the academic year beginning on October 1. Among those mentioned as recipients of grants is Dr. J. Furth, of the Cornell University Medical College, New York.

DR. W. G. OGG, director of the Macaulay Institute for Soil Research, Aberdeen, Scotland, has been appointed director of the Rothamsted Experimental Station to succeed Sir John Russell, who will retire in September.

AN Associated Press dispatch reports that Surgeon General Thomas Parran has announced the appointment of Dr. Raymond A. Vonderlehr as director of district No. 6 of the United States Public Health Service covering Puerto Rico and the Virgin Islands. Dr. Vonderlehr recently completed eight years' duty as assistant surgeon general in charge of the division of venereal diseases.

DR. LEVERETT D. BRISTOL, of Montclair, N. J., health director of the American Telegraph and Telephone Company, has been offered by the New Jersey State Board of Health the position of state health director, to succeed Dr. J. Lynn Mahaffey, of Haddonfield, who has resigned.

CAPTAIN JOSEPH N. LECONTE, formerly with the Chemical Warfare Service, Fourth Service Command, Atlanta, has been promoted from the rank of first lieutenant to become chief of Chemical Section Inspection, Chemical Warfare Service, Washington, D. C.

DR. LOGAN J. BENNETT, biologist of the U. S. Fish and Wildlife Service, has been commissioned in the Naval U. S. Reserve as a Lieutenant (j.g.). He reported for active duty on July 15. Dr. Bennett has been with the Fish and Wildlife Service for the past eight years. From 1938 to the time of his enlistment in the Navy, he has been leader of the Pennsylvania Cooperative Wildlife Research Unit with headquarters at the Pennsylvania State College.

DONALD MCLAUGHLIN resigned on July 1 as dean of the College of Engineering and chairman of the department of mining engineering of the University of California at Berkeley, to accept the position of vice-president and director of the Cerro de Pasco Copper Corporation, New York, N. Y. He is continuing as consulting geologist and director of the Homestake Mining Company and related companies.

DR. FLOYD S. MARKHAM, associate professor of bacteriology at the Ohio State University, has left for North Africa to take charge of laboratories for the Typhus Commission of the Rockefeller Foundation.

THE Lord President of the Council has promoted Dr. B. A. Southgate to be acting director of water pollution research in the British Department of Scientific and Industrial Research. He succeeds Dr. A. Parker, who has been made director of fuel research.

THE Frederick Price Lecture of the Royal College of Physicians of Edinburgh was delivered on July 2 by Sir Henry Dale, president of the Royal Society. The title of the lecture was "A Prospect in Therapeutics."

PROFESSOR EDWARD KASNER, of Columbia University, recently addressed the Forum of *Scripta Mathematica* in New York on "Circles, Spheres and Geology."

BY the will of Mrs. Harriette M. Arnold, of New York City, her residuary estate, amounting to $17,683,533, is distributed equally among St. Luke's Hospital, which also was bequeathed $50,000; the Metropolitan Museum of Art, New York Public Library, Trinity Church, Harvard College, Yale University and Princeton University. Other bequests include $100,000 each to Columbia University, Barnard College, Bard College at Annandale, N. Y., the General Theological Seminary of the Protestant Episcopal Church, New York Hospital and St. Mary's Hospital for Children, Inc. Among institutions receiving bequests of $50,000 are the University of the South, Sewanee, Tenn.; the New York Medical College Flower and Fifth Avenue Hospitals; Presbyterian Hospital in the City of New York, the Roosevelt Hospital and the Lying-in-Hospital. Bequests of $25,000 are made to Manhattan Eye, Ear and Throat Hospital, to Vassar College and to Smith College.

DISCUSSION

CIRQUES, HANGING VALLEYS AND HIGH-LEVEL BENCHES IN GLACIER NATIONAL PARK[1]

As shown on the topographic map of Glacier National Park there are, back in the mountains, numerous high-level cirques and relatively large benches on some of which are now small glaciers. Below these are nearly vertical cliffs 1,000 to 2,000 feet or more in height above the adjacent parts of the main valley

[1] Published by permission of the Director, Geological Survey, U. S. Department of the Interior.

floors. It has generally been considered that these features hang so high above the valley bottoms because the large Pleistocene trunk glaciers wore down their valley bottoms much faster than did the small tributary glaciers. It appears, however, that this is not the full explanation.

