

## METHODS

Pulmonary compartment studies were done with the patient sitting and using a modified Benedict-Roth apparatus. The residual volume was measured by a helium dilution method.<sup>4</sup> The maximum breathing capacity was measured in the modified Benedict-Roth apparatus for a 15-second period. In both the maximum breathing capacity and the vital capacity measurements, the largest values obtained were used if successive trials showed no further increment or evidence of learning. Usually three trials were sufficient. All gas volumes have been corrected to body temperature and pressure conditions, saturated with water vapor at body temperature, 37 C. (98.6 F.) (BTPS).

Standard values for the vital capacity were obtained by using the regression equation of Baldwin, Cournand and Richards.<sup>5</sup> The expected residual volume was calculated for each individual, with an attempt to correct for age by using Robinson's<sup>6</sup> data. The two standard deviation ranges obtained by Robinson for the residual volume and the total capacity were accepted as the range of normal values.

Expected maximum breathing capacity values were determined from the regression equation of Baldwin, and associates.<sup>5</sup> A range of normal variation of expected values was estimated from the data of Gray and associates,<sup>7</sup> although their observations were made on healthy young males and females rather than on a hospitalized group. Their values had a standard deviation  $\pm 13$  per cent for males and  $\pm 18$  per cent for females. Assuming a similar variability in the data of Baldwin and associates, we have arbitrarily used 26 per cent of the predicted value (two standard deviations) as an estimated range of normalcy.

Arterial blood was obtained from a radial artery after 2 per cent procaine hydrochloride infiltration. Arterial blood oxygen and carbon dioxide partial pressures ( $pO_2$  and  $pCO_2$ ) were determined in duplicate by the microbubble method of Riley, Proemmel and Franke.<sup>8</sup> Arterial serum and whole blood  $CO_2$  contents and arterial blood  $O_2$  content and capacity were measured by the manometric method of Van Slyke and Neill.<sup>9</sup> The arterial blood pH was calculated from  $pCO_2$  and serum  $CO_2$  by the Henderson-Hasselbach equation. Expired air was obtained synchronously with the arterial blood sample after a one to two-minute washout of the collecting system. The mean alveolar oxygen partial pressure ( $pO_2$ ) was calculated by the alveolar equation, and the alveolar-arterial oxygen partial pressure difference was obtained by subtracting the determined arterial  $pO_2$  from the calculated mean alveolar  $pO_2$ .

The endocrinologic effectiveness of ACTH was measured by the fall in eosinophil concentration in all instances, and by the rise in 17-ketosteroids excretion in most of the cases studied.<sup>10</sup>

## RESULTS

CASE 1 (F. F., P. B. B. H. no OE-649).—Thirty-seven years before this 53 year old patient was admitted to the Peter Bent Brigham Hospital she had pneumonia complicated with pleural effusion. Recovery was allegedly complete, and no further pulmonary symptoms

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6. Robinson, S.: Experimental Studies of Physical Fitness in Relation to Age, *Arbeitsphysiologie* **10**:251, 1938.

7. Gray, J. S.; Barnum, D. R.; Matheson, H. W., and Spies, S. N.: Ventilatory Function Tests: I. Voluntary Ventilation Capacity, *J. Clin. Invest.* **29**:677, 1950.

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10. Metabolic and endocrine observations on patients at the Peter Bent Brigham Hospital were made by members of Dr. Thorn's staff (Drs. T. F. Frawley, D. L. Wilson, and P. H. Forsham). Similar observations on patient L. H. were made by Dr. Fuller Albright's laboratory at the Massachusetts General Hospital.