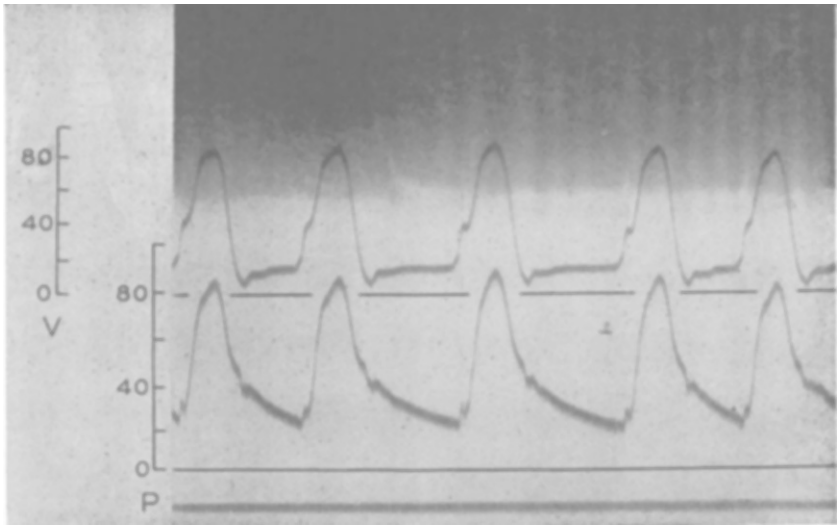

FIG. 3.
Simultaneous tracings in the right ventricle (upper) and in the pulmonary artery (lower) in a case of rheumatic valvulitis with hypertension in the lesser circulation. Note (a) the identity of form and pressure of both tracings during the later part of systole; (b) the small simultaneous oscillations on both tracings during early systole and diastole, presumably due to motion of the catheter in the heart.

Summary. 1. Simultaneous blood samplings and pressure recordings in 2 continuous segments of the circulatory system may be obtained in man by means of a specially designed double-lumen catheter. 2. The difference in oxygen content of 2 blood samples withdrawn simultaneously from 2 points located 10 cm apart in the right auricle and right ventricle was well within the limits of technical error in 8 out of 9 cases. 3. Examples are given of the recording of simultaneous mechanical events in (a) the right auricle and ventricle, (b) the right ventricle and the pulmonary artery.

15096

Simultaneous Registration of Intrathoracic, Right Intracardiac and Systemic Pressure in Man.*

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Study of the right intracardiac pressures in human subjects, by a technic previously described,[1] has yielded data, for the full interpretation of which a simultaneous record of

* This investigation was carried on under a contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and Columbia University, with the collaboration of New York University.

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1 Cournand, A., Lauson, H. D., Bloomfield, R. A., Breed, E. S., and Baldwin, E. deF., PROC. SOC. EXP. BIOL. AND MED., 1944, **55**, 34.

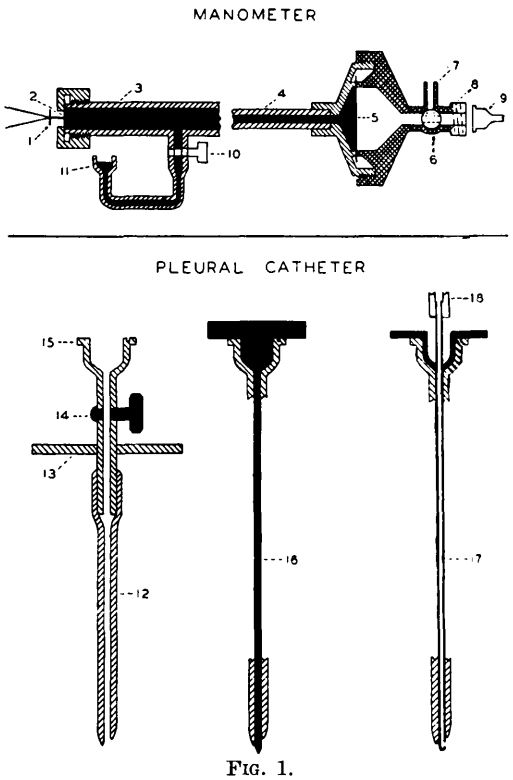

FIG. 1.
Diagrammatic Sketch of the Intrathoracic Pressure Recording System

1. Mirror. 2; Front membrane; 3. Capsule; 4. Lead tubing; 5. Rear membrane; 6. Three-way stopcock; 7. Side arm to calibrating mercury manometer; 8. Adaptor for pleural catheter; 9. Taper of pleural catheter; 10. Side-arm valve in capsule; 11. Water reservoir; 12. Pleural catheter; 13. Flanged metal joint; 14. Valve; 15. Taper of catheter; 16. Solid stylet; 17. Hollow stylet; 18. Connection to water manometer of pneumothorax apparatus.

the intrathoracic pressure is highly desirable. This is particularly true in the investigation of the circulation through the right heart under conditions of unusual respiratory effort, or in the presence of abnormalities of the pulmonary circulation.

