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NEWS OF RESEARCH

Keith M. Clayton, Dean of the School of Environmental Sciences, University of East Anglia, has much to tell us about his School. There has been quite a lot of overseas interest in this attempt to teach and research across a broader field than is customary, and a progress report may be of interest. He now has two full years of undergraduate intake (50 per year) and 15 faculty. A large building will be completed by 1972, and they then plan to expand to 100 intake and over 30 faculty. The scope of the School is indicated by the options they offer: applied earth science; ecology and palaeobiology; economic geography and locational analysis; geophysics and earth structure; hydrology and fluvial geomorphology; meteorology and climatology; oceanography; quaternary studies; rock chemistry; soil science; surface processes; tropical resources and development; and urban and regional planning. He hopes that visitors from the United States will take the two-hour rail trip from London to Norwich and inspect the School. Readers may be interested to know of the following publications. The 1969 edition of Current Research in British Geomorphology lists 330 workers with details of their fields of research and the techniques they use. It is a useful source for anyone planning to visit Britain and will enable him to locate the appropriate men in his field. The 1970 edition should be out by now; $1.25 (U.S.Cy) published by the British Geomorphological Research Group, and sold for them by GeoAbstracts, University of East Anglia, Norwich, Nor 88C, England. Another new annual is Computers in Geography 1970, edited by J. R. Tarrant with world-wide entries, including many from U.S.A., also published by GeoAbstracts, at $1.25. This list of researchers, the programs they use and other relevant details will be expanded in 1971 and called Computers in the Environmental Sciences. If you use a computer, send details of your programs (names, purpose, machine, peripherals, author, but not a listing) to J. R. Tarrant at the School of Environmental Sciences, University of East Anglia.

Jane M. Soons (Geography, Univ. Canterbury, Christchurch, N.Z.) is continuing her study of the physical environment in the South Island high country of New Zealand; she wishes to assess what erosion processes occur, the conditions under which they occur, and their relative importance. They fall into two groups: small scale, but very persistent processes such as frost lift, and large scale processes such as slipping and gullying, with associated debris flows, which are spasmodic and localized but highly effective when and where they occur. Small scale processes can be measured and observed fairly readily, since they occur over a wide area, and with considerable regularity. Thus frost lift by needle ice will occur on a high proportion of winter nights on any unvegetated area. It seems probable that this is one of the most efficient processes in the high country. Processes associated with rainfall, such as rainsplash, appear to be limited in their effect. Large scale processes are difficult to observe, since it is a matter of chance whether a quali-

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fied observer (or any observer) is on the spot when a slip or a debris flow takes place. So far we have not been able to establish the conditions most likely to favour such events; rainfalls as heavy as or heavier than those which were associated with known debris flows, for example, have failed to produce further examples.
Associated with the erosion studies are hydrological studies, and currently we are attempting to measure rates of infiltration and sub-surface movement of water during natural storms. Our studies so far suggest that surface runoff is relatively unimportant both from the erosive and hydrological points of view.

Robert M. Norris (Geology, Univ. Calif. at Santa Barbara) has finished reports on Cenozoic stratigraphy and geomorphology of the Lake Eyre region, South Australia, in cooperation with R. W. Jessup, CSIRO Division of Soils in Adelaide. He is now working on recent sedimentation off the northwest coast of South Island, New Zealand, plus a new bathymetric chart as one of the coastal series of the New Zealand Oceanographic Inst. in Wellington.

Reginald P. Briggs (USGS, GPO Drawer 2230, San Juan, PR) worked some time ago in central Puerto Rico where a perched valley some 6 km long occurs. Evidence from boulder deposits and regional relations suggest this valley is a mid-Cenozoic terrain remnant preserved as a result of uplift and peripheral stream capture. Nearby, there are small-scale U-shaped valleys in a tropical setting, resulting from abrasion by large boulders carried over tuffaceous bedrock during catastrophic floods with possible recurrence intervals of 30 yrs.

The topographic maps of Puerto Rico show a large variety of land forms characteristic of a tropical climate in a trade wind belt. Especially well shown are coastal features, tropical karst, fault-line scarps and valleys, and river features ranging from structurally controlled narrow canyons to broad floodplains with intricate meanders. Watson H. Monroe (USGS, GPO Drawer 2230, San Juan) has selected 15 maps that best show these features with lists of features displayed on each sheet, similar to the lists that accompany the USGS set of 100 topomaps illustrating specific physiographic features. These soon will be available from Map Information Office, USGS, Washington, D.C. 20242.

John T. Andrews (INSTAAR, Boulder, CO) continued his research in east Baffin Island in summer of 1969 on late and recent glacial chronologies and on current sea-level changes. Reconnaissance was undertaken on two small glaciated basins and two adjoining unglaciated basins that will be the center for intensive micro-meteorological investigation in 1970. Winter storage precipitation gauges were installed. Lichenometry was used on recent moraines and a check on growth provided by a number of old whaler's graves.

Barrie C. McDonald (Geol. Surv. Canada, Ottawa) spent the 1968 field season examining eskers throughout the Canadian Arctic, the 1969 season in detailed study of sedimentary structures in selected eskers, and will spend the 1970 season continuing the detailed field studies as well as beginning a flume-oriented project to facilitate interpretation of the structures.

Mapping in summer 1969 along the north shore of Lake Erie for Geol. Surv. Canada convinced Aleksis Dreimanis (Geology, Univ. Western Ontario, London) that the Southwold Drift must be placed back in its original position (as of 1957): between the Port Talbot and the Plum Point Interstadials; it represents a mid-Wisconsin glacial advance, probably correlative with the Titusville Till in Pennsylvania. In order that the postgraduate students in Pleistocene (as many as 8 at times) may associate with a variety of opinions, postdoctoral fellows and quaternary geologists joined the department: W. Stankowski from Poznan, Poland, and N. A. Morner from Stockholm, Sweden; others are planned for the near future.

Nelson R. Gadd (Geol. Surv. Canada, Ottawa) outlined his new ideas on the glacial history of southwest New Brunswick in GSC Report of Activities, Paper 70-1, Part A, 1969, p. 170-72. In addition, he has led many glacial geologists on several field trips to critical sites from the Bay of Fundy to Trois Rivieres, Quebec, who collectively support his ideas. Twenty-five others have short papers in the same GSC Report of Activities on Quaternary geology, sedimentology, and geomorphology.

Peter P. David (Geologie, Univ. de Montreal) has established 4 to 5 distinct periods of aeolian activity for the last 4,000 years in the Brandon dune area of Manitoba. These findings are based upon C^{14}-dated paleosols exposed in roadcuts across the dune field. In southwest Saskatchewan, the first Mazama ash occurrence has been confirmed. This extends the eastern limit of Mazama ash in Canada by more than 150 miles. Also in the department, Jacques Lebuis is terminating his work on the sand dunes of the Lac St-Jean area, Quebec, which concentrated on the interrelation of the structural and morphological evolution of these dunes. Franz Mayr is nearing completion of a redefinition of the Wurm stratigraphy of the Alps. After receipt of some C^{14} dates, he expects to make a detailed correlation of the Alpine chronology with the Wisconsin of northeastern North America.

Paul F. Karrow (Waterloo, Ontario) will make Quaternary stratigraphic studies for Geol. Surv. Canada summer of 1970. Thane Anderson, under his supervision for a Ph.D. degree, is finishing his palynological study of several southwest Ontario bogs, tying in vegetational changes to glacial lakes and ice advances.

As part of a larger work in Science, History, and Hudson Bay, a 41-page chapter on Quaternary Geology, by Hulbert A. Lee (then of Geol. Surv. of Canada; now Stittsville, Ontario), summarizes the Quaternary geology of the Hudson Bay region with emphasis on chronology of the ice sheets, marine inundation during and after deglaciation, and interpretation of raised strandlines in terms of glacial loading and isostatic rebound. During deglaciation marine invasion, known as the Tyrrell Sea, flooded the Hudson Bay region and may have divided the dwindling ice sheet into several parts and hastened its demise. Till and esker methods for mineral exploration were developed by Lee for Geol. Surv. Canada, which resulted in a technical success in finding a drift-covered kimberlite body. These mineral exploration methods are being further evaluated and developed for industry by Lee Geo-Indicators, Ltd. and have been extended to include non-glacial Quaternary deposits.

George M. Haselton (Geology, Clemson Univ., SC) will join a GSC party west of Hudson Bay in the eastern district of Keewatin in summer 1970 to sample eskers and other ice-contact deposits in order to find mineral bodies by using the mineral exploration methods of Lee.

In summer 1970, Archie M. Stalker (Geol. Surv. Canada, Ottawa) will continue Quaternary stratigraphic studies of 15 exposures in high bluffs along South Saskatchewan River, near Medicine Hat, southeast Alberta. C. S. Churcher (Zoology, Univ. Toronto) will conduct studies of the vertebrate fossils yielded by the beds there, and an archeological party from Univ. Calgary, under direction of Brian Reeves, will test the archeological potentials of the upper beds. B. De Vries of Fort du'tppelle, Saskatchewan will examine the botanical aspects of the beds. Nine to ten vertebrate fossil horizons are now recognized, including 3 postglacial ones, ranging from the Pliocene-Pleistocene boundary to late postglacial. More than 45 species of vertebrate animals belonging to 9 orders are recognized to date.

News from John A. Elson (Geology, McGill Univ., Montreal) is good. Pierre LaSalle reports that the Quebec Dept. Natural Resources will expand its Quaternary Studies Division by hiring another Pleistocene geologist. They will obtain also a C^{14} dating liquid scintillometer unit. LaSalle continues his field work in the Quebec City area, and his esker sampling and mapping in the Abitibi region. Jean-Yves Chagnon will continue his studies on quick clay earthflow slides in Quebec. At McGill Andrew J. Pearce is studying denudation rates attempting to obtain an average for postglacial denudation at Mount St. Hilaire. The project will be expanded to include other drainage basins. Elson is continuing his work on Glacial Lake Agassiz, and, having developed a pebble-shape method to identify beaches across certain gaps and areas where they are buried, will shortly produce a revised chronology of the beaches and a more general report on the lake. At McGill one of the highlights of the Spring was an Environmental Geology seminar, with many outside speakers, on pollution, population growth, seismicity, and earthquake damage. Elson suggested that perhaps the best way to clean up the Lake Erie basin was to drain the lake temporarily.

Ernest H. Muller (Geology, Syracuse Univ., NY) returns to Iceland summer 1970 to attend joint meetings of the Glaciological Society and the Icelandic Glaciological Society, and thence to Churchill Falls, Labrador, where one center of the Labradorian ice sheet made a last stand. The report of last year (1969) "Sea Ice Symposium" in Reykjavik is published by Almenna Bokafelagid in Icelandic, but the substance of the principal papers will be published in English in a future issue of Jokull.

David M. Mickelson (Geology, Ohio State Univ., Columbus) is undertaking a second season of field work on the Burroughs Glacier, Glacier Bay, Alaska, with Graham Larsen to set up the hydrologic studies. In summer 1969, several systems of marginal drainage channels, eskers, and kames were examined. Photographs taken through the years are being checked on location to determine the sequence and length of time of formation of these features.

A recently concluded third field season in Southern Victoria Land, Antarctica, by Wakefield Dort (Geology, Univ. Kansas, Lawrence) was divided between search for additional data on recent climatic changes and deglaciation, and study of the internal structure of polar mountain glaciers. At other times, Dort is working with the multiple tills, loesses, and paleosols being exposed by continuing quarry operations in northeast Kansas.

Peter W. Birkeland (Geol. Sci., Univ. Colorado, Boulder) reports the initiation of a program of study on the Quaternary deposits of western Colorado. One major purpose will be to assess the usefulness of a variety of quantitative age criteria in differentiating a local succession and in long-range correlation. Criteria include a variety of boulder weathering parameters, soil properties, perservation of original morphology, and lichenometrical parameters. Under Birkeland's supervision, Dan Miller is studying the Quaternary geology in two drainage basins in Sawatch Range tributary to Eagle River, and is developing a computer program to aid in the grouping of the deposits according to age. Also under Birkeland's supervision, Jim Yount is concentrating on the Neoglacial deposits of Independence Pass area, emphasizing quantification of criteria used to correlate Neoglacial deposits and determine if the detailed stratigraphy of Colorado Front Range, described by J. B. Benedict, occurs in the western ranges. Birkeland is working on the Quaternary deposits of Mt. Sopris, including rock glaciers up to 2 miles long. The mantling debris ranges in age from Bull Lake up to Gannett Peak, and some may be pre-Bull Lake age. Rock glaciers of Neoglacial are presently active; older ones are generally inactive.

