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Report of the 1961 National Science Foundation
SUMMER FLUID MECHANICS INSTITUTE FOR COLLEGE TEACHERS

by

James R. Barton, Director

Colorado State University
Fort Collins, Colorado

August 1961

ENGINEERING RESEARCH
AUG 11 1961
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Report of the
1961 National Science Foundation
SUMMER FLUID MECHANICS INSTITUTE
for
COLLEGE TEACHERS

June 19 through August 11, 1961

Submitted to
The National Science Foundation
by
James R. Barton, Director

Department of Civil Engineering
COLORADO STATE UNIVERSITY
Fort Collins, Colorado

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I. INSTITUTE OPERATION

There is, in the United States today, a very serious shortage of competent fluid mechanics teachers. Because of this shortage, many engineering teachers, particularly in smaller colleges and universities, have been assigned the responsibility of developing and teaching courses in fluid mechanics even though their major competence is in some other field of engineering. The purpose of this Institute was to provide teachers of fluid mechanics an opportunity to advance their technical competence in this subject area by attending formal graduate-level courses and seminars during an eight-week summer program. The graduate credit earned can be applied toward an advanced degree, either the M.S. or Ph.D. at this or some other University.

Six courses, listed subsequently, ranging in difficulty from the lower to intermediate graduate levels were offered. Each course carried graduate credit as shown. In addition to the courses, one two-hour seminar per week was held. Each student was required to attend all seminars. One credit was given for the seminar. Each student was required to take three courses plus the seminar.

List of Courses

<u>Number</u>	<u>Quarter-Credits</u>	<u>Instructor</u>
ME 134, Flow of Compressible Fluids	3	R. D. Haberstroh
CE 150, Intermediate Fluid Mechanics	4	J. R. Barton and G. L. Smith

CE 165, Hydrology	4	E. F. Schulz
CE 227, Mechanics of Ideal Fluids	3	J. E. Cermak
CE 255, Experimental Techniques in Fluid Mechanics	3	C. C. Britton
CE 260, Erosion and Sedimentation Problems	3	D. B. Simons
CE 291, Seminar in Fluid Mechanics	1	J. R. Barton

All participants were required to spend one day at the Bureau of Reclamation Laboratories at the Federal Center in Denver. Transportation was furnished by the Institute. Arrangements were made for conducted tours through the Laboratories. This proved to be one of the highlights of the Institute.

The program was planned to accommodate both new participants and returnees from last year's Institute. Fourteen of last year's participants attended the Institute this summer. They took the intermediate graduate level courses and should now be thoroughly competent technically to teach undergraduate courses and lower level graduate courses. It is not felt that these students would benefit by attending a third Institute on this subject.

The courses offered are regular courses taught during the school year. It appears to be most desirable, if graduate credit is to be given, to use to as great an extent as possible courses that are regularly taught in the University. In the first place, such courses have

been developed over a period of time and should, therefore, be more effective than a new course that is to be taught only once. Secondly, the grading standards are established and, thirdly, the other schools are much more inclined to accept transfer graduate credit for courses that are formally listed in another University's catalog.

The enrollment was fairly evenly distributed among these courses. The work requirements and grading standards were the same as those used in our regular graduate program. A few of the more poorly qualified students and one or two of the less sincere students had some difficulty in meeting the required work load but the remainder of the students worked very hard and did very well. If graduate credit is to be given in an Institute it is imperative that the courses be kept on a graduate level even if a few participants find the work too difficult for them. Most of these participants want to use this credit toward a Ph.D. either at this or some other University and would not have attended if the courses were without graduate credit.

II. STAFF

The Director, J. R. Barton, the Associate Director, M. E. Bender, and all of the teaching staff listed with the courses in Section I are regular staff members at Colorado State University. The Director worked full time during the

Institute and one-half time during the Spring Quarter preceding the Institute and all of the other staff members were on a one-half time basis during the Institute.

This staff is highly competent and is thoroughly familiar with the courses, teaching standards and grading methods in use here. For this type of program it appears much better to use regular staff members for the Institute than to use visiting professors.