Bordering the east front of the mountains there are, 1,000 to 2,500 feet or more above the intervening glaciated valley bottoms, remnants of old high-level piedmont benches which, near the mountains, are capped with much-weathered glacial drift, some of which is cemented to hard tillite. At corresponding levels farther out, similar bench remnants are capped with coarse, non-glacial stream gravel. When this ancient stream gravel and this old, weathered, early Pleistocene till were deposited the mountain gorges and the outer valleys were not so deep as now by 1,000 to 2,000 feet or more. If normal stream gradients, corresponding to the smooth, sloping bench tops, be projected back up the gorges to their heads, it is seen that many of the cirques, hanging side valleys and bench remnants are at heights corresponding in general with these projected old trunk valley bottoms. This relationship suggests that the tributary, V-shaped gulches and headwater hoppers which were later reshaped and enlarged by glaciation were genetically related to the positions of the late Tertiary or early Pleistocene valley bottoms. Down these valleys and out onto the smooth gravelly piedmont, the great early Pleistocene glaciers advanced, deposited their load and melted back up the valleys.

As a result of renewed regional uplift the streams then trenched the U-shaped early Pleistocene valley bottoms and cut V-shaped inner gorges to considerable depths before the last, or Wisconsin, stage of glaciation came on. Just how many interglacial stages there were in the region of Glacier Park is not definitely known; there were probably at least two. Each time the glaciers readvanced they deepened the valleys somewhat and they broadened the valley bottoms very notably by plucking and scouring away the lower side slopes. The broadening of the inner gorges by the readvancing glaciers was probably facilitated by the narrowness of the projecting craggy spurs between the numerous tributary gulches.

Such interglacial stream erosion both east and west of the Continental Divide undoubtedly accounts for much, if not most, of the Pleistocene valley deepening. The shapes of the inner gorges, the projecting spurs between the tributary gulches and the thin bedding and fractured condition of much of the sedimentary rock composing the mountains particularly favored the work of the glaciers in plucking masses of rock and wearing away and oversteepening of the lower side slopes. It seems to have been such a combination of alternating stream and glacial erosion which accounts for the lateral benches, hanging cirques and short tributary glaciated valleys being left so high above the bottoms of the trunk valleys down which the last of the Pleistocene glaciers advanced. Since the last of these great glaciers disappeared, the streams have accomplished relatively little erosion. There has been some, but not a great deal of, enlarging of the cirques by the small glaciers of Recent time.

WM. C. ALDEN

GRAZING VERSUS MAPLE SYRUP

THREE years ago at the request of A. C. Norris, an alumnus of Oberlin College, Miss Elaine Hoff, a graduate student in the department of botany at Oberlin College, undertook a cooperative study of maple groves in Lorain County, Ohio. Her analyses indicated that the quality of these groves was suffering from the fact that they were being used as pastures. One grower, R. E. Campbell, then fenced a grove containing 500 trees and excluded cattle, sheep and horses from it. An additional leased area gives a total of 1,425 trees covering about 225 acres which were protected or very slightly pastured. In the intervening two years, wildlife and tree seedlings have increased, and there have been some indications of increased sugar production, but it was difficult to obtain precise yield data. During the season just ended, however, the 1,425 trees which were protected from grazing produced an average of nearly 1 quart of syrup per tree against approximately 1 pint per tree from other groves in the neighborhood which have remained pastured. Furthermore, the unpastured area produced a yield of 40 barrels of sap after flow had ceased in the pastured woodlands. Previous to protection, the sap flow was no better than that of other pastured groves in the area. The 1943 yield represents an increase in gross income of $570 for the unpastured area. The area, rented for pasture, would have brought in less than half this amount.

While this test may not be conclusive, it is certainly significant, particularly in view of the fact that one of the most serious sources of economic waste in the North Central States is the grazing of woodlands and consequent destruction of undergrowth, including seedlings. Data accumulated by the Ohio Experiment Station indicate that an ungrazed, properly managed woodland can be quite as profitable as any acreage on the average farm. Other data indicate that enlightened practices of pasture management will yield nutrient values sufficient to reduce the area of feed crops and make unnecessary the use of woodlands for supplementary grazing.

Since writing the foregoing, I have had the follow-