THE GEOLOGICAL SOCIETY OF AMERICA

GEOMORPHOLOGY NEWSLETTER #6

April 1962

Here is your long-awaited Newsletter. Contributions as you will see have been many and voluminous, and much editing and shortening was necessary. Your new Editor must take this opportunity to thank all those who sent words of encouragement and who took time to write out and send in information about their research in geomorphology for others to share. Special thanks are due the corps of Associate Editors who materially helped in making this Newsletter a success; they and the areas they canvassed are Nelson R. Gadd, eastern Canada; Conrad P. Gravenor, western Canada; William C. Bradley, Rocky Mountain area; Arthur T. Fernald, central Atlantic States; Ernest H. Muller, New York and New England; William A. White, southeastern States. In the short time available since this Editor was chosen, it was difficult to obtain additional help; this note might serve as a request for volunteers. We need help from anyone living in the following three areas who might wish to act as Associate Editor next year when the time comes for another Newsletter: north central States - Minn., Wisc., Mich., Ill., Ind., Ohio, Ky., involving making contact with about 49 persons; Great Plains - N. Dak., So. Dak., Iowa, Nebr., Mo., Kansas, Okla., Texas, and Mexico, about 47; and the West Coast - Ariz., Utah, Nevada, Calif., Oregon, Wash., Hawaii, and Alaska, about 70 (this area may easily be subdivided). Attempts to contact some colleagues were foiled by obsolescent addresses; others kindly wrote asking to be dropped from our ranks; others wrote angrily asking why they didn't receive the last Newsletter, not realizing there hasn't been one since July 1959; and others wishing to receive the Newsletter although either not in this Group nor even in GSA.

Sidney E. White, Editor

Results of Official Ballot -- January 1962

Chairman:	John G. Fyles
First Vice-Chairman:	James H. Zumberge
Second Vice-Chairman:	M. Gordon Wolman
Secretary: (Holdover)	Laurence H. Nobles
New Panel Members:	Ernest H. Muller Paul R. Shaffer Clyde A. Wahrhaftig
Holdover Panel:	Robert F. Black Richard P. Goldthwait Herbert E. Wright, Jr.

NEWS ITEMS

Henry R. Schmoll, USGS (Wash.,D.C.), completed two field seasons of a three year project involving areal mapping of Slana-Tok area, south-central Alaska. The area extends across the Alaska Range from Copper River Basin to the Tanana River valley. Emphasis is being placed on Quaternary geology, largely glacial, including study of geomorphic features and a continuing study of macrofabrics of diamicton and associated gravel deposits.

Oscar J. Ferrians, Jr., USGS (Wash.,D.C.), completed field work in the northeastern part of Copper River Basin, Alaska. Emphasis was placed on determining distribution and character of unconsolidated deposits and the Pleistocene history.

Joint geological-biological investigations will be started in summer of 1962 in Kodiak Island Refuge area, Alaska, by Eric Hulten and Carl Lindroth, Sweden, by George Ball, Canada, and by Robert Rausch and Thor Karlstrom, USGS (Wash.,D.C.). Lynn Yehle, USGS (Wash.,D.C.), is continuing field work on the glacial geology of lower Chitina Valley, south-central Alaska. Arthur T. Fernald, USGS, completed a mapping project covering seven quadrangles in upper Tanana River valley, east-central Alaska, where glacial, eolian, and alluvial deposits are widespread. David S. McCulloch has joined the staff of USGS Alaskan Geology Branch to study Pleistocene geology in western Alaska.

Glaciological studies, supported by NSF with Troy L. Péwé as project supervisor, initiated during summer of 1960 on Gulkana Glacier in central Alaska Range by members of the Geology Dept., University of Alaska, were continued during 1961. Larry Mayo led a party concentrating on ablation and accumulation, and recording local weather and net total radiation. Seventy-nine ablation poles and 25 snow pits were used to measure ablation and accumulation on the three and one-half mile long glacier. Continuous weather observations were made for 3 months. Seventy-five of the ablation stakes were used in the surface motion study. This part of the program was led by Eugene Moores and included (1) a program of weekly, bimonthly, and monthly stake locations, (2) short interval studies consisting of daily observations of 7 stakes and two-day observations of 32 stakes, and (3) resurvey of transverse profiles established in 1960. Gravity measurements along one longitudinal and 3 transverse lines on the glacier were made by Paul Sellmann, with help from Ned Ostenso, University of Wisconsin.

Maynard M. Miller, Michigan State University, started in summer of 1961, a new 9-weeks field course in glaciology on the Juneau Icefield. Formal lectures along with field work combined instruction and research for the 15 students. Activity was integrated with the long-term investigations of the Juneau Icefield Research Program. Miller was assisted by Edward Andress in the course work, and in the field by T. R. Haley, K. A. Henderson, and E. L. Keithahn (Director, Alaska State Museum). The first six weeks involved learning about glaciological techniques on the upper icefield, and was followed by three weeks on glacial geology in the lower restricted zones of former glaciation. This will be repeated in 1962 and 1963 with increased offerings and enlarged senior staff. Reconnaissance regional survey of coastal glaciers in the Panhandle region

of Alaska also was initiated by M. M. Miller in September 1961. This survey, sponsored by National Geographic Society, is an attempt to assess current regime of glaciers representative of those studied by Tarr and Martin for the Society between 1909 and 1913, the results to be published as a commemorative volume. In 1961 the field party obtained information on about 300 glaciers; work will continue in 1962.

A. M. Stalker, Geological Survey of Canada, had published a paper on Buried Valleys in central and southern Alberta; he continued his work in 1961 on surficial geology near Lethbridge, Alberta, and proposes for 1962 a study of glacial stratigraphy and geomorphology of Blood Indian Reserve, near Lethbridge, where clarification of 7 Laurentide till sheets will be sought.

In 1960 O. L. Hughes, Geol. Survey of Canada, began a study of surficial geology and geomorphology in west-central Yukon Territory, including the Klondike district. Palynological studies of the muck deposits by Jaan Terasmae are in progress. Work in 1961 by Hughes on stream profiles and terraces revealed differential upwarp of the order of 800 feet, with an axis of uplift near the Alaskan border and an age of late Pliocene or early Pleistocene. In 1962, Hughes will go on Operation Porcupine, a helicopter-supported reconnaissance of Yukon and Lower Mackenzie areas north of 65 degrees. Bruce G. Craig, Geol. Survey of Canada, has had several papers published on surficial geology of several areas in Arctic Canada. In 1962 he will go on Operation Prince of Wales, a helicopter-supported reconnaissance of Boothia Peninsula, Somerset Island, King William Island, and Prince of Wales Island.

John G. Fyles, Geol. Survey Canada, joined the 1961 super-cub reconnaissance of the fjord region of west Ellesmere Island and of east Axel Heiberg Island; this included in part a study of high terraces containing possible interglacial wood-bearing deposits. Fyles is responsible for the function of the Survey's Radiocarbon Laboratory (operated by W. Dyck); the system wasfully calibrated and began operation early in 1962; publications of results are expected to appear periodically.

Extensive work is continuing in northern Canada both from the Knob Lake and Axel Heiberg Research Stations of McGill University. Geomorphological studies on Axel Heiberg Island were made last summer by Fritz Miller and

P. Adams, McGill University, by Sten Rudberg (Goteborg University, Sweden) and by Hans Boesch and H. Maag (Zurich, Switzerland).

The studies of E. P. Henderson, Geol. Survey Canada, of marine water levels in eastern and northern coastal areas of Newfoundland have brought to light a new shell locality 160 feet above sealevel, and evidence for shorelines (minus the shells) at 200 feet or more; these levels are higher than any recorded to date in these areas. A preliminary report on the glacial phenomena of Ellesmere Island by R. Christie, Geol. Survey Canada, may soon be expected.

