

## AWARDS AND ALLOWANCES

NSF participants receive 6 free credits and are furnished a travel allowance, plus all food, lodging and field facilities during the eight-week session. A travel allowance may not be given to non-U. S. nationals, unless studying in the United States.

## ACADEMIC CREDIT

Participants are registered in the Michigan State University summer quarter. Credit from 3 to 15 hours can be arranged depending on the student's need and academic obligations. For graduate students a minimum average of 6 credits is expected. All credits are transferable to other universities. The registration cost for 6 basic credits is paid by the Institute for NSF participants.

## ELIGIBILITY

NSF Awardees must be enrolled in or accepted for graduate work as candidates for a degree at their respective institutions. Indication of intent to go to graduate school is not sufficient. A generally high academic record or potential is expected. Considerable weight, however, is placed on personal character, demonstrated interest and professional motivation. Several post-doctoral or senior scientist awards are also given each year for qualified older scientists. Non-NSF participants can also be made available to qualified high school earth science or environmental science teachers. In selecting individuals for participation in this program, Michigan State University and FGER will not discriminate on grounds of race, creed, color or national origin of any staff member, or student applicant or participant.



*Theodolite station in Gilkey Canyon for the National Geographic Society's regional glacier survey.*

## APPLICATION

Application can be made, in special cases, as late as June 20th; however, earlier inquiry is urged. Letters of application should contain information on experience and adaptability to rugged field conditions; transcripts; evidence of graduate school status or acceptance; and letters of recommendation from a departmental or supervisory head, and two other individuals regarding scholarship and character. Two-thirds of the billets will be allocated by May 25th. All other participants will be notified before June 30th.

Make application to:

Dr. M. M. Miller, Director  
Glaciological and Arctic Sciences Institute  
Michigan State University, East Lansing, Michigan 48823  
Field Addresses: P.O. Box 775 Juneau, Alaska 99801  
P.O. Box 99, Atlin, B. C., Canada

## STAFF

- DR. MAYNARD M. MILLER, Director, Glaciological and Arctic Sciences Institute; Professor, Geology Dept., Michigan State University; Director, Foundation for Glacier and Environmental Research, Seattle, Wn. (glaciology, geomorphology; environmental geology; research methods and expedition techniques)
- DR. JAMES H. ANDERSON, Institute of Arctic Biology, University of Alaska; Research Associate, Foundation for Glacier & Environmental Research, Seattle, Wn. (arctic ecology, palynology, field methods)
- DR. ADAM CHRZANOWSKI, Surveying Engineering Dept., University of New Brunswick, Fredericton, Canada (field surveying, electronic surveys, geodesy, remote sensors)
- DR. EGON DORRER, Surveying Engineering Dept., University of New Brunswick, Fredericton, Canada (glacier surveys, aerial & terrestrial photogrammetry, data processing)
- DR. WILLIAM J. HINZE, Geology Dept., Michigan State University (geophysical methods, glacier geophysics)
- DR. GOTTFRIED KONECNY, Prof. of Photogrammetry, Technical University of Hanover, Germany (terrestrial photogrammetry, glacier and rock glacier surveys)
- DR. ROBERT W. LITTLE, Metallurgy, Mechanics and Materials Science Dept., Michigan State University (glacier and continuum mechanics)
- DR. EDWARD LITTLE, Research Associate, Foundation for Glacier & Environmental Research, Seattle, Wn. (glacier and sea ice physics, glaciology, and micro-meteorology)
- DR. JACK MAJOR, Botany Dept., University of California, Davis (arctic and mountain soils, alpine plant taxonomy, geobotanical research)
- DR. ROBERT L. NICHOLS, Geology Dept., Eastern Kentucky University (Pleistocene geology, Antarctic geomorphology, photogeology, polar environments and expedition methods)
- DR. DOUGLAS N. SWANSTON, Institute of Northern Forestry, USFS, Juneau, Alaska; Research Associate, Foundation for Glacier and Environmental Research, Seattle, Wn. (mass wastage, pedology, sub-arctic environments, glacier geology research)
- DR. AYLMEY THOMPSON, Meteorology Dept., Texas A & M University (mountain meteorology, synoptic and regional arctic climatology)
- WALTER I. WITTMANN, Director, Polar Oceanography, U.S. Naval Oceanographic Office, Washington, D. C. (polar oceanography, arctic basin environmental and sea ice studies)



