fluence of Professor Karl Pearson both in the matter and the manner of Dr. Pearl's productions. Although several of the articles are severely technical, they are written in an attractive style and the general reader who is interested in his own species, but who knows nothing of mathematics and little of biology will find in them material of interest. The serious student of human biology can not afford to neglect this volume.

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SPECIAL ARTICLES

UNICRYSTALLINE PALLADIUM WIRES

VARIOUS metals have within recent years been obtained in the form of "single crystal" wires, or wires in which the entire cross-section, save at exceptional points, is occupied by one crystal. The first metal to be so obtained appears to have been tungsten, and most of the subsequent studies of unicrystalline material have related to this metal. Other metals which have been prepared in unicrystalline form include molybdenum, aluminium, bismuth, lead, tin, zinc and cadmium, the work of Czochralski, of Polanyi and of Carpenter being particularly noteworthy in this connection.

Since the unicrystalline condition is the one in which a metal best lends itself to the investigation of many of its properties, experiments have been made by the writers with the purpose of producing unicrystalline wires of palladium. The palladium employed was a metal of exceptional purity, secured from the Bureau of Standards.[1] The treatment to which it was subjected consisted in causing the wire, after it had been drawn down to a diameter of approximately 0.05 mm (2 mils) and slightly annealed, to pass at a rate of 9.4 mm per hour past two mercury contacts, 25 mm distant from each other, while a current of from 550 to 600 milliamperes entered the wire through the lower, water-cooled contact, and left through the upper contact, which was not thus cooled. A considerable temperature gradient was in this way maintained in the portion of the wire included between the contacts, of which the hottest part was at a "yellow red." An asbestos enclosure served to protect the heated wire from draughts of air, in order that the variations of temperature might be as small as possible.

[1] The palladium was from that prepared in the recent investigations of the Bureau of Standards upon the platinum metals and came from a particular lot reported by the bureau in April, 1924, to be "nearly spectroscopically pure, containing a trace of calcium, but purer than any other palladium made or procured by the bureau."

Short pieces of the wires which had been thus treated were embedded in blocks of a 50 per cent. lead-tin alloy, which proved to have a convenient degree of hardness, and were then polished and simultaneously ground flat, with the finest grade of French emery paper. These specimens were etched by a three-minute immersion in a 1-normal solution of potassium bromide, saturated with bromine, or by a thirty-second treatment with aqua regia (3 HCl:1 HNO_3). Upon microscopic examination with vertical illumination, at a magnification of 200 diameters, they displayed clearly the appearances which Mark, Polanyi and Schmid[2] have described as characteristic of unicrystalline wires. Grain boundaries, while still to be found, occurred only at infrequent intervals; parallel etching lines marked the surface of the wire, and were unaltered in position by repeated etchings; and a system of ellipses, in planes which were parallel to each other but not to that of the etching lines, indicated points of incipient slip. In regions where the wire had been subjected to more than the average longitudinal stress it was seen to be constricted in one axial plane, but not in the plane normal to this, so that a ribbon had resulted. The fractured ends of treated wires which had been loaded to the breaking point exhibited a smooth plane of fracture, which formed an acute angle with the axis of the wire, instead of showing the irregular or cupped fracture of microcrystalline or untreated wire.

Rough measurements of the ductility of the wires, made by gradually increasing the tension upon lengths of from 80 to 159 mm, until rupture occurred, gave elongations which ranged from 0.7 to nearly 4.0 per cent. for three treated wires, while for two pieces of the untreated wire the elongations were too small to be measured by the method employed, being less than 0.2 per cent.

While no Roentgenographic examination has been made, it is therefore evident that palladium wires treated in the manner indicated are unicrystalline, and it is intended to study them further in respect to their occlusion of hydrogen, and to certain of their electrical and magnetic properties.