From the Department of Mines and Technical Surveys, Canada, Geographical Branch, comes this report on their recent activities. During 1961 the Northern Canada Section continued studies in physical geography in

several areas of the Canadian Arctic. In cooperation with the Polar Cont'l. Shelf Project, D. St-Onge completed a 3 year study of the geomorphology of Ellef Ringnes Island; ground temperature measurements also were taken and characteristics of flow and sedimentation in selected streams examined. Claude Greffard completed a preliminary examination of the geomorphology of Borden Island. Five of the geographers carried out a preliminary study of a wide area in central Baffin Island; the party, which included Jack D. Ives, J. T. Andrews, and P. L. Hill, studied the glacial morphology near the north end of Barnes Ice Cap; this included till fabric analysis of peculiar sub-lacustrine moraines and precise leveling of glacial lake shorelines.

V. W. Sim and C. Lamothe examined certain areas across the center of Baffin Island south of Barnes Ice Cap between Home Bay and Foxe Basin; They also began study of postglacial emergence on the Foxe Basin coast near Piling and Ikpik Bays. This work will continue for the next several years.

M. Brochu continued a study, begun during summer of 1960, on the nature of boulder barriers, a characteristic of the tidal zone of arctic waters; his field work this year was concentrated near Churchill and Frobisher.

In connection with the Inventory of Canadian Glaciers Project, G. Falconer accompanied Eastern Arctic Patrol vessel C. D. Howe, and compiled a photographic record of valley glaciers and ice caps of southern Ellesmere Island, Devon Island, and Baffin Island. Available early photographs are being compared to determine recent changes in ice margin positions.

J. R. Mackay continued his statistical analysis of terrain element characteristics in the Mackenzie Delta and Eskimo Lakes area; W. E. S. Henoch is completing a monograph on Physiography of the Arctic Red River Map Sheet; J. K. Fraser is engaged in preparation of a similar study of Boothia Peninsula, and V. W. Sim just finished a study of Physiography of Melville Peninsula.

J. Brian Bird, McGill University, writes that the research program on evolution of the St. Lawrence Lowlands and adjacent areas is continuing with work by Joyce C. Brown on the palynological aspects and J. T. Parry on deglaciation of the Laurentian valleys north of the Lowlands; statistical studies will be included in the future.

H. A. Lee, Geol. Survey Canada, has a preliminary map in press on work in the Riviere-du-Loup and Trois-Pistoles area where a series of three marine and non-marine clays were discovered. These and the moraines and eskers give evidence of a complex glacio-marine relationship that may allow direct tracing of Laurentide ice movement in this region.

Ed. Mirynech, Geol. Survey Canada, completed his work (for University of Toronto) on surficial geology of the region near Belleville, Ontario, and will extend studies of Pleistocene lake shorelines toward Kingston, Ontario, with expectation of correlation with marine levels

of the St. Lawrence valley. Nelson R. Gadd, Geol. Survey Canada, has a preliminary map in press on surficial geology of the Ottawa area, Ontario and Quebec; his 1962 field work will extend earlier work in the St. Lawrence valley east towards Quebec City.

John A. Elson, McGill University, with Barrie McDonald, continues work on the nature and origin of tills both in western Canada and in St. Lawrence valley.

R. W. Packer, University Western Ontario, is continuing research on shore erosion data along Lake Erie, Rondeau to Long Point; silt accumulation in Fanshawe Lake in cooperation with Upper Thames River Authorities; geomorphology of the St. Clair Delta; and on the angles of repose slopes in an analysis of the effect of climate and vegetation on maintaining slopes in glacial materials. Under supervision of Aleksis Dreimanis, Univ. Western Ontario, three senior theses dealing with till lithology of selected areas in southwest Ontario, one M.Sc. thesis on Pleistocene geology in the Beaverlodge area in Alberta, and one on recent nearshore sedimentation in Lake Erie, were completed. Dreimanis has research in progress on Pleistocene stratigraphy of southern Ontario and of southwestern Alberta, on geology of mastodon sites in the Wallaceburg area, Ontario, with emphasis on palynological studies, and on alluvial placers in British Columbia.

C. Laverdiere and A. Courtemanche, Service de Biogeographie, University of Montreal, together have published several papers on the glacial geology of the Mont Tremblant region, Quebec.

Paul F. Karrow, Ontario Dept. Mines, mapped the Scarborough area in eastern Toronto at such a scale that a sequence of four or five Wisconsinian tills was identified. Leveling of raised beaches, identified as those of Lakes Whittlesey and Warren (not previously known to extend so far northeastward) was carried out in the Galt and Brantford areas; mapping of the Guelph area will be completed in 1962.

The Great Lakes Institute, University of Toronto, is engaged in lake bottom studies, including scuba work and bottom coring. Under supervision of P. F. Karrow, work was completed by E. Lajtai on the University Avenue subway excavation Pleistocene materials, by R. C. Ostry on the tills of Scarborough, and by R. Hore on mineralogy of the tills of the Trenton area. Lajtai will work on stratigraphy of the Bloor-Danforth subway deposits for a doctorate degree.

W. O. Kupsch, University of Saskatchewan, and E. A. Christiansen, Saskatchewan Research Council sent us the following report on the Province of Saskatchewan. Systematic mapping of surficial deposits in Saskatchewan, initiated by Saskatchewan Research Council in 1958, constitutes the core of all research on Pleistocene geology in Saskatchewan. Field work was completed for the Willow Bunch Lake (72-H), Regina (72-I), and Wynyard (72-P) areas, and is still in progress in the Great Sand Hills (72-K) and Kindersley (72-N) areas. Some systematic mapping is done by permanent employees of Saskatchewan Research Council; some of it by graduate students seeking the doctorate degree and supported by the Council. Several more specialized research projects arose from the systematic mapping. The study of heavy minerals in till, and of

ostracods and gastropods in stratified material is now being pursued. Palynological investigations of peat bogs are continuing and it is expected that they, together with paleontological studies, will present a better picture of climatological changes in post-glacial time. Several new discoveries of buried wood were made, most of it postglacial. Radiocarbon dating is in full operation at a laboratory supported by both the National and the Saskatchewan Research Councils, and organic materials from several places are being analyzed. Pleistocene geologists in western Canada cooperated on a paper entitled: The Quaternary of Western Canada; it was presented at the Canadian Sedimentary Basins Symposium in Calgary last September.

A report, submitted by C. P. Gravenor, on Pleistocene work in Alberta by the Research Council of Alberta in 1961 indicates three programs were undertaken: (1) mapping of Cypress Hills area by J. Westgate (for doctoral work at University of Alberta); these hills rise about 2,000 feet above the Plains region, yet during glaciation their summits were not ice-covered and the highest glacial deposits are about 500 feet below the hilltops. The hills, therefore, offer one of the few areas in Canada where a southern ice border may be studied. To date, no Wisconsin material has been positively identified. Two more years of work in this area are planned. (2) Mapping in eastern Alberta, carried out for 8 years, will be continued, and (3) mapping of glacial geology in northern Alberta by helicopter survey, begun 3 years ago, is scheduled for completion in 1963; 25,000 to 30,000 square miles are covered per season. When this is done a reasonably complete map of the glacial deposits of Alberta will be available. In addition, two years ago a program was begun to study variation in the mineralogy and size analysis of surface tills in the province. To this end a grid pattern has been applied to the province and samples collected, each one being subject to a pebble count, clay analysis, heavy mineral analysis, and size analysis. The Soil Science Department, University of Alberta, and the Research Council, are cooperating in this venture.

William H. Mathews, University of British Columbia, is now concentrating on Tertiary geomorphology, but has written a paper on the discovery of salt water at the base of a fresh water fjord lake (Powell Lake) in British Columbia. The fjord was raised by isostatic rebound at the "end of the ice age" and original salt water has remained undisturbed at the base of the lake since that time.

During the summer of 1962, the Institute of Polar Studies, Ohio State University, hopes to have projects (1) in Glacier Bay, Alaska, working on ice contact deposits near Casement Glacier; (2) in Yukon Territory working on the sedimentation of Slims River Delta; and (3) at Sondestrom, Greenland, starting a base camp near Sukkertoppen Ice Cap for future studies of many kinds and for a beginning in climatology and glaciology.

