

feet high, blew off its head in 1932 spreading ashes in a radius of fifty miles. Izalco in El Salvador commenced its career, as stated, in 1769 and has been more or less active since. San Miguel in the eastern part of El Salvador near the coast is apparently inactive. A large lava flow at its base is intersected by the line of International Railways of Central America. Other volcanic peaks around the Gulf of Fonseca include Cosegüina in western Nicaragua which in the last century had one of the most noted eruptions in history. Eastward in Nicaragua extends a line of coastal volcanoes, terminating with Momotombo at the western end of Lake Managua, which has been quietly smoking for many decades. Southeast of the lake the Nicaragua Railway crosses lava beds near Santiago, which, after many years of quiescence, started smoking in 1925 and for several years threw out great clouds of sulphurous gas, which extended many miles offshore and damaged coffee plantations on the nearby hills until an earthquake started cinder slides closing the vents in the crater and the smoke ceased. There are inactive craters near the western end of Lake Nicaragua and on islands in the lake, but no other considerable volcanic activity between Mexico and Costa Rica.

Dr. Hobbs's comments in reference to a Nicaragua Canal indicate lack of familiarity with the various projects studied previous to the construction of the Panama Canal. The line indicated on his map never received any serious consideration nor was there any plan for a lock at Managua. The route across Nicaragua has been surveyed many times without material variations and most recently between 1929 and 1932. It utilizes the lowest natural divide between the oceans throughout the Americas, only 155 feet above sea level between the Pacific and Lake Nicaragua. At its nearest point, this line is sixty miles distant from Managua.

In general there seems to be little connection between earthquakes and volcanic eruptions in Central America. The most destructive in the Caribbean area in recent years was that at Kingston, Jamaica, in 1906, an island which has only vestiges of former volcanic activity.

The possibility of earthquake damage to an Isthmian Canal was considered by various commissions, in preliminary studies. The fact that earthquakes have damaged Central American cities does not prove that massive structures like those at Panama necessarily would be affected. On the other hand there can be no guarantee against the occurrence of earthquakes at any site. As there is no sure way of predicting the occurrence or magnitude of earthquakes, their possibility must be accepted and designs made based on our present knowledge of earthquake resistant structures. The Managua earthquake destroyed more than

a third of the city and killed an estimated 2,000 people. The buildings destroyed had stone or adobe walls unsupported against lateral shocks. Framed timber, steel and reinforced concrete structures were largely undamaged including a five-story building and a million-gallon reservoir. Proper engineering design now includes provision against lateral stresses due to earthquake shock. Such precautions have been taken in all design of important structures since the earthquake at San Francisco. Proximity to volcanoes is no reason for abandonment of construction activity, as is evidenced by the continued existence of the Port of Naples.

As concerns Dr. Hobbs's recommended canal at the Isthmus of Tehuantepec, this is a location which has never been seriously considered except for the ship railway proposed by Captain Eads about 1885. On this route there would be a long summit level at some seven hundred feet elevation and a doubtful water supply, two factors which eliminated it from consideration by the Isthmian Canal Commission. The author's recommendations amount in fact to a rejection of an impractical route in favor of another in the same category.

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COMPARATIVE STUDIES IN HUMAN BIOLOGY

SERIOUS reservations must be entered to certain points made by Professor Dice in his proposal for a program to study the problems of human biology by means of a concerted attack by the various disciplines concerned.¹ The following paragraph may be cited to give an example of the points to which exception is taken:

The characters of man that are inherited include not only his anatomical features, but also his physiology and his psychology. For instance, each of the races of man is distinguished by certain physical characters, but it is recognized by anthropologists that many races also exhibit clearly marked peculiarities of physiology and psychology. It will of course be admitted that psychological and physiological characters are perhaps somewhat more subject to modification by the environment than are anatomical ones.²

Quite aside from the looseness with which the term "psychological" is employed—since there is no indication in statement or context whether an inborn neural system or learned behavior mechanisms are implied—it must be pointed out that it is simply not true that anthropologists recognize that races exhibit psychological or, to a lesser degree, physiological differences. The fact of the matter is that practically all anthro-

¹ SCIENCE, N.S., 99: 457-461, 1944.