Seminar speakers included:

M. W. Bittinger	Ground Water Problems in Colorado
V. M. Yevdjevich	Ground Water Problems in Lebanon
Jack Washichek	Snow Surveying
A. R. Robinson	Trapezoidal Flumes
R. A. Schleusener	Hail Suppression Studies
Herbert Riehl	Tropical Hurricanes
Film on Fluid Mechanics by Ascher Shapiro	

III. SELECTION PROCEDURE

We received many inquiries and finally 83 completed applications. Each applicant was required to submit NSF forms 9C-24B and 9C-25B and, in addition, complete a supplementary sheet giving information not requested on the NSF forms. Each applicant was also requested to send official transcripts of all of his college and/or university grades.

The following basic criteria were used in selecting participants:

1. He must have a bachelor's degree from an accredited engineering school.
2. He must have taught (not as a graduate assistant) in an engineering school at least one year prior to June 1961 and he must have been teaching at the time application was made.
3. He must have taught fluid mechanics and have a real interest in developing a high level of competence in this field.
4. He must have the academic ability, as evidenced by his grades in past course work, to benefit from, and to perform satisfactorily in, a graduate program.

In addition to the above basic criteria, careful consideration was given to geographic distribution. An effort was made to accept no more than one from each school. We were not entirely successful in this because six of those initially selected declined the offer and, in the process of selecting from alternates, it was necessary to take applicants from schools from which we had already accepted a participant. The final distribution included participants from 37 schools located in 24 states, Washington, D. C., Canada and Korea. We feel that this wide distribution of

participants will provide the most benefit in upgrading instruction in fluid mechanics throughout the United States.

IV. ADMINISTRATION

Accommodations in modern dormitories near the Engineering Center were available for all participants. The dormitories have excellent lounge and dining facilities.

Sixteen participants lived in dormitories and 24 participants, primarily those with the larger families, lived in off-campus housing. Adequate off-campus housing was available for those desiring it.

The Engineering Library was the study center for the Institute. All reference material was placed on specially designated shelves for easy use.

The only formal recreation provided was a get-acquainted picnic for all participants and their families and all members of the Engineering School staff and their families, and an evening illustrated talk on Thailand by T. H. Evans, Dean of Engineering at Colorado State University. Dean Evans had just returned from a two-year assignment in Bangkok. Most of the participants brought their families with them and preferred to spend what time they could on week ends with their families in the mountains. Through the week, and sometimes even on weekends, they were very busy with their studies. In this type of program formal group recreation does not seem too desirable.

No administrative problems of any significance arose during the Institute.

V. EVALUATION

It is very difficult to evaluate a graduate study program such as this on any real tangible basis other than grades. The grades made by the participants were, in general, very satisfactory.

I think the more important evaluation, although completely intangible, would be the possible effect this Institute will have on the participants future teaching. Most of these participants were from smaller schools where each teacher must teach in more than one subject area. Many of the participants had a rather weak academic background in fluid mechanics although they were teaching fluid mechanics and many of them were in charge of fluid mechanics courses and laboratories. It follows that any program that would increase their technical competence must necessarily increase the effectiveness of their teaching. These participants were eager students and each of them increased his competence in the field enormously. I am confident that in this respect this Institute will greatly benefit fluid mechanics teaching in 37 colleges and universities throughout the United States, Canada and Korea.

Many of this group plan to use the credit earned in this Institute toward a Ph.D. degree. Some are planning to

return here some time in the future to complete their studies, and others intend to transfer this credit to another university.

The staff members of the Institute are very enthusiastic about the attitude and performance of the participants. We feel it has been very successful.

VI. RECOMMENDATIONS FOR THE FUTURE

The overall NSF policy under which these Institutes are conducted is excellent. The support for the participants and for the expenses of the Institute are both adequate. The freedom given the host Institution and particularly the Director is ideal and allows the flexibility so necessary to conduct an Institute for the maximum benefit of the participants.

The number of applications received this year was considerably less than the number received for the Institute last summer. I think this is largely due to the greater number of college-level Institutes funded this year. If the number funded for next year is even greater it will mean that many Institutes will not be able to get 40 or 50 deserving and needful participants. It will mean, however, that each applicant will have an opportunity to apply for admission to an Institute that very specifically meets his needs.

Many of the applications that we received for the 1960 Institute were from people who were not teaching fluid mechanics and obviously would not teach it but who wanted to attend an Institute anyway. This year we received a fewer total number of applications but just about as many from qualified applicants as we received in 1960.

In summary it appears that Institutes for approximately 25 students aimed specifically at helping a very definite group would be more feasible in the future than the larger more diversified programs. Because of this, the proposal that we have submitted for a Fluid Mechanics Institute for 1962 is for 25 participants and the program is designed specifically for those who are teaching fluid mechanics and yet have a very weak background in this subject. One lower level program would be provided for all participants.