Field investigation of anomalous surficial deposits on Niwot Ridge and Toll Ridge, near the Continental Divide in western Boulder County, Colorado, began summer 1968 and was completed by Richard F. Madole (Earth Sci., Adrian College, MI) in summer 1969. Study of the geometry of the deposits (shape, thickness, areal extent) was possible through use of a portable refraction seismograph. Composition, physiographic setting, and geometry indicate the material was transported to these ridge crests from the northwest. Size and sorting suggest the agent of transport was either glacier ice or mass movement. Most evidence favors glacier origin. Macrofabric analyses and the presence of well-sorted channel sands, 17 to 27 feet thick, flanking each side of Toll Ridge deposit are strong arguments for a glacial origin. Examination of the quartz grains with an electron microscope should yield definitive clues as to the origin of the deposits.

John W. Blagbrough (Museum of Northern Arizona, Flagstaff) has completed a survey of rock glaciers in 6 mountain ranges in southern New Mexico, and made a detailed study of these periglacial features in the Capitan Mountains. The rock glaciers indicate life zones may have been depressed about 4,000 feet, and suggest that zones of sporadic permafrost had a lower limit, between 8,000 and 9,000 feet, in southern New Mexico during late Pleistocene.

William A. Newman (Earth Sci., Northeastern Univ., Boston, MA) is analyzing the patterns of ice flow during Wisconsin deglaciation on northern Cape Breton Island, Nova Scotia.

Lon D. Drake (Geology, Univ. Iowa, Iowa City) continues to work on correlation techniques for tills across New England and on the two-till problem in east-central New Hampshire. Under his supervision, Robert S. Nelson has established a glacial sequence on the east flank of the Bighorn Mountains which correlates well with the classic sequence in the Wind River Mountains; he also has developed a quantitative method of correlation that helps in the separation of Pinedale I and Pinedale II.

Dan E. Hansen and Jack Kume (USGS, Vermillion, SD) published in N. Dak. Geol. Surv. Bull. 53, The Geology of Grand Forks County, which includes the glacial stratigraphy, glacial Lake Agassiz and its strandlines, and the whole glacial history of the area.

Don J. Easterbrook (Geology, Western Washington State Coll., Bellingham) spent a sabbatical studying classic type-localities for Pleistocene glaciation in the European Alps and Scandinavia, writing (with David Rahm) a short book on the Geomorphology of Washington, and studying late Pleistocene and Neoglacial events in the Northern Cascades near Mt. Baker.

Parker E. Calkin (Geol. Sci., State Univ. of NY at Buffalo) has finished working up data (with Robert Behling and Colin Bull) on their glacial history of the Wright Valley in Antarctica, and a preliminary report of the chronology including interaction of alpine, inland ice advances, and advances controlled by Northern Hemisphere glaciations will appear in the Antarctic Journal. Calkin (with Harold W. Borns) completed a second field season along the mountainous Quebec border region of Maine on the mechanism of ice dissipation and multiple glaciation of that area.

Donald F. Eschman (Geol. and Min., Univ. Michigan, Ann Arbor) is starting field work on the Lake Michigan-Saginaw and Saginaw-Huron-Erie interlobate regions in southern Michigan. Under his supervision, William Chapman is working on a glacial and terrace sequence in the Hoback Basin of northwestern Wyoming; Wendy Burgis finished describing the glacial oscillations that controlled the use of the Imlay Outlet (Imlay City) in Lake Maumee time, and, with William R. Farrand, is dating by C^{14} two additional wood zones in the Grand Rapids area, one above and the other below the greater than 50,000-year-old zone of Zumberge and Benninghoff. A group of undergraduates in geology are working on the pollen, mollusca, and sediments associated with a mastodon found 8 miles west of Ann Arbor.

Robert K. Fahnestock (Geology, State Univ. College, Fredonia, NY) with William C. Bradley (Geol. Sci., Univ. Colorado, Boulder) is finishing a report on the Knik River and Lake George, Alaska, and the effects of the breakout floods on the river sediments. Fahnestock and William Metzger have been looking at the buried topography and surficial deposits from the lake escarpment moraines in western New York to the lake shore with the idea of explaining the present configuration of shore and lake plain. Fahnestock and Ernest Muller will be studying the characteristics of tills and outwash of surging glaciers with the idea that recognition of ancient surges of portions of continental glaciers would have some bearing on the interpretation of the Pleistocene record and on the mechanism of surging.

William J. Wayne (now in Geology Dept., Univ. Nebraska, Lincoln) has written several fine papers about the Pleistocene history of Indiana (in Natural Features of Indiana; Indiana Acad. Sci.), and glacial geology in central and western Indiana and other places (Urban Geology - A Need and A Challenge; and Urban Geology of Madison County, Indiana). In so doing, Wayne has done Indiana a great service for which he will always be remembered. Now he is initiating observations on active and inactive processes of slope development in eastern Nebraska and other Pleistocene stratigraphic and mapping studies in Nebraska.

Robert LaFleur (Geology, Rensselaer Polytechnic Inst., Troy, NY) finished mapping the glacial deposits of the Schoharie and eastern Mohawk Valleys of New York. Several hundred well logs indicate complex multiple glaciation in addition to a few surface exposures. A synthesis of the Mohawk-Hudson deglaciation should result from this study.

Norman P. Lasca (Geol. Sci., Univ. Wisconsin, Milwaukee) spent winter 1969-70 continuing his river ice studies in northern Wisconsin, ice fabric analysis, and related channel changes as the river freezes; he also is mapping the "Valderan" boundary between Milwaukee and Green Bay and, with his students, is working on several geochemical problems in the Pleistocene-Recent lake sediments of Lake Michigan. The department's 25-foot recirculating flume is now fully operative and students are involved in sediment transport experiments. Robert F. Black, Ned K. Bleuer and Lasca are offering two Pleistocene field trips for the GSA at Milwaukee 1970 annual meetings: one is a two-day trip (9-10 Nov.), Pleistocene Geology and Geomorphology of Southern Wisconsin, including stratigraphy of the Illinoian and Wisconsinan drifts and a look at the "Driftless Area", and the other (14 Nov.), Glacial Geology in Eastern Wisconsin, including type locality of the Valderan drift and study of the Two Creeks buried forest.

Alan M. Jacobs (Illinois State Geol. Surv., Urbana) is liaison man on a joint project since 1968 between the Illinois State Geol. Surv. and the Limnological Research Ctr, Univ. of Minnesota. With Eberhard Grueger, postdoctoral student from Germany at Minnesota, Jacobs has studied the origin and physical stratigraphy of several lakes near Vandalia, Illinois. Grueger has worked on the pollen stratigraphy; both have obtained cores for clay mineral and C^{14} analyses. The Vandalia lakes were in a periglacial area during Woodfordian time and have recorded ecologic events in their sediment record continuously for over 40,000 years. Jacobs also is studying stream parameters in the Kaskaskia River system, and has provided stratigraphic information to a company that plans to strip-mine coal beneath 40 meters (sic) of glacial deposits. David L. Gross (Illinois State Geol. Surv.) in summer 1969 did extensive coring and grab sampling from Univ. Michigan's ship INLAND SEAS in the south end of Lake Michigan. This is new expanding research area for the Illinois Survey in which Charles W. Collinson, Jerry A. Lineback and Gross are working on the stratigraphy, areal distribution, composition, and geologic history of the unconsolidated sediments. At the same time using the same samples, Neil F. Shimp (Chemistry Group) and Harry V. Leland (limnologist, Univ. Illinois) are studying the chemistry and pollution of the bottom sediments, especially lead contamination. They expect extensive collection of sediment cores from the southern one-third of Lake Michigan in summer 1970. Environmental geology is receiving more emphasi in the Illinois Survey, and Gross has compiled a report "Geology for Planning in DeKalb County, Illinois" soon to be published by the Survey.

Ansel M. Gooding (Geol. & Soil Sci., Earlham Coll., Richmond, IN) is continuing studies of glacial stratigraphy in eastern Indiana, investigating the late and postglacial history of Ohio Valley alluviation and alluvial soil genesis, and getting deeply involved in environmental geology, via problems of waste disposal and stream and groundwater pollution.

Allan F. Schneider (Indiana Geol. Surv., Bloomington) finished the glacial geology map of the 1^{o} x 2^{o} Chicago Quadrangle (of northwestern Indiana) which is now at the printer. He has started a new study, the environmental geology of Lake and Porter Counties. With Mark Reshkin (Indiana Univ. Northwest, Gary), he has been immersed in a study of Glacial Lake Chicago, never adequately examined in Indiana; they are surprised by some of the C^{14} dates obtained from wood samples from lacustrine sands, but soon hope to establish a more reliable radiocarbon-based chronology for the south end of the lake. In northeastern Indiana, Schneider has delved into the complex problem of the relationships between the Saginaw and Erie ice lobes; much of the massive Packerton moraine, long thought to represent the terminus of the Saginaw lobe, actually may be composed largely of clayey till deposited by the Erie lobe. This till may be a cap or may form the core of the moraine. Very little is really known about the distribution (surface and subsurface) of the classical Wisconsinan drifts in Indiana.

Roger B. Colton (USGS, Denver, CO) continues his Connecticut glacial geology mapping program, completing the surficial geology of quadrangle after quadrangle in his production of a Glacial Geology map of Connecticut.

Henry E. Kane (Geology, Ball State Univ. Muncie, IN) is conducting late Cenozoic geomorphologic studies of the Lower Kentucky River near Carrollton, Kentucky; alluvial deposits have been mapped along 20 miles of the present course of the river. The effects of Pleistocene glaciation functioned in a way to cause diversions in the course of the river. Nebraskan (?) "stratified" drift may be present. Field evidence indicates major diversion of the Kentucky River from an eastwardly course (toward Cincinnati, generally) occurred in Kansas.

Eugene H. Walker (USGS, Boston, MA) is mapping the surficial geology of the Charles River basin as part of the cooperative program between the Massachusetts Water Resources Comm. and the Water Resources Div. of USGS. Three principal topographies are distinguished: till and bedrock forming hilly areas; coarse-textured ice-contact deposits, eskers, crevasse fillings, kame forms and deltas standing above valley floors; and fine-grained lake beds and backwater swamps occupying the extensive low-lying areas. The ice-contact deposits are the main source of water for town and industrial use, soon to be used extensively.

Heber D. Lessig (USDA - Soil Conservation Service, Athens, OH) has no conventional explanation for thick lacustrine deposits in western Washington County, Ohio, on the ridgetops about 100 feet higher than the Minford silts. He has help from Arthur Blickle (Ohio Univ.) finding pollen in these high deposits, from Jerry Wang (Soils Engr. Dept., Ohio Univ.) looking for differences or similarities in the clay minerals between red clay soil from bedrock and the red lacustrine clay, and from Gene Heien (Geology, Ohio Univ.) working on the clay mineral composition of the several high and lower lacustrine layers.

Harry L. Siebert, geologist with State of Connecticut Department of Transportation Bureau of Highways (Wethersfield, CT), writes that at the present time his work involves a long-term study of the stability of recently constructed rock slopes - determining rates of failure, weathering, and the effect of freeze-thaw, plus the succession of vegetation. If time permits, correlation between natural slopes and artificial slopes will be made.

J. Stewart Williams of geology and Alvin R. Southard of soils and meteorology (both Utah State Univ., Logan, UT) are completing their second year of study of patterned ground at low altitudes in northern Utah and southeastern Idaho. Results so far point to the importance of heavy montmorillonitic clay, formed by weathering of tuffaceous Cenozoic rocks exposed on Pleistocene surfaces, in forming stone stripes (sic), some of which are clearly post-Pleistocene in age.

Denis E. Marchand (Geol. & Geog., Bucknell Univ., Lewisburg, PA) soon will publish four papers on soil contamination, rates and modes of denudation, geobotanical relationships, and weathering processes in the White Mountains of eastern California. Currently, his work on the stratigraphy and chronology of pre-Wisconsin glacial deposits in eastern Pennsylvania shows that the pre-Wisconsin glacial margins have been incorrectly mapped in this area. This work will lead into soil development studies, clay mineralogy of soils, and the geochemistry of natural waters.

Stanley N. Davis (Geology, Univ. Missouri-Columbia) spent most of summer 1969 on the loess stratigraphy of northwestern Missouri where in places total loess thickness exceeds 100 ft. Many exposures in quarries and roadcuts are more than 60 feet. Under his supervision, Robert Pauken finished a study of fossil gastropods in loess of northern Missouri. Although a few sites were along the Mississippi River, most loess sites were within half a mile of the Missouri River floodplain. Pauken found a regional change in the fauna attributal to ecologic differences related to temperature and rainfall.