² *Ibid.*, p. 458.

pologists not committed to the racist dogma hold exactly the opposite. There is no evidence to prove that the physical traits which mark off the races of man are correlated with psychological characters, whether this be of the order of intelligence or aptitude; on the other hand, there is good reason to believe that the gamut of human potentiality is run by every sizable group of men.

Professor Dice's use of the phrase "many races" is confusing, since one of the most difficult anthropological problems is to delimit the races of man. Even the three- or four-fold grouping most generally accepted is not broad enough to encompass all cases—as, for instance, the "hairy Ainu" of the island of Sakhalin, variously classified as Caucasoid or Mongoloid; or the peoples of Polynesia. One wonders, indeed, why the word "race" was introduced at all, since Professor Dice seems to be concerned with genetic studies of a restricted group of families. Many anthropologists to-day, as a matter of fact, tend to define a race as an aggregate of genetic lines rather than in the simple taxonomic terms of an earlier fashion which seems to be implicit in Professor Dice's usage. Or is Professor Dice using the word "race" as a synonym for "local group"?

The employment of the term "environment" perhaps reveals the principal source of Professor Dice's confusion. Does he mean the natural environment? Or does he mean culture? At one point he writes that "hereditary trends within families give a basis for studies of the variations in morphology, physiology and psychology that are produced by environmental influences." Later he considers the difficulty of "untangling in human affairs the complex interrelations of heredity and environment." But he also speaks of "physical environment" and of "social environment." These are two quite different things, holding different implications for the study of human biology. It is perfectly possible that high altitude imposes certain conditions on the developing human organism that cause it to have a distinctive character. But this is not a phenomenon of the same order as the food habits of a people, since these comprise a cultural fact and vary widely within the range of possibility presented by any given natural environment.

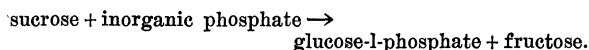
There is little question that a concerted attack on the problems of human biology, conceived and executed along the widest lines, is desirable. But such a study, made without a conceptual setting of the greatest clarity, and drawn in terms of the findings of all the various disciplines involved, will run the gravest danger of defeating its own ends and repeating errors of earlier days.

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ENZYMATIC SYNTHESIS OF CRYSTALLINE SUCROSE

THE bacterium *Pseudomonas saccharophila* Doudoroff was recently shown^{1, 2} to contain a sucrose phosphorylase catalyzing the reaction



The reaction appeared to be reversible since when glucose-1-phosphate and fructose were added to a partially purified enzyme preparation inorganic phosphate and a carbohydrate having certain properties of sucrose were formed. The evidence, however, was not sufficient to establish the identity of the synthetic carbohydrate.

Additional experiments which we have recently completed justify the conclusion that the synthetic product is identical with natural sucrose. By the use of an invertase-free sucrose phosphorylase preparation, 2.5 g of the carbohydrate were obtained in crystalline form. The empirical formula, specific rotation, refractive indices and other optical properties, x-ray pattern, rate of acid hydrolysis and the reducing values before and after invertase or acid hydrolysis of the crystalline compound were all found to be the same as those of sucrose. In addition, the octaacetate derivative of the synthetic carbohydrate was shown to be identical with the corresponding sucrose derivative.

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PENICILLIN PRODUCTION

DURING a study of the growth of *Penicillium notatum* on sulfite waste liquor for penicillin production it was found that whereas lactose may or may not act as a nutrient for mold growth, it definitely serves as a preservative for penicillin. Assuming the same action for the large amounts of lactose added in the commercial production of penicillin on corn steep liquor, a more plentiful substitute preservative was sought.

We have found in preliminary parallel experiments using corn steep liquor that starch dextrin can be substituted for lactose to give equally high quantities of penicillin. The substitution of lactose by dextrin in the commercial production of penicillin might make possible a desirable increase in such production.

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¹ M. Doudoroff, N. Kaplan and W. Z. Hassid, *Jour. Biol. Chem.*, 148: 67-75, 1943.

² M. Doudoroff, *Jour. Biol. Chem.*, 151: 351-361, 1943.