day, when the craniad end of the ureter is white and the caudal end shows a purple fluorescence.

It is shown that it is possible to trace the passage of a fluorescent drug through the body with the use of ultraviolet light. If the drug were injected intravenously it would appear and probably disappear from the organs in a much shorter time. Experiments are in progress to trace various fluorescent drugs in mammals after intravenous administration.

Reference

1. TAFT, C. H., and PLACE, J. A. *Texas Rep. Biol. Med.*, 1944, **2**, 61–76.

Modification of Metabolism Apparatus[1]

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Basal metabolism in man is commonly calculated on the basis of oxygen consumption. Clinical types of testing apparatus are designed for determining either (1) the amount of oxygen consumed during a definite period of time or (2) the time required for the consumption of a definite quantity of oxygen. The principal advantages in using a clinical type of apparatus are in their simplicity of operation and in computation of results. This type of apparatus is, however, not well adapted for metabolism studies that involve other than resting or basal conditions. The purpose of this report is to describe a modification of a standard type apparatus to broaden its usefulness in studies of oxygen consumption under various conditions of activity.

The essential feature of the present modification is the inclusion of a regulator valve and rate-meter tube (Rotameter),[2] which is inserted in the oxygen intake line of a standard closed-circuit apparatus of the Benedict-Roth type. The setup is shown in Fig. 1. With these additions, oxygen can be delivered at constant and measured rates simultaneously with the consumption. By adjusting the flow from a predicted demand (from standard tables) to the actual requirements a direct reading of the consumption can be made. In this case the oxygen-consumption line becomes parallel to a horizontal base line (Fig. 2, line A).

A brief discussion of the data shown in Fig. 2 will illustrate a method of using the apparatus and suggest further applications.

[1] I am especially indebted to Mr. George K. Porter, of Hatboro, Pennsylvania, technical authority on Rotameters; to Mr. Harold A. Hopkins, Philadelphia service representative for Benedict Roth apparatus; and to Mr. Warren E. Collins of Boston, who supplied some of the materials with which a bellows type apparatus (mentioned in text) was constructed.

[2] The "Rotameter" is a flow-rate meter of the "variable area" type. The metering element is a rotating free float operating in a precision, taper-bore tube, which is calibrated to give a direct reading of the rate of flow.

The initial oxygen-consumption line (A) was obtained on a subject by adjusting the flow to 260 cc. O_2 per minute, at which point the delivery and consumption balanced. This amount was delivered at 30 lbs. pressure throughout the test period, and represents the oxygen requirement under resting conditions (after one hour reclining). At (B) the subject was

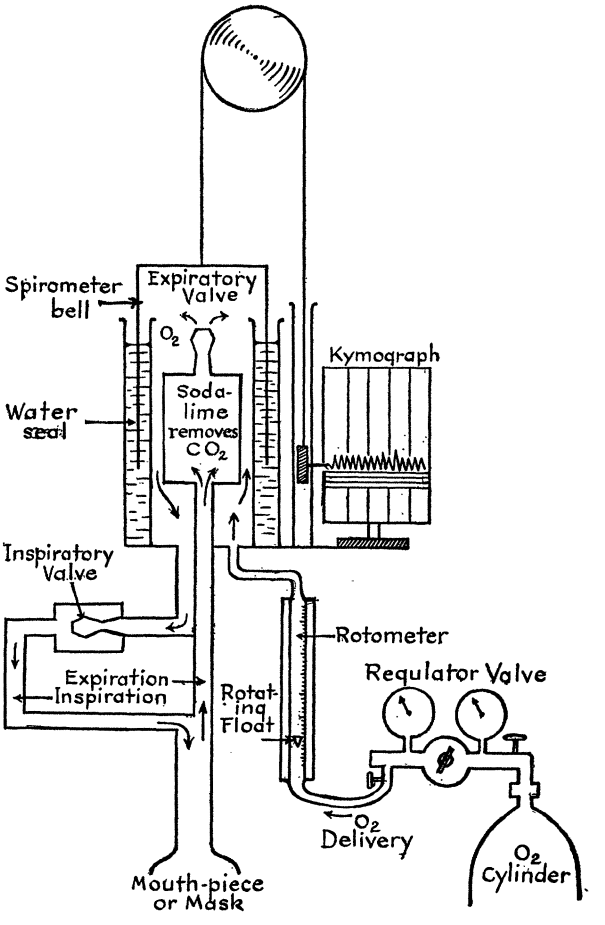

FIG. 1. A diagram of metabolism apparatus of the Benedict-Roth type showing the assembly of the regulator valve and Rotameter.

detached from the circuit, and while prevented from respiratory exchange with outside air, he ran down and up a flight of stairs and then was reconnected into the circuit. The duration and character of the recovery period (payment of oxygen debt) is shown by the curve (C), and the amount of oxygen required for performing the work is represented by the vertical distance between the level of the initial resting line (A′) and the secondary oxygen consumption line (D). The line (D), in leveling off, shows that full recovery has been effected.