Valmore C. Lamarche, Jr. (Tree-Ring Res. Lab., Univ. Arizona) still is studying paleotemperatures as evidenced by treeline changes and tree-ring growth at upper timberline, but is cooperating with USGS on using tree rings to date past floods and faulting in northern California.

Harold E. Malde (USGS, Denver, CO) has new information on ages of archeological materials. The first uranium-series dates for terrestrial bone, by measurement of all pertinent isotope ratios from samples from Valsequillo, Mexico, and the Lindenmeier site, Colorado, reveal that dates for bison bone from Lindenmeier are about 5,000 years younger than the C^{14} date. Bone of Bison (Gigantobison) Latifrons from terrace alluvium of Illinoian or Sangamon age along the Arkansas River in Colorado gives an "open system" U-series date of 160,000 +/-60,000 yrs. At Valsequillo, concordant dates by Th^{230} and Pa^{231} agree with a C^{14} date on shells from the same bed and indicate man's presence about 22,000 yrs ago. Other dates on bones from Valsequillo exceed 200,000 yrs and seem much too old!

William R. Farrand (Quaternary Res. Lab., Univ. Michigan, Ann Arbor), with Paul Goldberg under his supervision, is studying sediments at several prehistoric sites in Israel. Preliminary results at the Tabun Cave, Mount Carmel, show that the lower half of the sediments (Acheulian and Lower Levalloiso-Mousterian) are eolian in origin, apparently related to the last marine regression. The work at Tabun is under the leadership of Arthur J. Jelinek (Univ. Arizona). Both the "faunal break" and the "Gazella-Dama curve" commonly cited for Tabun appear to be functions primarily of the opening of the chimney of the inner chamber of the cave rather than climatically controlled. The other site under study is the cave of Qafzeh at Nazareth, being dug by B. Vandermeersch (Faculte des Sciences, Paris) who has excavated a number of early Homo sapiens skeletons associated with Mousterian artifacts.

Sherwood D. Tuttle (Geology, Univ. Iowa, Iowa City), while at United College Chinese Univ. of Hong Kong, tried to make a map and analyze the beaches of the Colony, but was disappointed in the lack of wave-built features and variety of morphology. Why, in a humid tropical area, with intensive weathering and high rate of erosion, was there a deficiency of sediments for beach construction?

Richard G. Baker (Geology, Univ. Iowa, Iowa City) has worked on palynological problems in Yellowstone Natl. Park for several years. His pollen and plant macrofossil studies suggest that after the Yellowstone icecap melted, tundra or parkland vegetation prevailed on the Yellowstone Plateau until about 11,600 yrs ago. At that time, a rapid change to pine forest occurred, and this forest has persisted with minor changes to the present. Neoglaciation is reflected by minor increases in spruce and fir starting about 5,000 yrs ago and culminating about 2,800 yrs ago.

Troy L. Pewe (Geology, Arizona State Univ., Tempe) is currently working with Richard D. Reger on the origin and distribution and climatic significance of altiplanation terraces in central Alaska. Under Pewe's supervision, Robert K. Merrill will study the Pleistocene geology of the White Mountains in eastern Arizona. An excellent glacial record has been established on the north side of the mountains and an interesting record of colluvial deposits also is present. Peter G. Kokalis is studying the terraces along the central Salt River Valley.

The Quaternary studies of C. Vance Haynes (Geol. Sci., Southern Methodist Univ., Dallas) in the upper San Pedro Valley of Arizona include mapping the late Pleistocene deposits in order to continue the work begun by Kirk Bryan and to understand the alluvial history of the river and its tributaries. Excavations at the Clovis site near Murray Springs will continue summer 1970 so as to investigate a bone-filled buried spring conduit.

Corwin C. Reeves (Geosciences, Texas Tech Univ., Lubbock) is involved in several projects: mapping of the New Mexico part of southern High Plains for Geologic Atlas Project revealed a here-to-fore unrecognized pre-Illinoian sand sheet which passes eastward beneath the well-known Illinoian "cover sands"; drainage pattern analysis from high altitude photomosaics of southern High Plains shows NW-SE, NE-SW, and N-S lineaments, probably a reflection of deep-seated fractures; geomorphic study of selected parts of the lunar surface, by cooperation of Lunar Science Inst. and MSC Photo Lab, has revealed no evidence of paleo-lacustrine features.

Armin J. Eardley (Geol. & Geophys., Univ. Utah, Salt Lake City) has studied the terraces of the water gaps and major canyons of the Wasatch Mountains and finds that a lower terrace is a result of previous fill, with three identifiable erosional terraces above, the Wasatch block was not tilted eastward during Basin and Range faulting, as previously postulated.

William J. Breed (Museum of Northern Arizona, Flagstaff) and Trevor Ford of Leicester, England, have been working in the eastern part of the Grand Canyon and will describe Chuar Butte, a toreva block. Breed has published a paper on a 3-mile-long Pliocene river channel in Wupatki Natl. Monument, and his wife, Carol S. Breed, is writing on the geomorphology of the Chinle Formation.

Rex M. Peterson (Earth Sci. & Astron., New Mexico State Univ., Las Cruces) finished a geomorphic study on three overlapping strips of K-band radar imagery covering 900 sq. miles of the Wasatch Mountains, and prepared maps of landforms, surface materials, present and ancestral drainage, and structure. He is now working on Apollo space photographs of the region around Las Cruces, NM.

Robert P. Sharp's (Geol. Sci., Calif. Inst. Technol., Pasadena) geomorphic work involves monitoring the behavior of the large intra-dune flats in the Algodones Dunes of the Imperial Valley of California; the dunes are dynamic, moving southeasterly at about 1 foot/yr. Sharp expects better data in 5 years. His other task is puzzling over the Mariner 6 and Mariner 7 photographs of Mars, regarding two types of terrain essentially free of craters. One terrain is chaotic, looking "for all the world" like the product of huge slumps and slides, which in some way may prove to be the most significant thing yet turned up on the martian surface. The other terrain is featureless, a real puzzle, and may indicate existence of an unusual type of rock rubble which is unable to preserve craters for any extended period. Studies of the cratered terrain of Mars are turning up some very interesting relationships, one of which is a possible episodic variation either in impact flux or surface modifying processes. "Field work on a body 40 million miles away isn't easy."

Harold T. U. Smith (Geology, Univ. Massachusetts, Amherst) has retired from departmental chairman duties after 13 years and is now ready for more research and teaching. In late 1969, he went to South-West Africa to study the Namib and Kalahari Deserts; this included 20 hours of flying time which resulted in hundred of aerial photographs. The best available map for ground travel in the Namib was a Gemini photo. The eolian erosion in the "Diamond Desert" described by Kaiser is fantastic! A shorter visit to the Simpson Desert of Australia revealed it to be similar to the Kalahari. These studies of deserts and dunes provide raw material for a monograph on Eolian Geology, long in preparation. Application of remote sensing techniques, particularly orbital photography, look excellent for geomorphic research. One phase of this is expected to involve study of recent Mariner photography of Mars for signs of desert phenomena.

For Larry H. Lattman (Geol. & Geophys., Pennsylvania State Univ. University Park; soon to be Chairman of Geology at Univ. Cincinnati), the third year of work on the pedimentation of alluvial fans in Nevada and the use of various types of remote sensors in their study, is completed. Film-filter combinations, thermal IR, and color film were used. Several of these sensors allowed an accurate and rapid delineation of areas of pedimented fan and modern fan building. Surface "case-hardening" of gravels which markedly affects gully development and slope evolution also was studied. Case hardened gullies now buried in alluvium may be significant in the hydrology of the fan.

Edwin D. McKee (USGS, Denver, CO) studied coastal dunes and related deposits in Brazil for a month with J. J. Bigarella of Curitiba. By means of vast quantities of test trenches, they examined contorted structures in the dunes in an attempt to determine differences resulting from various degrees of moisture in the sand and from tension or compression

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depending on the part of the dune affected. This work was a fieldtesting of ideas developed from flume experiments on slumping and traction flow in the Denver laboratory. Studies also were made of current direction indicators in various coastal environments and of the effects of roots in distorting or destroying lamination in sand. For exact location, they worked from Cabo Frio, north of Rio, south along the coast of Parana and Santa Catarina.

Donald J. Colquhoun (Geology, Univ. So. Carolina, Columbia) has been finishing many papers recently: Geomorphology of the Lower Coastal Plain of South Carolina; Coastal Plain Terraces in the Carolinas and Georgia; Tertiary Sea-Level Fluctuation (includes Quaternary), with Henry Johnson, Jr.; and Pleistocene Fossil Assemblage from Berkeley County, South Carolina, with Horace Richards and Stephen M. Herrick (and Reply, to C. W. Cooke). Colquhoun and Jack Pierce completed initial drilling and processing of Outer Banks (North Carolina) samples so as to learn methods of formation of barrier islands.

Nicholas K. Coch (Geology, Queens Coll. of City Univ. of N.Y., Flushing) in summer 1969 continued mapping the Pleistocene lagoonal complex west of Norfolk, Virginia. Core borings revealed major Pleistocene valley fills, extending below -30 ft. with thick peat at the base. C^{14} dating on Taxodium wood from this horizon gave an age of greater than 47,000 yrs B.P. A 14-ft.-thick peat bed on the edge of the lagoon complex was sampled in winter 1969 and will be analyzed for pollen content by Daniel Habib (Queens Coll.). This peat extends up to about 8 ft. of the present ground surface (22 ft. altitude) and may give the most complete record yet of late Pleistocene climatic change on the Virginia coastal plain. This work will continue summer of 1970. David H. Krinsley (Queens Coll.) and Coch have studied the surface features of quartz grains from these Virginia shoreline complexes. Shorelines with north to south drift contain quartz grains with "glacial" surface features whereas these are absent in shorelines with south to north drift. Maximum relative sea-level along a shoreline can be determined by a change from dominant "beach" quartz-grain surface features to "dune" features upward in the stratigraphic sequence. Inference based on microscopic evidence correlates extremely well with independent sedimentologic and morphologic evidence. The correlation suggests the method may be useful in older sequences where morphologic and stratigraphic data may be less abundant.

Peter E. Wolfe (Geology, Rutgers State Univ., New Brunswick, NJ) is carrying out research on the inversion of topography in the Pleistocene interglacial gravel-covered areas of the New Jersey coastal plain. Distribution of the gravels suggests that each unit was deposited along pre-existing valleys first, and that, when the valleys were filled, the alluvium spread over extensive interfluve areas forming a broad alluvial seaward-sloping plain. The altitude of the interglacial gravels suggests that each was graded to a sealevel higher than that of today. Between times of alluvial filling and lateral spreading, the streams re-excavated the valleys, some of which were below sea-level. Extensive postglacial erosion has almost completely removed the thin gravel cover from the uplands, carving valleys in the softer unconsolidated rock below, and leaving the former gravel-filled valleys as uplands with a characteristic inversion of relief.

A Planning Report on the coastal morphology and shore-protective structures of Block Island, Rhode Island, was prepared by John J. Fisher (Geology, Univ. Rhode Island, Kingston), as part of a multi-discipline study of potential use and development of all the island's resources. The coastal geology of Block Island is somewhat different than most shore recreational areas in that both sand beaches and unconsolidated sea-cliffs are part of the island's coastal recreational resources. The coastal study showed that if the scenic sea-cliffs are preserved from erosion, then undernourishment of the beaches eventually will occur to their detriment. The complete regional study is being supervised by an executive board of state and private groups as well as representatives of the Overview Group of Washington, D.C.

Lawrence F. Rooney and Donald D. Carr (Indiana Geol. Surv., Bloomington, IN) are making statistical comparisons of some ancient and modern karst surfaces.

