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KIRK BRYAN AWARD FOR 1967

Wahrhaftig, Clyde A., 1965, Stepped topography of the southern Sierra Nevada, California, Geol. Soc. Amer. Bull., v. 76, p. 1165-1190

After decades of stagnation in the interpretation of erosion surfaces, the recent papers by John Hack and Clyde Wahrhaftig have been like a breath of fresh air. Everyone has observed the conversion of granitic rocks into grus; the idea that this process, operating differentially, can promote the formation of benches in uniform-appearing rock, during a single period of degradation, is Wahrhaftig's unique view. High-level erosion surfaces in granitic terranes are common. Here is a mechanism to account for them without having to rely on cyclic or periodic events in the past. Besides a relationship with erosion surfaces, Wahrhaftig's idea may have great importance in explaining a variety of other geomorphic features; potential examples are knickpoints, steps in glaciated valleys, and pediments. The widespread importance of the ideas in this paper makes it a most valuable contribution to geomorphology.

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## NEWS ITEMS

Troy L. Péwé (Arizona State Univ., Tempe) has several projects going in Alaska — Marc Hoyer is finishing his study of an earthquake-triggered slide 30 miles southeast of Seward, Alaska; a mountaintop cascaded down and slid almost half a mile across a flat floodplain, for a total horizontal displacement of about a mile and also a total vertical displacement of almost a mile. Richard Reger and Péwé will initiate in full force the Altiplanation project they have with Cold Regions Research Engineering Lab on altiplanation terraces in Alaska summer of 1967. After a thorough search of the foreign literature and the small amount of North American literature, the lack of any real understanding and quantitative work on the origin of these terraces and associated periglacial phenomena is emphasized. James Rowe completed a preliminary study on the recent glacial advances of Puget Glacier, 30 miles s.e. of Seward, by means of dendrochronology and lichenometric dating. A prominent advance occurred in 1830 and an even more prominent advance but less accurately dated around 1750. The lichenometric growth rate curve appears to be similar to those from central Alaska and from the Alps. Randall Updike and Péwé will initiate a detailed project on the glacial geology of the San Francisco Peaks near Flagstaff, Ariz. Although an excellent report is available of Bob Sharp's work there of 25 years ago, the present attempt will be to do more detailed work and relate the glacial record to the volcanic sequence by means of paleomagnetic and potassium - argon dating.

Charles Matsch (Univ. Minnesota, Minneapolis) is conducting a study of the history of the many drainage outlets of glacial Lake Agassiz.

Paul F. Karrow (Dept. Earth Sciences, Univ. Waterloo, Ontario) continues mapping in the summers for the Geological Survey of Canada in the Stratford-Conestogo area, a complex area interlobate between the Huron, Georgian Bay, and Ontario-Erie ice lobes, each of which deposited 3 or 4 till sheets varying from Tazewell to Port Huron age. Most surface deposits are of Cary age and some till exposures are possibly of pre-Tazewell age. With Professors Fernando and Duthie (Biology Dept., Univ. Waterloo), Karrow plans to study the fossils of the interglacial and interstadial deposits of the Toronto area, including diatoms (already started) and beetles. Ontario Dept. Mines just published a 108-page report with colored maps on the Pleistocene Geology of the Scarborough area (Geol. Rept. No. 46). W. M. Tovell (Royal Ontario Museum, Toronto) is studying raised shorelines of glacial lakes in the southeast part of the Superior Basin. Compilation of data collected by the late R. E. Deane, and data from other sources, regarding possible drainage-ways across the submerged portion of the Niagara Escarpment southeast of Manitoulin Island is nearly completed; C. F. M. Lewis and Tovell are preparing this paper.

Investigations into the Pleistocene history of southeast Quebec, under the supervision of Ernest H. Muller, are being started in the Lake Megantic area by W. W. Shilts. These are an eastward extension of work done during the past 3 years by Barrie C. McDonald. (Geol. Survey of Canada). McDonald and B. G. Craig are beginning an examination of marine events and glacial stratigraphy in the Hudson Bay-James Bay Lowlands as a part of Operation Winisk (of Geol. Surv. Canada).

Aleksis Dreimanis (Univ. Western Ontario, London) with others has recently finished work on: volcanic ash layers of recent age at Banff Natl. Park; ages of Lake Arkona-Whittlesey and Post-Warren raised beaches in southwest Ontario; and secondary aragonite in a soil profile in southern Ontario.

Wakefield Dort, Jr. (Univ. of Kansas, Lawrence) spent a second austral summer (1966-67) in Antarctica with 5 weeks devoted to late-glacial chronology of Southern Victoria Land, but also including aspects of glacier structure and deformation, and unusual mineral occurrences in, on, and near glacier ice. From December 20 to March 10, he was United States Exchange Scientist with the Japanese Antarctic Research Expedition, travelling aboard expedition ship "Fuji" to the Japanese base at Showa. During summer 1966 he continued studies on Early Pleistocene deposits in northeast Kansas and on geomorphology of the Beaverhead Mountains-Birch Creek Valley-Lemhi Mountains area of east-central Idaho as it relates to the changing environment occupied by Early Man; these will continue in 1967.

Norman P. Lasca (Univ. of Wisconsin-Milwaukee) lived over a year (1965-66 ?) in Norway, studying the west coast moraines in the Hemnefjord area west of Trondheim. He was able to date one as being Ra age, the first time this has been accomplished on the west central Norwegian moraines, which correlates with the work of Björn Andersen and G. William Holmes on moraines in north Norway and Andersen's work in south Norway.