VII. ADDITIONAL COMMENTS

None

VIII. ROSTER OF PARTICIPANTS

<u>Name</u>	<u>Institution</u>	<u>Home Address</u>
Alger, George R.	South Dakota State College	208 17th Avenue Brookings, S. D.
Barnes, Albert H.	University of Kentucky	3320 Newburg Road Louisville 18, Ky.
Blair, Philip M.	San Jose State College	1526 Arbutus Drive San Jose 24, Calif.

<u>Name</u>	<u>Institution</u>	<u>Home Address</u>
Caffey, James E.	Arlington State College	1911 Lea Crest Arlington, Texas
Calder, Glen H.	Brigham Young University	195 West Sixth N. Mapleton, Utah
Carlton, Thomas A.	Mississippi State University	Route 2, Box 139A Starkville, Miss.
Carney, John Bryan	University of Arizona	2649 E. Eastland Tucson, Arizona
Chenoweth, Harry H.	University of Washington	4715 47th, N.E. Seattle 5, Wash.
Conover, Robert A.	Lafayette College	Route 3, Box 269 Nazareth, Pa.
Denson, Keith H.	Mississippi State University	209 S. Washington Starkville, Miss.
DiBiagio, Elmo L.	Loyola College	632 Colorado Ave. Baltimore 10, Md.
Dowdell, Rodger B.	University of Bridgeport	100 Freeman Ave. Stratford, Conn.
Fletcher, Alan G.	University of Idaho	324 North Grant Moscow, Idaho
Forss, Vincent A.	Lafayette College	Route 2 Easton, Pa.
Foxworthy, James E.	Loyola University	2140 Dorado Drive San Pedro, Calif.
Galarneau, Andre	Ecole Polytechnic	8492 Waverly St. Montreal, Quebec, Canada
Garton, James E.	Oklahoma State University	1923 West 10th Stillwater, Okla.
Glass, Quentin L.	South Dakota School of Mines	8 Oakland Rapid City, S. D.
Han, Chan Woo	Han Yang University	487-8 Donam-dong Sungbuk-ku, Seoul, Korea

<u>Name</u>	<u>Institution</u>	<u>Home Address</u>
Henry, J. David	Ferris Institute	622 Hutchinson Big Rapids, Mich.
Holmen, Harold	North Dakota State University	38-18 Ave. N. Fargo, N. D.
Javaher, James N.	Sacramento City College	4825 Hillsboro Lane Sacramento 22, Calif.
Kelnhofer, William J.	Catholic University of America	4111 Maryland Ave. Washington 16, D. C.
Kernander, William H.	St. Martin's College	Route 2, Box 233A Olympia, Wash.
Marshall, Richard D.	University of Arizona	3232 E. Linden St. Tucson, Arizona
McLeane, Robert W.	Louisiana Polytechnic Institute	Route 1 Greenwood Drive Ruston, La.
Middleton, George W.	North Carolina State College	2828 Claremont Rd Raleigh, N. C.
Muir, Clifford D.	Missouri School of Mines	Pennant Hotel Rolla, Mo.
Nath, John H.	Colorado State University	410 Circle Drive Fort Collins, Colo.
Nigro, Nicholas J.	Southern Illinois University	410½ N. Springer Carbondale, Ill.
Ousterhout, Donald S.	University of Alabama	1820 Fourth St. Tuscaloosa, Ala.
Reisman, Arnold	Los Angeles State College	1200 Branham St. Monterey Park, Calif.
Roscoe, Charles M.	Humboldt State College	3656 H Street Eureka, Calif.
Schiller, Robert E.	A & M College of Texas	510 Crescent Bryan, Texas
Smith, James L.	Bradley University	829 East Virginia Peoria, Ill.

<u>Name</u>	<u>Institution</u>	<u>Home Address</u>
Stamper, Eugene	Newark College of Engineering	73 Cranford Place Teaneck, N. J.
Tinkham, Howard C.	New Bedford Institute of Technology	Acushnet Road Mattapoisett, Mass.
Wylie, Evan B.	University of Denver	2041 S. Vine Denver 10, Colo.
Yarborough, Keith A.	University of Nevada	345 Ardmore Drive Reno, Nevada
Younkin, Larry M.	Geneva College	No. 5-C, College Hill Apts. Beaver Falls, Pa.