William F. Tanner (Geology, Florida State Univ., Tallahassee) has completed the first phase of a study relating sediment parameters and bottom mark geometry to wave height, water depth, and fetch, in modern lakes as small as 80 m wide and as large as 100 km; a similar study is being carried on in the Gulf of Mexico. From the data, he has developed equations which permit estimation (with error typically not more than ca. 50%) of ancient wave height, water depth, and fetch. He has applied the new methods to sediments which accumulated in a Jurassic lake in northern New Mexico, obtaining ancient parameters at several different localities. Under his supervision, Alan Niedoroda is working on 3-dimensional circulation in the nearshore zone outside the surf, along low to moderate-energy coasts. He has been able to show from field studies, wave tank studies, and computer work, that small random irregularities on the shallow shelf set up wave refraction patterns, which, under the ambient wave regimes, cause these irregularities to grow into regularly-spaced shoals. The latter are not destroyed despite the fact that wave energy is concentrated on them; instead, they serve as avenues of sediment transport transverse to the coast. These are the transverse bars of Shepard. Rip currents do not play any important role along coasts where transverse bars are well developed. Frank Stapor is working on the detailed history of sediment transport along selected reaches of low- to moderate-energy coasts, where he has been able to establish a compartmentalization of the coast. The drift system operates essentially within independent compartments, rather than continuously along the entire length of coast. He has measured volume drift rates (m^3/yr.) within each compartment. Each compartment may contain many of Niedoroda's transverse bars. James May is working on energy distribution along a line normal to the shore. This depends on the amount of shuffling of sand as well as on sand characteristics and wave and depth parameters. He also has dated coastal shell hash deposits by the ionium method. David Goetschius is working on the history of high marine terraces, probably Miocene and Pliocene in age. William Maxwell, in connection with a river terrace study, is dating ironstone masses which developed after deposition within sands and gravels of high terraces along the Alabama river system. Raymond Karpovich is using the scanning electron microscope to identify grain surface features diagnostic of various transporting agencies, primarily wind, river, and surf, and compiling a collection of photographs to be used in making reasonably reliable interpretations. Dennis Walton is studying the deflection of tidal currents by small offshore islands and the changes in erosion and deposition resulting from these deflections.

W. Armstrong Price (428 Ohio St., Corpus Christi, TX) has two active research projects: warm-region microrelief; and characteristics of barrier island chains, looking toward the description of a model chain from the morphological and environmental standpoints. Also, a long-neglected economic field is now underway, that of assisting the State, Municipal, and County governments in framing legislation and establishing administrative procedures for the regulation of shoreline and nearshore developments, insurance, recreation, traffic and safety measures.

For Richard M. Pratt (Geol. Sci., Virginia Polytech. Inst., Blacksburg) research interests have alternated between coastal Alaska with USGS on the Bering Sea project and the Atlantic over the Blake Plateau with the R/V EASTWARD (Duke Marine Lab) for several trips. The morphology of the Blake Plateau continues of major interest with its Gulf Stream-scoured shape and its granite erratics on top. "...the granite must have originated in the Guiana Shield area of South America and been transported down rivers and through the Caribbean by tree rafting."

Work in progress for Cyril J. Galvin, Jr. (Coastal Eng. Research Ctr, Little Falls Road, Washington, DC) involves study of ten consecutive weekly winter surveys of beach profiles at four Atlantic coast localities and surveys with lesser frequency at four other localities; 91 profiles are being repetitively surveyed in all. Wave data are being collected at all localities so as to correlate beach changes with wave climate. Data from three

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consecutive winters so far are compiled. Results from the first winter are in Coastal Eng. Res. Ctr. Miscellaneous Paper MP 3-69 with H. D. Urban. In collaboration with L. W. Tenney, a catalog in looseleaf form of all inlets through alluvial barriers on the Atlantic, Gulf, and Pacific Coasts of U.S.A. is prepared; the catalog contains charts and measurements of barrier island and inlet dimensions.

Richard J. Russell (Coastal Studies Inst., Louisiana State Univ., Baton Rouge) reports that within recent years it has become apparent that beach rock is but one expression of a widespread phenomenon: cementation of unconsolidated sediments within the zone of water-table fluctuation. Usually the cement is $CaCO_3$, most typical a low-Mg calcite, although in some places aragonite occurs. Beaches and water-table conditions were observed along Florida coasts, including the Keys and Dry Tortugas, in late 1969, and in early 1970, a beach-rock equivalent cemented by iron compounds along the coast of Oregon will be studied.

When Hurricane Camille struck the Gulf Coast, three parties from the Coastal Studies Inst. were in the field: a group studying processes on Fort Walton Beach, Florida, with meteorological, wave intensity, and current vector instrumentation; self-recording current meters at various depths out to 6 fathoms obtained excellent records indicating current velocities much higher than expected in a near-shore location. Another group running temperature, salinity, and bottom-configuration traverses about 5 miles from South Pass of Mississippi River managed to obtain aerial photographs two days after the storm impact, and many since. A third group in Barataria Bay west of the delta obtained an excellent record of the storm surge (which was no greater than that of the succeeding hurrican, Laurie). Although islands east of the delta were changed appreciably, and in some cases washed away, it is expected that their form will return to normal after some months.

Using Coast Guard ships, a Coastal Studies Inst. party has kept track of movement of the oil slick resulting from the accidents on the Chevron Platform north of Main Pass of Mississippi River. Forecasts for 24 hours ahead were verified by the slick behavior and much was learned about the complicated currents in Breton Sound.

Charles G. Higgins (Geology, Univ. California at Davis) is finishing his beachrock project with the next reports on the cement (no aragonite; but both high- and low-Mg calcite) and a particularly fine beachrock site near Pilos in southwest Greece.

Henry W. Menard (Scripps Inst. Oceanography, Univ. California at San Diego) and his associates have been preparing a series of Mercator projection bathymetric maps of the North Pacific at about 12 miles to an inch and also at about 60 miles to an inch. Now in its third year, the project involves compilation not only of Scripps Inst. data but also of many other sister oceanographic institutions. Soundings and magnetic anomalies are digitized and plotted by computer. One atlas is issued; others are nearing completion. This compilation of new data shows the bathymetry with a resolution not previously possible in such a large area. Gross physiography and structures are readily apparent. Contour interval varies from 200 fathoms on steep slopes to 20 fathoms on abyssal plains. The physiography of abyssal hills and plains will be added to give physiographic diagrams of a new type. These will be issued by the Institute of Marine Resources.

Richard O. Stone (Geol. Sci., Univ. Southern California, Los Angeles) has several students under his supervision engaged in geomorphologic research: David Carter, from Sheffield College, England, on the use of orbital photography of earth from Gemini and Apollo missions. Study of landforms, drainage, beach features, currents, and sediment transport in the upper Gulf of California will be made to determine if a relationship exists between these and other parameters and known fisheries. Kenneth Fishel, on an Office of Naval Research study of subaerial sand ripples in desert regions of southeastern California and of current ripples in the Percebu Lagoon of Baja California. Under the supervision of Donn S. Gorsline: wave-induced scour around natural and artificial objects on the seafloor by Harold Palmer revealed significant information on the mechanics of scour and how it

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may be inhibited. A second project by David O. Cook concentrated on sediment transport processes by shoaling waves. Another research project combined marine and subaerial processes in an examination of the Redondo submarine by Barbara Haner. Comparisons of the nature of the subaqueous fan to subaerial structures and processes was made. Bernard Pipkin undertook a project with several students using tracer sands to determine possible beach replenishment in the San Juan Capistrano area by San Juan Creek and Trabuco Creek.

Bruce C. Heezen (Lamont-Doherty Geol. Observatory of Columbia Univ., Palisades, NY) and Marie Tharp (US Naval Oceanog. Office) and artist H. C. Berran, published a third Natl. Geographic Society sea floor panorama, The Pacific Floor in late 1969. Others will be appearing, as well as a western Pacific sheet via GSA, and a bathymetric chart of the Antarctic in the Amer. Geog. Soc. Antarctia Folio series. Heezen was co-chief scientist of GLOMAR CHALLENGER during its drilling in the western Pacific in mid-1969. Jurassic pelagic sediments were found on the Shatsky Plateau, demonstrating that this feature dates at least from the mid-Mesozoic. Heezen, Tharp, and their students are continuing on the 1968 data collecting work on a voyage of USNS KANE to the Atlantic fracture zone. Early in 1970 Heezen and P. J. Fox led an expedition to the Caribbean trenches; one of the results was the demonstration of over 20,000 feet of subsidence on the northwest wall of the Puerto Rico Trench where reef and lagoonal limestones form the trench wall.

Edith M. McKee (416 Maple St., Winnetka, IL) finished work on bottom terrain and associated geology of Lake Michigan. In summer 1969, Lake Superior bottom terrain was studied with landforms presented in 3-dimensional terrain maps, as for Lake Michigan. This study shows at least 6 physiographic provinces within the Lake Superior Basin, directly related to the local and regional geology. These lake bottom studies coordinate geology, structure, tectonics, sedimentation, and paleogeomorphology in the 3-dimensional maps and displays.

Allen Sinnott (USGS, 32 Merritt Dr., Trenton, NJ) has returned from India where he worked with US Aid on an organizational program for a comprehensive hydrologic study of Narmada River Valley. Now, with Raymond L. Nace, he is studying the bathymetry changes (1876 to the present) and sedimentation in a small estuarine bay along the west side of Chesapeake Bay about 7 miles south of Annapolis.

Luna B. Leopold (USGS, Washington, DC) is continuing measurements of bedload on East Fork River near Pinedale, Wyoming. Using the newly designed bedload sampler of Edward Helley (USGS, Menlo Park, CA), they are trying to describe the time and spatial changes of bedload rates in a river during spring snowmelt rise. In collaboration with Thomas Dunne (McGill Univ.), William Bull (Univ. Arizona), and Robert Curry (Univ. Montana) measurements are being made of hillslope characteristics using a uniformly adopted description. This way of describing a hillslope hopefully is being used by scientists from various countries to begin a catalog or library of hillslope characteristics throughout the world. Anyone interested in the methodology may obtain a mimeographed copy from Leopold, direct.

Agatin T. Abbott (Geosciences, Univ. Hawaii, Honolulu) has been analyzing lateral stream capture in Hawaii. Especially in the wet areas of Hawaii, as the main valleys widen and also extend their youthful meanders, the closely spaced consequent stream channels are intercepted by the main valley. This interception in some places results in waterfall capture and in other places a more "gentle" diagonal slip-over of the victimized stream. Waterfall capture of the sub-parallel streams often produces a step-like series of plunge pools that eventually coalesce to form a nearly continuous uninterrupted vertical groove. With 200 inches of rain or more, waters of the captured stream may enlarge the vertical groove to the status of a subsidiary amphitheater-headed valley. The slip-over type of capture results in a thin ridge which intercedes between the main valley and the rapidly downcutting captured stream. Destruction of the ridge is fairly rpaid in these regions.

Raymundo J. Chico, (103 Woodlawn Rd., Baltimore, MD) works on drainage patterns and localization of mineral placers, especially in the Wyoming Red Desert on stratigraphy and uranium occurrences.

Charles S. Alexander (Geogr., Univ. Illinois, Urbana) has two research projects in southern Illinois. One is directed towards determining the effect of forest vis-a-vis grass upon rate of creep, a long term affair with instruments now set up, but five years to wait for "the creep to act." The second is jointly with Jean Cutler Prior (Iowa Geol. Surv.) studying the elements affecting distribution and sedimentation rate on the Black Bottom portion of the Ohio River floodplain, including computer-derived maps of sand, silt, and clay.

Frank A. Swenson (USGS, Denver, CO) was requested by Natl. Park Service to study the relative positions of Arkansas River meanders and Bents Old Fort (Colorado) established 1833 and abandoned 1849. From a sequence of courses, there has been relatively little shift of meanders since 1869, the earliest date of any records.

Alan V. Jopling (Geogr., Univ. Toronto) has two students working on mass-wasting in the Banff Natl. Park area and two others in the Toronto area on geomorphology and sedimentology of the Brampton esker and the Oak Ridges moraine. Laboratory work either in progress or about to start includes study of factors controlling angle of repose of granular materials, mechanics of mudflows, and small-scale river and delta experiments. One of Jopling's colleagues, Ken Hewitt (Erindale Coll.) is doing research on mass-wasting in the Rocky Mountains (?), and another, Brian Greenwood (Scarborough Coll.) is studying coastal sediments in New Brunswick.

Lee Wilson (Geol., Columbia Univ., NY) has gathered as much information on fluvial sediment yield as possible, from gaging station records, reservoir surveys, and experimental plots. These are tested against a number of environmental factors encompassing climatic, geologic, topographic, and land use parameters. He hopes to obtain polynomial regressions which explain broad patterns of erosion, especially in the United States where data are most complete. Some of the climatic data involve new appraches to seasonality, using the air mass concepts. Results are complex but differ from some published observations. The Langbein and Schumm semiarid peak is seen to be not universal. In southern California, a regression with precipitation, area, and relief explains about half the variation in sediment yield to reservoirs, with erosion increasing rapidly with precipitation (to ca. 40").

Henry T. Ore (Geol., Idaho State Univ., Pocatello) is studying drainage basin analysis as part of a long-term alluvial fan study, involving the surfaces of 6 fans in central Idaho measured and factor analysis and variance analysis applied. In summer 1970, he will begin a paleogeomorphic study of the surface of the Ephraim fluviatile sediments just below the Peterson lacustrine Cretaceous beds in the Gannett Group in east Idaho and west Wyoming.

