tions of the depth of the Mohorovičić discontinuity would have to consider the low velocity layer.

The source of most shallow earthquakes would be in the low velocity layer. The amplitudes of the direct waves would decrease rather fast with distance, and their travel times would be affected by the velocity in all layers above the earthquake source. Rays starting not too far from a horizontal direction, upward or downward, could not leave the low velocity layer in accordance with ray optics. Thus, they could form a "sofar channel" with the peculiar properties which have been studied in the atmosphere and the ocean. At some distance outside such a channel rather large amplitudes are found. Energy radiating from the channel would form the phase (indicated by $\overline{P}$) which has been considered the direct wave in earthquake records. Actually, the direct longitudinal wave in earthquake records would arrive almost simultaneously with the sofar wave at certain distances. The inside limit of the sofar wave would be at distances of 50 km or more, depending on local conditions. The direct wave, traveling above the channel, would precede the $\overline{P}$-wave by increasing time intervals. This phase (called Py in records of California earthquakes) has been considered previously to be a wave refracted through a deeper layer. C. F. Richter is now investigating a number of records from smaller earthquakes in southern California, including data from four semipermanent stations with highly sensitive Benioff-vertical seismographs that have been installed especially for such research. His results to date (unpublished) are in excellent agreement with the new hypothesis. The interpretation of earthquake records studied previously requires an origin time 1–2 sec later, since in the earlier interpretation it has been generally assumed (incorrectly) that $\overline{P}$ starts at the time of origin of the shock. This difference of 1–2 sec has to be subtracted from all Pasadena travel time curves. It explains the fact that waves from the Baker Day test at Bikini arrived about 2 sec earlier than was calculated. The new hypothesis explains other phenomena found from earthquake records.

Thus far, few attempts have been made to explain the fact that material with higher velocity exists on top of material with lower velocity. The author had previously assumed that this was explained by local patches of old sedimentary rocks covering the "granitic layer" and H. O. Wood assumed it was owing to local effects of high pressure. It seems now that the phenomenon of the low velocity layer is much more general, at least in the continents. It must be explained either by assuming a succession of relatively thin layers of different material in many regions of the earth's crust or, what is more likely, by the effect of physical processes. In a given material, the velocity of the elastic waves is mainly an effect of pressure and temperature. Experiments indicate that the pressure increases the wave velocity in a given material rather considerably in the upper few kilometers, but much less below about 10 km. Few data are available for the effects of temperature; for quartz, and to a lesser degree for diabase, they indicate a decrease in wave velocity with increasing temperature, followed by an increase. For quartz, a strong minimum can be expected at a depth of roughly 25 km, where the transition from alpha quartz to beta quartz should take place. For diabase, a minor minimum has been calculated by Birch and Dow to occur at a depth of about 10 km. Similar data for feldspar and other constituents of the material in the earth's crust are necessary to establish the actual cause of the low velocity layer at a depth below about 15 km if its existence is proven.

The Mohorovičić discontinuity is not much affected by the new hypothesis. It is still considered by the author to mark the transition from simatic material (basalt, gebbro, etc.) above it to ultrabasic rock below; the decrease in wave velocity at a depth of about 80 km is believed to result from the transition from crystalline to amorphous material near or at the melting point.

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Effect of Insulin on the Potassium and Inorganic Phosphate Content of the Medium in Experiments with Isolated Rat Diaphragms

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In 1923 and 1924, Harrop and Benedict (*6, 7*) and Briggs *et al.* (*2*) found a drop in serum potassium after administration of insulin to normal and diabetic human individuals and experimental animals. Their observations have been confirmed repeatedly and it has been shown that this effect was due to a shift of potassium from the extracellular to the intracellular space (*3, 11*). No studies have been made, however, of the effect of insulin on the potassium metabolism of isolated organs or tissues.

In recent years, the rat diaphragm has been widely used for the study of carbohydrate metabolism of the isolated muscle (*4, 9*). For the present investigation the technique of Gemmill (*4*) has been used.

