

cerebrospinal fluid pressure increased from 64.24 mm.  $H_2O$  to 225.41 mm.  $H_2O$ . Results from experiment two, showed the following: arterial pH changed by only .05 units;  $P_{CO_2}$  increased from 29.9 mm. Hg to 56 mm. Hg; no significant change in arterial blood pressure; no significant change in cerebrospinal fluid pressure. The results from experiment three are significant. Signs of progressive hypercapnia were noted to occur during the untreated apneic oxygenation; however, they were reversed during the treated apneic oxygenation. The pH which had decreased to 6.98 returned to 7.38  $P_{CO_2}$  decreased from 139.6 mm. Hg to 78.6 mm. Hg; mean arterial blood pressure decreased from 164 mm. Hg to 146 mm. Hg; cerebrospinal fluid pressure decreased from 133 mm.  $H_2O$  to 57.64 mm.  $H_2O$ . In view of our observations we believe that THAM may have a clinical value in counteracting one of the acute deleterious effects of progressive hypercapnia; namely, an increased cerebrospinal fluid pressure.

**Audio-Visual Demonstration of the Fetal Heart Beat.** PETER G. LEHNDORFF, M.D. *Department of Anesthesiology, Burbank Hospital, Fitchburg, Massachusetts.* The instrument for the audio-visual demonstration of fetal heart beats, previously described (*Anesthesiology* 19: 104, 1958), has been considerably improved. The audiomonitor has been made simple, compact, sparkproof and sufficiently sensitive to be of considerable use. ECG and EEG methods for monitoring fetal heart beats, while more valid, are not practical for smaller hospitals; and audio-monitoring has become our method of choice. The monitor now consists of: (1) a transistorized, battery driven (4 v.) pre-amplifier-amplifier, which "clips" soundwaves, eliminates treble sounds, and suppresses (to a large extent) bowel sounds, maternal heart-sounds and other random noises; (2) two microphones, one for location, the other (light and sensitive) remains taped to the patient; (3) a loud speaker or earphones and a needle indicator for audio-visual "reading" of the signal; (4) an electronic pulse-counter to facilitate counting high pulse rates. The instrument has been useful in: location of heart sounds not heard with the stethoscope, observation during contractions, demonstration

of changes of fetal heart beat during contraction and their improvement during oxygen inhalation by the mother. Using this monitor, severe irregularities in fetal heart beat were discovered which made possible changes in obstetrical management so that 2 cesarean sections were done in time to save the distressed infants. In most cases the monitor was used to attract attention to changes which were usually confirmed by more standard means. Plans for further development include: a recording device for making permanent records, elimination of forceps noise, and simultaneous monitoring of mother and unborn child. [Sponsored by Worcester North Chapter, The Massachusetts Heart Association. Equipment furnished by E. & J. Manufacturing Company.]

**Measurement of Electrical and Mechanical Events of the Cardiac Cycle During Halothane Anesthesia.** DAVID M. LITTLE, JR., M.D., AND JAMES B. GIVEN, M.D. *Department of Anesthesiology, Hartford Hospital, Hartford 15, Connecticut.* Most previous observations of the effect of anesthetic agents upon cardiac activity have been concerned primarily with two aspects of cardiac activity, output or rhythm. The present study was designed to investigate some of the other effects of halothane (Fluothane) anesthesia upon the heart by measuring the relationship between certain of the electrical and mechanical events of the cardiac cycle. Simultaneous records of the electrocardiogram and phonocardiogram, and of the electrocardiogram and the carotid pulse tracing, were obtained on a Sanborn Twin-Beam photographic recorder. The following time intervals were then measured from the recordings: (1) Q wave to first tone (electrical ventricular systole); (2) first tone to carotid pulse rise (approximate isometric contraction period); (3) Q wave to carotid pulse rise (indirect isometric contraction period); (4) first tone to second tone (mechanical ventricular systole); and (5) R-R' interval (heart rate). Control records were taken on 10 normal, healthy female patients following pre-medication for pelvic surgery, and repeat records were taken towards the end of operation during nitrous oxide-halothane anesthesia. Halothane was administered from a Fluotec vaporizer in concentrations of 0.7-1.5 per cent