H. Thomas Ore (Idaho State Univ., Pocatello) has two projects going: (1) post-10,000 yr. geomorphology and sedimentology of an area on the San Dieguito River near Escondido, Calif.; the deposits are associated with artifacts of early Recent man of that area; the study was undertaken to aid an archeologist in environmental interpretations of cultural remains; and (2) post-15,000 year history of Lake Mohave (a beach-playa association near Baker, Calif.), with high lake stands recorded by beach levels, shell (mollusc) remains, and differing sediment types, controlled at its north end by an overflow channel; again the geologic materials and geomorphic forms are associated with abundant cultural remains.

Mark A. Melton (Geography Dept., Univ. of British Columbia, Vancouver) is still as busy as ever with research projects on generation of kinetic energy in drainage basins and on hillslopes, and on a river profile model that uses elementary Markov process theory.



Jane L. Forsyth (Bowling Green State Univ., Bowling Green, Ohio) plans summer of 1967 for completion of the up-to-date remapping of glaciation of Logan County, mid-west Ohio. The first of the mapping is in press with Ohio Geol. Survey as a 7.5 minute geologic map (East Liberty Quad.). Also on agenda for summer is a cooperative project with a B.G.S.U. botanist on relation of edaphic factors (geology & soils) to tree distribution on some of the Lake Erie Islands. This relationship of plant species to geology & soils is more and more of great interest; it was a valuable mapping tool in Logan County and seems basic to the ecology of the Lake Erie Islands. Forsyth would appreciate it if anyone else who has been working with or using this relationship in any way would care to share ideas.

Parker E. Calkin (State Univ. of New York at Buffalo) expects his Glacial Geology of the Victoria Valley System, Southern Victoria Land, Antarctica will be published in the next volume of "Antarctic Research Series" of Amer. Geophys. Union; description and movement studies of the large barchan dune in this area are being written up by Robert H. Rutherford, Gerald Holdsworth, and Calkin. Calkin's current work is in the Erie Lowlands and south of Buffalo where he has discovered beach ridges possibly equivalent to Grassmere, Lundy, and Early Algonquin lake levels, not previously described. In addition, there is much evidence of glacial pause at Leverett's Gowanda, Buffalo, and Alden moraines, with Gowanda and Buffalo moraines having been overridden by the ice that formed them.

The field work of Peter W. Birkeland (Dept. of Soils & Plant Nutrition, Univ. of Calif., Berkeley) along the Truckee River shows the correlations of Sierra Nevada glaciations with fluctuations of Lake Lahontan as proposed by Roger Morrison are valid. This is based upon counts of boulder lithology, soil development, and by tracing flood gravels (due to emptying of ice-dammed Lake Tahoe) downstream where they are in contact with Lake Lahontan sediments. The clay mineralogy of soils formed on the Pleistocene deposits changes from halloysite on outwash in the eastern Sierra to predominantly montmorillonite on sediments of Lake Lahontan; there is no clay mineral sequence with time and the effect of paleoclimate on clay mineral formation is not evident. Birkeland also is finishing a paper with C. M. Wentworth and Meyer Rubin on late Wisconsin to Recent alluvial fan deposition and soil formation along the California coast near Malibu. The deposit is dated by stratigraphy, radiocarbon dates on soil organic matter and carbonate, soil profile development, heavy mineral weathering, and approximate rates of soil carbonate translocation.

Don J. Easterbrook (Western Washington State Coll., Bellingham) will be spending summer of 1967 on an N.S.F. Research Project, investigating the relationship of late Pleistocene continental glaciation to alpine glaciers in the Northern Cascades. He is also working on pre-Vashon chronology in the Puget Lowland, and with palynological studies being done by Barbara Spross to establish Wisconsin climatic trends to be tied to K-Ar dated ash units.

In summer of 1966, Gerald M. Richmond and Kenneth L. Pierce (U. S. Geol. Surv., Denver) mapped the surficial geology of the southeast quarter of Yellowstone Natl. Park, and determined that a Pinedale ice cap 3,000 feet thick centered over the Yellowstone Lake area. In 1967, Richmond and Harry A. Waldrop will map Canyon Village, Pelican Cone, and West Thumb Quads. in the central part of the Park. Pierce will map Abiathar Peak and Tower Junction Quads. in the northeast part of the Park.

Fred V. Steece (South Dakota Geol. Survey, Vermillion) has done reconnaissance mapping in a vast area of stagnation or "dead-ice" moraine, deposited by late Wisconsin ice on Coteau des Prairies in northeast South Dakota. Steece plans to begin detailed mapping of four 15 minute Quads. on the Coteau during the 1967 field season, involving such stagnation features as rimmed kettles (one nearly a square mile in area), disintegration ridges, disintegration channels, ice-perched lacustrine deposits, and several features of unknown origin. Cleo M. Christensen is mapping Pleistocene deposits in Bon Homme County, South Dakota, bordered on the south by the Missouri River; it is hoped that the age of the Missouri River and its tributary system will thereby be better understood.

Robert H. Rutherford (Univ. of South Dakota, Vermillion) still is mainly interested in the geomorphology and glacial geology of the Ellsworth Mountains, Antarctica, although he will start a study for 2 months in summer of 1967 for South Dakota Geol. Survey in the Big Stone Lake area bordering South Dakota and Minnesota.

John W. Blagbrough (Albuquerque, New Mexico) and Steven E. Farkas completed a study of rock glaciers in the San Mateo Mountains of southcentral New Mexico. These features are at approx. 9000 feet, about 2000 feet below the Wisconsin orographic snowline, and thus indicate nonglacial origin. They are thought to have developed from coalescing and individual lobes of talus that became cemented by interstitial ice. Blagbrough has begun a study of talus covering remnants of ancient cliffs located several hundred feet from a modern escarpment in Red Rock Valley, northwest New Mexico. It is hoped that the talus may be dated and rate of cliff retreat established.