*Oversnow vehicles on Hades Highway Névé.*



*Dog team on the Taku Névé*



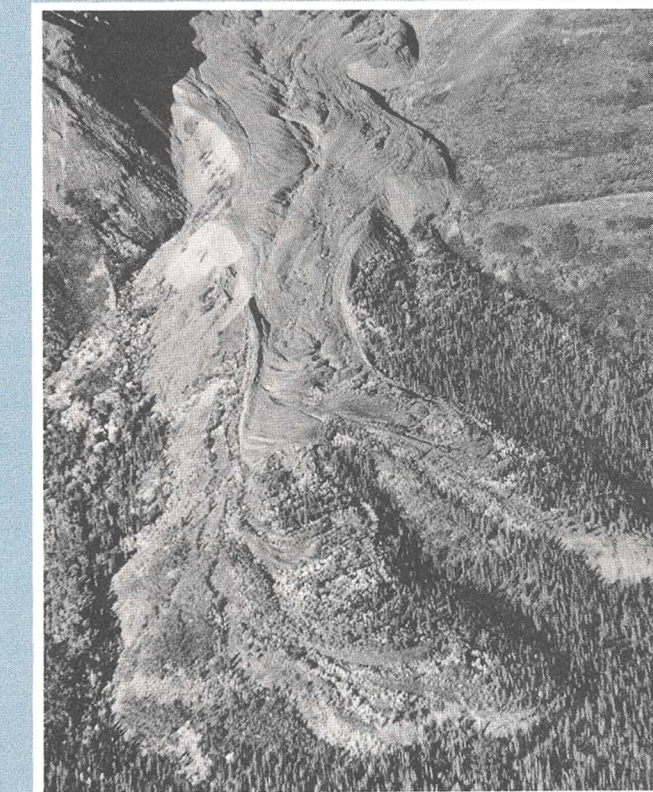
*Electro-thermic glacier drilling on the Juneau Icefield.*

- DR. ALFRED PINCHAK, Fluid Mechanics Dept., Case Western Reserve University, Cleveland, Ohio (glacio-hydrology, fluid mechanics, structural glaciology, statistical methods)
- Medical Staff, Safety and Survival Instruction:* W. M. Smith, M.D., Foundation for Glacier & Environmental Research (medical coordinator); E. Crippen, M.D.; G. D. Gibson, M.D.; H. C. McDade, M.D.; R. Schutt, M.D.; H. Bressler; D. Thomas; V. Sundberg; O. Daiber; D. Loof.
- Administration, Liaison and Logistics Staff,* Juneau-Atlin Headquarters: J. W. Miller, K. Schoen, D. Littlefield, C. Perman, J. Harvey, D. Williams, A. and N. Livingston, K. Loken.
- Camp and Field Operations Staff:* R. Dilts, L. Schoen, R. Asher, A. Clough, W. Lokey, Lock Miller, M. Calvert, E. Reynolds, R. Mc.C. Miller, L. D. Miller, R. Mack, T. McMullin, R. Warren, E. Bressler, S. Hulse, H. Rossiter, C. Cox.
- Adjunct Lecturers and Research Affiliates:* M. Alford and W. Maylor, Inland Waters Branch, Whitehorse, Y. T., Canada (hydro-metrics, Yukon-B.C. water resources management); Dr. D. Brew, Dr. A. Ford, and V. Berwick, U.S. Geological Survey (bedrock geology; Alaska hydrology); Dr. G. Cloud, Metallurgy, Mechanics and Materials Science Dept., Michigan State University (ice mechanics and flow deformation); Dr. F. A. Milan, Anthropology Dept., Univ. of Wisconsin (Arctic anthropology); F. W. Poole, Meteorologist-in-charge, ESSA Weather Bureau, Juneau, Alaska (Alaskan climatology); L. Schoen and W. Turpening, Found. for Glacier & Environ. Research (glacier geophysics); Dr. M. Johnson, Mammalogy Museum, University of Puget Sound (Arctic zoological environments); Dr. A. T. Cross, Botany & Geology Depts., Michigan State Univ. (geobotany, tundra environments); Dr. John M. Campbell, Anthropology Dept., Univ. of New Mexico (Arctic anthropology and ecology); J. Houston, Ch., Canadian Eskimo Arts Council (Eskimo archaeology and culture); J. Wallen, Director, Alaska State Museum, Juneau (Thlingit and Aleut culture); R. Shaw, Found. for Glacier and Environ. Research (gravity surveys); Prof. N. Sullivan, La Salle College, Philadelphia (geomorphology and glacier cave speleology); A. Tallman, Geology Dept., Michigan State Univ. (glacier and periglacial geology; and academic assistant); D. Lietzke, Soils Science Dept., Michigan State Univ. (arctic and glacial soils); G. Warner, Metallurgy, Mechanics and Materials Science Dept., Michigan State Univ. (glacier deformation research; and academic assistant); S. Hulse, Univ. of Washington (glacier hydrology); W. Dittrich, Univ. of Colorado (glaciology); R. Warren, Mathematics Dept., Central Michigan Univ. (glacier mechanics); D. Molenaar, U. S. Geological Survey, Tacoma, Wn. (hydrology, expedition techniques); Dr. T. Abrams, Abrams Aerial Survey Corp., Lansing, Mich. (aerial surveys).