Stanley A. Schumm (Geol., Colorado State Univ., Fort Collins) has proceded with a model study of river meanders on a 100 ft. x 24 ft. stream table and has duplicated Freidkin's results. He can show major changes in the meander pattern as the slope of the surface on which the channel form is changed and as the type of sediment load moved through the channel is changed by the introduction of kaolinite (suspended load). In summer 1970 he will start an outdoor experimental study of drainage network development and drainage basin evolution in a 50 ft. x 30 ft. box to which artificial precipitation can be applied. The erosional development of the system will be documented and data on runoff, sediment yield and hydrograph characteristics will be collected for storm events during each evolutionary stage of the system. During the experiments, periodic low-level flights will be made over the drainage system so as to obtain remote sensing spectral signatures of the diverse terrain types.

Dale F. Ritter (Geol., Franklin & Marshall Coll., Lancaster, PA) in summer 1970 plans to finish work on the evolution of the piedmont region of the Beartooth Mountains in southern Montana and to start preliminary studies in the southern part of the Big Horn Basin trying to trace terraces from the Wind River Basin through the Wind River Canyon.

Patrick A. Glancy (USGS, Water Resources Div., Carson City, NV) is studying erosion and fluvial sediment transport in the Incline Village area in the northeast part of the Lake Tahoe Basin. Objectives of the study include quantitative evaluation of fluvial sediment being transported by major streams into Lake Tahoe, and identification of source of sediment. It is expected that some estimate may be made of the relative proportion of sediment being naturally eroded compared to that resulting from urbanization of the area.

Wilton N. Melhorn (Geol., Purdue Univ., Lafayette, IN) is making extensive fluvial morphology studies with the ultimate hope of establishing a quantitative system of stream classification. Under his supervision, Daniel M. Coffman completed a study of the accuracy of drainage basin maps drawn f[illegible] USGS 1:24,000 topomaps and the effect that "missing" stream segments have on the Strahler order of the basin. The percent of all stream segments which could be obtained from a basin on a given quadrangle was found to be a function of relief, age, and geology; recovery of segments varied from 15% to nearly 100% for Indiana, resulting in drastic differences in the accuracy of ordered drainage networks. Control was provided by drainage maps prepared for engineering purposes from aerial photographs. This very low recovery, for many maps, of actual stream nets has rather important effects on any study requiring stream ordering. Previously, it has been conventional to obtain stream nets simply from the published maps. In addition, using a digitizer for data collection, we are nearing publication of a computer program which automatically will produce ordered drainage basin maps and calculate some 30 of the most important stream parameters from stream segment coordinate data.

In the Department of Geography at Univ. Maryland (College Park, MD), geomorphologists doing research are Frank Ahnert, who has finished work on denudation rates in mid-latitude drainage basins, but is continuing his computer application to slope development models; Daniel B. Krinsley has been working on climatic interpretation of playas in Iran; Charles Roswell is investigating wind and water gaps in relation to drainage development in the folded Appalachians; and Richard H. Kesel has been involved with inselberg formation under various climatic environments.

Perry H. Rahn (Geol. & Geological Eng., South Dakota School of Mines & Techn., Rapid City) is dividing his efforts between studying the hydrogeology of Paleozoic rocks flanking the Black Hills (groundwater recharged by disappearing streams and precipitation on the Pahasapa limestone supplies the "Dakota Sandstone" with left-over water emerging at large springs) and engineering application of remote sensing on Interstate Hwy 90 (fractures are sometimes more apparent on color infrared aerial photographs than on black & white).

M. Artesian Saines (with Roy F. Weston, Westchester, PA) is studying as a hydrogeologist the availability of groundwater in the buried Pleistocene outwash channels of New Castle County, Delaware.

Walter M. Small (Cooperstown, PA) writes that comparison of preglacial with postglacial age drainage networks in northeast Ohio, northwest Pennsylvania, and western New York areas need more study. Hundreds of drill records are now available to obtain thickness of fill and depth of preglacial valleys. Data may be found at USGS Water resources section at Allegheny Coll., Meadville, PA.

Keith M. Hussey (Earth Sci., Iowa State Univ., Ames) has been conducting a study in a western Iowa postglacial drainage basin where the main stream valley in part is superimposed in drift over a preglacial bedrock valley, to determine the hydrologic properties of the underlying aquifers. An interesting by-product is the relationship of the modern drainage basin to the ancient basin. Robert C. Palmquist is making two studies in the northeast part of the Big Horn Basin in Wyoming. One concerns the glacial and terrace chronology in the Norwood Creek drainage basin. The other is on the drainage evolution of that portion of Shell Creek drainage basin that lies outside the mountains.

James C. Brice (Earth Sci., Washington Univ., St. Louis, MO) has discovered a method for measuring lateral shift and other changes at a river reach by the simultaneous projection of two aerial photographs taken in different years. Meandering segments of Frenchman Creek, Nebraska, had an average linear shift of 23.6 ft. for the period 1938-1958, as compared with 13.2 ft. for the period 1958-1964. In terms of area, the rate of lateral shift was roughly doubled by releases of irrigation water from Enders Dam.

Marie E. Morisawa (Geol., State Univ. of New York at Binghamton) has completed a study with biologist Martin Murie, Antioch Coll., on the evaluation of natural river environments, which involved the Little Miami River, Ohio, and the Green River, Wyoming. They established objective criteria for river basin environments useful in the decision-making process for future hydrologic exploitation of rivers.

Robert H. Rutford (Geol., Univ. South Dakota, Vermillion) reports that Alain Kahil has completed work on the terraces of the White River in western South Dakota.

Dwight R. Crandell and Donal R. Mullineaux (both USGS, Denver, CO) are continuing with the USGS Cascade Range volcanic hazards project. Having now finished an appraisal at Lassen Volcanic Natl. Park in northern California, they will be joined in summer 1970 by Jack H. Hyde (Tacoma Community Coll., Tacoma, WA) and Clifford A. Hopson (Univ. California, Santa Barbara) to continue field work on the geologic history of the south side of Mount St. Helens in southwest Washington.

Richard L. Burroughs (Geol., Adams State Coll., Alamosa, CO) in his mapping of the San Luis Hills in the central portion of the Rio Grande Trough in San Luis Valley has shown that this volcanic terrain was either partially or completely buried in the recent geologic past and is now being exhumed.

The central Kentucky Karst region, because of the reknown of its caves and voluminous literature, is a frequent stop-over for distinguished world-travelling geomorphologists, guided by Erwin R. Pohl (Horse Cave, KY). Current studies by Pohl in south-central Kentucky include identification and recognition of baselevel and geomorphic control by geographically extensive, resistant, and relatively impervious beds. One such horizon, the Lost River Chert bed, has been traced from central Indiana through Kentucky and into Tennessee. Other controls exist, but several have yet to be traced out.

Eugene P. Kiver (Eastern Washington State Coll., Cheney) is working on the glacial history of the Cloud Peak-Piney Creek area in the Big Horn Mountains, Wyoming, and on the Neoglacial history of the Wallowa Mountains, Oregon. A two-week investigation (with Martin Mumma) of the Mount Rainier steam caves will be conducted summer 1970. Work on the glacial geology of the southern Medicine Bow Mountains, Colorado and Wyoming, involved techniques of moraine separation using the migration of fine sizes through the soil profile and sound pulse analysis of weathered and fresh granitic boulders.

Walter S. Newman (Geol., Queens Coll. of City Univ. of New York, Flushing), with David Thurber and three students are studying the late Quaternary geology of the Hudson River Estuary. The valley has a reversed bedrock thalweg with more than 600 ft. of closure, so the Hudson Valley appears to be the world's lowest latitude fjord. There is some evidence suggesting the valley was subject to a coulee episode in late glacial time. Fossils show the estuary to have had greater salinities upvalley during the interval 4,000-6,000 yrs B.P. Newman has continued his work on the Montauk Peninsula of Long Island where there is evidence for two glaciations, a superimposed loess blanket and the transformation of a three-island archipelago into a peninsula within the past few 1000 yrs. In addition, his studies of borings in and on the littoral of the extreme western end of Long Island Sound show a Wisconsin lacustrine-marine-regression-glacial readvance-marine transgression sequence involving interplay of both crustal and sea-level fluctuations. Diatoms, molluscs, and forams suggest lateglacial and early postglacial climates similar to today.

Richard C. Anderson (Geol., Augustana Coll., Rock Island, IL) presently is mapping the surficial geology of Rock Island County for the Illinois Geol. Surv. to provide bedrock data for a concurrent soil survey and to prepare for urban geology and city planning.

G. Gordon Connally (Geol., Lafayette Coll., Easton, PA) finished in summer 1969 work on the Glen Falls quadrangle for N.Y. State Geol. Surv. Two ice advances so far have been identified near Glen Falls, the earliest being the classical Wisconsinan and the later being a readvance about 12,600 yrs ago. With Leslie A. Sirkin, Connally collected peat samples for redating the bottom of Pine Log Camp bog.

Charles S. Denny (USGS, Beltsville, MD), after devoting 15 months to the Powell Centennial for the Survey, is able to finish reports on the Quaternary geology of the northeast Adirondack region, of the Mooers (sic) and Rouses Point quadrangles, NY, after which he will join the DELMAVA project with many other geologists from the Survey.

After a prolonged serious illness, Victor C. Miller (Geogr. & Geol., Indiana State Univ., Terre Haute, IN) is able to supervise students undertaking geomorphologic research: Carl Dinga is making a quantitative correlation study of the relation between dip magnitude and homoclinal ridge crest height, and ridge asymmetry and width in the Valley and Ridge province of Pennsylvania, in the Arkansas Valley, and in the fold belt of Wind River Basin. David Kilgore is working near Clinch Mountain in the southwest corner of Virginia investigating why and how the North Fork of the Holston River leaves its subsequent course along limestone beds to cut across Little Mountain into Devonian shale and then bakc through other gaps into Mississippian limestone. At two places, the river goes in and out of a single gap! Roberto Garza is studying the linear streams in the Nashville Basin and adjacent Highland Rim and their possible relation to joint control.

In the Georgia Coastal Plain Robert C. Vorhis (USGS, Water Resources Div., Atlanta, GA) finds that the depositional strike of successively younger formations rotates in a counterclockwise direction. From the surface on crystalline rocks up through Oligocene time, the strike rotation amounts to 53°. For the Pleistocene terraces, Cooke's 1939 map suggests that a similar 35° rotation of strike occurred from Brandywine through Pamlico time. Several possible explanations include differential settling, tilting during slight uplift, but differential initial sedimentation seems the most reasonable.

Since 1966, Aaron C. Waters (Geol., Univ. California, Santa Cruz) and Richard V. Fisher (Geol., Univ. California, Santa Barbara) have been investigating maar volcanoes (40 or more) in western United States, northern Mexico, Hawaii, and New Zealand. Some of the maars erupted into ancient lakes, such as Lake Bonneville in Utah and Christmas Valley, Oregon. Others erupted near shorelines (Diamond Head, and others, Hawaii) or in low-lying coastal regions (Auckland, New Zealand). Others blasted through underground aquifers where surface water was absent (Cerro Colorado, Sonora, Mexico). The characteristic bowl-like craters of maars and the ever-presence chilled basaltic glass shards, in combination with evidence of water within the environment of eruption, shows that water is a dominant factor in their development. Rising magma contacts water at a shallow depth, giving rise to shallow explosions, producing the bowl-shaped crater and the abundant glass shards. Easily accessible maars showing cross bedding and dune shapes due to deposition of debris from base surge density clouds are Zuni Salt Lake, New Mexico, and Ubehebe Craters, Death Valley, California (exposed in roadcuts near the tourist's lookout). Next will come study of the deposits and landforms of modern phreatovolcanic eruptions where base surges were observed, i.e., Capelinhos in the Azores, Surtsey in Iceland, and Taal in the Philippines.

Richard E. Kucera (Geol., Univ. British Columbia, Vancouver) for the past 3 years has been photographing geologic processes and resultant morphologic changes (using 16 mm time-lapse cinematography) of micro-changes that occur at the terminus of the Athabasca glacier including ice-recession and evolution of annual recessional moraines; and shoreline changes along the Spanish Banks, B.C., of miniature drainage systems on the beach.

