A NEW building which will serve as a laboratory for research in agricultural by-products will be built on the Iowa State College campus as soon as plans now in preparation are completed and bids for construction can be requested. Official word of the appropriation of $70,000 for the building by the Public Works Administration has been received from the U. S. Department of Agriculture at Washington, D. C., by T. R. Agg, dean of engineering, and P. Burke Jacobs, chief of the Ames Field Station. The money was allotted with the understanding that the building be placed under construction within the shortest possible time to provide immediate employment for about 50 men for approximately 6 months. Preliminary plans call for a structure about 35 feet high and containing about 60,000 square feet of floor space.

IN the furtherance of the oceanographic studies to which he has dedicated his steel cruiser, the *Velero III,* Captain G. Allan Hancock, of Los Angeles and Santa Maria, California, is undertaking his fourth cruise along the Pacific shores of North, South and Central America, and to a number of the adjacent islands. Among others, the Galapagos Islands are to be revisited to fill in certain gaps in the collecting of the previous cruises by Captain Hancock in those waters. The expeditionary staff comprises Captain G. Allan Hancock, director and captain; Mr. W. Charles Swett, executive officer and cinematographer; Dr. E. O. Palmer, physician; Dr. C. McLean Fraser, of the University of British Columbia, hydroids and other coelenterates; Dr. Harold W. Manter, of the University of Nebraska, representing the Carnegie Institution of Washington, trematode parasites of fishes; Dr. Wm. Randolph Taylor, of the University of Michigan, marine algae; Dr. Waldo L. Schmitt, of the Smithsonian Institution, crustacea, and Mr. John S. Garth, of the University of Southern California, ornithology and entomology. It was expected the expedition would sail from Los Angeles about December 30, and would be in the field for a period of two months or more.

DISCUSSION

ARE THERE GRANITIC AND BASALTIC SHELLS IN THE EARTH?

GEOLOGISTS at the present time seem to be gradually accepting the theory that the surface materials of the earth consist, in general, of a thin and incomplete layer of sediments over a thicker, but also incomplete, shell of granitic and gneissic material, which in turn overlies a probably thicker and continuous shell of basaltic (and peridotitic?) material. The incomplete shell of granitic material has been named the Sial, and the complete shell of basaltic material has been called the Sima.

It seems worth while to call attention to the fact that data now available suggest an explanation of this arrangement of the earth's near-surface materials (Sial and Sima), and, in fact, seem to require such an arrangement. The significant data are the following:

First: It has long been known that basaltic rocks are heavier than granitic rocks, and it is now well established that this is true at all temperatures and pressures found within the earth-zone in question, whether the substances are solid or liquid.

Second: Granitic rocks contain about twice as much radium as basaltic rocks. Considerable variations exist in different regions, but comparable measures nearly always disclose more radium in granitic rocks than in basaltic rocks of the same region, and, in general, the granites and rhyolites contain at least twice as much radium as the gabbros and basalts.

Third: Under normal conditions in the earth rhyolitic magmas crystallize at lower temperatures than basaltic magmas; in fact, after a careful study of all the data, Larsen[1] concluded that most rhyolitic magmas crystallize between 600° and 700° C., while most basaltic magmas crystallize between 800° and 900° C. Therefore, there is a difference of 200° C. between the average temperatures of crystallization of these two types of magmas.

Fourth: The measured geothermal gradient indicates that temperatures increase steadily (though not at a uniform rate) with increasing depth, and it is reasonable to infer that near-fusion temperatures exist in the earth at moderate depths. The existence of volcanoes proves that fusion temperatures exist, at least locally.

Fifth: The study of igneous rocks in the field and in the laboratory proves that differentiation is an important process affecting all kinds of magmas. There is much difference of opinion regarding the explanation of the process, but its existence and importance are no longer questioned.

Sixth: There are numerous minor and peculiar products of differentiation, but the two normal and abundant end-products of the process are rocks of the granitic and basaltic types.

The relation between these facts and the existence of a (partial) shell of Sial above the shell of Sima deserves careful attention. The facts seem not only to explain, but also to require, such an arrangement of earth materials. Perhaps the simplest way to

[1] *Am. Mineral.*, xiv: p. 81, 1929.

make this clear is to describe conditions and processes in the earth as determined by these facts.