# ARCTIC AND MOUNTAIN ENVIRONMENTS

12th Summer Institute of  
Glaciological and Arctic Sciences  
JULY 7 — AUGUST 31, 1971  
JUNEAU ICEFIELD, ALASKA  
and adjacent regions

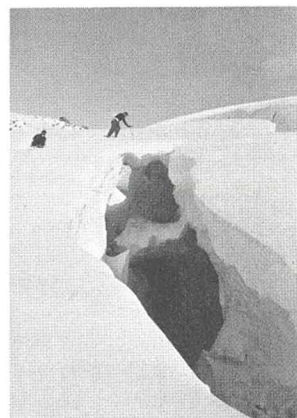
Sponsored by the National Science Foundation and Michigan State University in cooperation with the Foundation for Glacier and Environmental Research and the Juneau Icefield Research Program



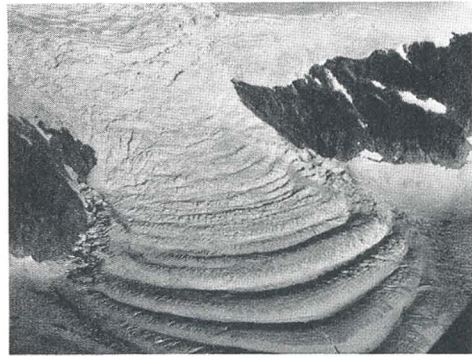
*Rock glacier in the Alaska-B.C.-Yukon border region*



*Student meteorologist at Camp 10 station*



*Field party crossing crevasse on East Twin Glacier*



*Icefall and wave-ogives on Vaughan Lewis Glacier near Camp 18*

## PURPOSE

The Juneau Icefield Research Program (JIRP) was planned in 1941-42 and was organized in 1946 to pursue detailed long-term research on interrelationship of the many disciplines necessary to interpret and understand the total environment of arctic and mountain regions. As an extension of this basic program, the Summer Institute of Glaciological and Arctic Sciences was organized in 1959 to provide the combined academic and field training, primarily at the graduate level, which is so essential to the solution of these multi-varied problems. The aim is to insure basic knowledge and a total systems competence in potential polar and mountain scientists, but beyond this to provide practical training with broad significance for geologists, hydrologists, atmospheric scientists, and ecologists who have general as well as scientific environmental interests.

Students not only have the opportunity to observe and study sub-aerial processes in a dynamic region of existing glaciers, but also to gain appreciation of the inter-science investigational approach in studies of the overall environment which are applicable not only to still pristine wilderness regions but to scientific environmental problems in rural and urban areas alike.

As part of their training, participants attend lectures at pertinent field sites, participate in demonstrations with instruments and materials in the field, and take and record a variety of different scientific measurements under supervision as part of an actual, on-going, long-range research program and related investigations from high-elevation and continental periglacial areas to low-level temperate and maritime regions. Through this approach, students gain a realistic understanding of glacio-climatological, glacio-geological and glacio-ecological relationships in natural systems. In addition to academic offerings, the Institute gives practical field work and extensive experience in a variety of personally challenging environments.

