shows the bent type of adapter used principally in single cell isolation. It consists of a base (A) made to screw or slip on a manipulator mounting; a piece of 22 gauge hypodermic needle wire (B) 1 inch long bent to less than 90 degrees ¼ inch from its end and sharpened to a bevel; a cup (C) large enough to admit a piece of capillary tubing which will fit over the needle; (D) represents a micropipette. In use the cup may be filled with wax, vaseline or some other sealing substance or it may be empty, depending on the pressure to be exerted in exhausting the pipette of fluid. The pipette is warmed before use and is slipped over the adapter end into the cup. The sealing substance in the cup makes a perfect seal.

The adapter described in Diagram 2 is essentially the same as the one described in Diagram 1 as to dimensions and construction, except that it is not bent at one end but is allowed to remain straight. This type of adapter is used in micro-injection experiments where a relatively large volume of fluid is to be handled. The pipette shank can be made to any length. The pipette must be sealed in with cement or sealing wax to prevent it from turning.

Diagram 3 shows an end view of an adapter and pipette in place. It illustrates how the pipette must be turned to allow the light to strike its tip rather than the metal adapter.

These adapters are made for me by the South Bend Watch Service, South Bend, Indiana, and have been in use for over a year.

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SPECIAL ARTICLES

THE ENERGY REQUIREMENT OF AN ACROMEGALIC GIANT

During the spring of 1933, the author had the privilege of studying the gaseous exchange of a group of pituitary cases who were in Boston on a professional engagement. The results have been reported[1] and showed a marked lowering in the energy requirement of all the dwarfs. The results with the giant in the group (J. E.) were recognized and reported as unsatisfactory at the time of testing. At an earlier date, a measurement had been attempted with this subject elsewhere, using a small portable apparatus, the oxygen content of which was speedily exhausted with somewhat disturbing results. While our own approach utilized the open circuit method with large Tissot containers, a certain apprehension, residual from his previous experience, precluded the attainment of that tranquility essential for accurate measurement. His return to Boston this spring gave opportunity for a repetition of the study under the better conditions of a corrected psychology. While a fairly complete study was again carried out,[2] only the respiratory exchange will be reported here. It may be said, however, that the results of the 1934 studies showed a surprisingly precise correspondence with those of the previous year.

The open circuit method was again used, and the respiratory metabolism was measured by Dr. Thorne M. Carpenter and his associate, Mr. Robert C. Lee, to both of whom it is a pleasure to express my appreciation.

The orienting physical data are given in Table I. The height measurement implies a growth of one inch during the past year, which I am disposed to question. The subject had been spending the winter in the South and was in definitely better physical condition than when previously studied. I attribute his apparent gain probably to a more erect carriage and am supported in some degree by the fact that the span dimension remained unchanged. On the other hand, the sitting height failed to show the increment that would accord with this hypothesis; posture, however, plays a significant rôle in this measurement. The other data show a gratifying concordance.

TABLE I
Dimensions

Datum	1933	1934
Standing height (cm)	228.6	231.1
Span (cm)	236.2	236.2
Sitting height (cm)	110.5	111.2
Index	0.483	0.481
Chest (cm)	124.3	123.2
Waist (cm)	107.0	106.7
Weight (kg)	163.3	162.7
Area (sq. m.)	3.125	3.236

The respiratory data are shown in Table II.

TABLE II
Oxygen Consumption

Datum	1934		1933
Respiratory quotient	0.806 0.800	0.803	0.890
Oxygen, per minute	356.2 cc 358.7 cc	357.5 cc	419.7 cc
Energy, per 24 hours	2,466 Cal. 2,480 Cal.	2,473 Cal.	2,969 Cal.

[1] Rowe, *Jour. Nutr.*, 7 573, 1934.
[2] Rowe and Mortimer, *Endocrin.*, 18: 20, 1934.

The respiratory quotient in 1933 was one of the indices pointing to a lack of basal conditions. In addition, the systolic blood in the present series was 126 mm as against an earlier level of 146 mm, while the diastolic pressure was unchanged at 90 mm. The earlier pulse rate was 78; during the present study, 60 was recorded, a value in harmony with other independent measurements during both sets of observations.

Comparison of the observed rate with our usual prediction standards is given in Table III.