A. L. Washburn, Yale University, is fighting the desire to return to northeast Greenland to his test area near Mestersvig on the south shore of Kong Oscars Fjord, but instead is writing up his work, which has continued there with Hugh M. Raup, Harvard Forest, since 1956.

Washburn's work stresses instrumental observations of frost action and downslope movement, but includes some of the problems of glaciation. Raup's work involves the relationships between distribution and development of vegetation and the patterned ground. Together they will publish several reports.

From mid-August to early September, 1961, Donald J. Eschman, University of Michigan, visited the doctoral field area of Fred Pessl, Jr., also near Mestersvig, northeast Greenland; the two then spent two weeks in Iceland locating areas for future work on "sandur" and on relationship of glacial moraines to stream terraces to raised shorelines. Under Eschman's supervision, Norm Lasca will begin his doctoral field work in Skeldal near Mestersvig in late March, 1962.

William E. Davies and Daniel B. Krinsley, USGS (Wash., D.C.), are completing an 8-year study of the existing regime of glaciers in north Greenland. Preliminary results indicate a distinct retreat during the last 50 years. A parallel study of the glacial geology of north Greenland has established the maximum marine transgression as 8,550 years b. p. as well as confirming the supposition that north Greenland was NOT covered by an ice cap during the Wisconsin.

Bjørn G. Anderson, University of Oslo, and G. William Holmes, USGS, completed field work on glaciation in Ullsfjord, northern Norway, an area where excellent glacio-marine deposits are well exposed. Holmes will begin work with the New England Branch, USGS, compiling a glacial map of Massachusetts.

C. Wroe Wolfe, Boston University, writes that Ira Furlong and Wolfe are planning to investigate the possible interrelationship of geomorphic expression to the origin of granites in west-central Maine; the surface morphology may be indicative of a method of emplacement of various types of granite plutons in the area. Wolfe and Roy Farnsworth completed an analysis of erosion surfaces in Massachusetts and are making a semi-quantitative analysis of profiles by using a newly developed "bandwidth" method.

Frederick Johnson, R. S. Peabody Foundation (Andover, Mass.) continues archeological work on Cape Cod, and during February collected samples in Mexico for C^{14} dating of a stratigraphy that should range from 8,000 B.C. to 1,500 A.D.

Newton E. Chute, Syracuse University, is writing on the glacial deposits of several quadrangles south and southeast of Boston, mapped as part of the USGS cooperative program in Massachusetts. Among other problems he is considering the meaning of till-mantled topography developed on several hundred feet of sand and gravel in the Marshfield Hills.

Arthur L. Bloom, Cornell University, continues his research on coastal geomorphology of Connecticut, but would like to exchange correspondence with any of us who has had experience in measuring coastal sedimentation rates by spreading marker beds of colored sands on depositional surfaces (write to him, at Geology Dept., Cornell Univ., Ithaca, N.Y.).

Joseph E. Upson, USGA (Mineola,N.Y.), has been working on the depths and configuration of bedrock valleys along the New England coast, now below sealevel and also partly filled with glacial and post-glacial deposits. Peat acquired from a depth of about 30 feet below sealevel in New Haven Harbor has a C^{14} age of about 5,900 years b. p. With the help of John W. Hawley, University of Illinois, new information from records of bridge and tunnel boring on submarine stratigraphy of New York Harbor also has been obtained.

Robert LaFleur, Rensselaer Polytechnic Institute, is mapping glacial geology in the central and northern Hudson Valley, proceding from the now completed Troy quadrangle to the Cohoes and Schuylerville sheets. As a byproduct, he is accumulating information on sedimentary structures in glaciofluvial deposits which may be of value in determining depositional history of ice-contact deposits.

Charles S. Denny, USGS (Wash.,D.C.), after 3 months work in Kentucky this spring, plans to continue field work, studying the Pleistocene geology of the west side of the Champlain trough, in New York.

Donald R. Coates, Harpur College (Endicott,N.Y.), finished his work on hydrogeology of certain New York drainage basins. With support of the Research Foundation of the State of New York, he plans this summer to commence a re-evaluation of concepts of drainage evolution in eastern New York.

John H. Moss, Franklin & Marshall College, and Dale Ritter, Princeton University, completed their work on the Binghampton substage of glaciation between the Finger Lakes region and the Catskill Mountains. Moss is following up this work with a study of terrace development and of sedimentologic characteristics of the drift in Chenango and Susquehanna River valleys from Chenango Forks to Sayre, Pennsylvania.

Henry D. Thompson, Hunter College, plans to retire from active teaching in 1963, although he will continue to direct one of the NSF projects at Hunter College, and to investigate the characteristics and probable origins of flat uplands in the Appalachians.

Ernest H. Muller, Syracuse University, continues field work in western New York and mapping of surface geology under sponsorship of the N. Y. State Science Service.

Charles Benziger, project geologist for Uhl, Hall and Rich at Niagara Falls, has reached the cleanup stage after completion of major construction on the Niagara Power Project. He writes of "formation of a new international ice sheet" on the Niagara River, with its accompanying threat of damage downriver during spring breakup.

Edward Buehler and Irving H. Tesmer, University of Buffalo, finished a bulletin on the Geology of Erie County (incidentally including the City of Buffalo), to be published by the Buffalo Society of Natural Sciences.

On the basis of field work and information derived from mile-apart

shallow auger holes, Henry S. Johnson, Jr., (State Geologist) Columbia, South Carolina, and D. J. Colquhoun, in the area near Holly Hill (Eutawville quadrangle), South Carolina, have evidence that the 230 to 250 foot scarp on the upper Coastal Plain is a Miocene sea cliff with Miocene marine deposits on one side and no Miocene deposits on the other. They also can demonstrate that no marine Pleistocene exists above the 95 foot (Wicomico) shoreline.

By obtaining the age of tektite showers in southern Georgia, A. S. Furcron, Department of Mines, Mining and Geology (Atlanta, Ga.), is determining the age of the surficial rocks in this region; the results of his work will appear in the Georgia Mineral Newsletter: Geologic Age of the Tektite Shower and its Associated Rocks of the Georgia Coastal Plain.

Robert O. Vernon, Florida Geological Survey (Tallahassee), states that the Survey is engaged in "completely revising the geology of Florida" (sic), to be issued in five volumes, the first being a study of the landforms of Florida; he is joined in this work by Harbans S. Puri, and by William A. White, University of North Carolina. Between them they will delineate the geomorphic forms of the whole State. The Florida Survey already has an extensive geologic program in operation.

A bulletin on the Geology of Knox County in central Ohio is soon to be printed by the Ohio Geological Survey. The chapter on Glacial Geology and accompanying map was prepared by Jane L. Forsyth. Of particular interest to us are the sections written on the Soils and on the correlation of end moraines and terraces with soils.

Kay Everett at Ohio State University (Institute of Polar Studies), under supervision of Richard P. Goldthwait, will be finishing observations and analyzing data in 1962 on two studies of microscopic motions on slopes. One area is at Neotoma in the hills of southeast Ohio on northeast- and southwest-facing slopes in residual soil; the other is at Ogoturk Creek, Alaska, on similar slopes but over permafrost. Some very clear seasonal creep is being measured.

Ansel M. Gooding, Earlham College (Richmond, Indiana), and associates and students are continuing their NSF and Kettering Foundation supported program of Pleistocene and Soil Genesis Research in eastern Indiana. Mapping and stratigraphic studies, till fabric analysis and mineralogic studies of tills and buried soils, and pollen and molluscan studies of buried soils, interstadial deposits and surface bogs will go on during the 1962 field season.

George W. White, University of Illinois, was on leave for the academic year 1960-61 for work in Ohio on a USGS Professional Paper on the glacial deposits of northeastern Ohio. Students of White and of Paul R. Shaffer, University of Illinois, who are completing work for the doctorate degree and their subjects are:

Stanley M. Totten - Glacial geology of Richland County, Ohio;
Robert Simmons - Wisconsinan geochronological determinations based upon Amine decay rates (from molluscan materials);

George M. Hughes - Glacial geology of the Redwater and Morinville areas, Alberta;
James E. Greer - Surficial geology and ground-water resources of the Touchwood Hills area, Saskatchewan;
Hilton W. Johnson - Illinoian drift of the Buffalo Hart area, central Illinois.