D I V E R S S U N D R Y I T E M S
(Not arranged as to subject matter, as before)

Werner D. Brueckner (Geol., Memorial Univ. of Newfoundland, St. John's) was on sabbatical leave for more than a year in Switzerland mapping to the southeast of Lake Lucerne for the Geological Atlas of Switzerland, Quaternary deposits ranging from moraines of several late stages of Wuerm glaciation to various kinds of landslides, talus, alluvial fans, and terraces. One part of his work included study of a core of a great interglacial landslide under a blanket of moraine. Postglacial sea-level changes occupies his time at home now.

The major thrust of research for Donald R. Coates (Geol., State Univ. of New York at Binghamton) has been to quantify the terrain of the glaciated Appalachian Plateau and a part of the Allegheny Plateau. Many different computer programs have been written, computer-mapping techniques used, statistical analyses of data made, similar topographies elsewhere in the world examined, and numerous reports of work given for comments by colleagues. The departmental program in geomorphology and sedimentology and fluid systems is growing, with Marie Morisawa joining in early 1970, and Iaakov Karcz (now with Geol. Surv. of Israel) joining in September 1970 to design the flume laboratories and specialize in fluid mechanics and stream bed forms.

Jane L. Forsyth (Geol., Bowling Green State Univ., Bowling Green, OH) leads a busy life complicated by working with biologists on the relationship of geologic substrate and the pre-settlement tree vegetation of Ohio, on the distribution of plants restricted to limestone-dolomite bedrock, on South Bass Island (Lake Erie) tree vegetation and bedrock beneath, and on the postglacial history of the Lake Erie Basin. In fact, the entire postglacial story (Maumee I to Lundy) had to take place between less than 14,000 and 12,000 yrs ago, and was followed by a most tremendous flood when the ice first retreated north to permit the first drainage eastward off the Niagara Escarpment, repeated on a yearly basis.

The Antarctic Research Program on instrumentation of patterned ground of Robert F. Black, and Thomas E. Berg (Killed November 1969 in a helicopter accident in Victoria Land, Antarctica) (both of Geol. and Geophys., Univ. Wisconsin, Madison) is being closed down. It spanned ten years of measurements of heat flow and moisture movements in patterned ground; The instruments are calibrated again and will remain unmolested in a scientific preserve for future measurements five or ten years from now. Black is involved summer 1970 in the Aleutian Islands on a combined geologic, archeologic, and anthropologic study of the Aleuts.

Robert S. Dietz is at work at the ESSA Atlantic Oceanographic and Meteorologic Laboratories (Miami, FL) on the morphology of continental slopes especially as applied to continental drift. With John Holden and Walter Sproll, he has completed a new improved reconstruction of continents with absolute geographic coordinates, with precise fits not only for closing the Atlantic Ocean but also for fitting Antarctica into Africa and Antarctica into Australia, but lacking a good fit for India. Refinements of the fit between Africa and North America are being made which will require return to the African coast summer 1970.

Kenneth G. Smith (90 So. Ammors St., Lakewood, CO) is now with Inlet Oil Company working on possible production of offshore placer minerals. "By shallow geophysical surveys of shorelines and deep embayments, we are able to determine thickness of fills or offshore bars, trends, relation to current or tidal flow directions, etc. Following this with bottom sampling for geochemical analysis, we define favorable placer mineral prospects which we then drill in detail to determine extent and vertical distribution of the minerals, as well as economic potential of the deposit."

Kwang-Yan Lee (USGS, Washington, DC) completed 1969 field work in souteast Kentucky, and in spring 1970 started Quaternary-Tertiary geologic mapping in the Jackson Purchase area of western Kentucky.

We have a question from an academic! Arthur L. Bloom (Geol. Sci., Cornell Univ., Ithaca, NY) would like to exchange geomorphology examination questions. A good exam should reflect scope and emphasis of the course, but perhaps we all could get some fresh ideas by finding what others ask. As an example, Art Bloom sends us one of his: According to Buedel, "most of the relief features in those parts of the middle-latitude regions that have escaped glaciation but have been subjected to 'periglaciation' were rapidly shaped by the deep excavation of broad valleys in the cold ages of the Pleistocene, this process of excavation being halted in the Holocene, as well as being suspended in the interglacial ages. ... He thus assigns only an insignificant role in the development of the relief of such regions to normal erosion by the streams and rivers that now flow in their valleys." Art Bloom's question to his class is: What evidence would you seek to prove or disprove that the central Appalachians of the United States had been dominantly shaped by periglacial rather than "normal" processes? Send Art some of your old geomorphology exams.

"I have belatedly become aware that a major revolution has been occurring in basic geomorphic outlook; the new empiricism reflects an abandonment of the simplistic rationalism on which Hutton and Playfair (and W. M. Davis and L. C. King) built their geomorphic outlook, in favor of a kind of phenomenological relativism, as I understand those terms (See also Mann, 1970, G.S.A. Bull., p. 95 ff). Oddly enough, this revolution in basic philosophy that has already taken place in physics and biology ..., seems to be affecting geology first through geomorphology, producing a virtually unbridgeable communication gap between the younger generation of geomorphologists and their geological and older geomorphic colleagues." This is from Charles Higgins (Univ. Calif. at Davis). What do you think of it?

Rhodes W. Fairbridge (Geol., Columbia Univ., NY) spent January 1970 in North Africa and, apart from visiting coastal terraces west of Algiers that date back to Calabrian, most of the time was devoted to a study of the paleo-geomorphologic features of the Ordovician Ice Age in the central Sahara. He reports that the striated pavements are better preserved there than for any part of North American or Scandinavian Pleistocene that he has seen. Under totally arid conditions there today, the upper Ordovician contains an extraordinary wealth of glacial and periglacial features: grooves, gouges, sickle furrows, lunate fractures, roches mountonnees, drumlins, eskers, proglacial stream-fill, sandurs, permafrost effects, pingos, sand springs. Relative movement of the "Gondwana" (South) Pole is traced back through 450 million years to this northern hemisphere setting, and, in spite of Meyerhoff's pleadings to the contrary, Fairbridge would put the Ordovician equator through North America and the north pole near Australia.

Howard E. Simpson (Eng. Geol., USGS, Denver, CO) writes that his entire career has been in the field of land utilization, starting out first mapping glacial deposits and Cretaceous beds in southeast South Dakota, then 12 years mapping glacial deposits and Triassic beds in the Connecticut Lowland, and metamorphic rocks of the Western Upland, then 3 years compiling geology for the USGS report on the Northeast Corridor for Dept. of Transportation, site-investigation for A.E.C. and Corps of Engineers, and now on a cooperative project with Denver Regional Council of Governments in a 450-sq. mi. area west and south of Denver. The primary task is to take available bedrock and surficial geology and "translate" with field and laboratory work, into engineering geologic maps for the benefit of planners, engineers, architects, developers, and others. "Over the years I have had to acquire an increasing amount of engineering background, but I have found that a sound basis of geomorphology is a major key to a better understanding of other problems and possible solutions for them."

Arthur D. Howard is on sabbatical teaching photogeology to professors from South American universities at the Geoscience Institute of the Federal University of Rio de Janeiro, Brazil.

Waldo S. Glock (INSTAAR, Boulder, CO) is using tree rings and tree growth entirely for interpretative aspects, as evaluation criteria for increase or decrease in rainfall, and as an aid in detecting such changes along with geomorphic effects.

Laurence H. Nobles (Geol., Northwestern Univ., Evanston, IL) has three papers in preparation. The first is entitled, "Angle of Repose Slope of Unread Documents on Administrative Desks". The second (of even greater geologic import) is "Imbrication as a Method of Pseudo-organization of Materials Better Ignored". The third, while not written primarily for geologists, has portents for all of us in the sciences, is "Procrastination: An Administrative Panacea or a Way of Life?". As geomorphologist gone "deaning", Nobles hopes that for the good of science some hard-nosed editor will mercifully reject all three papers.

Robert H. Ruhe (formerly of Agronomy, Iowa State Univ., Ames; now Geology, Indiana Univ., Bloomington) has slowly wound down his research studies in Iowa, in hillslope evolution and associated soil formation, in geohydrology of a watershed in loess country after 7 yrs of effort, and in regional loess sedimentation, weathering, and soil formation.

Earl M. P. Lovejoy (Geol., Univ. Texas at El Paso) is making detailed structural and geomorphic studies of the Basin and Range province in Nevada, although currently working on the Franklin Mountains nearer home.

John R. Williams (4 Forest Notch, Cohasset, MA) is working with the Water Resources Div. in southeastern Massachusetts on Pleistocene stratigraphy in support of groundwater appraisals in the Ten Mile River Basin, in the Taunton River Basin, and on the coastal drainage basins tributary to Cape Cod and Buzzards Bay. His report on occurrence of ground water in permafrost regions of Alaska is still in preparation.

Franklin D. Patton (Geol., Univ. Illinois, Urbana) listed his activities in geomorphology: field study and evaluation of geologic factors influencing landslides (sic) along a part of the Marginal Highway on the eastern slopes of the Andes in Peru; field study of large rock slides due to engineering construction activity in Colorado, California, and Puerto Rico; study of aerial photographs of large rock slides in the United States and western Canada; and laboratory study of the shear strength of soil-rock interfaces.

Irving H. Tesmer (Geosciences, State Univ. College at Buffalo, NY) continues in summer 1970 work on geology of Acttaraugus (sic) County, New York, involving observations on the geomorphology, as well as the stratigraphy and paleontology of the county.

Raymond C. Murray (Geol., Rutgers Univ., New Brunswick, NJ) with two students, Duncan Sibley and Charles Bandoian, are studying Pleistocene and Recent carbonate sediments and rocks on Bonaire in the Netherlands Antilles. Recent carbonate rock that appears to be cemented beneath sea-level, beach rock and carbonate mud accumulating in an almost isolated lagoon represent one study, aimed at the role of physical-chemical and biological processes in the formation of $CaCO_3$. A high terrace of late Pliocene or early Pleistocene age is partially dolomitized, an example of recent dolomitization that may have occurred by evaporative reflux soon after deposition.

George H. Crowl (Geol. & Geogr., Ohio Wesleyan Univ., Delaware, OH) has finished writing on the Pleistocene of the middle Delarware Valley for the Pennsylvania Geol. Survey.

Edwin E. Larson (Geol. Sci., Univ. Colorado, Boulder, CO) has started a computerized trend-surface analysis of the Colorado Front Range erosion surfaces to learn what trends actually might exist there. What turns up may be quite unintelligible, but at least it is a fresh approach to this age-old problem.

David P. Stewart (Geol., Miami Univ., Oxford, OH) and Paul MacClintock (formerly of Princeton Univ.) have published a remarkably detailed and controversial account of The Surficial Geology and Pleistocene History of Vermont (Vermont Geol. Surv., Bull. No. 31, 251 pages, 1969).

ANNOUNCEMENTS PROGRAMS

October 2-4 1970, Friends of the Pleistocene Rocky Mountain Section Field Conference to the San Francisco Peaks, Flagstaff, Arizona. Leaders: Troy L. Pewe & Randall G. Updike. Tentative schedule: Friday, Oct. 2nd PM registration, Americana Motel; 8 PM lecture by Pewe and Updike on the San Francisco Peaks at the Museum of Northern Arizona, Flagstaff; Saturday, Oct. 3rd, 6:30 AM busses depart from Americana Motel for the Snow Bowl; climb Agassiz Peak, 12,356 ft. with aid of ski lift, walk down Interior Valley to Lockett Meadow, met by busses; Sunday, Oct. 4th, 8 AM autos leave motel for Lockett Meadow, return to motel at 4 or 5 PM. Both leaders have spent several summers unravelling the glacial history of San Francisco Peaks, as well as the volcanic history, including mudflows and periglacial features. From the top of Agassiz Peak on down the group can examine successively, Neoglacial, Wisconsin, Illinoian glacial deposits, and mid-Pleistocene and early Pleistocene colluvial deposits.

Early October 1970, Friends of the Pleistocene Cordilleran Section Field Conference in coastal areas of Coos and Curry Counties, southwest Oregon. Organized: Richard J. Janda Subject will be Quaternary sedimentation and tectonism (along the coast), planned as a working conference (not as a lecture tour); route will be from the North Bend-Coos Bay, Oregon airport to the Crescent City, California airport; both airports are served by Air West and have rent-a-car service available. Most of the conference activities will center on the fishing village of Port Orford, Oregon. Motels, restaurants, and campgrounds are available along the route. All potential participants please write as soon as possible to Richard J. Janda, USGS, 345 Middlefield Road, Menlo Park, CA 94025. Let him know your plans.