TABLE III

RELATIVE DEVIATIONS

Standard	1934 Pred.	1934 Dev.	1933 Pred.	1933 Dev.
		Per cent.		Per cent.
Harris–Benedict[3]	3,277	−24	3,279	−9
Boothby[4]–Aub–DuBois[5]	3,130	−21	3,110	−5
Average		−23		−7

The present figures demonstrate a frank depression of the basal rate to a level consonant with the subject's known pituitary status.

But one point remains for brief consideration. DuBois[6] called attention a number of years ago to the fact that febrile temperatures cause a definite and rather uniform increase in the oxygen exchange, the coefficient being of the order of + 7.2 per cent. per degree Fahrenheit. During the test of 1933, the subject's oral temperature was 98.6°, while in that here reported, the more characteristic level of 96.8° was observed. Allowance for the temperature difference on the above basis would lower the 1933 average to − 22 per cent. Whether his earlier instability produced an augmentation of temperature, as it certainly did of systolic blood pressure and pulse rate, is a question. Oral temperatures are well known to lack a nice precision as indices of the mean body temperature. Whatever the mechanisms involved, there can be no question but that the present measurements are much more nearly representative of the subject's energy exchange and demonstrate an established level of hypofunction.

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[3] Harris and Benedict, *Carn. Inst. Pub.* No. 279, 1919.

[4] Boothby and Sandiford, *Jour. Biol. Chem.*, 54: 767, 1922.

[5] Aub and DuBois, *Arch. Int. Med.*, 19: 831, 1917.

[6] DuBois, *Jour. Am. Med. Ass.*, 77: 352, 1921.

THE DETERMINATION OF CO_2 IN THE ATMOSPHERE OF A CLOSED SYSTEM[1]

IN a recent note[2] Elizabeth M. Smyth described methods of determining the CO_2 content of an atmosphere in a closed system. These methods were based on the estimation of pH in a solution of $NaHCO_3$ plus a suitable indicator.

The thermal conductivity method offers distinct advantages for determinations of CO_2 content in closed systems, since this method is capable of high accuracy, as well as being both rapid and convenient in use, and it is believed that a brief statement of important references on the method will be of interest to workers in many fields of investigation. The fundamental principles involved are well described in various sources.[3] The method has been applied to the determination of CO_2 concentration in greenhouse atmospheres[4] and has also been used for the analysis of expired air.[5] H. A. Daynes has used the thermal conductivity device for the study of respiration in small insects,[6] and determinations of CO_2 in leaf respiration in the dark and assimilation in the light have been made by J. C. Waller.[7] A further development of the method was used in a research on the effect of manurial deficiency on the respiration and assimilation rates in barley.[8] H. A. Daynes has described a simple experiment in which a seed, such as a bean, is allowed to germinate in a small chamber attached to one tube of a thermal conductivity cell. A steady increase in CO_2 in the chamber is noticeable in a few minutes. If the chamber is immersed in ice, the increase practically ceases, but is resumed as the seed warms up after being taken out of the cooling vessel.[9]

Attention is called to the utility of the method because of its numerous advantages. The absolute accuracy can be of the order of ± 0.01 per cent. of CO_2 in concentrations up to 5 per cent. Readings can be

[1] Communication from the Research Laboratory, Leeds and Northrup Company, Philadelphia, Pa.

[2] SCIENCE, 80: 294, 1934.

[3] P. E. Palmer and E. R. Weaver, Technologic Paper of the Bureau of Standards No. 249, 1924; also "Gas Analysis by Measurement of Thermal Conductivity," by H. A. Daynes, Cambridge Press, 1933.

[4] C. Z. Rosecrans, *Jl. Optical Soc. and Rev. Sci. Instruments*, 14: 479, 1927.

[5] A. K. Noyons, *Arch. Néerland. physical.*, 7: 488, 1933; also P. G. Ledig and R. S. Lyman, *Jour. Clin. Invest.*, 4: 495, 1927; also H. W. Knipping, *Zeits. physikal. Chem.*, 141: 1, 1924.

[6] H. A. Daynes, *Proc. Physical Soc.*, 37: 349, 1925.

[7] J. C. Waller, *New Phytologist*, 25: 109, 1926; also 28: 291, 1929.

[8] F. G. Gregory and F. J. Richards, *Ann. Bot.*, 43: 119, 1929.

[9] H. A. Daynes, *Jour. Soc. Chem. Ind.*, 45: 8, 1926.