After spending 3 months in the Swiss Alps last winter (1966-67 ?) and seeing snow in all degrees of thickness, wetness, dryness, and so on, Charles G. Higgins (Univ. of Calif., Davis) believes that for every type of soil/water downslope movement there is an analogous type of soil/snow downslope movement, ranging from slow creep to rapid block slide and fall, from slump and tumbling movements to flows of various sorts. He further believes that studies of these and attempts to classify them in some sensible mechanical way might help us understand better the nature and relationships of soil/water downslope movement.

Herbert J. Summers, Jr. and Richard O. Stone (Univ. of Southern Calif., Los Angeles) have a grant from Office of Naval Research to undertake time-lapse photographic study of sub-aerial and subaqueous ripple marks to determine nature, formation, and rate of movement of ripples and to contrast their occurrence in these two environments; Donald F. Nemeth is completing a Geomorphic and Sedimentary Study of Talus -- on slopes in the Sierras, Mojave Desert, and Transverse Ranges; he has accumulated much statistical data. Barbara E. Hackett-Haner from Wales is finishing the geomorphology and sedimentary characteristics of the Redondo Submarine Fan, southern California. Stone has just completed a "Desert Glossary" for Elsevier Press, the bulk of which is concerned with terminology (geomorphic, geologic, and physiographic) applied in the North American deserts.

The San Luis Valley (100 miles by 50 miles) of southern Colorado, as far as recent surface geologic studies is concerned, has been ignored; the most recent work is the mapping of two (2) degree sheets in the southern part of the Valley by U. S. Geol. Survey. There have been no detailed geomorphic, volcanic, or structural studies within the Valley. Richard L. Burroughs (Adams State Coll., Alamosa, Colorado) will begin a study of the Valley in the volcanic terrain along the Colorado-New Mexico border and work northward.

Charles E. Price (U. S. Bureau of Reclamation, Sacramento, Calif.) recently mapped the geology of most of English Ridge Reservoir on the Eel River; the remainder of the reservoir site had been mapped by Bureau geologists Louis Frei and Gerald Bartell. Nearly sixty slides have been recognized in the 30-mile long area -- all in Jurassic (?) and Cretaceous Franciscan and Chico rocks. Slope stability analyses by rock mechanics methods are not considered feasible due to rock inhomogeneities. A statistical analysis of the slides yielded an inexact but useful equation for the critical slope. In most localities around the reservoir area, the equation permits computation of the critical slope cotangent to an accuracy of about 0.5. Significant factors were found to include faults, groundwater conditions, stream density, and vegetation.

Research on stream valley widths in relationship to stream discharge is being carried out by Neil E. Salisbury and his assistants (Dept. Geography, Univ. of Iowa, Iowa City). The first phase of the study will be reported in a monograph in press as Iowa Studies in Geography, No. 5, entitled, "The Valleys of Iowa - I: Valley Width and stream discharge relationships in the major streams."

Luna B. Leopold and Ralph A. Bagnold (U. S. Geol. Survey, Washington) are planning to work together in central Wyoming summer of 1967 on the problem of measuring natural bedload and suspended load in a stream. They have designed equipment rather similar to what Epstein used two decades ago to take the total bedload out of the stream, weigh it and measure it and then return it. These measurements will be accompanied by hydraulic and computational comparisons. William W. Emmett is engaged on the problem of hydraulics of overland flow, partly a laboratory and later a field experiment. Garnett P. Williams (U. S. Geol. Surv., Washington) is continuing his experiments on bedload transport in the U.S.G.S. hydraulics laboratory on the effect of different specified depths in bedload movement. These experiments differ from many others in that he is using a non-recirculating flume of a design rather comparable to that of G. K. Gilbert. This is in contradistinction to the usual recirculating flumes used in most labs for sediment research.

Cyril J. Galvin, Jr. reports that the U. S. Army Coastal Engring Research Ctr. (since 1963 the successor to the Beach Erosion Board) has been and is active in laboratory and field research; results of this work are published and distributed free by the Center; a list of titles available may be obtained by writing the Center at 5201 Little Falls Road, N.W. Washington, D.C. 20016. Studies in progress by Coastal Engr. Res. Ctr. staff member include the effect of model size and sediment parameters on beach profiles, the laboratory generation of beach cusps, and the production of lag gravel by wind erosion. The beach profile study of John Ahrens involves work with different types of sediment and 3 sizes of models, the largest being comparable to natural conditions. Beach cusps or cusp-like features can be produced in at least 3 ways on a lab beach; the process described by Russell and McIntire (1965) produces periodic mounds on the lab beach, and a different process produces cusps whose spacing can be predicted from wave characteristics. In the lag gravel study, 3 large boxes of sand-gravel mixtures are exposed to the weather on the C.E.R.C. grounds and the gradual accumulation of a protective layer of gravel at the surface has been measured by monthly coring since September 1965.

Kenneth O. Emery (Woods Hole Oceanographic Inst.) kindly sent lists of Woods Hole manuscripts published during 1966 (30 of them) and of others in press (38). Elazar Uchupi published 3 maps of sea floor topography along the entire Atlantic coast in 1965, one for the eastern Gulf of Mexico in 1966, and two others for the remainder of the Gulf are to appear in 1967. Four other maps are being prepared for joint publication with the Canadian Hydrographic Service. These 10 charts comprise an area larger than the land part of U.S. east of the Mississippi River. R. M. Pratt has in press a general chart that covers the entire western North Atlantic Ocean at a scale of 1:3,600,000 -- an area very nearly the same as that of the total United States.

