLUTIONARY BIOLOGY Evolution as change in the genetic makeup of populations, Genetic variation, the gene pool, the rate of natural selection adaptation, species and speciation, the concept of phylogeny, phylogeny and classification	3
	40 hours of lecture

GENERAL BIOLOGY B101

FALL 1969-70

WEEK	DATE	LABORATORY
I	9/17-9/20	Introduction
II	9/23-9/27	Biology of Organic Molecules
III	9/30-10/4	Microscopy and The Metric System
IV	10/7-10/11	Cells and Their Organization
V	10/14-10/18	Osmoregulation
VI	10/21-10/25	EXAM
VII	10/28-11/1	Paper Chromatography of Plant Pigments and Amino Acids
VIII	11/4-11/8	Photosynthetic Rate and Respiration
IX	11/11-11/15	Cell Reproduction
X	11/18-11/22	EXAM
XI	12/2-12/6	Genetics
XII	12/9-12/13	Developmental Biology
XIII	12/16-12/20	Biology of Monera & Protista
XIV	1/6-1/10	EXAM

LECTURE EXAMS: I. Monday, October 14
II. Monday, November 11
III. Monday, December 9

GENERAL BIOLOGY B102

SPRING 1968

WEEK	DATE	LABORATORY
I	2/4-2/7	Introduction
II	2/10-2/14	Porifera, Coelenterata, Platyhelminthes
III	2/17-2/21	Nematoda, Annelida, Mollusca
IV	2/24-2/28	Crustacea, Insecta, Echinodermata
V	3/3-3/7	LAB EXAM I
VI	3/10-3/14	Amphibian
VII	3/17-3/21	Vertebrate Anatomy
VIII	3/24-3/28	Vertebrate Anatomy
IX	3/31-4/4	SPRING VACATION
X	4/7-4/11	Animal Behavior
XI	4/14-4/18	LAB EXAM II
XII	4/21-4/25	Plant Anatomy
XIII	4/28-5/2	Plant Development
XIV	5/5-5/9	Diversity in Plants - Bryophyta
XV	5/12-5/16	Diversity in Plants - Tracheophyta
XVI	5/19-5/24	LAB EXAM III

LECTURE EXAMS: I. Friday, February 23
II. Friday, March 28
III. Wednesday, April 30

BASIC CHEMISTRY REQUIRED

Professor _____ Dept: Environmental ____ Organismic ____ Population ____

List those concepts from Chemistry that students must know and will actually USE in each of your courses. List each course separately. Use extra sheets if necessary.

LOWER DIVISION:

COURSE NO._____ NAME_____

COURSE NO._____ NAME_____

UPPER DIVISION:

COURSE NO._____ NAME_____

COURSE NO._____ NAME_____

500 LEVEL:

COURSE NO._____ NAME_____

Report of the Department of Biology Planning Committee

INTRODUCTION

The balance between change and stability in the biological ~~activities~~ sciences at the U of C must be weighed carefully, and this committee has attempted to be certain that any recommended changes be meritorious, and not taken for some whim or fancy. The strength of our present efforts must not be dissipated, and at the same time we must allow for the orderly modifications which will be necessary to meet the new challenges of our science. The Department of Biology has long had a strong direction in environmental biology, and this area is now in a national and international up-surge. Maintenance of vitality in this area is imperative. Likewise, efforts in ~~ecological~~ physiological and ~~descriptive~~ ~~systematic~~ biology have had a ~~long~~, useful, and significant history in the Department. These areas should be placed in a more favorable light, with their activities being appreciated fully, and challenged to new growth. Aided by new tools and new directions, these areas have the potentiality for continued effective contributions to teaching and additions to knowledge. Everything possible must be done to encourage the achievement of such potentiality. Perhaps the newest area of development in biology on the Boulder Campus has yet to be defined precisely, and its boundaries are not fully established. This area, variously called quantitative, or theoretical, or mathematical, with the word ecology, or systematics, or evolution or genetics appended, now has a sufficient number of interested investigators on the faculty to be considered as requiring its own identity.

The need for new emphasis on lower levels of biological organization has already been recognized and the major outline of its functions delineated in the establishment of the Department of Cellular, Molecular, and Developmental Biology within the College of Arts and Sciences. This area can contribute to the overall biological effort of the University in enhanced

manner if the University is successful in its efforts to attract Professor Keith Porter to be chairman of that Department.

The desire to accomplish modifications with ~~the least disruption, most~~ the greatest economy, and orderly transfer from present status to new administrative structure, has been another goal of this committee. Unless we can achieve the changes recommended below without a major investment in new staff and administrative positions, we cannot expect approval of changes by the Administration of the University. ~~Therefore~~ The recommendations ~~have attempted to~~ indicate how we may approach the modifications without losing ~~and not be~~ unrealistic in development of a new organizational pattern.