John C. Frye, Herbert D. Glass, and H. Bo Willman, Illinois State Geological Survey, are assembling results of three years work on mineralogical stratigraphy of loesses in Illinois and of the Illinois tills. Nearly 2000 X-ray determinations of fine fractions, light and heavy mineral fraction counts, and a small number of chemical checks on the mineralogical work have been made. Results show that a clearer distinction may be made within certain zones of the loesses by means of mineral composition, and that a very clear-cut relationship of percentage of montmorillonite to valley source area of the various loesses exists. In the case of the till deposits, the results are not so spectacular but nonetheless significant, since there are distinct differences among various lobate sources and yet many generalizations concerning the mineralogy of the fine fraction or matrix of the tills do not hold true on a regional basis. John P. Kempton, Illinois State Geol. Survey, is continuing his work on the Pleistocene geology of the buried Ticona Valley of north central Illinois, and will use this work for his doctorate degree at University of Illinois.

J. Harlen Bretz, University of Chicago, has finished a paper on Dynamic Equilibrium and the Ozark Land Forms in which dynamic equilibrium is critically examined; his Geomorphic History of the Ozarks of Missouri is nearly completed.

A. Byron Leonard, University of Kansas, and John Frye, completed field work on Pleistocene terraces of the Red River Valley of Texas for the Bureau of Economic Geology of University of Texas.

Larry Doyle, St. Mary's University (San Antonio), now Chairman of Geology at St. Mary's, manages to do Pleistocene work each summer as Research Affiliate with the Illinois State Geol. Survey.

The North Dakota Geological Survey, headed by Wilson M. Laird, has been carrying on an active glacial mapping program, with manuscripts ready for printer or in preparation, on Kidder, Stutsman, Logan, and McIntosh Counties, and field work in progress in Barnes and Burleigh Counties. The deposits of some of the perched lakes on the dead ice moraines in the Coteau district also are being examined.

In 1961, Harry Waldrop, now of USGS (Denver), although then under the guidance of W. C. Bradley, completed his glaciological studies (movement, glacier structures) of Arapahoe Glacier in the Colorado Front Range; part of his work included assembling a photographic record of ice shrinkage during the past century.

Richard F. Madole, Ohio State University, continued his mapping of glacial outwash terraces from the mountain glaciated zone of the

upper St. Vrain drainage area, Colorado Front Range, eastward through the canyons to the Colorado Piedmont. This work is an extension of his 1959-60 studies of the glacial sequence of South St. Vrain-Brainard Lake region.

Sidney E. White, sponsored by Institute of Polar Studies (Ohio State University) and Institute of Arctic and Alpine Research (University of Colorado) initiated in 1961 a 10-year study of Late Pleistocene and recent glacial and periglacial events on the east side of the Colorado Front Range. Precise movement studies of three rock glaciers were started, to be repeated at 3-4 year intervals.

Bob MacNish, University of Michigan, under supervision of D. J. Eschman, begins field work in Wet Mountain Valley, Colorado, in 1962, and Phil Wagner starts mapping glacial deposits of the Stillwater River area of southern Montana.

George Merk, Adams State College (Alamosa, Colo.), under guidance of W. C. Bradley, completed study of dune structures at Great Sand Dunes Natl. Monument. The dune structures, shown in part by superb photographs, seem to indicate formation by alternating winds from opposite directions.

Henry F. Donner, Western Reserve University, started a new project last summer in west central Colorado on the physiographic history of Colorado River from Kremmling to Dotsero; most of 1961 involved reconnaissance and obtaining instrumental control for future mapping. Summer of 1962 will be spent plotting the geomorphology on aerial photographs.

Harold J. Cook, Cook Museum of Natural History (Agate, Nebr.), is actively engaged in pursuing new concepts of late Tertiary major crustal deformations in the Rocky Mountain region. His work emphasizes the importance of combining geomorphic studies with structural, stratigraphic, paleontologic, and ecologic changes that occurred in west-central North America throughout the Miocene and Pliocene as well as in the Pleistocene. He reported this work at the Internatl. Geol. Congress in Copenhagen and has several papers out on the subject.

Under leadership of John de la Montagne, Montana State College (Bozeman), a regional study of Yellowstone Valley (north of the park) and the contiguous Gallatin Range, involving feld work in structure and stratigraphy as well as geomorphology, is being started. This project began with study of paleogeomorphology and glacial geology of the faulted Tertiary trough known as Yellowstone Valley. He supervised masters theses on a study of the Crazy Mountains surfaces near Livingston, and on Tertiary stratigraphy and geomorphology on both sides of Gallatin Valley. He also is working on uplifted and tilted Yellowstone Lake terraces (around the south arms of the Lake) and on spectacular ice-thrust ramparts of huge volcanic boulders of the winter shorelines there.

Sponsored by NSF grant, J. H. Moss is studying glacial geology and terrace development in Boulder River drainage area, Beartooth Mountains, Montana in an attempt to secure new information for an article on Quaternary geology

of the Rocky Mountains (for the compendium on The Quaternary of United States, edited by Kalervo Rankama).

Under NSF grant, Donald L. Graf and A. J. Eardley, University of Utah, are studying Pleistocene and present sediments of Great Salt Lake Desert Basin. Graf's interest is in the carbonates whereas Eardley's is in the lacustrine and climatic history. Two cores to depths of 600 feet were taken as well as a number of shallow cores. Canal banks of the potash works of Bonneville, Ltd., also were measured and sampled. A paper on the recent history of the Great Salt Lake Desert has the origin of the gypsum dunes as its chief contribution.

Robert Bright, University of Minnesota, and Meyer Rubin, USGS (Wash., D.C.), plan to do field work in 1962 in the Red Rock-Marsh Valley area, Idaho, where connection between studies of Lake Bonneville and those at American Falls may be possible; mapping this spillway area and collecting datable materials is anticipated.

Wakefield Dort, Jr., University of Kansas, devoted part of summer of 1961 to a second season of field work in Birch Creek Valley and southern Lemhi Mountains in east-central Idaho and is planning to return during 1962. He is working on the glacial geology and geomorphologic portions of interdisciplinary studies which also involve archeologists from Idaho State College and Harvard's Peabody Museum, Soil Conservation Service personnel, and soils, vegetation, and climate experts from University of Idaho. Major aspects of these studies include determination of details of late glacial and post-glacial climatic changes which occurred during time of human occupancy and how these changes affected geological processes as well as plant and animal life in the area, development of a method of dating by analysis of cirque form, obtaining of C^{14} dates, and comparison of dates obtained by the radiocarbon and obsidian-hydration methods.

David B. Slemmons, Mackay School of Mines, University of Nevada, and Edmond F. Lawrence, Consulting Geologist in Reno, in the Fall of 1960 established a series of surveyed points on three rock glaciers in the Sonora Pass area, Sierra Nevada; in the Fall of 1962 these points will be resurveyed and a new survey set up on a rock glacier on Mt. Wheeler, Nevada, in the proposed Great Basin Natl. Park.

Peter Birkland, formerly of Stanford University, completed his doctorate thesis on Pleistocene geology of an area north of Lake Tahoe, California, including restudy of the type area for Tahoe glaciation of the Sierra Nevada

Last summer Dwight R. Crandell, USGS (Denver), did reconnaissance of the glacial geology of the Cascades and other mountain ranges of Oregon, and the Olympic Mountains of Washington. His main project, along with Bob Miller and Don Mullineaux, is study of the glacial, pyroclastic, and mudflow deposits of Mount Rainer. One of the interesting results of this work is the finding of evidence interpreted as indicative of three major Wisconsin glaciations, of which the youngest is correlative with the classical Wisconsin of central United States. Part-time study by Mullineaux and Crandell will start in summer of 1962 on stratigraphy of early (?) and middle (?) Wisconsin glacial and nonglacial deposits in the Puget

Sound lowland of western Washington.

