Elimination curves were made for two patients. The shape of the curve indicated that the major portion of the drug was eliminated within the first thirty-five minutes from the termination of anesthesia, which on the electroencephalogram appeared to be relatively deep.

On the basis of the present findings it does not seem to be justifiable to assign definite electroencephalogram patterns to corresponding estimated depths of trifluoroethylvinyl ether anesthesia. The rapidity of action of trifluoroethylvinyl ether made it almost impossible to satisfactorily judge depth of anesthesia by clinical signs. The correlation of blood levels and electroencephalogram patterns more nearly reflected the true depth of anesthesia, but here too there were factors that altered the electroencephalogram pattern so that the true state of cortical activity was not reflected. Some electroencephalogram patterns seemed correlative with trifluoroethylvinyl ether blood levels but further work is necessary to delineate these more precisely.

Studies of Two New Potent Analgesics: Anileridine and Dihydrocodeine. ARTHUR S. KEATS, M.D., J. TELFORD, M.D., AND Y. KUROSU, M.D., Department of Anesthesiology, Baylor University College of Medicine, Houston, Texas.

ANILERIDINE dihydrochloride, a substituted meperidine (aminophenylethyl meperidine), was compared to meperidine (50 mg. intramuscularly) and dihydrocodeine bitartrate was compared to morphine (10 mg. subcutaneously). Analgesic potency was determined by the method described by Keats, Beecher, and Mosteller (J. Appl. Physiol. 1: 35, 1950). The effects on respiration were determined in normal subjects in whom alveolar ventilation and end-tidal carbon dioxide tension were measured simultaneously before and after drug administration, both on room air and 3 to 4 per cent carbon dioxide inhalation. The frequencies of various subjective drug effects were determined in surgical patients on the day before operation.

Forty milligrams of Anileridine was found to be the analgesic equivalent of 100 mg. of meperidine. Fifty milligrams of Anileridine exceeded 100 mg. of meperidine in analgesic potency. At 40 mg., Anileridine depressed respiration as much as 100 mg. of meperidine. However after 3 hours, respiration had returned to control levels following Anileridine whereas respiration remained depressed following meperidine. Two groups of surgical patients (40 in each) received either Anileridine (50 mg.) or meperidine (100 mg.) intramuscularly. Qualitatively Anileridine produced all the subjective effects of meperidine including nausea, vomiting, and itching. However sedative effects were less common after Anileridine and fewer patients found the psychic effects of Anileridine to be pleasant.

Dihydrocodeine (30 mg.) was only 9 per cent less effective than morphine (10 mg.) in relieving postoperative pain. At this dose respiration was only slightly depressed at one hour following drug administration and not depressed at three hours. At 30 mg. the subjective effects of dihydrocodeine were more similar to that of a placebo than to morphine (30 patients in each group). The incidence of nausea and vomiting following dihydrocodeine was not greater than that following a placebo. Sixty milligrams of dihydrocodeine was found to be the analgesic equivalent of 10 mg. of morphine. However at this dose, respiration was depressed almost as much as following 10 mg. of morphine. Ninety milligrams of dihydrocodeine produced no greater analgesia than 60 mg. Dihydrocodeine was unable to exceed the analgesia of 10 mg. of morphine in these doses.

An Infant Pneumotachograph. BENTON D. KING, M.D., AND STANLEY JAMES, M.D., Departments of Anesthesiology, State University of New York at New York and Columbia University College of Physicians and Surgeons, New York, New York.

PROBLEMS encountered in the measurement of respiration of the newborn infant are related primarily to the subjects's lack of cooperation, small tidal volume and lability of respiratory pattern. Measuring apparatus must of necessity incorporate light weight, small dead space, low inertia and minimal resistance. These demands have been fulfilled by various modifications of the Silverman child pneumotachograph mask.

The instrument consists of a light plastic face piece with two 0.28 square inch Monel® metal screens (400 mesh) lying parallel over the breathing aperture. An annular manifold for sampling the pressure drop across the outer screen was placed between the two. As in any conventional pneumotachograph, a screen (in this case the outer) was provided to create a slight fixed resistance to the flow of respired air. Varying the angle at which gas impinged on this screen was found to produce inconsistent calibration for known flows. The inner screen was added to convert turbulent expired air into a laminar pattern before presentation to the outer recording screen. With this innovation, a linear response for flows well beyond those encountered in the infant could be obtained regardless of the incident angle of the gas stream.

The dead space has been reduced to less than 4 cc. by employing a very shallow mask and using a silicone plastic material (Sili Putty®) as the mask seal, instead of an inflated rubber ring. This substance proved excellent protection against leaks, held the mask closely to the skin without pressure being applied, and removed the necessity of fixing the mask with head straps. The effect of the dead space could be further reduced by introducing a steady flow of air or oxygen of up to 1000 cc./minute through a side tap in the mask. The volume of inspiration and expiration was not changed by this added steady flow, the effect being merely to change the baseline of the record. The unit as described had a resistance of 0.21 mm. H_2O/liter/minute. At an 8 liter-minute flow rate, the resistance was 1.7 mm. H_2O, a flow rate above that usually encountered in the infant at rest. For comparison, the resistance of a laboratory wet test gas meter, a type which has been used for measurement of infant respiration, was 15 mm. H_2O at the same flow rate.

This pneumotachograph mask has been designed to permit measurement of tidal volume and velocity of air flow during studies on neonatal respiration and infant resuscitation. The design can be modified for use in anesthesia circuits by the addition of a second manifold and valves for inspiration and expiration. Low resistance will be sacrificed by the use of valves, but the small dead space will not be appreciably altered.

Acute Effect of Low-Flow Extracorporeal Circulation on Cerebral Physiology. JAMES H. MATTHEWS, M.D., J. J. BUCKLEY, M.D., AND F. H. VAN BERGEN, M.D., Department of Anesthesiology, University of Minnesota School of Medicine, Minneapolis, Minnesota.

THE simplified bubble oxygenator system developed for direct vision intracardiac surgery has been used to perfuse more than 140 patients at blood flow rates significantly less than normal cardiac output. When the electroencephalograms of these patients were compared with those reported in the literature, they appeared similar to patterns observed during hypocapnia, hypoxia, hypotension, and analagous circumstances. This investigation was begun to determine if these conditions exist during low-flow extracorporeal circulation.

Only data collected from 27 acyanotic patients with ventricular septal defects will be presented. This group includes patients between 8 months and 38 years of age. Following cyclopropane or thiopental-flaxedil® induction, anesthesia was maintained with thiopental-flaxedil®-nitrous oxide until the perfusion began. No anesthetic was given during the perfusion. Occasionally 50 per cent nitrous oxide was required to facilitate chest closure. Electroencephalograms were recorded periodically before the perfusion, continuously during the perfusion, and intermittently thereafter.

After performing a bilateral, sternal splitting thoracotomy, the surgeon isolated the left subclavian artery, and sacrificed the vertebral artery on that side. The scalp electroencephalogram electrodes usually were placed on the left side of the head. The subclavian artery was catheterized to provide an inflow tract from the oxygenator to the aorta. At this point the electroencephalogram indicated that, irrespective of age, there was an early stimulation and then a decrease in the frequency and the amplitude of fast (a and b) activity. Slow wave forms (c and d) appeared in tracings that previously had