Ten rats of 80–100 g body weight, which had been fasted for 24 hr, were killed by decapitation. The diaphragms were taken out and divided in two halves. Ten hemidiaphragms were incubated in 20 ml of a buffer solution with a mineral composition closely resembling blood plasma (*5*) and equilibrated with a gas mixture of 93% oxygen + 7% carbon dioxide. The pH of this buffer after equilibration is 7.4. The buffer solution contained glucose in a concentration of 200 mg%. The ten other hemidiaphragms of the same animals were incubated under similar conditions in a buffer solution

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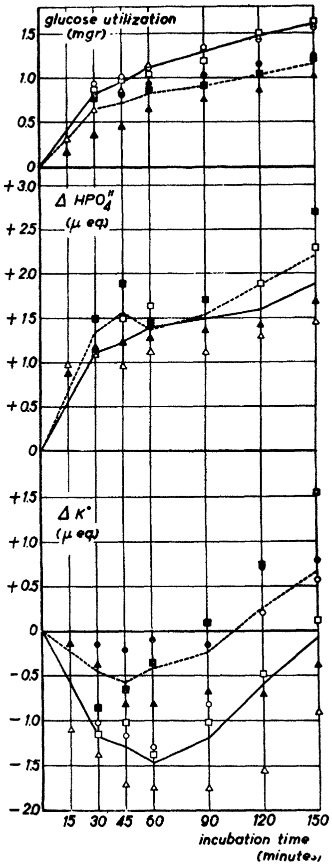

FIG. 1. Glucose utilization (in mg) and concomitant changes in inorganic phosphate and potassium content (in microequivalents) of the medium, calculated per 100 mg of diaphragm present in each vessel. The closed circles, squares, and triangles represent experiments without insulin; the averages are connected by the dotted curves. The open circles, squares, and triangles, the averages of which are connected by the continuous curves, represent the parallel experiments with added insulin.

containing in addition 0.5 units of insulin per ml.[3]

Both vessels were shaken at a rate of 120/min at 37° C, and samples of the medium were taken from each flask after 30, 45, 60, 90, 120, and 150 min. In the samples, glucose was determined by the method of Somogyi (*8*), inorganic phosphate after Briggs (*1*), and potassium with the aid of a flame photometer constructed by one of us (*10*). The results of three consecutive experiments, expressed as changes in the medium, calculated per 100 mg of wet tissue, are summarized in Fig. 1. Inorganic phosphate was determined in only two of these experiments.

Significant differences were observed in the glucose utilization, which proceeded at a greater velocity in the presence of insulin.

In the evaluation of the changes in the potassium and phosphate content of the medium, it should be kept in mind that every surviving tissue gives off phosphate and potassium through autolysis. This phenomenon tends to counteract any shift of phosphate or potassium which might accompany the penetration of glucose into the cells. Under these circumstances there was no evidence of a shift of inorganic phosphate into the diaphragms, either with or without insulin. The inorganic phosphate of the medium slowly increased in both vessels. The potassium content of the medium, however, showed a definite initial decrease, indicating a transfer of potassium into the muscle cells. In the presence of insulin the potassium shift was significantly larger in every experiment. The largest values for the potassium shift were found after one hour's incubation. At that moment, the difference in potassium shift between the flask with and that without added insulin amounted to about 1 microequivalent per 100 mg of wet tissue. It is concluded that a transfer of potassium from the medium into the muscle cells is associated with the utilization of glucose by the isolated rat diaphragm. This transfer is enhanced by the addition of insulin. Why we did not find in these experiments a concomitant shift in inorganic phosphate will be the subject of further study.

[3] We are indebted to Dr. J. Lens, of Organon Laboratories, for a crystalline preparation of insulin, containing 22.5 units per mg.

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The Effect of Changes in Body Weight on Atherosclerosis in the Rabbit[1]

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Atherosclerosis is probably responsible for more deaths on this continent than any other pathological process (*3, 4*). The high incidence of the fatal sequelae of this disease in the obese has been known to life insurance statisticians for many years (*1*). In 1947, Wilens (*9, 10*) reported analyses of autopsy findings in man which revealed atherosclerosis to be strikingly associated with adiposity. Evidence was also presented (*10*) showing that the characteristic lipid component of the lesions regresses during weight loss.

This evidence that a caloric intake in excess of energy requirement is associated with a high incidence of atherosclerosis in man suggests the possibility that weight loss due to decreased consumption or absorption of food,

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