William S. Cooper, Boulder, Colorado, has prepared a third publication in his series on sand dunes of the Pacific Coast of North America; this latest deals with geomorphology of the California Coastal Dunes. In the future, his series will be completed with a treatment of the plant ecology of the dunes of the whole coastline.

Until recently Columbia University has not been noted for its Pleistocene studies, although geomorphology has had a long and rich history there. But now several workers are active in various aspects of Pleistocene geology.

Wallace Broecker is running a "hot" radiocarbon laboratory at Lamont Geological Observatory and is also developing the ionium method of dating; he is continuing his study of Great Basin pluvial chronology and beginning a restudy of Two Creeks interval chronology (with W.R.Farrand

David Ericson at Lamont is studying microfossils in deep sea cores and has been able to locate tentatively the Plio-Pleistocene boundary in some of these cores on the basis of extinction of Discoasters which may be correlated with the onset of the first refrigeration in the Pleistocene.

Maurice Ewing and William Donn are busily modifying, revising, and adding to their Theory of Ice Ages.

Rhodes Fairbridge, who recently published a comprehensive article on eustatic changes of sealevel, spent Autumn 1961 studying river terraces in the Sudan (with Ralph Solecki also of Columbia) in connection with archeological studies there. He is currently a visiting professor at the Sorbonne (Paris).

William Farrand is now offering several courses and a program of study in Pleistocene work; his current research is on postglacial uplift, on isobases of the marine limit, and with the Lamont staff on glacial sealevels revealed by oceanic cores. He spent the past summer with Solecki looking for Early Man on the Arctic Slope of Alaska.

In the field of geomorphology, Arthur Strahler and his students are engaged in research on beach morphology and beach-forming processes under support of the Geography Branch of ONR. Studies have been completed of the mathematical nature of plan and profile of bars, beaches, and spits at Sandy Hook, N.J. A method of coating coarse sediments with daylight fluorescent dyes has allowed sediments to be traced under various combination of wave and wind activity.

Bruce Heezen at Lamont is preparing a treatise on the geomorphology of the South Atlantic to accompany the physiographic diagram of the basin, prepared jointly with Marie Tharp and published recently by GSA. Among the developments during this study was the discovery of east-west fracture zones in the equatorial Atlantic involving total offset of the axis of the mid-Atlantic Ridge of nearly 2000 miles. Last summer Heezen was a guest of the Academy of Sciences of the USSR in Moscow and visited many laboratories including one of submarine geomorphology of the Institute of Oceanology and the geomorphology

one of the Institute of Geography; he found a relatively large group of enthusiastic and talented workers in the submarine geomorphology laboratory. They are preparing a new bathymetric chart of the Pacific Ocean based in part on the data collected by many of their research expeditions.

The Rappahannock River sedimentation studies of Bruce Nelson, Virginia Polytechnic Institute, now nearing completion, will consider in the final reports sediment transport from freshwater to the oceans, chemical and mineralogical relations between sediments and their parent soils and the effects of post-Pleistocene events, particle size and mineralogical differentiation in bottom sediments along estuarine gradients, and clay mineral and geochemical problems.

James C. Maxwell, University of Missouri, currently is working on a terrain analysis system for Corps of Engineers Waterways Experiment Station at Vicksburg, Mississippi. The system is used to describe both macro-forms of relief greater than ten feet, and micro-forms of relief from a fraction of a foot to ten feet.

Brian Bluck, University College (Swansea, Wales), completed field investigation of pebble distribution on alluvial fans in the Arrow Canyon Range, Clark County, Nevada, during a post-doctoral fellowship term at University of Illinois.

On the basis of a large NSF grant for Investigations into Fluvial and Related Geomorphic Processes of Arid and Semiarid Regions, Mark A. Melton, Geology Department, University of Arizona, has been determining hydrologic characteristics of San Pedro River, 40 miles east of Tucson, a stream that flows entirely on alluvial fill. The stream seems independent of bedrock, and its nature is determined instead by climate and tributary characteristics. It will become possible to relate gradient changes and other channel properties to the effects of certain tributaries; this will be done by using statistical techniques (serial correlation, autoregression analysis, and powerspectrum analysis). Eventually, characteristics of these streams can be compared with similar data from rivers in humid regions.

John D. Winslow, USGS (Albany,N.Y.), writes that his present work on ground water resources is near Schenectady on the west edge of the so-called Lake Albany area, mapping glacial geology and delineating the courses of filled or buried valleys.

George E. Heim,Jr., now Geology Department, University of Illinois, recently had published, with others, three preliminary groundwater resources reports with the Missouri Geological Survey on Nochway, Holt, and Atchison Counties, and on the Quaternary system in the stratigraphic succession in Missouri. To be released soon are reports on geology of Platte Co., Missouri, with extensive discussions of the Pleistocene deposits north of Kansas City, and on the bedrock topography of northwest Missouri.

Charles G. Higgins, University of California (Davis), will start a

25-month investigation, sponsored by ONR, of beach rock along the coast of Greece in June 1962, with the first year spent in collecting and field study, and the second on laboratory analysis. He herewith invites any fellow geomorphologists who happen to be passing through Greece this coming academic year to visit him in the field; he may be reached after June 10th through Prof. W. K. Pritchett, American School of Classical Studies, Athens.

William C. Bradley, University of Colorado, will start a two-summer field program, sponsored by NSF, on the marine terraces around Santa Cruz, California, where he will attempt to determine bedrock topography beneath the terraces by means of a sledge hammer seismograph.

W. Armstrong Price, Corpus Christi, Texas, has submitted the following manuscripts and short notes to journals for publication during the past two years, and also is working currently on these research projects on coastal features:

Some features of the geomorphology of mean sea-level position and some findings at variance with traditional hypotheses;
Patterns of flow and channeling in tidal inlets;
Stages of oxidation coloration in dune and barrier sands with age;
Tidal inlets and headland-flanking barriers;
Salinity and moisture stabilization, critical factors in clay dune building;
Clay dunes of the world;
Geomorphology of the top of the Pleistocene in Corpus Christi Bay beneath Recent bay sediments (for Institute of Marine Science, Univ. of Texas, and with Steward Grossman, Humble Oil & Refining Co. Research Lab.);
Fluctuations of the barrier chain of the Freeport delta of Brazos River and their bearing on the origin of the barrier chain and beach ridge (financed by AAPG Research Comm.)

With R. A. Bagnold of England, a review of information on large-scale eolian features, the so-called giant dunes, is in progress, and in the planning stage is a study of dune growth rates and sub-dune surfaces of clay dunes along the Texas coast, to be dated by C^{14} dating of midden materials and natural inclusions.

Richard J. Russell, Louisiana State University, writes that current research activities of Coastal Studies Institute personnel, under sponsorship of the Geography Branch, ONR, include studies of: origin, character, and distribution of beach rock; geomorphological and palynological aspects of coastal marsh deposits; development of barrier island complexes; hurricane-caused coastal changes; beach processes; and various aspects of delta development. Russell is continuing his own studies of beach rock, presented a paper on Mass Movements in Contrasting Latitudes at the 1961 INQUA meeting in Warsaw, and organized and chaired a symposium on Pacific Island Terraces: Eustatic? at the 1961 Tenth Pacific Science Congress in Honolulu. As part of the symposium, William G. McIntire presented

a paper on Mauritius: River-Mouth Terraces and Present Eustatic Sea Stand. McIntire has been carrying out a series of palynological and geomorphological studies of coastal marsh deposits in New England, Louisiana, and northern Mexico. James P. Morgan is directing extensive detailed work on Recent sediments and associated minor primary structures of part of the lower Mississippi River delta and is continuing a study of long term effects of hurricane damage along the Louisiana coastline. Harley J. Walker initiated a study of the geomorphology of Colville River delta in northern Alaska. Patrick J. V. Delaney, University of Rio Grande do Sul, Brazil, is studying the barrier island complex of extreme southern Brazil and northern Uruguay. David D. Smith is preparing reports on the geomorphic development of the Outer Banks of North Carolina. During summer of 1961 he made a geologic-glaciologic study of Ice Island Arlis II in the Arctic Ocean. A series of research projects being carried out by Graduate Students include: time-lapse photography of variations in beach morphology in the Hatteras area, North Carolina; report on Las Bela coast, West Pakistan; studies of Recent peat deposits along the southwest Louisiana coast; paleoecologic investigations in southeast Louisiana and southwest Mississippi; and study of beach plants and ecology of a lagoon near Cabo Rojo, Mexico.