With the method described below, continuous records of the intrathoracic pressure cycle, synchronous with the records of the right intracardiac pressure pulses, have been obtained in 6 cases. In most of these, the femoral arterial pressure was simultaneously registered. The electrocardiogram was routinely taken as a part of the study in all instances. The technic employed for recording the intrathoracic pressure was as follows:

A modification of the Hamilton manometer[2] was designed, which uses a wider mirror-bearing membrane to allow greater sensitivity. The fluid-filled lead tubing leading from the capsule is closed, at the end nearest to the patient, by a wide membrane of heat-treated beryllium copper, 0.0009 inches thick and 2.5 cm in diameter, the function of which is to prevent contamination of the pleura with fluid. The membrane is held in place by a knurled nut of conical shape, hollow within, which terminates in a 3-way stopcock. One opening in the stopcock is connected with a mercury manometer, to permit calibration. The other opening is adapted to fit a specially designed pleural catheter. Because of the effect of varying environmental temperatures upon the internal tension of this sealed system, a side-arm valve, connected to a small water reservoir, is inserted into the capsule to permit repeated equilibration with the atmospheric pressure.

The pleural catheter consists of a short segment of No. 9F cardiac catheter, with smooth rounded end and an opening of suitable size at the intrapleural extremity. The opposite end is fitted to a flanged metal joint, which contains a stopcock, and which is tapered to permit air-tight fitting to the manometer by a simple rotary motion of the flange. A sharp-pointed solid stylet is inserted into the saline-moistened catheter for penetration of the outer chest wall; this is then replaced by a blunt-ended hollow stylet for puncture of the pleura. The second stylet is connected to the water manometer of a pneumothorax apparatus for immediate detection of entry into the pleural space. As soon as this is accomplished, the stylet is withdrawn far enough to permit closing the valve in the catheter, after which it is completely withdrawn. The catheter is then attached to the recording manometer, and the valve opened. Further manipulation is governed by inspection of the motion of the recording light beam. With sufficient novocaine infiltration of the site of the chest puncture, the catheter has been left in place without undue discomfort

2 Hamilton, W. F., Brewer, G., and Brotman, I., *Am. J. Physiol.*, 1934, **107**, 427.

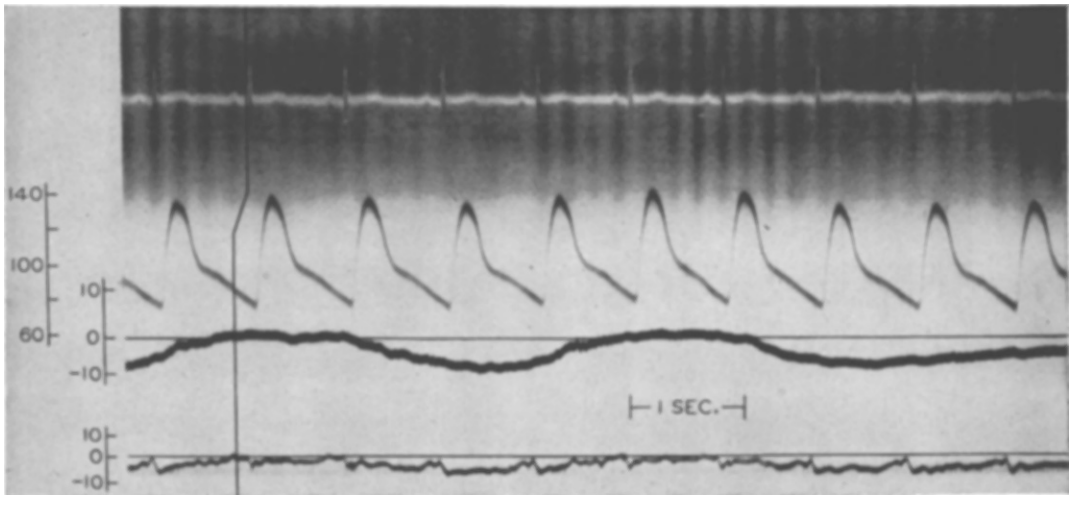

FIG. 2.

Femoral arterial pressure (upper curve), intrathoracic pressure (middle curve), and right intraauricular pressure (lower curve, retouched to improve contrast) from a patient with a recently-induced therapeutic pneumothorax. The respiration is somewhat deeper than normal. In this and succeeding figures, zero intracardiac pressure is taken as the hydrostatic level 5 cm below the angle of Louis. All scales represent mm of mercury.

