as does the *t* test. When a pool variance *t* test was applied to the 45 minute PGR scores, the differences between the scores of each drug and placebo were highly significant (P < 1 per cent). An additional study was instituted to determine the correlation of rating scales and the psychogalvanic reflex as a method of evaluating preanesthetic drugs. The same four drugs (hydroxyzine, promethazine, pentobarbital, meperidine) and a placebo were used at three dose levels. Each patient was simultaneously evaluated by PGR changes and rating scales by two independent observers on a double blind basis. The PGR was measured as previously described and six rating scales (eyelid movement, eyelid position, facial tension, bodily movement, breathing regularity, and awakeness) were rated on a 7 point scale as in previous studies. Statistical analysis showed that the PGR and the rating scales, bodily movement and eyelid movement, changed in a similar direction and degree. The correlation was highly significant to the 0.5 per cent level of confidence. Both methods of evaluation showed a highly significant difference between all drug dosages and the placebo. Drug dose curves could not be drawn from this data due to the small groups of patients (five). *Comment:* Additional studies will be made to determine if a dose effect can be demonstrated. There appears to be no way at present to rule out the possibility that the PGR merely shows change in peripheral autonomic reactions due to the drugs tested. Statistically this study shows a good correlation between changes produced by preanesthetic drugs as measured by a machine (PGR) and as measured by an observer.

Effect of Respiratory Obstruction on Brain Size and Motion. HAROLD F. CHASE, M.D., M. A. KILMORE, M.S., and R. M. TOMASELLO, R.N., *Jefferson Medical College, Department of Anesthesiology, Philadelphia, Pennsylvania.* By observing the cerebrospinal fluid pressure and by direct observation of the brain, it has been noted that pulsation of the brain occurs, which corresponds to the rhythm of respiration. A more careful observation showed that the brain moved outward during expiration or increased intrathoracic pressure. In previous work it has been reported that this pulsation was greatly exaggerated during respiratory obstruction and if unrelieved, eventually led to a herniated brain. *Method:* Central arterial, central venous endotracheal, esophageal pressures as well as the electrocardiogram were recorded on a direct writing Grass polygraph. Movement of the brain was recorded graphically on a smoked kymograph and also electronically, using a variable capacitor and the polygraph as the readout instrument. The electronic instrument was developed in our laboratory. In the first group of dogs, inspiratory, expiratory, and endotracheal (combined inspiratory and expiratory) obstruction were produced for 10 minutes each, allowing sufficient time for the animal to recover between episodes. *Results:* The immediate effect of inspiratory obstruction was: (1) exaggerated respiratory pulsations of the brain and (2) a decrease in the size of the brain, which eventually returned to the control size or became herniated if the animal could not compensate for the obstruction. With expiratory obstruction, there was an immediate increase in the size of the brain, in contrast to inspiratory obstruction. After expiratory obstruction was removed, the brain returned to its preobstruction size almost immediately, whereas after removal of inspiratory obstruction, in animals which could not fully compensate, it took much longer time for the brain to return to its preobstruction size. Endotracheal or to-and-fro obstruction caused the widest respiratory pulsations of the brain, and also caused the brain to herniate. After endotracheal obstruction was removed, as during inspiratory obstruction, there was a considerable lag of time before the brain returned to its control size. In all cases, the pattern of the pulsating brain was similar to the pattern of the venous pressure. To see how the intrapulmonary pressure changes produced during obstruction, without hypercapnia or hypoxemia, might affect the size of the brain, experiments were performed using the Bird ventilator. Even a rate of 10/minute with positive endotracheal pressure of 10 mm. Hg produced a significant change in respiratory pulsation pattern of the brain as compared with that of normal breathing. When the ventilation rate is increased there is a slight increase in the mean size of the brain. A higher endotracheal pressure will cause wider pulsation and a simultaneous increase in mean size of the brain. Since hypercapnia and hypoxemia can both be present during obstructed breathing, one could assume that there would be an increased blood supply to the brain. Intravenous dextran was administered to a group of animals to quickly increase circulating blood volume. It was found that infusion of 150 cc. of dextran produced a dramatic increase in brain size. *Comment:* It is suggested that during respiratory obstruction blood is shifted in each cycle to the pulmonary and intrathoracic vessels on inspiration and to the peripheral circulation, particularly to the brain, on exhalation. The amount of blood going to the brain is enhanced in those situations which create hypercapnia.

Determination of Halothane-Ether Ratios by Infrared Spectrometry. JOHN I. DAVIES, M.D., SEYMOUR BAKERMAN, PH.D., M.D., GARETH B. GISH, M.S., STEVEN N. ANGELL, A.B., and EVAN L. FREDERICKSON, M.D., *Division of Anesthesiology, University of Kansas Medical Center, Kansas City, Kansas.* Halothane-ether mixtures form an azeotrope in proportions of halothane 68.3 per cent and diethyl ether 31.7 per cent by volume (Boivin, P. A., Hudon, F., and Jacques, A.: Canad. Anaesth. Soc. J. *5:* 409, 1959; Hall, K. D., Norris, F., and Downs, S.: Anesthesiology *21:* 522, 1960), and gas chromatography will separate the two components. Biological membranes may also differentiate between the two components. The purpose of this study was to ascertain whether a difference could be demonstrated in the proportions of halothane and ether in respired gases during induction of, and recovery from, anesthesia using the azeotrope. *Method:* Samples for analysis were collected as follows: (1) Directly from a Fluotec vaporizer containing the azeotrope and vaporized with oxygen. (2) In a closed system following induction to a moderately deep surgical plane using the azeotrope in oxygen (after minimal thiopental, succinylcholine, topical cocaine and intubation). (3) Following surgery, with oxygen being inhaled, exhaled gases were collected using a Rudolph Anesthesia Valve. Oxygen, nitrogen and carbon dioxide in the samples were removed in a vacuum system by distillation using liquid nitrogen (−195° C.), acetone and dry ice (−79° C.), and ice water mixtures (0° C.). The samples were transferred in the vacuum system to a sample cell path length of 10 cm. and a volume of 200 ml. at known pressures and at room temperature for infrared analysis. The Perkin-Elmer Model 21 double-beam infrared spectrometer with sodium chloride optics was used to analyze the gases in the sample cell. The instrument was calibrated with water, carbon dioxide and polystyrene between 2 and 15 microns. The spectra of ether and of halothane were determined at various pressures. There was at least one prominent band for each compound between 2 and 15 microns wave length that was not overlapped by bands of the other component—3.5 micron band of ether and the 14 micron band of halothane. Optical density concentration curves were constructed for each compound and for the azeotrope using the base-line optical density technique (Heigl, J. J., Bell, M. F., and White, J. V.: Anal. Chem. *19:* 293, 1947). The calibration curves for halothane and for halothane in the azeotrope were superimposed, while those curves for ether and for ether in the azeotrope showed a pressure broadening-like effect. Therefore, the calibration curves for each component in the azeotrope were used as standard references. *Results:* Satisfactory samples were obtained from 6 patients. Results attained by the base-line method of analysis of these samples for determining optical density and interpreted by the Beer-Lambert law show that during induction of anesthesia the ratio of halothane to ether increased from a mean (± S.D.) of 2.39 (± 0.15) to 3.03 (± 0.37). This shows that ether is preferentially absorbed by the body from the azeotrope. During the immediate postanesthetic period, the ratio of halothane to ether is decreased to a mean of 1.68 (± 0.25) and shows that ether is eliminated in a greater proportion than in the original azeotrope. These differences are found to be significant ($P \leq 0.001$) according to the t test. These results demonstrate that bio-