Above all, the committee has been cognizant of the necessity to meet the objectives of the University in its requirements to train professional biologists, to help in the production of new knowledge through research, to contribute to the general education programs of the University ~~College, to help train secondary school and junior college teachers of biology, and to share in the education of students enrolled in such specialized curricula as nursing, physical therapy, medical technology, and conservation education.~~ The organizational changes recommended are designed with these objectives in mind.

ORGANIZATION

The committee proposes that from the ~~one~~ present Department, three Departments be formed, thus, in essence adding only two to the ~~presently~~ existent number of Departments. These three are: 1. Organismic Biology, 2. Environmental Biology, and 3. Population Studies. The overall organization of biologists ~~then~~ would include, with the three Departments listed above, the Department of Cellular, Molecular, and Developmental Biology on the Boulder Campus, with the Denver and Colorado Springs Center faculties being independent of the Boulder groups as far as curricula and administra-

tive activities are concerned. However, the members of the biological faculties of the Centers could be given joint appointments in the Boulder Departments, should they so desire, and ~~should appropriate administrative machinery~~ be ~~available.~~ In addition to the curricular offerings of the several Departments, there must be a core program, developed along well-coordinated interdepartmental lines. The chairmen of the four Departments, plus the Director of the Core Program (<u>ex officio</u>) would form a Council on Biology ~~ical Sciences~~ for the Boulder Campus. This Council would be concerned with overall coordination of curricula, financial policy, building planning and space utilization, and administration of interdepartmental activities, ~~and~~ facilities, and staff personnel.

Suggested, ~~but by no means final,~~ definitions of the Departments and their disciplinary content are given as follows:

(1) <u>Organismic</u>. Descriptive, ~~and~~ comparative and experimental studies of organisms, ~~including~~ with the main emphasis on physiological and morphological approaches. ~~structural, functional, and taxonomic analyses.~~

(2) <u>Environmental</u>. Interactions between organisms and their environments, including both field studies and ~~experimental analyses~~ ~~[illegible]~~.

(3) <u>Population</u> ~~<u>studies</u>~~. Theoretical and mathematical approaches to populations (taxonomic and distributional) and experimental and evolutionary problems.

These Departments are thought of as being organized in relationship to the approaches to biological knowledge and research, rather than to ~~the~~ taxonomic groups ~~with which they deal~~. The definitions given above are broad enough so that, for example, an ecologist ~~taxonomist~~ who becomes interested in an adaptive physiology problem would feel no pressure to change Departments. And yet, should circumstances develop where persons on one faculty feel that their work would better fit into another Department, machinery should be provided to consider ~~allow~~ such a move.

The field of organismic biology, as herein defined, is of extreme importance on this campus, and even though it is one of the kinds of biology which encompasses

Change ... list of new descriptions.

many of the classical approaches of biology, more staffing is needed representing studies of important groups of organisms which are not now being investigated on this campus. Classical taxonomy and morphology are essential backgrounds for very large segments of biology of other kinds. This area must be strengthened by additional staffing. Also this Department would provide an effective place for persons who are often spoken of as functional and developmental anatomists.

Environmental biology is an area for which the University of Colorado has unique advantages which must be exploited. While it is true that large amounts of information have been accumulated, and some important generalizations have been proposed concerning factors of interaction between organisms and their environments in the Boulder region, there must be more kinds of field information accumulated and analyzed. Appropriate use of sophisticated tools available will greatly increase the efficacy of field studies. In addition, the availability of modern instrumentation, by which rigorously controlled experiments can be carried out and the data analyzed, will enable physiologists particularly interested in adaptive mechanisms to provide much more in the way of significant knowledge.

Population studies will be concerned largely with investigations of populations and their evolution and characteristics at various levels. Though much of such work will require the employment of the modern methods of genetics and biogeography combined with theoretical ecology, mathematical analysis and modeling will play a large role. For this the effective use of computers is essential, because their use can provide for highly efficient storage and retrieval of many kinds of data which formerly could not be handled efficiently. Growth and change in populations; evolution below, at, and above the species level; analysis of factors which influence genetic stability and change; and behavioral interactions of environmental and genetic factors in plants and animals, including man, can be expected to profit from the use of theoretical,

genetical, and mathematic approaches.

In addition to the several Departments, which are the curricular agencies, there are several institutes and the Museum, which are engaged in biological research and whose staffs ~~may be~~ are contributing to ~~the~~ biological teaching and curriculum efforts. These should remain autonomous, but when their personnel have joint appointments in the regular Departments, they then have representation in the affairs which pertain to their interests. Such entities should not become degree-granting units, and should not establish curricula outside the Departments.