Arthur L. Bloom (Cornell Univ., Ithaca, N.Y.) sends us the following release: Between 7 Feb and 7 Apr 1967, a Scripps Inst. of Oceanography ship, HORIZON, logged over 6500 nautical miles through central Pacific in pursuit of the elusive 1-meter bench and related evidence of changing Pleistocene sealevel. Participating scientists were (Editor note: nicknames only were reported) Fran Shepard, Joe Curray, Josh Tracey, Norm Newell, Herb Veeh, Bill Newman, and Art Bloom. Code name was CARMARSEL (Caroline-Marshall Sealevel). Much will be heard about our conclusions in the coming months. Right now evidence for a postglacial high stand of sealevel, that is so widely reported from the Pacific Basin, seems much less convincing in the field than in published reports. A difficult time was had in finding even possible "raised reefs", and most of the possibilities proved only to be recemented storm rubble.

Edith M. McKee (Winnetka, Illinois) has been developing a detailed terrain study of the floor of the Arctic Ocean Basin north of Alaska-Canada, indicating scour channels of turbidity currents, sediment distribution patterns, and effects of currents on igneous and sedimentary submarine outcrops. During summer of 1967, a program of mapping the geology and terrain of central Lake Michigan may permit correlation of geophysical exploration data into scaled terrain diagrams usable by engineers, biologists, and others.

Nicholas K. Coch (Southampton Coll., Long Island Univ., Southampton, N.Y.) is continuing detailed mapping of Pleistocene sediments in southeast Virginia. A new aspect of the work is the delineation of a shoreline between the Elberon (110+-120-feet) and Norfolk (45+-50-feet) levels. The 1967 field season will be used to study sedimentary facies and dispersal patterns associated with this shoreline and its river terraces. Coch also with students has mapped sedimentary facies in Shinnecock Bay on the south shore of Long Island. Coring shows two different sediment patterns at depth, the lower one representing the facies existing prior to opening of Shinnecock Inlet during the great 1938 hurricane. When finished it is expected the study will reveal the effects of opening and closing of barrier inlets on bay sedimentation patterns.

Donald R. Coates (State Univ. of New York at Binghamton) is building a house near Avon on Cape Hatteras which will serve as research base and retreat for new studies on beach morphology and shore processes - a new project for him.

The Office of Arid Lands Research (Univ. of Arizona, Tucson) has been engaged for about two years on an investigation of the status of knowledge of the arid regions of the world. Topics considered include weather and climate, flora and fauna, cultural geography, geomorphology and surface-water hydrology. Lawrence K. Lustig has a report on geomorphology and hydrology of the world's deserts soon to be published as a chapter in a compendium of all reports by Univ. of Arizona Press late in 1967. With the exception of China and USSR, it summarizes available information on each of the countries within the arid zone, with references to approx. 2700 pertinent papers and documents, a discussion of arid regions, and recommendations for future research. Results to date are encouraging of a trend-surface analysis of Basin and Range topography; third order trend-surface maps of several variables, including area-of-range/total area, mean range length, width, height, relief, and trend, and width/length, width/height, and length/height ratios represented on each of the 45 1:250,000 maps of the whole region, may permit generalizations on regional distribution of fans and pediments, and reasons for this distribution.

Zane Spiegel (Box 1541, Santa Fe, N.M.) writes about the results of his work on thickness of late Quaternary alluvium in the Rio Grande and Canadian River valleys in New Mexico and west Texas. On the basis of data for dam and bridge sites in the Rio Grande valley from Cochiti Dam site to El Paso, Texas (about 300 miles), the depth of late Quaternary alluvium in the inner valley in this reach ranges from 63 to 80 feet below normal river level. In most of this area, the alluvium fills a buried valley eroded into the Santa Fe group of late Miocene (?) to early Pleistocene age. Accurate determinations of depth of the alluvium are possible only in bedrock sites or where the Santa Fe group consists of thick clays deposited in ancient playa basins or distal regions of ancient coalesced alluvial fans. Superimposed on the natural river aggradation is large-scale aggradation of the Rio Grande caused by Caballo Dam, Elephant Butte Dam, and 8 major concrete diversion dams. This manmade aggradation extends upstream from each dam to the next higher dam, causing extensive flooding and high water tables with attendant salinization of soils and non-beneficial evapotranspiration along the inner valley floor. The relative uniform thickness of Rio Grande alluvium contrasts strongly with Canadian River alluvium in eastern New Mexico and west Texas; alluvium increases gradually from 25 feet at Conchas Dam, N.M. to 192 feet thick at Sanford Dam, Texas. The thickening may be caused by Quaternary subsidence in the Mississippi embayment. Similar thickening probably also has occurred in the lower Rio Grande valley, but has not propagated upstream beyond the area of severe structural disturbance in the Big Bend region.

Arthur T. Fernald (U. S. Geol. Survey, Denver) is making a detailed study of Yucca Flat, an alluvial basin within the Nevada Test Site, where an unprecedented number of drill holes, cores, and geophysical logs are available.

Lee Wilson (Columbia Univ., N.Y.) is attempting to revise the concept of morphogenetic regions, and to correlate the distribution of geomorphic process with genetic climatic types based on air mass distribution.

D I V E R S   S U N D R Y   I T E M S

Research relating geomorphological phenomena to hydrological processes (and vice versa) is one of the general fields of interest to the International Hydrological Decade. Proposed contributions to the I.H.D. may be any of the following: on-going (sic!) activities not requiring financial assistance; proposals requesting endorsement by the National Committee as an aid in obtaining financial assistance; and, when funds are available, requests for I.H.D. funding. Further information may be obtained from L. A. Heindl, Executive-Secretary, U. S. Natl. Comm. for the I. H. D., Natl. Academy of Sciences, 2101 Constitution Ave., N.W. Washington, D.C. 20418 (Item dtd 1 July 1966.)