Richard J. Chorley of Cambridge University, England, is gathering material for an extended study of William Morris Davis and is soliciting assistance.

William E. Davies, USGS, is compiling a Karst Atlas of the United States, a portion of which is designed to meet specifications of The Commission on Karst, Internatl. Geogr. Union for an International Karst Atlas.

Arthur D. Howard, Stanford University, is teaching geology in San Salvador, Brazil, and will not return to this country until next summer; Stanley N. Davis, Stanford, has recently returned from a trip to Chile.

William A. Kneller, Chairman, Geology and Geography Department, University of Toledo, completed a 15-month Natl. Science Faculty Fellowship at University of Michigan, and is continuing his "computer oriented statistical evaluation" of the petrography of glacio-fluvial gravels.

Paul MacClintock, Princeton University, has finished writing on the Pleistocene History of the St. Lawrence Lowlands, given his manuscript to the New York State Geol. Survey, and will move to Tucson, Arizona, to join Mark A. Melton in his work on fluvial processes of arid and semiarid regions.

George B. Maxey retired from Illinois State Geol. Survey, as Head of the Section on Ground-Water Geology and Geophysical Exploration for almost 7 years, to teach at University of Nevada and take charge of the hydrologic work at their new Desert Research Institute.

Ronald F. Peel, Geography Department, Bristol University (Bristol, England), a specialist in arid region geomorphology, especially of the Sahara, completed in January 1962 a semester of teaching in Geography, University of Indiana.

Paul R. Shaffer, University of Illinois, is on leave for 1961-62, living in Washington, D.C., and serving as Program Director for College and Elementary Programs of NSF.

Stephen S. Visher, Bloomington, Indiana, reports that he has in advanced stage of preparation biographical sketches of some 40 geomorphologists prominent some 50 years ago, to be published in Annals Assoc. Amer. Geographers.

Caspar Rappenecker, University of Florida (Gainesville), writes that "geomorphology has been recognized here" because of his appointment as department head and because they hope to emphasize Earth Science for teachers in the secondary schools throughout Florida.

S. W. Spencer is now with Texaco, Inc. in Farmington, N.M., having left the USGS program in Connecticut two years ago.

Howard H. Waldron, USGS (Seattle), is completing his second year as Technical Advisor in Engineering Geology to the Government of Indonesia, but will return in summer of 1962 to continue studying the glacial geology of the Puget Sound area. Although he traveled throughout most of Indonesia, most of his work was in applied geology - on damsites, foundations, irrigation projects, and landslides. Many exciting geomorphic problems exist that need our attention, but unsettled conditions make geologic investigation nearly impossible now.

James H. Zumberge, University of Michigan, soon will join the ranks of geologist turned administrator; he will become President of Michigan's new Grand Valley College, Grand Rapids, and meet his first freshman class in September 1963. He hopes his colleagues will keep in touch and continue to send him their reprints. His research projects in Antarctic glaciology will be carried on by Charles Swithinbank (now leading an expedition on the Ross Ice Shelf); the Lake Superior studies for this coming summer will be handled by W. R. Farrand.

EXPERIMENTAL STUDIES

Written specifically for this Newsletter are these four accounts of current coastal research, submitted by William F. Tanner, Florida State University.

Origin of oscillation ripple marks. The hypothesis was expressed that three distinct velocities are involved: orbital velocity at the water surface, orbital velocity at the water bottom, and translational velocity of the geometric system (but not of the water itself). It appears obvious that each of the orbital velocities must be related directly to the translational velocity by means of some function which depends on the orbital radius, and therefore that they must be related directly to each other. It also seems that the orbital velocities do not have this relationship, with the surface orbit having higher velocity than the water bottom orbit. The velocity difference should be significant. To test this hypothesis, a model has been built and operated, with the assistance of John Waskom.

The model consists of a wooden spool having a larger radius at one end (representing the water surface orbit) and a smaller radius at the other end (representing the water bottom orbit). (Air-water slippage has been taken care of by a sliding base arrangement). The larger wheel is rolled down a straight track, and the smaller wheel allowed to roll along over a surface of loose, wet sand. Four or five passes are sufficient to develop a ripple mark field. The degree of ripple symmetry appears to be a function of the translational velocity of the system; with relatively slow, and therefore realistic, velocities, almost perfectly symmetrical ripple marks are formed.

Additional work is being carried out with various wheel diameters and with various sand sizes.

Origin of meander and braided patterns. Model streams have been used in the laboratory, over a period of about five years, to study the results obtained by varying, one at a time, various parameters, including gradient (i.e., slope), discharge, bed roughness, fluid density, channel width, channel depth, and nature (i.e.,rigidity) of channel walls. It has been possible to study model streams which have NO walls in the usual sense; these streams have been developed on sloping surfaces (such as glass), both above and below the surface. Both types of model behave realistically, although the channel geometry has been better in streams suspended below the glass.

Results prove beyond any reasonable doubt that both meandering and braiding are roughness effects. Braiding occurs where the width-depth ratio is high, and meandering where the ratio is in intermediate numbers (on the order of one); restricting the ratio to

numbers very close to one, and limiting the stream by rigid walls produces a rippled water surface where the bed is rigid, or a rippled bed surface where the bed is movable.

The conceptual model which best explains the many and varied observations is that of the helical or spiral cell. A single spiral cell produces a single meander turn or loop. Induced (higher order) cells produce the diamond-shaped bar which is characteristic of the braided stream. In a natural meandering stream, many first-order cells are strung out from each other in a downstream direction; in a natural braided stream, cells of various orders occur adjacent to each other, with the diamond-shaped bar between cells of n^{th} and $(n + 2)^{nd}$ order. Induced cells, on a very small scale, build slightly curved but roughly symmetrical ripple marks which parallel the direction of stream flow.

Deformation of water particle orbits (wave motion) due to (a) refraction associated with shoaling, and (b) vector combination of two or more wave sets. The first part of this problem involves deformation of a single wave pattern. Streamline divergence (such as in an embayment) should not only result in reduced wave energy per linear foot of coast (as contrasted with increased tidal energy per linear foot of coast), but should also result in reduced vertical diameter of the wave orbit, and hence a wave type having a rather high steepness ratio (such as swells). Streamline convergence (such as around a headland) should result not only in increased wave energy (and decreased tidal energy), but also an increased vertical diameter of the orbit, and hence a wave type having a rather low steepness ratio (such as storm waves). Both results should obtain from a single wave train.

The second part of the problem involves changes due to the combination of two or more wave sets. It has been shown previously that where two different sets have the same period, a ripple mark field is established in which the ripple marks bisect the angle between the two wave sets. It is now reasoned that vector addition of bottom components of two or more orbital sets should result in determination of essentially parallel bands of relatively more and relatively less transportation of bottom materials. These bands should be rather indistinct, and therefore perhaps hard to locate and identify. They might have prominent second-order effects, however; one possibility is the beach cusp pattern. This statement is, in effect, a revision of Branner's suggestion. A model for testing these ideas is being designed, in association with Takashi Ichiye of the Florida State University Oceanographic Institute.

Coastal form is the end product of many different factors, possibly 20 or more in number. Two of the most important are (a) energy delivered to the coast, in the form of waves or tides, and (b) rate of movement of beach materials. The first of these can be approximated fairly easily by several different procedures, one being by measuring average breaker heights and tidal ranges. The second is more difficult to measure, partly because it is inadequately defined.

Several different rates are available for use: (i) average particle velocity (with the dimensions LT^{-1}), (ii) accumulation and depletion rates, such as might be measured against a groin or jetty (MT^{-1}), (iii) various mass transport rates ($ML^{-1}T^{-1}$, $ML^{-2}T^{-1}$, $ML^{-3}T^{-1}$), and possibly others.