There are two ways in which the efforts and activities of the Departments will be coordinated: a Council on Biology, and a Core Program.

The Council on Biology would be composed of the Chairmen of the four Departments plus the Director of the Core Program (ex officio). This group of persons would elect one of its own membership to serve as Chairman of the Council ~~for a definite (though not prolonged) period~~ on a rotating basis. The Council would be concerned with problems of ~~concern~~ significance to all of the Departments. As examples, we suggest the following: establishment of curricular patterns involving prevention of course duplication; purvue over courses which might be offered for credit in all Departments; establishment of priorities in the addition of staff; development of curricula for teacher training at the undergraduate and master's degree levels; general development of and administration of common facilities, such as stockroom, instrument shop, greenhouses and graphics laboratory; planning and utilization of space and facilities; and establishment of overall fiscal policies for the ~~several~~ Departments so that none will be short-changed. It must also have authority for some preliminary screening of graduate students, and helping the undecided graduate students to find the right niche.

The Core Program is thought of as a series of courses which would be required of all majors in the ~~several~~ Departments involved, it would be so

developed as to satisfy the needs of the ~~several~~ Departments at the basic level. It should also insure that, regardless of the area into which a student decides to major, he will have the appropriate background. ~~It is thought of, further, as a program to which~~ All Departments would contribute teaching personnel, both in regular Faculty and in teaching assistants. ~~We all want the products of the curricula of the Departments to be biologists, who see their own special fields of interest in relationship to the whole.~~ The Core Program will have to be developed on the basis of what we now have, ~~but~~ with provision for healthy progress toward something ~~much~~ better, and allowance for modification as the course of biology itself changes. It likely would consist of a freshman course or courses, plus some additions; under no circumstances should it involve more than four semesters of required courses, and at the same time should provide that students, who are not majors in the Departments or engaged in the teacher training curricula, would be able to take two semesters, and perhaps then be prepared for some other courses in the Departments, as necessary for their professional interests.

The Director of the Core Program ~~would~~ must be a regularly appointed faculty member in one of the four Departments.

In addition to the basic Core Program, there should be other inter-departmentally authorized courses, ~~both~~ at the advanced undergraduate and graduate levels. We might envisage a Senior Honors Seminar as one such course. ~~Certainly~~ At the graduate level, courses in biomathematics, instrumentation, history of biology, philosophy of biology, etc., would fall in such a category. The Council on Biology would be expected to encourage any such developments which would tend to increase the effectiveness of curricula and research.

DEPARTMENT AND CURRICULUM DEVELOPMENT

The members of the present Department should choose which of the Departments they wish to join. When such a choice has been made, they are not necessarily "stuck" to that Department indefinitely, but could choose to be considered for transfer to another Department if it becomes evident that their interests are not receiving adequate expression in the Department of their first choice. There will have to be a time of settling down.

In the meantime, however, the persons who have selected membership in a particular Department should start to construct their curriculum and establish their own basis of organization. It is likely that one member of each group could be selected as a temporary, and quite unofficial, chairman during the changeover period. Committees could be selected to work on problems which will be faced by the Departments. But the major prerogatives for the members should lie within the membership of the Departments, and not be dictated by outside interests. The changes necessary for development of the new departmental organization should not be abrupt, but the new Departments would be informal units in the old Department of Biology during the time of transition, probably a year or year-and-a-half. In this time the old Department would be phased out, and additions to staff would involve only the new units. Once the Departments are actually authorized, then a more formal pattern for each can be established quickly and the Council can start its operations. If the basic spadework has been done. Further, it would be expected that in the establishment of balance in the development of the Departments, the Council would provide a major coordinating voice, and would insure that all Departments be allowed to grow in such a manner as to insure that biology as a whole is well-represented, and that fads and fancies never be allowed to dictate which Departments shall be given priority in additions of faculty or other personnel.

In conclusion, this committee has attempted to give the widest possible latitude for orderly growth of a vital, growing science. We must insure that the traditionally valid areas of biology are sustained while at the same time we encourage effective proliferation into other areas, some of which have yet to be defined. We must insure these activities both in the research programs and curricular offerings of the Departments. What is needed now is the support and active participation of the members of the present Department of Biology faculty in the development of plans for the future. ~~Unless every person will work toward achievement of plans which can be accepted by all of us, and be accepted by the Administration, no kind of organization can succeed.~~

The planning committee should serve as a focus for continued planning, organization and advise until it can be supplanted by the Council.