Because of the interest inspired by Frederick Schotten and Russell Coope (Univ. of Birmingham) who have opened a whole new approach to Pleistocene research by their identification of beetle fragments and the interpretation of these fragments in terms of paleoecology, several entomologist-ecologists in this country are now beginning to investigate this field. One such person, Robert C. Graves (due to the prodding of Jane Forsyth), is becoming properly enthusiastic and would welcome beetle-iferous samples in order to get started in this type of research. Please send beetles (and matrix) to him, care of Biology Dept., Bowling Green State Univ., Bowling Green, Ohio 43402

Keith Clayton invites any geomorphologists and Quaternary geologists to visit his new school in Norwich, England, where he will be starting a School of Environmental Sciences at University of East Anglia (an English University new 3 years ago). His school curriculum will cover the whole of the systematic aspects of geography and geology, and include climatology and pedology. Clayton also visited the States in March 1967 and was able to arrange an exchange of material between G.S.A. (Bibliography Exclusive of North America) and his London School of Economics (Geo Abstracts) over the abstracting of items geomorphological, thus affording more complete coverage and reducing duplication of effort.

Robert P. Sharp (Calif. Inst. of Techn., Pasadena) reports that in recent months he has been spending considerable time worrying about processes active on the surface of Mars to modify the topographic features, primarily impact craters, shown thereon by Mariner IV photographs. This is a fascinating problem, and geomorphologists and geologists actually can help a great deal; most opinions so far expressed about surface features on Mars have come from astronomers or radar and radio men. Our background experience with earthly processes and features certainly qualifies us to play an important role in this endeavor, and he hopes other geomorphologists will seize the opportunities to capitalize upon interpretation of data now being brought to us by various space probes on both lunar and martian surfaces. (Here's our chance to describe unearthy processes!)

Richard E. Kucera (Univ. of British Columbia, Vancouver), supported by Natl. Res. Council, will continue time-lapse photography studies on processes and morphological changes in different environments, both in laboratory and in the field, specifically on: micro-morphological changes on the Athabasca and Saskatchewan Glaciers, including evolution of surface drainage; and growth and migration of erosional and depositional features produced by shoreline processes in southern British Columbia. His work on the geomorphology of the Browns Park formation in the Yampa district, northwest Colorado, is continuing also.

William J. Wayne, Allan F. Schneider, and Richard L. Powell (Indiana Geol. Survey, Bloomington) all contributed semi-popular papers "Ice and Land: a review of the Tertiary and Pleistocene history of Indiana," "Physiography," and "Caves: speleology and karst hydrology," respectively, to the handsome 600-page book Natural Features of Indiana published July 1966 by the Indiana Academy of Science in celebration of Indiana's sesquicentennial year. A chapter on soils was contributed by Herb Ulrich and a fine treatment of limnology was written by David G. Frey.

From Lee Clayton (Univ. of North Dakota, Grand Forks): John Tinker is completing work on soils on the lateral moraines of the Martin River glacier in Alaska, and soon will begin a study of slope processes on the Tongue River and Sentinel Butte formations in the Little Missouri River Badlands. Ladd Hagmaier will begin geomorphic mapping of a Badlands drainage basin. Robert Willson is finishing studies of the glacial geology and hydrogeology of Shell Creek drainage in northwest North Dakota and will start work in the Hydrogeology section of the Virginia Geol. Survey. Howard Reith, Dennis Nielsen, and Rodger Reede will begin mapping the glacial geology of parts of Nelson and Walsh Counties in east North Dakota. Alan Cvancara is studying changes in postglacial mussel distribution in river terraces of east North Dakota. and Mark Erickson is finishing his study of the postglacial sedimentology of Glovers Pond, New Jersey.

W. Armstrong Price (Corpus Christi, Texas) wrote many articles for the Earth Science Encyclopedias, worked further on origin of detrital barriers, emergent spits, and sand cays, and in September, expects to work on remedial possibilities for the control of blowing salt-saturated clay pellets from the Central Mud Flats of Laguna Madre. Defoliation of vegetation up to 20 miles inland has been caused by these pellets and salty dust blown from the flats when a canal dug through to sealevel killed the algal cover of the flats by preventing wind-driven sheets of water from keeping the algal mat alive. The process is that of clay dune genesis and has been known to change soils and flora for 8 miles downwind as a cumulative effect of several thousand years.

Alan V. Jopling (Dept. of Geography, Univ. of Toronto) advises us that his geomorphology facilities are being expanded to cater to a growing population of graduate students, and a field research program was initiated to include downslope movement studies on the outskirts of the City of Toronto.

Stephen C. Porter (Univ. of Washington, Seattle) sent the following: Last summer (1966) we made a reconnaissance survey of glaciated country in West Pakistan as the first phase in a projected study that will last several years. Travelling by Land Rover, we crossed the Lowarai Pass north of Peshawar and traveled as far north as Chitral in the Hindu Kush. Subsequently we explored the Swat Kohistan north of Saidu and the Kaghan Valley to the east of the Indus. A remarkably good glacial sequence, involving at least 3 major advances was found in Swat Kohistan; this area will be studied subsequently. A brief survey also was made of the Himalayas next to the Vale of Kashmir in India where Neoglacial moraines border the Kolahoi Glacier.

Recently completed studies at Univ. of Washington include a chronological study of Neoglacial moraines in the northern Cascade Range by C. Dan Miller, the relationship of alpine glaciers to the Puget ice lobe along the west margin of the Cascade Range by Kenneth Knoll, and reconnaissance of glacial marine drifts and related sediments on the northern Olympic Peninsula by Donald Biederman.