The mass transport rates refer to volume of material moved per unit time: along a given length of beach, across a given area, and through a given prism, respectively. Ultimately the third of these will have to be used. Meanwhile, difficulties in making measurements prevent accurate determination of those transport rates which could furnish really reliable information for a more careful analysis of factors controlling coastal form.

P A L Y N O L O G Y

We are reminded of the Internatl. Conference on Palynology, 23-27 April 1962, at University of Arizona, Tucson. From the enthusiastic response of many palynologists with many divergent fields of interests from all over the world, this conference promises to be one of the best. The preliminary program of ten sections are: Stratigraphy; Evolution and Floristic Affinities; Morphology and Taxonomy; Prehistory and Archeology; Aerobiology; Melittopalynology; Ecology, Paleoecology and Paleoclimatology; Microscopic Algae; Techniques and Data Processing; and Demonstration Sessions at the Microscope. The symposia meeting during the Conference will cover such topics as Early Plants, Pennsylvanian-Permian Boundary, Cretaceous-Tertiary Boundary, Evolution of Gymnosperms and Mesozoic Stratigraphy, and the Pleistocene.

On Pleistocene pollen analysis and related studies at University of Minnesota's Geology Department, Herbert E. Wright, reports that William A. Watts (Lecturer, Botany School, Trinity College, Dublin) is Visiting Lecturer in the Geology and Botany Departments for 1962 and is studying plant macrofossils from Minnesota late- and post-glacial lake sediments for which pollen diagrams already are prepared. William Van Zeist, visiting pollen analyst to the Geology Department in 1960-61, returned to his position in the Biological-Archeological Institute, University of Groningen, after working on material collected by Wright in southwestern Iran in 1960. Van Zeist and Wright hope to return to Iran in spring of 1963 to obtain additional lake-sediment cores for more comprehensive pollen analysis, since preliminary results show conspicuous post-glacial vegetational changes heretofore unsuspected. Edward J. Cushing returned from a year at the pollen laboratory of the Geological Survey of Denmark as Fulbright Fellow; he is currently completing a doctoral study on late-glacial pollen stratigraphy of east-central Minnesota. Louis J. Maher, Jr., who completed a pollen study in the San Juan Mountains of Colorado, now holds a NATO post-doctoral fellowship at the Botany School, University

of Cambridge, and next year will join the Geology Department, University of Wisconsin, to begin research in Pleistocene pollen analysis. C. T. Shay currently holds a Fulbright Fellowship in the pollen laboratory of the National Museum in Copenhagen and will return to Minnesota next year to complete a pollen study of sediments associated with Lake Agassiz beaches. J. A. McAndrews is working on the vegetational history of the prairie-forest border in northwestern Minnesota through pollen analysis. T. C. Winter completed pollen study of a lake in southern Minnesota and plans to undertake pollen studies for USGS in St. Paul. R. C. Bright completed field work in the area of Pleistocene Lake Thatcher in southern Idaho, and next year will continue paleolimnologic work in Wyoming, Idaho, and Utah, including his postponed study of the Saltair core from Lake Bonneville. R. O. Megard, Zoology Department, Indiana University, Anne M. Bent, and Wright are completing paleolimnologic studies in the Chuska Mountains, northwestern New Mexico. Other students have started projects in Pleistocene glacial geology, paleolimnology, and pollen analysis. Visiting pollen analyst for next year will be C. R. Janssen, University of Utrecht.

FIELD CONFERENCES

On May 12 and 13, 1962, the Friends of the Pleistocene (Midwest) will examine evidence, new and old, for the possible preclassical Wisconsin glaciation in Ohio. Friends will gather in Columbus at Ohio State University's Institute of Polar Studies on evening of 11th. Plans include review of a recently dated till section near Columbus, study of possible buried soils and pre-outer Wisconsin terraces in Hocking Valley. Then the trip will follow the Wisconsin limit westward and visit deep Russell Soils on drift beyond the Cuba moraine, concluding with the much-argued buried soils at Brush Creek and Sidney in west-central Ohio on Sunday morning. Participating Pleistocene workers in any field are welcome (contact R. P. Goldthwait, Geology Dept., Ohio State Univ., 125 South Oval Drive, Columbus 10, Ohio).

The Friends of the Pleistocene (Midwest) met in Alberta in spring of 1961 for their annual field conference. Roughly 40 geologists and soil scientists from western Canada and midwest USA attended the 3-day conference to see the glacial deposits of the Edmonton district and of east-central Alberta; the weather cooperated and copious quantities of rain resulted in a first-hand demonstration of the western variety of gumbo.

Approximately 40 persons from USA attended the 6th Congress of INQUA in Warsaw, Poland, September 1961. Geomorphologists in this, the largest United States delegation to an INQUA Congress, included R. F. Black, R. W. Fairbridge, W. R. Farrand, R. F. Flint, S. S. Judson, E. H. Muller, L. L. Ray, H. G. Richards, G. M. Richmond, R. J. Russell, H. T. U. Smith, and H. E. Wright. Previous Congresses were held in Copenhagen 1928, Leningrad 1932, Vienna 1936, Rome-Pisa 1953, and Madrid-Barcelona 1957.

QUATERNARY RESEARCH IN POLAND

During the past decade an average of about 75 papers were published annually by some 60 investigators, covering all aspects of Quaternary research in Poland; this involved more than 30 periodicals. Among these are Starunia published in Kracow since 1934 but now appearing as Eclogae Quaternare, Przeglad Peryglacjalny (Periglacial Review) and the Geological Institute's series Z badan cwartorzedue Polski (From Polish Quaternary Research). Principal centers of geomorphic and Quaternary Research are located in most university cities. Largest of these centers is the Geological Institute in Warsaw which corresponds to our USGS in many respects, and where, therefore, much of the research has its practical application. Also in Warsaw are the Muzeum Ziemi (Museum of the Earth) where in the past B. Halicki has been active, the Institute of Geological Sciences, and the Geographic Institute. The Jagellonian University in Krakow is a second center with the Geographic Institute under M. Klimaszewski devoted to morphologic studies of the southern Polish Upland, the Botanical Institute under W. Szafer directed toward paleobotanic investigations, and the paleozoologic laboratory of the Zoological Institute. Concentration on periglacial problems has developed at University of Lodz under the influence of J. Dylik. Quaternary stratigraphy and geomorphology also are stressed by groups under A. Jahn at University of Wroclaw, B. Krygowski at Poznan, A. Malicki at Lublin, and R. Galon at Torun.

1965 INQUA CONGRESS

The Seventh International Congress of INQUA, International Association for Quaternary Research, will be held in Colorado, August 30 to September 4 inclusive, 1965, on the campus of University of Colorado at Boulder, and in Denver. INQUA is an interscience organization which endeavors to bring together on an international level the viewpoints of several disciplines interested in research on the Quaternary. Disciplines represented include archeology, climatology, ecology, geology, geography, geomorphology, glaciology, limnology, invertebrate and vertebrate paleontology, soil science, and oceanography. An invitation to hold the Congress in United States submitted by the U. S. Committee for INQUA on behalf of the National Academy of Science, Research Council, was accepted at the Congress in Warsaw. The U. S. Committee, a Committee of the National Academy, is composed of representatives from the leading societies of the many disciplines listed above.

The following skeletal organization for the 1965 Congress was elected to office by the Committee at a meeting in Denver and will be broadened as plans develop: President, Richard F. Flint; Vice-Presidents, William S. Cooper (ecology), Laurence M. Gould (glaciology and geomorphology), Morris M. Leighton (geology), James Thorp (soils), Harry Wexler (climatology); Secretary General, Gerald M. Richmond; Co-Chairman Local Committee, William C. Bradley and William S. Osborn; Chairman Program Committee, John F. Lance; Chairman Finance Committee, Terah L. Smiley; Chairman Grants

In Aid Committee, Edward S. Deevey; Coordinators Field Excursions, H.T.U.Smith and C. Bertrand Schultz; Co-Editors in Chief, David G. Frey and Herbert E. Wright; Chairman Overseas Charter Plane Service, Fritz F. Koczy. Additional names will be added to the list above as acceptances are received.