Calibrations of the particular Rotameter which we have been using give accurate deliveries within a range

of from 200 to 800 cc. per minute. In this range the float moves through a distance of 125 mm. This

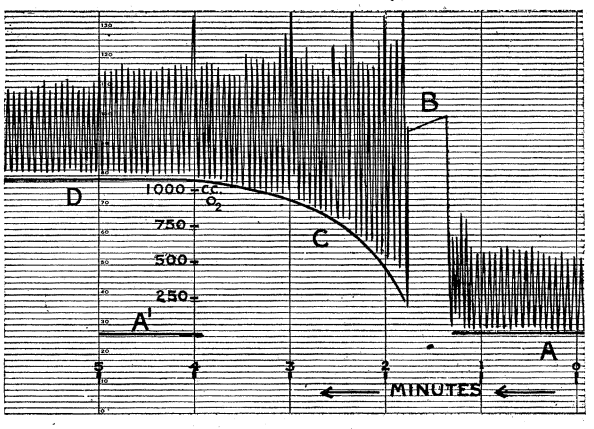

FIG. 2. A kymographic recording of the effect of a stair-climbing exercise on metabolism. Note recovery period as shown by the curve (C).

Rotameter was designed to measure small flows of liquids used in aviation equipment. Obviously, a tube of greater length with a similar range of delivery would aid in more precise reading.

Corrections for temperature and pressure for the Rotameter delivery are negligible and may be disregarded. Such corrections, however, are necessary for gas in the spirometer.

My principal purpose in designing the modification was for use in connection with class work of a course called "Applied Physiology." The report is given here with the thought that investigators more especially interested in metabolism studies may be better able to further develop the present modification. Our experience with the apparatus as shown in Fig. 1 indicates the desirability of redesigning other parts of the apparatus, especially for use with the Rotameter. One modification we have tried is the substitution of a respiratory bellows in place of the water spirometer. This makes respiratory movements much easier on the subject but increases difficulty of computations. Refinements in the construction and assembly of the apparatus would obviously contribute to greater accuracy and also further broaden its application.

Letters to the Editor

The McDonald Observatory

Your announcement of appointments at the Yerkes and the McDonald Observatories (*Science*, 1946, 103, 80), should be corrected to the effect that the McDonald Observatory is a part of the University of Texas and not of the University of Chicago. Appointments for both observatories are made by the University of Chicago, but the University of Texas owns the McDonald Observatory and approves the appointments.

OTTO STRUVE, *Director*
The W. J. McDonald Observatory, Fort Davis, Texas

Museum of Science and Industry

In *Science* (1946, 103, 17) you refer to our sister institution in New York as "The Museum of Science and Industry." This is misleading even though you add the words "Rockefeller Center, New York." We feel, in view of the history of the two institutions, that we are entitled to have our museum associated with that name.

The New York museum was founded under the name of "The Museum of the Peaceful Arts," while ours carried the name "The Rosenwald Industrial Museum." When we changed our name to "The Museum of Science and Industry," they changed to "The New York Museum of Science and Industry." At that time we protested the close copy of our name, but they declined to change, claiming that the qualifying words "New York" made the distinction clear. Certainly, to leave off these words is unfair to this institution, which considers itself entitled to its proper designation before the public. We will appreciate your consideration of this point.

RUSSELL H. ANDERSON
Museum of Science and Industry, Chicago

Malaria and Rainfall Periodicity in Palestine

The war has demonstrated the vital necessity of medico-geographical work. Yet, in order to be useful, it seems to us that future work in this field should avoid some of the pitfalls found in Dr. H. de Terra's "Rainfall periodicity in relation to malaria and agriculture in the Near East" (*Science*, 1945, 101, 629–631).

Studies in medical geography should be based not only on geography, but equally on medicine. Of course, excessive or insufficient regional rainfall is one of the causal factors of malaria epidemics, and such correlations have been attempted since the time of Hippocrates. (A. Hirsch has provided a survey of such attempts, which were particularly numerous about a hundred years ago, in *Handbook of Geographical and Historical Pathology*. London, 1883, Vol. I, pp. 258 ff.) It is not possible, however, to predict malaria epidemics simply on the basis of probable maxima of rainfall, for to do so is to reduce the complicated process underlying a malaria epidemic to one simple factor: the quantity of anopheles. (I. J. Kligler, who is one of Dr. de Terra's main sources, makes the follow-