The Quaternary program at Univ. of Washington has been enhanced by the addition of A. L. Washburn, on a half-time basis, to conduct interdisciplinary seminars in Quaternary research; Fiorenzo C. Ugolini in the School of Forestry, to direct research in soil genesis and paleopedology; and George I. Quimby in the Anthropology Dept. and acting Director of the Burke Museum, to conduct research in the relationship of Early Man to Quaternary events in the Pacific Northwest.

Under joint auspices of Indiana Univ. and Indiana Geol. Survey, William J. Wayne is teaching a novel course: Geology of the Human Environment, dealing with the significance of regional and local geologic features in the use of land, discussions on kinds of rocks & natural processes acting on them important in determining man's use of land, the manner by which geology controls drainage, water supply, and engineering problems, and an interpretation of problems by which geologic data may be useful to regional and local planners, all illustrated with case histories. Wayne has recently returned to Bloomington after a semester as Visiting Professor in the Geology Dept. of Univ. of Wisconsin.



The status of the Encyclopedia of Earth Sciences, according to Rhodes W. Fairbridge (Columbia Univ., N.Y.) — Volume 1 - Oceanography, with many articles on submarine topography, is published and selling well; Volume 2 - Atmospheric Sciences and Astrogeology, with many articles on climatology, is due summer of 1967; Volume 3 - Geomorphology, should appear late in 1967. Volume 6, publication date unknown, will contain articles on pedology and hydrology.

Reg. C. Sprigg (Geosurveys of Australia Pty. Ltd., Adelaide) kindly sent two accounts:

1. Submerged lunette-lakes in southeastern South Australia — aerial reconnaissance and colour photography along the southeast coast of South Australia resulted in discovery of well preserved lunettes lying 20-40 feet below sealevel. Lunar-shaped lakes with sediment ridges accumulated on one side are a feature of much of Australia. Sprigg postulated that lunettes are features of the Pleistocene "glacial phase" formed principally during times of high wind and low sealevel. A search for submerged examples in the southeast province was successful. A suite of these lakes occurs in the lee of a drowned aeolianite beach 2-4 miles west of Kingston, opposite the southern Coorong Beach. At least 6 subcircular lakes can be clearly distinguished.
2. Submarine Canyons — M. V. SAORI, oceanographic vessel owned by Geosurveys has recently run the approx. 100 fathom line from Hobart via Western Tasmania to southwest of Adelaide. At least 6 new submarine canyons were located, adding to 8 previously identified in the area. The "Murray" submarine canyons lying south of Kangaroo Island are possibly as deep as any found elsewhere in the world.

#### C O N F E R E N C E S

The Annual Meeting of the Geol. Association of Canada, to be held at Queens University, Kingston, Ontario, 31 Aug to 2 Sept 1967, will have sessions on geomorphology, groundwater, Pleistocene, and possibly Great Lakes geology. A two-day field trip led by E. Miryech, J. Terasmae, and E. P. Henderson in eastern Ontario will follow the meetings.

The 12th Congress of the International Association for Hydraulic Research and the International Hydrology Symposium will be held at Colorado State Univ., Fort Collins, Colorado September, 1967. The theme for these conferences is "The development of a better bridge between hydraulics and hydrology." Anyone interested in attending should write to I.A.H.R. Organizing Committee, Colorado State Univ., Fort Collins, Colo. 80521 to obtain a copy of IAHR Bulletin No. 2 which gives all details for the conference and application forms. 11-14 Sept 1967 are the dates for the Congress. About 250-300 papers are expected, plus general reports, two special lectures, and discussions. All will be compiled in about 6 volumes of Congress proceedings, obtainable by subscription in advance for \$35. Prior to the IAHR Congress, an I.H.S. on new ideas and methods in Hydrology will be held 6-8 Sept 1967, also at C.S.U. Papers presented, plus reports and discussions will be published in 2 volumes as Symposium proceedings, obtainable by subscription in advance for \$15. The proceedings for both the 12th IAHR Congress and the IHS will be available during and after the conferences for \$55.

The Midwest Friends of the Pleistocene field trip was held in southcentral North Dakota 19-21 May 1967; Ted Freers and Lee Clayton organized the trip; they examined glacial stagnation evidence on the Missouri Coteau, including dead-ice moraine, collapsed superglacial river sediment, collapsed superglacial lake sediment, ice-walled lake plains, disintegration ridges, disintegration trenches, and associated superglacial fossils. The guidebook, containing a roadlog and 18 papers on the Pleistocene geology of the Coteau and adjacent areas, is for sale as North Dakota Geol. Survey Miscell. Ser. 30.

## PUBLICATIONS

It is expected that a new Glacial Map of Canada on a scale of 1:5,000,000 will be released by the Geol. Survey of Canada later this year. Compilation was made 1964-1966 but additions were made into 1967. As well as providing a summation of published and available unpublished data, the map includes aerial photointerpretations made by the authors in an endeavour to present an integrated Canada-wide picture (V. K. Prest, D. R. Grant, and V. N. Rampton). The map shows unglaciated areas, and the limit of the last or classical Wisconsin ice sheet, and a composite picture of the glacial features left by the receding Wisconsin ice in the form of transverse and parallel ice-flow features. Areas of glacial lakes and marine overlap are greatly changed from earlier maps. Elevations on the marine limit provide the most reliable data available on isostatic adjustment during deglaciation. In places, however, the marine limit figures reflect the influence of late ice that has prevented development of shoreline features at expected altitudes.