November 11, 1970, 1:00 to 4:00 PM and also 8:00 PM Pleistocene Symposium, Milwaukee. The Geomorphology Division of the Geological Society of America has initiated and now sponsors a Pleistocene Symposium followed by an informal discussion at the 1970 Annual Meetings in Milwaukee. The theme is "The Wisconsinan Stage - A symposium on the terminology, chronology, stratigraphy, and climate of the classical midwest area and correlation with other parts of the world." The following will speak or contribute to the symposium: George W. White; John C. Frye and H. B. Willman; H. E. Wright, Jr. and Charles L. Matsch; Aleksis Dreimanis and Richard P. Goldthwait; W. S. Broecker and John Imbrie; C. C. Langway, W. Dansgaard, S. J. Johnsen, H. Clausen, Anthony J. Gow, Samuel Epstein, and R. P. Sharp. It is hoped that all those interested will plan their day in order to attend the symposium Wednesday, November 11th, from 1:00 to 4:00 PM, and the informal discussion that evening at 8:00 PM. The committee from the Geomorphology Division that organized this symposium consists of Robert F. Black, Chm., Richard P. Goldthwait, and H. B. Willman.

Any geomorphologist wishing to study planet Earth by Gemini or Apollo photographs now may do so. To obtain photographs, he needs to have computer print-outs from an 1108-FORTRAN V Computer Program informally called GEMSORT prepared for and ordered from Mapping Sciences Laboratory, N.A.S.A., Manned Spacecraft Ctr, Houston, TX 77058, and the Technical Working Paper (Photographic Data Computer Program: GEMSORT), prepared by Sumner B. Hixon (504 Misty Lawn, Friendswood, TX) dtd 10 Feb 70 (same NASA address) from which he will learn how to read the print-outs and order the photos he wishes. To order a photo, the geomorphologist needs 3 numbers; these are the first 3 listed in the basic data line (in the print-out, the mission number, the magazine or roll number, and the main photo number). Usually the cost is about $3.50 ea for color and $1.00 ea for black & white prints. The missions available from the 25 Mar 70 print-outs are Gemini flights 3 through 12, and Apollo 6, 7 & 9 earth shots. Gemini has black & white prints made from color negs; Apollo has color only. The GEMSORT program lists and sorts photos from about 104 geographic areas. It also lists the data by mission with the area descriptions of each photo printed as one line below the basic data line. The Techn. Working Paper has instructions on how to read the basic data

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lines, and contains index maps of the areas (Area Description Maps): Middle East, Africa, India, China, Indonesia, Burma-Vietnam, Pacific, Australia, South America, Mexico, Caribbean, Central America, and United States. The basic data line includes additional valuable information about each photo that will help decide whether or not this is the photo to buy: latitude and longitude of the principal point, time of photography (also sunrise or sunset), camera, film, exposure, filter used, altitude of camera, cloud cover (%), camera tilt direction, and sun angle at principal point. It takes a bit of study but it might be well worth the extra effort. A similar program is underway for the Lunar photography. (Editor's note: The Techn. Working Paper measures 8x10.5x1.5 inches, and each of the two print-outs, flat, measure 11x15x3 inches; all 3 weigh 25 lbs!!)

Of interest to geomorphologists, museum curators, and teachers, are the new relief globes made by Rand McNally & Company. The Geo-Physical Relief Globe of the face of the Earth is more than six feet in diameter (75 inches, actually), fabricated of epoxy reinforced with fiberglas laminations, created by a staff of cartographers and sculptors under the direction of Kenneth S. Fagg (who sent us the data and brochure; Geo-Physical Dept., Rand McNally & Co., P.O. Box 109, Ossining, NY 10562). Bill Menard was their overall consultant, with the assistance of Robert Fisher, Bruce Heezen, Rhodes Fairbridge, Ned Ostenso, Bill DeLeeuw, and others, each supervising the area of his specialty. All is painted in realistic color. Also, now a six-foot relief globe of the Moon with the far side as accurately modelled as the near side, painted to simulate optimum viewing conditions, is ready for the public. Fagg also has completely revised his paintings of the topography of the ocean floors in accord with the latest findings and they are now published in a new edition of Life Magazine book, "The Sea".

Again, after a two-year interval, we call your attention to the fact that Army Research Office-Durham is interested in supporting worthwhile research in Geomorphology. The Director of ARO-D Division of Environmental Sciences, William Van Royen (ARO-D, Division Environmental Sciences, Box CM, Duke Station, Durham, NC 27706) reminds us that since geomorphological research involves field work, and review of proposals normally requires 3 to 4 months, it is well to get proposals in before December. "Proposals for basis research ... should have the goal of establishing or aiding in the establishment of some general principle, and should have more than strictly local validity or applicability." Fundamental divisions of geology in which ARO-D is interested are Mineralogy, Petrology, Structural Geology, Sedimentation and Stratigraphy, Geomorphology, Glaciology, Hydrology, and parts of Geophysics. Areas listed as of interest under Geomorphology and Glaciology are: various types of studies of landforms and forms of natural drainage; the processes that create or influence landforms, including classification and morphometric aspects; analysis of landforms of the humid tropics, deserts, polar areas, and of mountainous regions, including relationships of landforms to rocks and structure and the effects of present or past climatic conditions; the nature of various kinds of glacial terrain, surface effects of permafrost, nature of organic terrain, of karst surfaces, of volcanic terrain; nature and geographic distribution of snow, firn, and glaciers, pertinent properties of snow, firn, and ice, characteristics and modes of movement of glaciers, erosional and depositional effects of glaciation, and related phenomena such as avalanches, permafrost, ice-induced soil phenomena, and periglacial phenomena.

The latest release in the AGI - Encyclopedia Britannica Earth Science film series is "Heartbeat of a Volcano". John S. Shelton (E. B. Films, 6519 Fountain Ave., Hollywood, CA 90028) produced it and states that it features the work of USGS men at the Volcano Observatory on Kilauea as they probe the outside of the live volcano with tiltmeters, geodimeters, seismometers, thermometers, gas-samplers, and make field observations to understand what is going on inside. Shelton's team was fortunate to arrive just after an eruption and to remain through a very exciting eruption, so that his film documents what geologists do to restore their instrument network after an eruption has disrupted it. what they do between eruptions, and during an eruption.

To keep you up to date with progress at the School of Earth Sciences, University of Arizona, Tucson AR: Beginning in July 1970, the Departments of Geology and of Geochronology will be merged into the Department of Geosciences, with a faculty of 30, graduate students of more than 100, and undergraduate majors of slightly less than 100. The Laboratory of Tree-Ring Research is essentially a research unit in the School of Earth Sciences; three areas of current research are of interest to us: the 7,500-yr bristlecone-pine-tree chronology in the correction of C^{14} dating technique, the use of tree-ring studies to establish past climatic changes in western North America, and the use of dendrochronology in the study of rates of geomorphic processes. The Office of Arid Lands Studies has devoted most of its efforts in recent years to bibliographic research in the development of bibliographic storage and retrieval systems for deserts; it has also been active in the publication of several monographs relating to arid lands. Graduate studies and research in geomorphology is under the direction of William B. Bull; Director of the School of Earth Sciences is James H. Zumberge.

Ronald K. DeFord (Geol. Sci., Univ. Texas at Austin) submits the following (edited) communication: Barrial versus Playa. After 33 years a correction has finally received some notice. In 1936 Ezequiel Ordonez politely pointed out an error in geomorphic terminology. Describing basins or bolsons in the "North-Central Plateau of Mexico", he wrote (A.A.P.G., 20, p. 1290): "In some of these basins, the bases of the sierras extend toward the middle of the plain like very gently inclined planes which end at the barrial, improperly called 'playa' by the American geologists and geographers." In Spanish, playa means beach, shore, or strand; (barrial means mire or wet area - ED.) In the 1969 Guidebook of the Border Region (N.M. Geol. Society, 20th Field Conf.) both Morrison and Hawley have used barrial and remarked that playa is incorrect. Comes now Internatl. Ctr. for Arid and Semi-Arid Land Studies (ICASALS) scheduling a playa-lake symposium on 29-30 October 1970; it would do well to consider the name itself. Nevertheless, come to the ICASALS Texas Tech University Department of Geosciences Symposium on Playa-lake Basins of the World on 29-30 Oct 70. A day and a half will be spent on papers and discussions, and half a day in the field in the West Texas "pluvial lake complex". Write to C. C. Reeves, Jr., at Texas Tech Univ., Dept. Geosciences, P.O. Box 4109, Lubbock, TX 79409 for details. Perhaps if you attend, you will learn about playas, barrials, and even lake-lake basins! It can't be as bad as learning about Table Mesa in front of the Sierra Nevada Mountains by the Rio Grande River!!

Summary of activities during the past academic year at the Quaternary Research Center, Univ. Washington, Seattle, WA - New faculty members joining as part of the Research Center's program include Matsuo Tsukada (Botany, Palynology), David Piper (Geological Oceanography), and Minze Stuiver (Isotope Geochem. & Radiometric Dating). John R. Reid (Univ. No. Dakota) and Giuseppi Orombelli (Univ. Milan, Italy) participated as postdoctoral fellows. The Distinguished Visiting Professor program brought Walter Kubiena (Univ. Hamburg - Soil micromorphology) and Akira Higashi (Hokkaido Univ. - Low-temperature Physics) to campus for one quarter each. Stephen Porter is continuing research on Pleistocene glaciation in the southern North Cascade Range. Laboratory work is being done on soils of different ages on the east flank of the Range. Kenneth Hopkins completed studies of late Pleistocene volcanism and glaciation on the south side of Mount Adams volcano, and has documented a complex interstratification of lavas and drift sheets encompassing at least the Wisconsin glaciation. Donald Biederman finished studies of Quaternary stratigraphy on the northern Olympic Peninsula where he found two glaciomarine drifts, the oldest dating to ca. 38,000 yrs. During the last glaciation, the Juan de Fuca glacier lobe extended at least as far as the present Pacific Coast of Washington. Robert Carson is completing work on the interrelationships of Olympic alpine glaciers and the Puget Lobe in the southern Olympic Peninsula during several Pleistocene glaciations. George Linkletter spent a second field season in the Dry Valleys of Antarctica and is now completing laboratory work centering on weathering and soil formation on drift sheets of different geologic age. Norman Ten Brink will continue work in the Søndre Strømfjord area of west Greenland on late Pleistocene and Holocene chronology of ice withdrawal and deleveling. Continued on page 24

Mark Weber has finished one of two seasons' field work in the Bitterroot Range and Bitterroot Valley of Montana on relationships between alpine glaciations and fluctuations of Glacial Lake Missoula. Robert Skinner is beginning a second season of stratigraphic field studies in the Moose River Basin of the Hudson Bay Lowland, concentrating on defining the depositional environment of the nonglacial organic-bearing sediments of the Missinaibi nonglacial interval. Allan Koch and Hugh McLean completed a detailed stratigraphy of thick pumice and ash in the Guatemala City region, Guatemala, where they also completed mapping two geologic quadrangles for the Guatemalan Government. A. Lincoln Washburn, besides his duties as Director of Quat. Res. Ctr., President of AMQUA, and Editor of Quaternary Research, is involved in planning for a new periglacial laboratory complex for next year.

Several years ago, the Bureau of Geology, within the State of Florida's Department of Natural Resources (P.O. Drawer 631, Tallahassee, FL) started preparation toward a Geology of Florida, for which several chapters already are published. A chapter on the landforms of Florida, prepared by William A. White (Univ. North Carolina, Chapel Hill), covers the peninsular part of the State, and a Part B covering the panhandle region, prepared by Robert O. Vernon (Bureau of Geology, State of Florida) probably will be printed separately. The landforms are classified by place names or geographic distribution; landforms down to sizes as small as dunes if appreciable are recognized.

Robert K. Fahnestock asks us these questions: "Why doesn't the Newsletter take a few 'outrageous' positions for some of us to shoot at - for example: Why is much of the most interesting geomorphology being done by people outside of the field, by sedimentologists, by engineers, by hydrologists, by botanists? Is geomorphology really superficial geology or is it really the fundamental geology behind the decisions the field geologist, the structural, petroleum, and engineering geologist makes in his work?" Well, is it? Why not write and let us know what YOU think. We're ready to listen.