## DATE

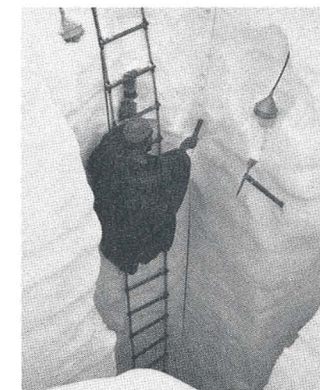
The Institute will be held for eight weeks, from July 7 to August 31, 1971. For qualified students interested in participation in the affiliated Juneau Icefield Research Program and allied regional research projects, or for those who desire field work on thesis problems, up to a month of additional field work can be arranged, beginning as early as June 1 and extending as late as October 1.

## THE CURRICULUM

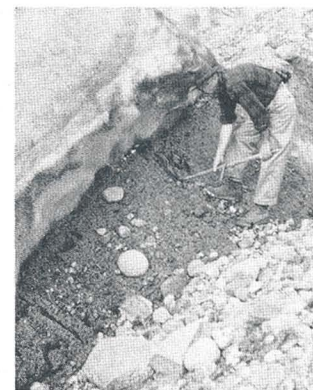
1971 Catalogued courses via Michigan State University are offered as follows:

### GRADUATE COURSES

- GLG 814 Field Glaciology (3-6 cr)
- GLG 800 Sec. 1 Arctic Environmental Field Sciences (3 cr)
- GLG 800 Sec. 2 Terrestrial and Glacial Photogrammetry (2-6 cr)
- GLG 800 Sec. 3 Glacier Surveys and Field Mapping (1-3 cr)
- GLG 800 Sec. 4 Glacio-ecology (geobotanical) (1-3 cr)
- GLG 800 Sec. 5 Glacio-ecology (biological) (1-2 cr)
- GLG 800 Sec. 6 Glacio-lichenometry (1-2 cr)
- GLG 800 Sec. 7 Periglacial Geomorphology and Pleistocene Environments (1-6 cr)
- GLG 800 Sec. 8 Glaciology and Glacier Physics (1-6 cr)
- GLG 800 Sec. 9 Arctic and Mountain Geomorphology (1-6 cr)
- GLG 800 Sec. 10 Glacier Mechanics (2-3 cr)
- GLG 800 Sec. 11 Glacio-meteorology (1-3 cr)



*Density and melt-water measurements, Upper Taku Glacier*



*Debris-entrained thrust surface, Mendenhall Glacier*

- GLG 800 Sec. 12 Glacio-hydrology and Fluid mechanics (1-3 cr)
- GLG 800 Sec. 13 Glacier geophysics (1-3 cr)
- GLG 800 Sec. 14 Arctic Oceanography (1-3 cr)
- GLG 800 Sec. 15 Arctic and Hostile Environment Survival (1-3 cr)
- GLG 899 Thesis field research (Masters) (var. cr)
- GLG 999 Thesis field research (Doctoral) (var. cr)

### UNDERGRADUATE COURSES

- GLG 303 Mountain and Arctic Environmental Science (3 cr)
- GLG 445 Field Studies (Glaciology and Geomorphology) (3-6 cr)
- GLG 471 Terrestrial and Glacial Photogrammetry (4 cr)
- GLG 400H Honors work (special topics) (1-3 cr)

These courses are designed to take full advantage of a classical glacial, periglacial and mountain and arctic environment in terms of field and "laboratory" instruction.

Additionally, special lectures, field studies and problem sessions are held on adjunct topics such as mapping, surveying, geophysical exploration techniques, snow physics, sea ice physics, radiation budgets, mass wastage and continuum mechanics, lichenometry, glacio-oceanography, permafrost, glacio-fluvial processes, Arctic taxonomy, glacial chronology, mountain geology, and Arctic, mountain, and glacial soils.

All offerings are given concurrently during a concerted work session on the Juneau Icefield, emphasizing Neoglacial conditions. Each participant is exposed to all offerings, but is examined only in those areas in which he is registered. A sixth week is used for work on a specific field problem, dependent on the student's aims, interests, and abilities. The last two weeks generally are concentrated in the Atlin area where deglaciated terrain provides a suitable opportunity for study of Cordilleran Wisconsinan chronology and Holocene periglacial environments. For those wishing to ally the instructional program with a specific thesis project, or equivalent research, including post-doctoral research, field problems may be developed and, where pertinent, variable credit obtained.