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GEOLOGICAL OBSERVATIONS ON THE ISLAND OF MAUI, HAWAII

THE island of Maui, the second largest of the Hawaiian group, is the principal section of a great vol-

[2] Mark, Polanyi and Schmid, *Zeit. Physik.*, 12 (1923), 58–72; 78–110; 111–116.

canic structure which includes in addition the islands of Molokai (with the submerged Penguin Bank extending westward from west Molokai toward Oahu), Lanai and Kahoolawe. The Maui group, a term suggested for this structure as a whole, comprises at least six principal eruptive centers, two each on Maui and Molokai, and one on Lanai and on Kahoolawe. The significance of the Penguin Bank is unknown. It may be the summit of a volcanic mountain which was not built above the level of the ocean, but more probably it represents a formerly emergent island which has been completely eroded or has subsided below sea level. The depths over most of the Penguin Bank are from 20 to 40 fathoms. If the bank be an eroded island, the outer margins doubtless consist of detritus derived from the former land mass by streams or by wave-attack along the shores together with a certain amount of organic débris. The inner portion is a wave-cut basaltic platform on which is a relatively thin veneer of sediment and reef limestone; the hydrographic charts note the widespread distribution of sand, coral and shells over the bank.

Whether the members of the Maui group were ever connected above sea level is uncertain, but their close submarine relations are clearly shown on the hydrographic charts of the islands. Submergences of greater magnitude than the depths of water in any of the channels between the islands of the Maui group apparently have taken place in Hawaii; hence exposed connections may have formerly existed. For example, large sections of the islands of Molokai and Niihau have been down-faulted below sea level; the depths of water within four miles of the faulted coasts are from 328 to 466 fathoms in the case of Molokai and from 240 to 319 fathoms in the case of Niihau. The Maui group is separated from Hawaii by a channel 30 miles wide and from 1,000 to 1,800 fathoms deep; the channel between the Penguin Bank and Oahu is about 12 miles wide and from 300 to 375 fathoms deep. The submarine connection between the Maui group and Oahu, therefore, is much closer than with Hawaii. It is not improbable that Oahu and the Maui group form a huge, complex lava dome; Hawaii, with its five major eruptive centers, is a separate volcanic unit.

The island of Maui is composed of two domes, connected by a low saddle, not more than 250 feet in elevation above sea level. Haleakala, east Maui (elevation, 10,032 feet) is a young dome with its constructional surface and its many parasitic cinder cones for the most part well preserved. On the northern, northeastern and southeastern slopes, the heavy trade wind rainfall has given rise to numerous streams which have cut deep, young canyons into the flanks of the dome, thereby exposing limited sections of the underground structure. Broad, practically undissected, tabular interfluves separate the valleys. The rainfall over the southeastern slope is lighter than over the northern section; hence the gorges are less numerous and not so deep. The heads of the valleys are a considerable distance below the summit of Haleakala, which projects well above the zone of maximum rainfall. The upper portion of the windward slopes and practically all the leeward slopes are virtually untouched by erosion. In the rainy section, deep weathering of the surface lavas has produced a thick soil cover, which supports a dense growth of vegetation. On the drier slopes, the decomposition of the lavas has been relatively slight, and the covering of natural vegetation is sparse. The cinder cones vary in age, and consequently in their stage of dissection. The oldest cones on the windward (northern and northeastern) slopes have been most deeply eroded. The windward coast of Haleakala has been wave-cliffed to some extent; the leeward coast shows little cliffing.

At the summit of Haleakala is the great faulted depression for which the island of Maui is so justly famous. The structure is 7.8 miles in length and 2.3 miles in width; the walls are steeply sloping scarps 2,000 to 2,500 feet in height. Two fault-gaps, one on the northern and one on the eastern side, break the continuity of the walls. On the relatively flat floor of the depression are a number of very recent cinder cones and lava flows; some of the latter have cascaded down the slopes of the mountain through the discharge-ways provided by the two fault-gaps. The scarps have suffered more or less dissection especially on the eastern side where the rainfall is heaviest. The original form of the cinder cones is almost perfectly preserved, and the ejectamenta composing them have been lateritized only to a very slight degree. The depression has been explained both as a volcanic rent and as a volcanic sink; insufficient field work has been done to determine the exact nature of the dislocation. If the structure be a rent, it is the sole example of its kind described in the world; if a sink, it represents a form transitional between the small sinks, such as are present at the summits of Kilauea and Mauna Loa on Hawaii, and the great, amphitheater-like structures which have been formed by the down-faulting of major sections of Kauai and of east and west Oahu. The relation of the movements which produced the fault-gaps to the development of the main depression have not been ascertained.