Pre- or post-Congress field trips of 5 to 10 days duration are being planned in the New England New York State area, Florida coast, Gulf coast, Midwest regions, Northern and Middle Rocky Mountains, and the Southwest. A special trip from California to Salt Lake City for delegates entering the country from the Pacific is also under consideration. Those interested in leadership or any phase of field trip participation should contact H.T.U.Smith, University of Massachusetts, Amherst, or C. Bertrand Schultz, Nebraska State Museum, Lincoln. H.E.Wright, University of Minnesota, will be in charge of a series of regional summaries on the Quaternary of United States to be prepared for the Congress, in addition to guidebooks for each field trip. He would appreciate hearing from anyone interested in preparing or assisting in the preparation of such a summary. Comments and offers of assistance in any phase of the work are solicited. Address inquiries to the appropriate individual or to the Secretary General, 7th INQUA Congress, Gerald M. Richmond (Bldg.25,Denver Federal Center, Denver, Colorado).

QUATERNARY INFORMATION

At the earnest request of the Japanese delegation under K. Kobayashi of Shinshu University, the 6th INQUA Congress (Warsaw, Poland) established a Commission on Tephrochronology to stimulate development of the potentialities of interbedded ash layers for correlation and dating. One member of the United States delegation to INQUA attended a meeting called to support the action. The invitation which follows is a direct consequence of the ensuing failure of interlingual communication. Geologists, pedologists and others whose investigations involve use of interbedded ash layers in the correlation of Quaternary sediments are invited to correspond with Ernest H. Muller, Geology Dept., Syracuse Univ. to create a means for mutual exchange of information.

Status knowledge about the Quaternary of the World is currently under review (part of a series that ultimately will treat each geologic system).

Kalervo Rankama, University of Helsinki, is editor, and the series will be published by Interscience Publishers. Contributors invited to write on the Quaternary of the United States include R. F. Flint, C. D. Holmes, J. H. Moss, G. M. Richmond, J. H. Birman, C. A. Wahrhaftig, W. C. Smith, T. L. Péwé, D. M. Hopkins, and D. R. Crandell.

TRANSLATIONS

Two translations of Soviet publications, prepared by M. C. Blake, are available upon request from David M. Hopkins, USGS, Alaskan Geology Branch, 345 Middlefield Road, Menlo Park, California.:

Merklin, R.L., 1954, Contribution to the knowledge of marine Tertiary fauna of North-East Siberia: Reports Acad. Sci. USSR, n.s., v.95, no.2;

Layrova, M.A., and Troitskey, S.L., 1960, Inter-glacial transgressions in Northern Europe and Siberia: in Geol. Congr., XXI Session, Reports of Soviet Geologists: Sec. 4, Chronology and Climatology of the Quaternary, p.124-136 (Publishing House of the Sciences of USSR, Moscow, 1960).

According to Dave Hopkins, this volume contains a series of papers in Russian which apparently were scheduled for the Congress, but many of them were not actually given there and do not appear in the official Congress proceedings.

William A. Kneller, University of Toledo, with NSF financial help through the Geophysical and Polar Research Center, University of Wisconsin, has translated

Geology of the Soviet Arctic: v.81 of Arctic Institute of the Ministry of Geology and Conservation of the Mineral Wealth of USSR, edited by F.G.Markov and D.V.Nalivkin.

RECENT PUBLICATIONS

One of the finest investigations of mass movements and other slope processes is in the paper by Anders Rapp (Geographical Institute, University of Uppsala) on Recent development of mountain slopes in Karkevagge and surroundings, northern Scandinavia, published in Geografiska Annaler, vol. XLII, Nos. 2-3, 1960. Much of Rapp's area of study was visited by an international group of geomorphologists during the Periglacial Symposium of the 19th Internatl. Geographical Congress at Abisko, Sweden in 1960. The publication itself of 130 pages is an attractively illustrated account with many excellent photographs (38), 30 tables, 29 sketches, and 14 maps, two in color as foldouts at the back. In order that we may appreciate the scope of Rapp's work, the main subjects of his study follow: description of methods used and of the area (including climate, vegetation, and soils); movement, deposition, release, and periodicity of rockfalls; the same for rockslides; activity, denudation, and erosion by snow avalanches; earthslides, mudflows, gullying and slope wash and their erosive ability; transportation of dissolved salts; measurement of talus creep, creep in block fields, and their efficacy in erosion; solifluction and its efficacy in erosion; and the con-

cluding discussion on total slope denudation.

Adrian E. Scheidegger has performed a singular service for all geomorphologists in his 321 page treatment of Theoretical Geomorphology, published in 1961 by Springer-Verlag, and in 1962 by Prentice Hall (Englewood Cliffs, N. J., $13.50). After a rather serious introduction and physical background, the book develops in somewhat greater detail the mechanics of slope formation, river bed processes, growth of drainage basins, the theory of aquatic effects, niveal effects (glaciology) eolian features, and special features (hoodoos, geysers, nuées ardentes, cave formation). It deals especially with endogenetic processes involving hydrodynamics of viscous fluids (water, ice, wind). Since this well-documented modern handling of these geomorphological subjects, more completely treated elsewhere by others, is an up to date compilation, it may well become a valuable reference for many, but we hesitate to suggest that it will someday replace our time-honored textbooks unless very radical changes are made in our manner of presenting geomorphology.

Fred M. Bullard's Volcanoes: in history, in theory, in eruption was published in 1962 by University of Texas Press (Austin 12, Texas,. $7.50). In one respect, it is the first of its kind; it consists of 441 pages, with a spectacular color frontispiece of Paricutin, 40 photographs, 32 sketches, and 40 maps, two of which fold out. The three parts of the book deal with Facts and Fiction about Volcanoes; Types of Volcanic Eruptions; and Theory, Cycles, and Utilization of Volcanoes. In another respect, the book is a collection all in one place of a great deal of information about volcanoes that others have written, yet much of the last portion is new.

Soils in Canada: Geological, pedological, and engineering studies, edited by R. F. Legget, contains seven papers on Pleistocene geology in Canada, a study of muskeg, one on soil mineralogy, three on pedology, and four on soil mechanics. This Royal Society of Canada Special Publication series No 111 of 224 pages may be obtained from University of Toronto Press (Toronto 5, Ont.) for $6.50.

In 1961 The Finger Lakes Region: Its Origin and Nature, a book of 156 pages, written by O. D. von Engeln, was published by Cornell University Press (Ithaca, N. Y., $4.50).

Our attention has been called by Richard F. Hadley to the work of the Branch of General Hydrology, USGS, Denver, published in USGS Professional Paper 424 A through D, Geological Survey in Research 1961 (See Chapter A for summary of geomorphic work in progress). Some items of interest suggested by Hadley are:

Dimensions of some stable alluvial channels, by S. A. Schumm, Art. 13, p. 26

Some effects of microclimate on slope morphology and drainage basin development, by R. F. Hadley, Art. 16, p. 32

Recent flood-plain formation along the Cimarron River in Kansas, by S. A. Schumm and R. W. Lichty, Art. 48, p. 112

Influence of riparian vegetation on channel shape, north-eastern Arizona, by R. F. Hadley, Art. 156, p. 30-31.

Geomorphological Abstracts, edited by Keith M. Clayton, is a worthwhile assemblage of abstracts from the literature of North America, British Commonwealth, and most West European periodicals, and from several geological and geographical congresses. It is published four times a year for $2.50. The 1961 issues contained 424 abstracts from more than 100 journals. Issue No. 6 (Sept. 1961) of 36 pages has 106 abstracts under headings on Geophysics(!), Weathering & Slopes, Rivers, Regional Physiography, Glacial Morphology, Other Pleistocene, Periglacial, Karst, Arid Areas, Coasts, and Miscellaneous. Issues Nos. 1 and 2 already are out of print; subscription orders may be addressed to:

Geomorphological Abstracts, Geography Department, London School of Economics, Aldwych, London W. C. 2, England

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REMEMBER**

MORE TO COME:

If -- the members of the Group want it, so

Send your contributions for the next Newsletter to.

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