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 course 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 their 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 and breadth 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 of 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. Crumpacker, John DeFries, John M. Emlen, Brij M. Kapoor, Estella Leopold, Askell Löve, and David Rogers. In addition, John Rattenbury of the University of New Zealand will teach a course in evolution during next fall, as a Visiting Professor on sabbatical leave. We expect other joint appointments from various members of the Institute for Behavioral Genetics, the University Museum, and the Institute for Artic 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

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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 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 - interested 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.

its fields. This will assist us in getting outside funds for research, training and building up facilities that now are not met with in Boulder.

Staff Needs

Since the faculty of the Department of Population Studies will be considerably more productive than the present Department of Biology (average publications per year and person in 1967: 6.5, as compared to 1.9 of the present Department and 1.0 for the other members of the present faculty), its need for secretarial help will be greater, Since David Rogers has a secretary paid from his grant, 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 the graduate student support, we assume that the present number of Teaching Assistants of the Department of Biology will be evenly divided between the new Departments, which then will furnish the core course with its needs of Teaching Assistants. 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, laboratories lecture rooms, and rooms 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 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.

Space Requirements: Estimated Needs for Next 7 or 8 Years -

1. Laboratory

a. Teaching

Principles of genetics - 1,350 sq. ft.

Quantitative + Population Genetics 450 sq ft.

Behavioral Genetics 450 sq ft.

Plant Cytology + Biosystematics 450

~~Taxonomics~~

Preparation lab for all genetics 810 sq ft.

Taxometrics + Documentation 900 sq ft.

aux space { Evolutionary biochemistry 600 sq ft.

450 " "

b. Research laboratory

1 for 1a FTE, 14 1540 sq ft.

Grad. student, 15 975 " "

Res. Assoc. 5 550

Aux. Space 1100

c. Herbarium space 675 sq. ft.

d. Data processing equipment room 600 sq ft.

e. Instrument room 400 sq ft.

f. Greenhouse 1800 sq ft.

g. Animal Room 1500 sq ft.

h. Aux. Space 1490

Space P2

2. Classroom ~~Lecture~~ facilities
~~+ Genetics~~

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

b. 5 Small classrooms (30 students)

c. 1 Seminar room (30 places).

3. Office space

14 faculty offices @ 120 asf./ea.		1680
1 chairman's office.		200
1 admin. asst office.		65
2 secy. offices		150
5 Res. Assoc. offices		600
14 Grad. Stud. offices @ 65 asf. ea.		910

CURRICULUM

Undergraduate	Graduate
Principles of Genetics*	Taximetrics*
Quantitative Genetics*	Plant biosystematics*
Behavioral Genetics*	Plant cytology*
Molecular Genetics*	Modern Theories of Evolution*
Genetic biogeography*	Theoretical Population Biology*
Biostatistics	Population genetics*
Finite biomathematics	Palynology
	Mathematical Modeling of Biological Systems
	Evolutionary biochemistry

*Courses Now offered; the remaining named courses are merely suggestive, and depend upon the ~~xtxt~~ FTEs who will join us. No mention is made of cross-disciplinary work at this time, but appropriate ~~connections with other fields~~ departments on campus will be consulted ~~xxx~~ before any decision on new curricula. For example, population studies should include demographic studies, now in the Department of Sociology

Space requirements.

Genetics

1. Principals of Genetics--laboratory. 30 students/lab. section, 7 sections, 1350 square ft. Preparation room, 400 square feet. 400.
2. Quantitative and Behavioral genetics laboratory--10 students/lab. 350 square feet.
3.

Greenhouses
Growth Chamb. (anim + pl.)
Herbarium
EDP room
Library

Staff -

Herb. Techn.

Gardner

Animal

Cytol. Techn.

EDP operator.

PROPOSED CURRICULUM

Undergraduate

Principles of Genetics w/ lab.
Population Biology
Cytogenetics
Population Genetics
Biogeography
Animal Ecology
Plant Ecology
Taximetrics
Topics in Ecological Genetics
Microecology
Techniques in Cytogenetics

Graduate

Behavioral Ecology Seminar
Theoretical Ecology Seminar
Quantitative Genetics
Advanced Behavioral Genetics
Independent Study
Thesis
Advanced Taximetrics: Theoretical
Karyology
Biosystematics
Experimental Population Genetics
Population Studies

Future Courses

Biostatistics
Advanced Biostatistics
Finite Mathematics
Topics in Biomathematics
Animal Behavior
Topics in Animal Behavior
Math. Models of Bio. Systems

Princ. Genetics w/ lab. - 3 hr. lab - 168 students
7 lab sections 24 students/lab 850 sq. ft.

{Pop. genetics
{Cytogenetics

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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. Insert also We anticipate the need for the following ~~additional~~ 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, ~~xxxxxxxxx~~ with interest in biological problems as a stimulus for investigating useful mathematical ~~xxxxx~~ procedures.

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These 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 availablity of candidates and concurrence of the existing faculty.

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