From geomorphologic evidence, Haleakala appears to be slightly older than Mauna Kea, Hawaii, whose erosional features closely resemble those of the former dome. The fluviatile dissection of the windward slopes of Mauna Kea is not so far advanced as on windward Haleakala, although the rainfall and consequently the rate of erosion over the two domes is about the same. The principal volcanic center on Haleakala probably became extinct in the late Pleistocene, though the eruption of the cinder cones and lava flows in the summit depression evidently took place much later, since they are definitely younger than the lavas of the surrounding scarps. Subsidiary activity continued as late as 1750, when small flows from fissures not far from sea level on the southwestern side buried part of a Hawaiian village.

Whether all activity has ceased or whether further eruptions from lateral fissures or vents may yet take place is, of course, uncertain; the principal vent, however, appears to have been finally sealed. Subsidiary activity on Mauna Kea apparently ceased earlier than on Haleakala. Only two of the principal Hawaiian vents, Mauna Kea and Hualalai on the island of Hawaii, have become extinct since the cessation of the major eruptivity of Haleakala.

No evidences of glaciation have been found on Haleakala, while small moraines have been discovered at the summit of Mauna Kea (elevation 13,825 feet). The considerably lower elevation of the summit of the Maui dome (10,032 feet) probably accounts for this.

West Maui (elevation 5,788 feet) is a much smaller and older dome which has been greatly dissected by streams radiating from a small summit plateau, the center of the heaviest rainfall and the principal watershed. The fluviatile topography of the dome is submature, but the heavier rainfall over the windward slopes has caused more rapid erosion and consequently a somewhat more advanced topographic development of that section of the dome. The streams have cut very deep, narrow canyons, having huge, amphitheater-like heads and long extents of cliffed walls throughout their courses. The interfluves are fairly broad near the shore; inland, where the multiplication of tributaries has resulted in more extensive erosion of the dome, the divides are narrow, serrate ridges. The headward growth of the canyons has not yet reached its ultimate goal, hence the slightly dissected summit plateau, a remnant of the original constructional surface, has been preserved. Stupendous sea-cliffs have been cut into the northern and northeastern coasts; low cliffs are present locally along the leeward shores. Judging from the extent of fluviatile and marine erosion, the principal eruptive center on west Maui became extinct late in the Tertiary. As on all the extinct domes in Hawaii, activity continued intermittently from subordinate centers after the sealing of the main vent. The completion of the west Maui and the Kauai domes probably took place at approximately the same time. Kauai has been more deeply eroded, but this appears to be due to the heavier rainfall over its windward slopes and summit plateau, the larger area of its watersheds, the greater volume of its streams, and the consequently more rapid rate of erosion over most of its surface.

Splendid sections of the underground structure of the west Maui dome are exposed in the great canyons and in the sea-cliffs. Maui thus is an especially attractive field for the geologist, since side by side are two lava domes, one possessing, with only slight erosional modifications, the original constructional outlines, and the other exhibiting sub-surface relations as the result of the long erosion to which it has been subjected.

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMEMT OF SCIENCE

MEDICAL SCIENCES AT THE WASHINGTON MEETING

(Reports for Section N and the Federation of American Societies for Experimental Biology appeared in Science for February 6.)

The American Physiological Society

President, A. J. Carlson.

Secretary, Walter J. Meek, University of Missouri, Columbia, Mo.

(Report by Walter J. Meek)

THE thirty-seventh annual meeting of the American Physiological Society was held December 29, 30, 31, with members present from all parts of the United States. Among the items attended to at the business meeting are the following: Announcement was made of the continuation of the Wm. T. Porter Fellowship for Physiological Research, administration of which has been entrusted to the Physiological Society. Dr. A. J. Carlson was reappointed as representative of the society to the National Research Council. As representatives to the Union of American Biological Societies, the Physiological Society reelected C. W. Greene and A. J. Carlson. Dr. Greene's report that plans for *Biological Abstracts* were well under way was heard with approval. The annual editorial and financial reports of the *American Journal of Physiology* and of *Physiological Reviews* showed a profitable year and a slight increase in the credit balance of these publications. Dr. D. R. Hooker was elected managing editor of the *American Journal of Physiology* for 1925. The council named