P U B L I C A T I O N S
O F A L L K I N D S

Photo-Interpretation Studies of Desert Basins in Northern Africa, by H. T. U. Smith (Univ. Massachusetts, Amherst) prepared for Air Force Cambridge Research Labs (Office of Aerospace Res., U.S. Air Force, Bedford, MA 01730) from World War II aerial photographs and a few 1952 personal field observations, is a 77-page (53 text pages) mimeographed 8.5x11 inch report, dated June 1969, with 5 maps, one fortunately showing location of illustrations, another distribution of the desert basins, and 22 oblique and near-vertical Tri-Metrogon photographs and one ground photo, all excellently reproduced, and 119 references. Distribution is unlimited, so write for one. The regional geographic, geologic, and climatic setting in north Africa comes first, followed by the geography of the north African Desert Basin areas, ground conditions in basins known from field studies (based on excellent bibliographic study), interpretation of basins for which field data are lacking (based on topnotch photointerpretation), analysis of basin floor development, and photo indicators of surface conditions. The second half of this report essentially is a textbook of aerial photointerpretation by a master of the subject, plus a very generous accounting of the desert geomorphology of north Africa.

Arid Zone Newsletter, published under the auspices of the Commonwealth Scientific and Industrial Research Organization of Canberra, Australia, has been reviewed here annually for the past 4 or 5 years. The mailing list of Arid Zone Newsletter has increased sharply due to growing awareness among Australian scientists and the general public of their own arid region problems, as well as due to the interest of many foreign scientists. The 1968 Newsletter of 178 pages includes not only the usual worthwhile reports of research being done and publications in all Earth and Life Sciences by Australian University personnel, State, Territory, and Commonwealth Organizations, but also contains for the first time a list of 132 recent and forthcoming publications and theses from all sources in the sciences.

Have you seen Geologic and Hydrologic Research Through Space Acquired Data for Alabama, a delineation of linear features and application to Reservoir Engineering using Apollo 9 multispectral photography, by W. J. Powell, C. W. Copeland, and J. A. Drahovzal?? It is Information Series 41, prepared jointly by USGS and Geol. Survey of Alabama, in cooperation with NASA, and was kindly sent to us by Philip E. LaMoreaux, State Geologist of Alabama (P.O. Drawer O, University, AL 35486). The photographs representing a 6,400 sq. mi. area in east-central Alabama are reproduced in black & white and in color with numerous features delineated on them: physical and physiographic divisions, cultural, geologic, the principal lineations, and water resources, data collection sites, and selected wells and springs. Reproduction of the color infrared photographs are especially good, on which the principal lineations are shown. These are relatively straight, long lineations that intersect Appalachian structural axes and are thought to be fractures that resulted from a reoriented stress field developed sometime after the main phase of Appalachian mountain building. Apparent coincidence of the linear features with areas of known anomalies of streamflow, of large capacity wells and springs, quarry drainage, and dam leakage problems indicate that lineations may have not only a marked geologic effect but also may be of great hydrologic, environmental, and economic significance (from Abstract). This old photointerpreter (Ed.) attempted on the unmarked color photographs to identify the principal lineations and found several, none of which, however, coincided with those recognized in the report. Reexamination of the lineations on the marked photographs and comparison with the unmarked photographs leaves considerable doubt in the mind of this reviewer as to the identification of and interpretation of such features at such a scale by anyone without prior knowledge of the geology of the area.

Pleistocene Stratigraphy of Northwestern Pennsylvania, by George W. White, Stanley M. Totten, and David L. Gross, Pennsylvania Geol. Survey Bull. G 55, has just appeared. This reports on studies of the stratigraphy of the tills, with emphasis on the early Wisconsinan and pre-Wisconsinan tills, as a result of field work from 1964 through 1967 and laboratory work during this time. One of the features of the work is a series of longitudinal sections showing the various drift units exposed over long distances in strip mine excavations and superhighway cuts. The trend surface analyses show the areas of addition of local material to the till and the amount and the areas of non-addition of local material, which are therefore areas of deposition only.

Pleistocene Deposits of the Northwestern Allegheny Plateau, U.S.A., appeared in the Quarterly Journal of the Geological Society of London, v. 124, pp. 131-151, 1969, written by George W. White. This paper includes a time-space diagram for the tills of the Grand River Lobe and the Killbuck Lobe in Ohio and Pennsylvania. White was invited to give this paper at a meeting of the Geological Society of London in November 1967.

Andrew J. Mozola (Wayne State Univ., Detroit, MI) has compiled a summary of geologic information for engineers and planners for construction projects, site developement, and land use in his 25-page Geology for Land and Ground-Water Developement in Wayne County, Michigan, a State of Michigan, Dept. of Natural Resources, Rept. of Investigation 3, 1969. The report discusses the bedrock geology, glacial geology, and ground-water geology, with many cross-sections and diagrams to help the reader, but most important are the 4 maps in pocket, all drawn to same scale, of geology, topography of bedrock surface, glacial drift thickness, and surface glacial features of the County. A stratigraphic section of bedrock Paleozoic through Recent, and a small Bedrock Map of Michigan happily also are enclosed.

Floyd R. Nave (Wittenberg Univ., Springfield, OH) published Pleistocene Mollusca of Southwestern Ohio in Sterkiana, No. 34, June 1969, describing systematically 62 species of mollusca recovered from 3 lacustrine and one interstadial silt deposit. There are six sketches, 7 Tables and 9 Plates of species distribution; the systematic paleontology covers more than 25 pages; the paleoecology more than 5 pages, in a total of 68 pages.

Pleistocene Mollusca of Ohio, Part 4 (of 4 parts), Bull. 62, 245 pages, 1970, at $2.50, by Aurele La Rocque (Ohio State Univ., Columbus) State of Ohio Division of Geol. Survey, continues the pagination of this Bulletin (Part 1, 1966, pp. 1-111, in The Geomorphologist, No. 11, p. 11; Part 2, 1967, pp. 113-356, in The Geomorphologist, No. 12, p. 14; Part 3, 1968 pp. 357-553, in The Geomorphologist, No. 13, p. 8) through page 800 for Chapter 7, Terrestria Gastropoda, and Selected References (558, not including those made previously in the synonymies and ecological summaries). Attached is a list of the complete Contents, Illustrations, and Plates of all 4 parts. Suborder Basommatophora has 10 Families and 29 Genera; Suborder Orthurethra has 4 Families and 10 Genera. These are the familiar species of the Pleistocene terrestrial sediments upon which invertebrate paleontologists and Quaternary geomorphologists are dependent for correlation. As in previous Parts, outline Maps of North America show distribution of the more important species, 123 for this Part 4, all but one having an inset Map of Ohio showing distribution by county. Plates 15 through 18 on glossy paper of sketches of 18 species and photographs of 43 additional species follow page 800. Sketches, black and white photographs, and replicas of the living animal of 93 species are in the text. This Part 4 completes the series of a remarkable compilation of freshwater and land molluscs which should be extremely valuable to the student of both living and Pleistocene nonmarine molluscs in eastern North America.

The U.S. Geological Survey Bulletin 1288, on Surficial Geology of Mount Rainier National Park, Washington, by Dwight R. Crandell (USGS, Denver, CO) is an admirable attempt to put geology before the public. The 40-page Bulletin is a carefully written non-technical discussion or glossary of each of the surficial deposits in the Park area (from Alluvial Cones and Avalanche deposits to Mudflows and Talus) with a 29-color geologic map in pocket for the amateur to revel in and seek out and find his favorite deposit. The text is easy to read with properly spaced 10 black and white photographs and sketches and 11 color photographs, adequately illustrating the deposits. Dwight Crandell also has written a 42-page USGS Bulletin 1292 on The Geologic Story of Mount Rainier, which in itself brings the "geologic past of one of America's most scenic volcanoes" to the attention of the geologist and the more studious rock-hound. It contains 14 black and white sketches, maps, and photographs and 11 color photographs.

The last of the 1965 INQUA Congress publications is printed and ready for sale to the public: The Periglacial Environment: Past and Present, with Troy L. Pewe, Editor, from the McGill University Press, 3458 Redpath St., Montreal 109, Canada, 544 pages, 1969, 6x9x1.5 inches, at $25.00. It contains 25 papers based upon the Symposium on Cold Climate Environment and Processes, held in Fairbanks, Alaska. The papers deal with processes and features in the present periglacial environment all over the world, and with cold climate phenomena formed under former periglacial conditions. In addition, the disciplines represented in this collection are geology, botany, vertebrate and invertebrate paleontology, soil science, geochronology, physical anthropology, archeology, and physical geography.

John R. Reid (Geol., Univ. North Dakota, Grand Forks) has written a very instructive account comparing features formed in association with dead ice in the past (North Dakota) with features forming today in the presence of stagnant glacier ice (Alaska), entitled, Glaciers - "Living and Dead" in Proc. North Dakota Acad. Sci., 1967. In addition, Reid's work on the Effects of a Debris Slide on "Sioux Glacier" in south-central Alaska was published in Journ. Glaciol., 1969. With Samuel S. Harrison, he also published a cleverly determined Flood-Frequency Graph Based on Tree-Scar Data for the Turtel River in eastern North Dakota, in Proc. North Dakota Acad. Sci., 1967. While on sabbatical to the Quaternary Research Ctr, Univ. Washington, Reid finished two papers on the Glacial History of and the Geomorphology of Martin River Glacier, Alaska.

In an attractively illustrated Baylor Geological Studies Bulletin No. 17, Raymond L. Lewand, Jr. has extended the excellent professional publications of this Studies by his The Geomorphic Evolution of the Leon River System (a tributary to Brazos River in east-central Texas).

Geomorphology of Inglefield Land, North Greenland, by Robert L. Nichols (Geol., Eastern Kentucky Univ., Richmond, KY) has appeared in Meddelelser om Grønland, Bd. 188, Nr. 1, 1969, with 109 pages, 12 maps and sketches, 6 vertical, 8 oblique aerial, and 23 ground photographs. There can be no doubt now that Inglefield Land was completely glaciated, and that the Grønland Indlandsis probably extended northwest to or nearly to Ellesmere Island. Elevated deltas and beaches show the marine limit is about 285 ft. in the southwest and 210 ft. in the northeast and that higher marine terraces do not exist. Expectable periglacial features of such a low-altitude polar region do exist, although it is surprising that wind as an erosive agent is insignificant there. Many surface features indicating lack of moisture suggest an arid climate for thousands of years.

Richard H. Ragle (RFD, Box 72, Norwhich, VT) records that the 220-page Volume I of the Icefield Ranges Research Project, Scientific Results, covers the years 1961 through 1965 and the physical sciences; it may be requested from the American Geographical Society in New York. Volume II, III, IV, and V will follow at intervals in the next few years.

Oscar J. Ferrians, Jr. writes that USGS Professional Paper 678, on Permafrost and Related Engineering Problems in Alaska, with Reuben Kachadoorian and Gordon W. Greene, with 37 pages, 10 maps and sketches, and 26 photographs, 1969, best sums up his current activities. The three authors have shown that without knowledge of permafrost and its capabilities, man generates nearly unsurmountable engineering problems for himself and the structures he builds that so easily could have been avoided.

Bulletin 80 of the Dept. of Mines, Mining and Geology, entitled, Paleozoic-Precambrian Appalachian Problems, Georgia State Div. of Conservation, Geological Survey, 1969, most kindly sent to us by A. S. Furcon, contains these papers: Stratigraphy of the Chickamauga Supergroup in its Type Area, by Robert C. Milici and James W. Smith; Stratigraphy and Structure of an Area in the Vicinity of Adairsville, Georgia, by K. Spalvins; Late Precambrian and Early Paleozoic Erosional and Depositional Sequences of Northern and Central Virginia, by A. S. Furcon; Stratigraphy and Structure of the Murphy Marble Belt in Parts of Northern Georgia, by William M. Fairley; and Isotopic Dating and Metamorphic Isograds of the Crystalline Rocks of Georgia, by James W. Smith, J. M. Wampler, and M. A. Green.

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Please send your BALLOT to the Secretary of the Geomorphology Division as soon as you can. We need your vote on the proposed Name of the Division, on the time the terms of office begin for our Officers, and on the dual slate for Second Vice-Chairman so that our Elections will be more realistic elections. As of May 1970, there were 628 Affiliates in the Division, and this number of ballots were mailed out. As of 4 July 1970, only 276 had been returned! Please send your BALLOT, no matter what the date is. We need complete representation. By the way, 14 missed the issues on the back of the ballot, one forgot to sign his, and 3 did not put on a stamp. Maybe the Secretary can collect postage due in beer at the next cash bar!

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The Editor apologizes for the lateness of this Newsletter, having intended to start editing and composing in April and type final copy by mid-May. Weeks of campus disturbances, lockout, and subsequent extension of classes prevented this. During the winter, more than 500 requests for news were mailed. Replies were overwhelming and this Editor cannot begin to thank the many friends and colleagues, and total strangers (but not any longer) who not only supported this issue of the Newsletter, but also the previous 8 issues since 1962.

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4 July 1970 Sidney E. White, Editor