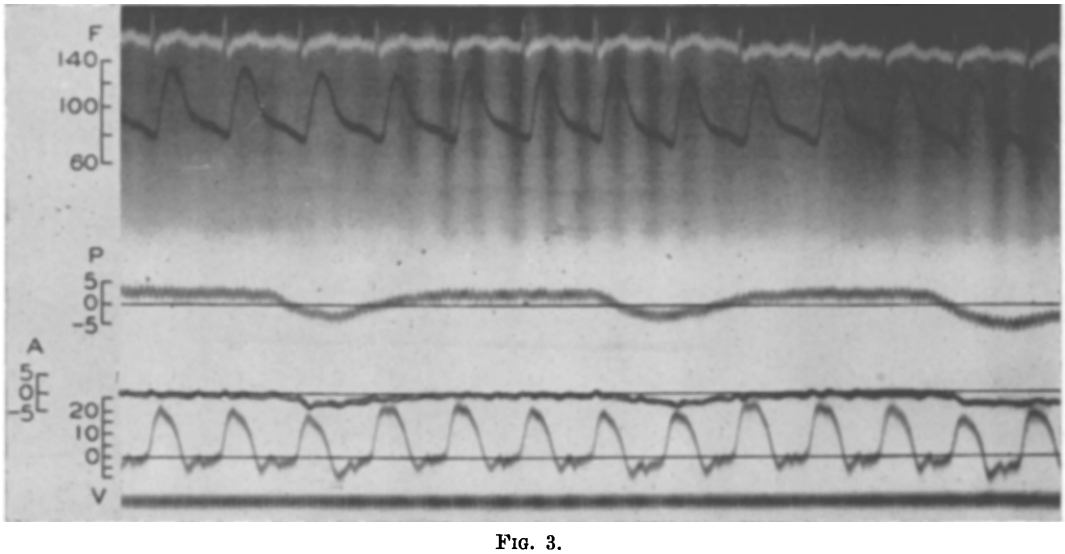

FIG. 3.

Intrathoracic pressure (upper curve), right intraauricular pressure (middle curve, retouched) and right intraventricular pressure (lower curve), from another patient with recent pneumothorax. The simultaneous recording of pressures from both chambers of the right heart was done through a double-lumen catheter.[3] The 3 sharp rises of intrathoracic pressure are due to 3 coughs.

for as long as 4 hours. The frequency of this recording system is about 25 vibrations per second, with a sensitivity of approximately 1.3 mm per mm of mercury pressure. The length of the optical lever is about 6 feet.

Summary. A method is presented for the optical recording of intra-pleural pressure

[3] Cournand, A., Bloomfield, R. A., and Lauson, H. D., PROC. SOC. EXP. BIOL. AND MED., 1945, **60**, 73.

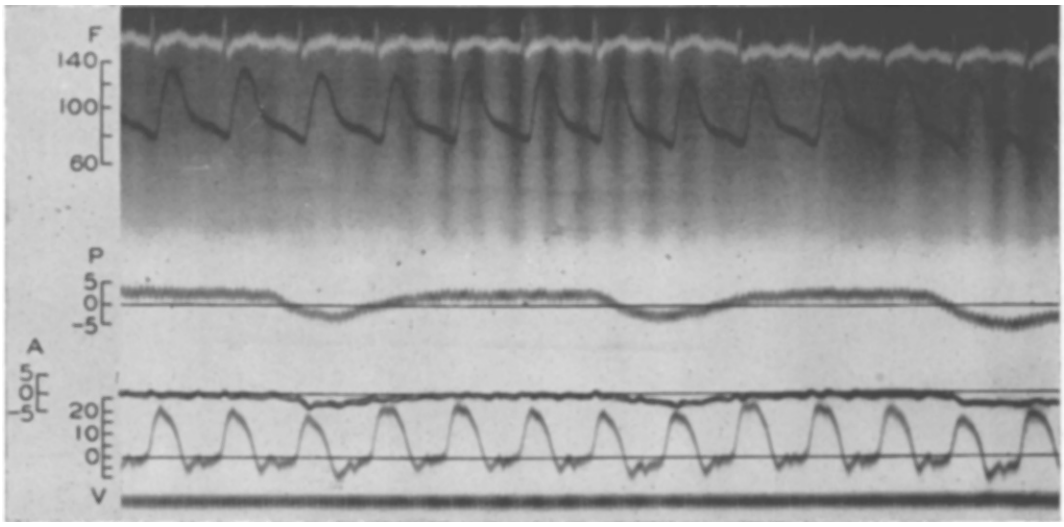

FIG. 4.
From above downward, femoral arterial, intrathoracic, right intraauricular (slightly damped) and right intraventricular pressure records from the same patient as in Fig. 3, recorded immediately after 500 cc of air had been injected into the intrapleural space. Respiration is quiet.

simultaneously with right heart pressure changes, utilizing the intracardiac catheterization technic in conjunction with a specially designed recording manometer and pleural catheter. Reproductions of several tracings are shown.

15097 P

Horizontal Intracortical Organization in the Cerebral Control of Limb Movement.*

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It has been widely assumed in theories of brain function that horizontal spread of excitations through the cortex is an important factor in cerebral integration. Not only the irradiation of discrete neural impulses through the fiber feltwork of the cortex, but also the mass conduction of intercellular electrical currents and potentials and the establishment of patterns of "field forces" spreading across the cortex have been presumed to play integrative roles of utmost importance in cerebral organization. The following experiments, however, undertaken to test the influence of such horizontal intracortical organization in the control of limb coordination have failed to demonstrate the existence of any major organizing influence of the sort. Lesions in the cortical arm areas of the monkey (Macaca mulatta) designed to disrupt any patterns of horizontal intracortical

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