7. Lilly; John C. 1946. "Studies on the Mixing of Gases Within the Respiratory System with a New Type Nitrogen Meter." (Abstract) Fed. Proc. 5:64

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Studies on the mixing of gases within the respiratory system with a new type nitrogen meter. J. C. LILLY, (introduced by D. W. Bronk). *E. R. Johnson Foundation, Univ. of Pennsylvania.* In studying respiratory processes, the analysis of the role of the gas mixing which occurs in the respiratory passages has been hampered by a lack of experimental methods which can record fast changes in gas composition. In the present study, rapid physical methods were used to record gas volumes (an electrical condenser manometer) and gas concentrations (a nitrogen meter, which photoelectrically records the ultraviolet light emitted by this gas as it flows through a continuously evacuated electrical-discharge tube).

The subject breathes oxygen until the expired gas contains less than 1% nitrogen. While holding an inspiration, he is connected to the recording devices and an air mixture. The record is started on the first expiration and continues during subsequent respiratory cycles. The expiration following the first inhalation of air produces a record which is divided into three nitrogen fraction phases: 1) 70 to 125 cc. of air diluted with water vapor, 2) 100 to 150 cc. of gas with rapidly falling N_2 fraction, 3) the remaining expired volume at an effectively constant N_2 concentration. Phases 1 and 2 are tentatively named "the kinetic deadspace", for an inert gas. Phase 3 gives essentially the same N_2 fraction at the end of both normal and maximal expirations. Phases 1 and 2 are relatively independent of ventilation velocities, and have approximately the same volumes in normal respiration, hyperventilation, and in vital capacity maneuvers. From these records, the kinetic dead space, residual volume, total instantaneous lung volume and maximal lung volume, have been calculated, and were satisfactorily reproducible. [*Work done under contract with the Office of Scientific Research and Development.*]