An account of the Quaternary Geology of Canada by Vic Prest will be included as a chapter in the forthcoming centennial volume of the Geological Survey entitled, "Geology and Economic Minerals of Canada." It will provide an outline of the older Pleistocene glacial and non-glacial events, especially as documented by buried organic materials found in situ, or included in till. In the discussion of deglaciation, Canada is divided into a number of natural units indicated by regional patterns of glacial features. Each of these regions is believed to have been influenced by specific components of the composite Wisconsin ice mass. A new history of the glacial Great Lakes is tied in to events in the Champlain Sea, Lake Agassiz, and Barlow-Ojibway Basins.

A publication of recent vintage that may have escaped most of us is entitled, "Pleistocene and post-Pleistocene climatic variations in the Pacific area," resulting from a Symposium arranged and edited by David Blumenstock, formerly of U. S. Weather Bureau, who unfortunately died prior to the final editing of the Symposium. The final editing was undertaken by Homer Aschmann of Univ. of Calif. at Riverside. The Symposium was a part of 10th Pacific Science Congress held in Honolulu in 1961, is published by the Bishop Museum Press, is dated 1966, and may be obtained from them in Honolulu.

Geomorphological Abstracts, Index 1960 - 1965 (for Nos. 1-27), edited by Keith M. Clayton, paperbound (in durable linen, attractive), 8.5" x 5.5", 371 pp., 1966, cost: \$7. Write to: Geo Abstracts, London School of Economics, Aldwych, London, W.C. 2, England. Would you believe more than 3500 abstracts in 27 separate issues were published in Geomorphological Abstracts between June 1960 and December 1965! A consolidated index of Geo Abstracts has been needed for those 27 issues; one now is expected every 4 years. This Index is computer ordered, therefore printing is legible and the book is easy and pleasant to use. For the Subject Index, keywords have been selected by the Editor from titles and the body of abstracts, placed in conventional left-hand position, and in keyword groups, and each item is indexed in about 7 different ways. Location by geographical area also is obvious at a glance. Author Index is simple listing of all authors followed by date of article or book and the first 30 characters of the title to help identify. All of course is related to the 27 issues of Geo Abstracts through Dec 1965, which you will need at your elbow to complete your bibliographic search, providing thus a remarkable service for us.

These thousands of publications in the great field of geomorphology, as witnessed by continuation of Geo Abstracts with more complete coverage year after year, as shown in Keith Clayton's Bibliography of British Geomorphology (reported in Geomorph Newsltr #10, p.25, 1966), and as became obvious after John Elson's comments and analysis in Geomorph Newsltr #10, p.23-24, 1966, are evidence of the rapid growth and universal interest in geomorphology. This Index now of the first 5 years of Geo Abstracts, a most valuable time- and effort-saver, is a more than essential tool for anyone working and writing in any one of the many fields of geomorphology today.

The second issue of Current Research in Geomorphology, June 1965 records work in progress in Britain and elsewhere in the world during 1964-1965 by 304 different persons in University Departments of Geography in Britain and in a few departments outside of Universities. The first issue included 160 persons, not counting 30 late entries. This doubling of entries, many of whom are working in more than two lines of research specialty, reflects not only an increase in geomorphologists but the wider coverage of recording by Compiler Bruce Proudfoot. All of this reflects the growing interest in this subject in Britain, carefully registered by the strong British Geomorphological Research Group. For this issue, or the next soon to be published, send \$1 to Bruce Proudfoot, Univ. of Durham, Science Laboratories, South Road, Durham City, England

Pleistocene Mollusca of Ohio, Part 1 (of 4 parts), 1966, 111 pp., by Aurele La Rocque (Ohio State Univ., Columbus, Ohio) is Bull. 62 of State of Ohio Division of Geol. Survey, priced at \$2.50, contains an introductory chapter, one on geologic setting, and a third on paleoecology (Chaps 4 - 7 will appear as succeeding parts of Bull. 62 covering classification and description of Naiades, Sphaeriidae, and freshwater and terrestrial Gastropoda). The introduction discusses such topics as General Nature of Pleistocene Nonmarine Molluscan Faunas, Classification of Pleistocene Mollusca of Ohio, Stratigraphic Interpretation of Molluscan Assemblages, Collecting Methods, Laboratory Methods, and Distribution Records. Geologic setting briefly accounts for the Nature of Deposits and the Pleistocene History of Ohio. After short statements on basic assumptions in the chapter on Paleoecology, the bulk of Part 1 (92 pages) is concerned with Assemblages (lists) from Pliocene (4, none Ohio); Nebraskan or Aftonian (1, Nebraska); Aftonian (1, Kansas); Kansan (27, none Ohio); Yarmouth (1, Indiana); Illinoian (7, none Ohio); Sangamon (6, none Ohio); Wisconsin (73, 39 of which are in Ohio, and 10 in Indiana); and Pleistocene Assemblages of Uncertain Age (14, all Missouri). Living Assemblages (373, Manitoba - 29, Michigan - 68, Minnesota - 22, New York - 45, Ohio - 43, Ontario - 14, Quebec - 8, Wisconsin - 144) comprise the main contribution (59 pages) of this part.