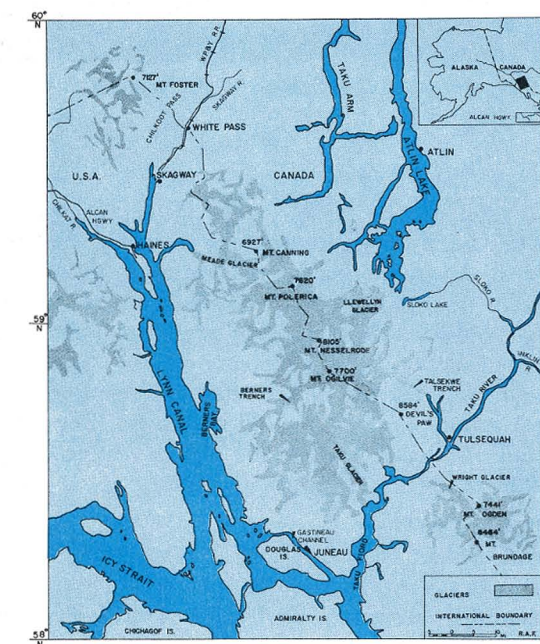
## PARTICIPANTS

Fourteen National Science Foundation (NSF), field participantships are available at the graduate and post-doctoral levels, plus four Institute graduate level awards, two affiliated science teacher scholarships, and three Foundation for Glacier and Environmental Research (FGER) grants for qualified undergraduates. Places for

additional graduate and undergraduate participants are available at \$1200 per student. There are also opportunities for several promising high school seniors with environmental science interests. Two graduate teaching assistantships and five JIRP research assistantships are also offered in connection with on-going research programs to outstanding previous participants or others having equivalent experience.

## LOCATION

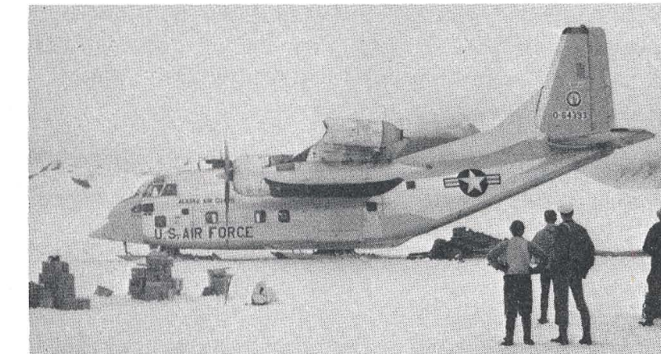
The main glacier area sites lie on or near the Juneau Icefield in the Alaska-Canada Coast Range between Juneau, Alaska and Atlin, B. C. In past seasons field trips have been conducted to observe phenomena in the deglaciated coastal environs, such as Glacier Bay, the Chilkat region, the forested fiords of Lynn Canal, the Taku River Valley and in the Dezadeash Lake and Atlin Lake areas on the continental side of the Boundary Range. Special emphasis will be given this year to the Atlin District, lying adjacent to the icefield on the north. Here a remarkable array of Wisconsinan deglaciation features and periglacial phenomena are observed. For this part of the program a permanent headquarters station is maintained at Atlin, B. C., from which field trips are also made to the Southwestern Yukon for geological and ecological observations and field work.



*Map of Juneau Icefield and Taku-Atlin region, Alaska-Canada*



*Helicopter operations on the icefield*



*Alaska Air National Guard ski-plane at Camp 10*

## FACILITIES AND LOGISTICS

Thirteen main stations and 17 lesser camps and research facilities are located on the icefield and its peripheral areas. Permanent aluminum-sheathed and well-insulated buildings exist at field sites. Wooden shelters and tents are used at trail camps. A 2500-volume library containing pertinent research materials, maps, aerial photos and other basic references is maintained at the three main icefield stations, as well as in the environmental sciences research library at the Atlin base station. A wide range of field and laboratory equipment for geophysical, glaciological, surveying, photogrammetric, botanical, meteorological and geological work is available for teaching and research.

Communication between camps and with the Juneau and Atlin bases is handled by radio. Helicopters, charter aircraft, and ski-planes are used for transportation, with ground transport carried out via foot travel, oversnow vehicles, dog team and skis.

Permanent installations are provided by the Juneau Icefield Research Program via its sponsor, the Foundation for Glacier and Environmental Research, c/o The Pacific Science Center, Seattle, Washington.