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Report

UNDERGRADUATE RESEARCH PARTICIPATION PROGRAM

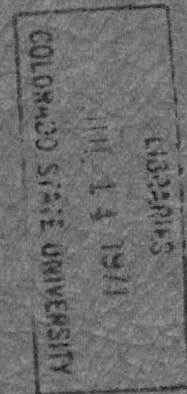
at

Colorado State University

by

James R. Barton
Director

June 15, 1960



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UNDERGRADUATE RESEARCH PARTICIPATION PROGRAM

at

Colorado State University

Summer 1959

Academic Year 1959-60

Submitted to

National Science Foundation

by

James R. Barton
Director

Civil Engineering Section
Colorado State University
Fort Collins, Colorado

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Summary of Program

The undergraduate research participation program at Colorado State University extended from June 1959 to April 1, 1960, and it supported 21 undergraduate students on supervised research projects. All of the students were selected from the student body of the University by the various supervisors involved. Nine of the students finished their work during the summer, and the other twelve worked during the school year.

Research Projects and Personnel

The following list gives the participants, their advisers, and the projects on which they worked:

No.	Students Name	School and Department	Project Leaders	Research Projects
<u>School of Agriculture</u>				
1	Arden Collette	Agronomy - Crops	D. Wood	Invitro culture of bean embryos
2	Clifford Johnson	Agronomy - Soils	K. Brengle	Moisture storage related to weed cover
3	James Carlson*	Animal Husbandry	C. Story	Value of nitrogen fertilization on mountain meadow hay
4	Ruth Lamb*	Dairy Industry	G. Ward	Silica gel chromatography and determination of blood sugar level
5	Joyce Maxwell	Horticulture	H. Chapman	A study of factors affecting the chipping quality of potatoes
<u>School of Arts & Sciences</u>				
6	Sally Mickle	Botany	R. Baker	Nitrogen metabolism of the fungus hypomyces sp.
7	Gary Strobel	Botany	C. Livingston	Antiviral properties of some chemicals against potato virus x in vivo
8	John Pearson*	Chemistry	C. Guss	Preparation and reactions of mesityl aldehyde
9	Allan Miller*	Geology	W. Laval	Geologic map of the Manhattan Mining District
10	Marilyn Doig	Mathematics	C. Rogers	Ordered pairs and the properties of an improper integral
11	Daniel Hill	Physics	L. Hadley	Developing methods to condense out alkali metal films
12	Richard Price	Physics	J. Faris	K-band microwave cavities
<u>School of Engineering</u>				
13	Clayton Enix*	Agricultural	N. Evans	A study in onion production
14	Clayton Ogier*	Civil	S. Karaki	The hydraulic jump in a circular conduit
15	Jeris Danielson*	Civil	R. Schleusener	Hail suppression evaluation
16	Charles Platz*	Electrical	E. Schulz	Wave basin studies
17	Jack Ferguson *	Mechanical	R. Smith	Two phase, single component fluid flow.
<u>School of Forestry</u>				
18	Robert Roughton	Game Management	H. Steinhoff	The role of cover in the Cache La Poudre winter deer range
19	Craig Shuler	Utilization	H. Troxell	Permeability of Engelmann Spruce

*Reported as summer session participants

No.	Students Name	School and Department	Project Leaders	Research Projects
20	Roger Krause*	<u>School of Vet. Medicine</u> Pathology	D. Maag	New Laboratory procedure for detecting selenium toxicosis
21	Cary Collins*	<u>School of Business & Econ.</u> Computing Center	E. Remmenga	Multiple Co-Variance Program on an IBM 704

Objectives of the Program

This program was designed to stimulate the research attitude in a few well qualified undergraduate students. It is believed that this objective was met to a lesser or greater degree in the case of every participant. The program also had the goal of assisting professors in accomplishing research which they otherwise might not have been able to get done. This objective was met in many of the projects.

Selection of Participants

The method of selecting these students varied from department to department. In most cases, the adviser who had been given a student to work with him would choose a student whom he knew to be a good student. The selection was made on the basis of the professor's past experience with the student. By knowing the student personally, the professor was already familiar with the student's ability and his interest in research. Our experience indicates that students who were selected by the professor as a result of his personal acquaintance with the student, generally did a better job and benefited more than those who were selected by other means.

Another method of selection was to form a departmental committee, advertise for applicants, and then on the basis of the student's application form and his academic record, choose the most likely prospect. Although this method was satisfactory, the lack of close previous association between the student and his adviser seems to have some disadvantages. Of course since some student advisers are on full-time research, they have no opportunity to become acquainted with undergraduate students and therefore must

rely on the student's record and other faculty members as a means of selecting him.

Administrative Organization

The administrative organization of the project was very flexible. Advisers and students were notified of the essential features and requirements of the program by the program director. The details of operation were then worked out between the advisers and their students. Although the program director visited most of the projects and knew most of the students, there was not a close relationship between students and director as there was between each adviser and his student. During the summer of 1959, all participants attended regularly scheduled seminars, where they were exposed to research in several fields of endeavor. This helped to broaden the student's outlook on research. The participants who were working during the academic year did not attend regular seminars except in their own departments and this is felt to be a disadvantage which should be corrected in the future if possible.