If it be assumed that the earth's surface materials, to a considerable depth, at some time were not divided in zones or shells, but were approximately homogeneous, would they continue to be homogeneous indefinitely? No change is to be expected in the uppermost part, if it remains below fusion temperatures, but at some depth earth temperatures due to the normal geothermal gradient will be near fusion temperatures for the average rock materials. The radium present in the rocks will slowly raise the temperatures, since rocks are such good thermal insulators that heat will not be conducted away as fast as radioactivity produces it. Selective fusion of some parts is probable without the aid of heat derived from radioactive processes. After liquefaction (of any considerable mass) the magma thus produced will be lighter than the surrounding rocks and, even without fractures, it will therefore move slowly toward the surface. One mode of motion will be by means of rock flowage, in the same way that a balloon moves in the air, except that the motion is very much slower. After a time the magma will reach a cooler level and begin to crystallize; then (and perhaps before) differentiation will take place, leading to a gradual development of a more acid part and a more basic part. The level reached by the magma as a whole may be such that the basic part, perhaps produced by settling of the early products of crystallization, remains solid, while the acid part may remain liquid, because its crystallization temperature is about two hundred degrees lower than that of the basic part (if differentiation has produced a granitic fraction). Accordingly, the acid part will be slowly forced to a level still closer to the surface; and this process will be aided by the fact that the radium content of the original magma will be unequally divided between the differentiation products in such a way that the acid part will contain about twice as great a percentage as the basic part. Accordingly, the cooling effects of adjoining solid rocks will be more efficient in lowering (or preventing the rise of) the temperature of the basic part than in lowering the temperature of the acid part.

Ever since the beginning of the Paleozoic era such processes have affected the surface of the earth only locally—but even in this way a considerable fraction of the earth's surface has been subjected to the process. However, during the Precambrian the surface was affected more generally, so that the results of the process are to be found everywhere over the exposed Precambrian areas.

It is worthy of note that, once a mass of granitic composition is forced upward into the Sial shell, it is impossible for it to return to the underlying Sima. For, if such a mass, by subsidence or otherwise, is gradually buried toward the level of the Sima, it will liquefy at a level considerably above the basaltic substratum, since its fusion temperature is about 200° below that of the Sima, and the latter is believed to be near its fusion temperature.

Also, no granitic mass (or possible granitic differentiate) can long remain in the Sima, because, even if the Sima is not liquid or vitreous, it is believed to be at near-fusion temperatures, at which the granitic mass would be liquid and would therefore be forced toward the surface, since it would be considerably lighter than the surrounding Sima. Furthermore, such a granitic mass would contain about twice as much radium as the surrounding Sima, and would therefore gradually become hotter than the latter; so that, even if the upper part of the Sima is at a temperature level in some parts of the earth at which granite does not melt, the granitic mass would be further heated by its own radioactivity, and thus finally melt. On account of marked differences in specific gravity granitic magmas can not remain in the Sima.

It is true that, at least since Precambrian time, basaltic masses can remain indefinitely at the surface, but in the deeper and hotter portions of the earth an arrangement of rock materials controlled by gravity, and aided by radioactivity, differentiation and fusion temperatures, seems inevitable in the light of our present knowledge of the significant data on these subjects.

Such an arrangement corresponds well with the fact that seismic data require the existence of two (or more) shells with different properties near the earth's surface.

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A. N. WINCHELL

UNIVERSITY OF WISCONSIN

COPPER IN RELATION TO CHLOROPHYL AND HEMOGLOBIN FORMATION

IT is known that chlorophyl, the respiratory pigment of plants, and hemoglobin, the respiratory pigment of the red blood cells of animals, are related chemically. One point of difference, however, is that magnesium is the element in chlorophyl corresponding to iron in hemoglobin. Under certain conditions the amounts of these pigments are decreased. A diet deficit in iron, for example, will cause a decrease in hemoglobin producing a condition known as anemia. Orange growers in Florida have recognized for a number of years that when citrus fruit trees are set on certain types of grove land—marl, for example—the leaves of the trees, instead of developing the characteristic deep green color, become spotted yellow, a