The Contents of Geografiska Annaler, Ser. A, Vol. 48A, 1966 (Generalstabens Litografiska Anstalt, Vasagatan 16, Fack, Stockholm 1, Sweden), Editor, Anders Rapp.:

- No. 1: Ashwell, I. Y., The Pleistocene history of some rivers in western Iceland, 11 pp.;  
Ragg, J. M. and Bibby, J. S., Frost weathering and solifluction products in southern Scotland, 11 pp.;  
Benedict, James B., Radiocarbon dates from a stone-banked terrace in the Colorado Rocky Mountains, U.S.A., 8 pp.;  
Stenborg, Thorsten, Some observations of differential ice-movements on Mikka-glaciären, 8 pp.;  
Larsson, Rolf Å., Notes on ice-velocity data from observations on Mikkaglaciären,  
Schytt, Valter, Notes on glaciological activities in Kebnekaise, 3 pp.;  
Sweden during 1965, 8 pp.;  
Olsson, G. and Lundevall, C.-F., A newly discovered cave system at Lummelunda, Gotland, 4 pp.
- No. 2: Dahl, Ragnar, Block fields, weathering pits and tor-like forms in the Narvik Mountains, Nordland, Norway, 31 pp.;  
Dahlskog, Sten, Sedimentation and vegetation in a Lapland Mountain delta, 16 pp.;  
Forsgren, Bernt, Tritium determinations in the study of palsa formation, 9 pp.
- No. 3: Price, Robert J., Eskers near the Casement Glacier, Alaska, 15 pp.;  
Østrem, Gunnar, The height of the glaciation limit in southern British Columbia and Alberta, 13 pp.;  
Davies, John A., The assessment of evapotranspiration for Nigeria, 18 pp.;  
Jochimsen, von Maren, Ist die Grösse des Flechtenthallus wirklich ein brauchbarer Masstab zur Datierung von glazialmorphologischen Relikten, 8 pp.
- No. 4: Meland, Nils and Norrman, John O., Transport velocities of single particles in bed-load motion, 18 pp.;  
Bailey, Harry P., The mean annual range and standard deviation as measures of dispersion of temperature around the annual mean, 12 pp.
- Concluded, page 12

Contents of Geogr. Annaler, Ser. A, v. 48A, 1966, Issue No. 4, concluded -  
Arnborg, L., Walker, H. J., and Peippo, J., Water discharge in the Colville River, 1962 (northern Alaska), 16 pp.;  
Worsley, Peter, Fossil frost wedge polygons at Congleton, Cheshire, England, 9 pp.;  
Ives, J. D., Block fields, associated weathering forms on mountain tops and the nunatak hypothesis, 4 pp.;  
Dahl, Ragnar, Block fields and other weathering forms in the Narvik Mountains, 4 pp.

Geografiska Annaler, Ser. A, vol. 49A, 1967, No. 1 will be issued in June 1967 and is a monograph on deltaic processes and delta morphology. Issues Nos. 2 - 4 is a special volume dedicated to Professor Filip Hjulström, and will contain the following 20 papers:  
Cailleux, A., Actions du vent et du froid entre le Yukon et Anchorage (Alaska);  
Dahl, R., Post-glacial micro-weathering and sinking of bedrock surfaces in the Narvik district;  
Gjessing, J., Potholes in connection with plastic scouring forms;  
Holtedahl, H., Notes on the formation of fjords and fjord-valleys;  
Hoppe, G., Case studies of deglaciation patterns;  
Jahn, A., Some features of mass-movement on Spitsbergen slopes;  
Larsson, L., Anisotropy at precambrian rocks and post-crystalline deformation models;  
Leopold, L., Observations on unmeasured rivers;  
Louis, H., Reliefumkehr durch Rumpfflächenbildung in Tanganyika;  
Russell, R., Aspects of coastal morphology;  
Schattner, I., Geomorphology of the northern coast of Israel;  
Schou, A., Pecan Islands. A truncated chenier ridge complex in the Mississippi delta;  
Schytt, V., A study of "Ablation Gradient";  
Svensson, H., Studies of a ground pattern. Field observations and aerial-photograph analysis in a plain in eastern Skåne, South-Sweden;  
Tricart, J., Quelques aspects du transport des alluvions grossieres et du faconnement des lits fluviaux;  
Walker, H.J., Suspended load in the Colville River, Alaska, 1962;  
Wallén, C.C., Aridity definitions and their applicability;  
Wolman, M.G., Urban development: A cycle of sedimentation and erosion in river channels;  
Yatsu, E., Some problems on mass movements;  
Østrem, G., Glacio-hydrological discharge and sediment transport studies in the Decade Glacier area, Baffin Island, N.W.T.

Publications of more than possible interest, some in periodicals less readily available:  
Although reported in Geomorph Newsltr #10, p.9, 1966, several of you wished us to give the full reference to Rudolf Martin's 1966 paper on -  
Paleogeomorphology and its application to exploration for oil and gas (with examples from western Canada), Amer. Assoc. Petrol. Geol. Bull., v. 50, no. 10, p. 2277-2311  
Gjessing, Just, 1966, Some effects of ice erosion on the development of Norwegian valleys and fjords, Norsk Geografisk Tidsskrift, Bd. XX, H. 8, p. 273-299  
Twidale, Charles R., 1966, Chronology of denudation in the southern Flinders Ranges, south Australia, Trans. Roy. Soc. South Australia, v.90, p.3-28, with 7 photos;  
-----, 1966, Geomorphology of the Leichhardt-Gilbert area, North-West Queensland, Comm. Sci. Ind. Res. Org., Melbourne, Land Res. Series No. 16, 56 pp., with 24 figs., 20 photos, and colored map in pocket of (1) land forms, (2) former and present plains of erosion, and (3) geology, by C.E.Prichard, all representing a tremendous effort of reporting on an area nearly 5% of the continent  
Dreimanis, Aleksis, 1966, The Port Talbot interstade of the Wisconsin glaciation, Canadian Journ. Earth Sciences, v. 3, p. 305-325, the brief but complete interpretation, with profile sections, radiocarbon dates tables, till characteristics, and pollen diagrams  
Coch, Nicholas K., 1965, Post-Miocene stratigraphy and morphology, Inner Coastal Plain, southeastern Virginia, Techn. Rept. 6, Geography Branch, U. S. Office Naval Research, 97 pp. (Contract NONR 609(40), Task Order NR 388-064)

Sidney E. White, Editor