The bookkeeping procedures were set up in the bookkeeping department of the Civil Engineering Research Section, and financial details on each student were handled here.

The director then was responsible for the over-all operation of the program and he answered questions for advisers and students concerning what could be done under the contract and what could not be done. For instance, the problem of spending funds for expendable supplies arose in several departments and

the director had to make decisions concerning what expenses properly fell in this category. The director also reviewed each student's record to make sure that he was an acceptable candidate. On the other hand, all details concerning the actual performance of the research project were worked out between the adviser and the student; and there was, in every case, a close contact between the student and the faculty member acting as adviser. It is believed here that this close contact between student and professor is the core of this undergraduate research program and is absolutely essential to its success. It is through this relationship that the students receive their inspiration and their "feel" for research. If the professor is enthusiastic, it generally follows that the student catches this spirit and research becomes a basic part of his professional outlook.

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Results The participants who were working during

As a result of personal interviews with the participants and their advisers, it is very apparent that all participants derived some good from the program. At least 13 of the 21 participants are going on to graduate school and of these 13, at least 5 are going as a direct result of their participation in this program.

Most of the students have been very enthusiastic in their praise of this program and they evidenced their enthusiasm by accomplishing good work on their respective projects. Although enthusiasm and love for research are abstract qualities, they are nevertheless real and hold real promise for the production of concrete results in the future. The results of this program, however, are not limited to abstract results. Several papers are in

the process of preparation and some are already completed. For convenience, these are listed in summary form:

1. Jim Carlson - Two publications are in the process of being written. The first paper is presently ready for the reviewing committee and will be published in the fall.
2. Cary Collins - Mr. Collins produced a multiple co-variance program for an IBM-704 computer and this program has been used successfully at least twice since he finished.
3. Jack Ferguson - The work started by Ferguson is being continued by another participant this coming summer, and a paper is planned for this coming fall.
4. Daniel Hill - As a result of Mr. Hill's work, Dr. Hadley, his adviser, presented a paper at the Optical Society of America at a meeting in Washington, D. C., in April 1960.
5. Roger Krause - A new laboratory procedure for detecting selenium toxicosis was developed and this procedure has been used successfully since in the diagnostic laboratory of the Veterinary Medicine School.
6. Sally Mickle - Two papers based on Miss Mickle's work are now in progress.
7. Allan Miller - Mr. Miller produced a geographic map of the old mining area that he surveyed. This area had not been previously mapped, and the map will be filed in the Geology Department for future reference.

8. Clayton Ogier - A paper is presently being prepared by Mr. Karaki with Mr. Ogier as co-author.
9. Gary Strobel - A technical paper was presented by Mr. Strobel at the April meeting of the Wyoming-Colorado Academy of Science.
10. Both Jerry Danielson and Charles Platz were working on large research projects and their work was included in the final reports made to the sponsors of the respective projects.

Evaluation of Local Program

This program was definitely a great asset to every participant. Without exception, they all gained a new appreciation for the problems of scientific research.

The advisers who had the vision of this program were able to do much more with their students than the ones who accepted the student as welcome assistance. Although most of our advisers entered into the true spirit of the program, some were more enthusiastic and more effective than others. From our experience here, it seems reasonable to assume that the student's benefit from this program is directly proportional to the adviser's ability to catch the spirit of the program.

The students who were given small isolated, yet complete, projects to work on seemed to make more progress and derive more benefit than students who worked on large projects where they were only working on a small phase of the over-all problem. It also seems that three or four small projects which are in effect only methods or procedures are not very effective either.

Most of our students were essentially independent workers so that they could follow through on ideas which they themselves obtained. This type of freedom for the student is good although he must have some guidance from his adviser.

The seminars were effective in helping the student gain an appreciation for other fields of endeavor.

Our experience here indicates that this NSF program is a very good one and we believe that it will prove to be a real aid in increasing our national supply of research people.

Recommendations for Future Local Programs

Participants in future programs should have the opportunity of attending more seminars, and discussion meetings should be arranged in which the students may discuss among themselves their various projects.

It would be a good thing if this program were publicized on the campus more extensively so that it would be a campus honor to be chosen as a participant.

Where a selection is possible, projects should be chosen that are submitted by professors who are anxious and enthusiastic about getting an undergraduate student to work with. If the professor is really enthusiastic about the project and spends time with the student, the results are bound to be favorable.

Strive to get projects which are short enough and simple enough so that the student can make actual progress in solving the problem. If it is short enough, he can go through the steps of planning the research, doing the experimental work, summarizing the data and results, and actually drawing the conclusions from the result obtained. If the student spends all of his time on any one of the first three steps, he fails to get a full appreciation of research.

Undergraduate Research Participation Program of NSF

This is an excellent program and should be continued. It is beneficial to students, professors, and to institutions. As far as the program here at Colorado State University is concerned, the following recommendations seem worthwhile.

1. Some money to subsidize advisers of projects is very necessary and should be continued.
2. \$600 for a participant is a bit low in order to attract the truly top grade students in the professional fields.
3. Some of the money used for expendable supplies should be available for more permanent pieces of equipment. This is especially true in the case of projects which otherwise might not need much in the way of expendable supplies.