SCIENCE

VOL. 100 FRIDAY, AUGUST 4, 1944 No. 2588

SCIENCE: A Weekly Journal devoted to the Advancement of Science. Editorial communications should be sent to the editors of SCIENCE, Lancaster, Pa. Published every Friday by

THE SCIENCE PRESS

Lancaster, Pennsylvania

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary in the Smithsonian Institution Building, Washington 25, D. C.

MODERN EVIDENCES FOR DIFFERENTIAL MOVEMENT OF CERTAIN POINTS ON THE EARTH'S SURFACE[1]

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THE subject of our discussion is one of those problems that not only straddles the border line between departments of knowledge, but transgresses far into the adjacent territories of several sciences. I am reminded of an apt warning for which Bulwer-Lytton is responsible, not to fall "into the error of the would-be scholar—namely, quoting second-hand." Making no pose as a geologist, however, I must confess that what I may have to say in regard to physiographic examples of differential displacements in the earth's crust will have to be from such little knowledge as I have been able to borrow from you geologists, and I venture to proffer such second-hand information only on the ground that we have a board of experts among us to whom questionable points may be referred subsequently. My excuse for venturing upon this subject comes from a very vital interest that must concern every student of the earth.

Certain investigations with which I have been more or less engaged for the last fifteen years seem to lend promise that the problem of lateral shifts in the earth's crust may be helped toward solution by the continued observation of the latitude and longitude of certain presumably fixed points on the earth's surface. In that unique organization of students of the earth sciences, the American Geophysical Union, experts from many different, but interrelated fields commingle freely. It would appear that it was through such commingling some astronomers became contaminated by some geologists perhaps with a fond hope that a little contamination of astronomy with geology might be of mutual benefit. In the time at our disposal I hope I

[1] An address presented to the Geological Section of the New York Academy of Sciences on April 3, 1944.

cause these substances interfere in the analysis for hippurate.

Table 1 contains the results of studies on ten persons by these methods. The observations reported here were all made on subjects apparently free from renal disease. Several had considerable anemia, as reflected in the oxygen content of the arterial blood. The renal arteriovenous oxygen difference in the 8 cases in which it was determined varied from 1.9 to 2.8 volumes per cent. In contrast the difference in oxygen content of the mixed venous and arterial blood varied from 3.4 to 6.1 volumes per cent. The cardiac index in these subjects ranged from 2.3 to 3.8. With arterial plasma hippurate levels below 2.49 mgm per cent., the extraction by the kidney varied from 85 to 100 per cent. except for one case, when it was zero.

In all the cases reported here, in which oxygen studies were carried out, a low renal arteriovenous oxygen difference has been found. This was first noted in animals by Claude Bernard[10] in 1858. More recently Van Slyke *et al.*,[11] and Mason, Blalock and Harrison[12] have obtained similar values in animals with explanted kidneys. Weiss, Parker and Robb[2] have reported studies on renal venous and arterial blood from patients under spinal anesthesia during a surgical procedure for suspension of the kidney. The renal arterio-venous oxygen difference in three such subjects was 1.29, 2.87 and 2.96 volumes per cent., while in a patient with malignant nephrosclerosis the arterial and venous oxygen contents were 11.17 and 11.32 volumes per cent., respectively. Our results are of the same order of magnitude, but have been obtained under more physiologic circumstances. Other chemical studies are now in progress.

The use of diodrast clearance by the kidney to determine renal plasma flow is based on the assumption that at low plasma levels diodrast is completely extracted during a single circulation through the kidney.[13] The only direct evidence available at present is that from studies on animals with explanted kidneys. In such animals White[14] obtained an average extraction of 74 per cent. of the arterial content. Later Corcoran, Smith and Page,[15] using slightly lower plasma levels of diodrast, reported a value of 87 per cent. Recently it has been demonstrated that the clearance of sodium para-amino hippurate is identical with that of diodrast under normal conditions.[16] This substance has the advantage of a simple and accurate method of determination, plus the theoretical advantage of less diffusion into the red blood cells. We have used this material instead of diodrast, and our value of 88 per cent. extraction fits well with the other observations. Since renal vein blood contains not only the venous outflow from the active excretory renal tissue, but that of surrounding supporting tissue in addition, one would not expect to find absolutely complete removal of diodrast or hippurate from the blood leaving the kidney.

The value obtained in Case B. J. is of interest. Most likely it indicates failure to enter the renal vein, but the oxygen difference is low. White[14] and Corcoran *et al.*,[15] both report anomalously low extraction values on isolated occasions. They suggest that, while these results may represent technical errors, they may indicate changing tubular activity.

SUMMARY

Catheterization of the renal vein offers a safe and relatively simple method of obtaining blood as it leaves the kidney in the resting unanesthetized human subject.

In preliminary observation on 8 subjects the renal arteriovenous oxygen difference varied from 1.9 to 2.8 volumes per cent., averaging 2.3 volumes per cent. Sodium para-amino hippurate, at low plasma levels, was 88 per cent. extracted during a single circulation through the kidney.

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BABOR, JOSEPH A. and GARRETT W. THIESSEN. *How to Solve Problems in Physical Chemistry.* Illustrated. Pp. ix + 215. Thomas Y. Crowell Co. $1.25.

BROOKS, B. T. *Peace, Plenty and Petroleum.* Pp. vi + 197. Jaques Cattell Press. $2.50.

JORDAN, PASUAL. *Physics of the 20th Century.* Pp. xii + 185. Philosophical Library. $4.00.

KNAYSI, GEORGES. *Elements of Bacterial Cytology.* Pp. xii + 209. Illustrated. Comstock Publishing Company. $3.50.

MELLON, M. G. *Quantitative Analysis Record Book.* Thomas Y. Crowell Co. $.75.

OLSON, EVERETT C. and AGNES WHITMARSH. *Foreign Maps.* Illustrated. Pp. xvii + 237. Harper & Brothers. $4.00.

Science in Soviet Russia. Pp. ix + 97. Jaques Cattell Press. $1.50.

SHILLABER, CHARLES. *Photomicrography Theory and Practice.* Illustrated. Pp. viii + 773. John Wiley & Sons. $10.00.