ministering to a pregnant woman, or causing or procuring to be taken by her, any drug, poison, substance or noxious thing, or unlawfully using or causing to be used any instrument or other method whatsoever, with intent to procure or cause an abortion."

The statutes on this subject recognize the right of a physician to produce an abortion in the interest of the mother. The question arises: Should this right be exercised? Without undertaking to discuss the various conditions under which the exercise of this right might be considered, the broad proposition is laid down that the occasions on which it would become imperative to sacrifice the life of the child to save that of the mother are extremely rare. With the two great resources of rectal alimentation and Cesarean section at command, it is believed that practically every pregnancy can be safely carried to a point at which the life of the child may be saved. The methods and means of maintaining nutrition by rectal alimentation have been so perfected that the production of abortion, or of premature delivery, for gravid nausea should rarely or never be required. At all events, by this resource the woman ought to be carried to the point of certain viability of the child before premature delivery is resorted to. For deformed pelvis surgery, with its tremendous advances in skill and technique, offers in Cesarean section a resource for saving the life of the child, and at the same time of jeopardizing to such a small degree that of the mother, that it should be universally employed in such cases. Dr. L. L. Hill, a surgeon of distinction in my state, and fully informed on these questions, furnished me recently the following statistics applying to Cesarean section: "1. Zweifel performed 76 Cesarean sections with 1 death. (J. Whitridge Williams, professor of obstetrics in the Johns Hopkins University, 1903.) 2. In 1903 J. Whitridge Williams collected the reports of 335 cases of Cesarean section by various operators, with a mortality of 6.87 per cent. 3. Not a single death of a mother occurred in 11 Cesarean sections recently performed at Johns Hopkins Hospital. 4. The mortality in Cesarean section should be about the same as that resulting from operations for simple ovarian tumor."

Without pursuing this discussion further, I submit to this Section the following propositions, and invite an expression of judgment thereon, not only by the individual members, but by the body:

1. The conjunction of male and female germs constitutes, from a scientific standpoint, birth.

2. The term conception should be abolished and that of birth substituted therefor.

3. In dealing with all stages of pregnancy, even the earliest, physicians should realize the extreme gravity of the condition, and should never condemn to death a fetus, however young, without the maturest consideration, and without calling to their aid the highest professional authority within reach; in a word, without carrying the case to the nearest and wisest medical supreme court accessible.

4. The principles herein contended for should be impressed on the members of the profession, taught to medical students and promulgated widely among the people.

5. Medical men should interest themselves to see that the statutes of their respective states are ample for the protection of the *fetus in utero*.

DISCUSSION.

DR. H. O. MARCY, Boston, said that his opinions correspond with those of Dr. Sanders. He believes that the conclusions

should be emphasized most positively. A physician may induce an abortion because he believes that the life of the mother is more valuable than the life of the fetus, but he should try to conserve the life of both to the best of his ability.

DR. W. H. SANDERS declared that it was not stated in the paper that abortion should never be brought about, but that it should be the result of very mature consideration and after consultation with the highest and wisest and most experienced authorities within reach.

STUDIES IN ROENTGEN RAY DIAGNOSIS OF CHEST DISEASES.

JAMES E. TALLEY, M.D.

AND

WILLIAM S. NEWCOMET, M.D.

PHILADELPHIA.

I.

The use of the Roentgen ray as an aid in the diagnosis of chest diseases has by no means received the attention that it justly merits. No doubt its neglect has been principally due to the fact that the expense is still a factor, and at the same time the danger from burns, which lately has been so grossly magnified, has deterred many who would have otherwise given their sanction, if not direct co-operation.

When the x-ray first came to be used, it seemed as if it was to be generally adopted for routine examinations in diseases of the chest, mainly through the use of the fluoroscope, but during the excitement many methods of examination were advised that consisted of so much detail that it served more to repel than to at-

tract those who were only passively interested. For instance, methods were advised to measure the density of pulmonary consolidations by such means as graduated metal scales, of different sorts, i. e., one layer of metal superimposed on another, different thicknesses of wire, or different sized perforations in a sheet of metal, and it was soon found that the personal equation was such a great factor that, generally speaking, they were found to be useless, and we hear very little about them. Besides the element of personal equation, other facts entered into the cause of error by the use of such apparatus.

The fluoroscope itself was soon found to be a rather fickle instrument. This was caused in the most part by its degeneration, or variation in the salt from day to day. At the same time the variation of the *x*-ray tube, darkness of the room, the length of time the examiner has allowed his eyes to become accustomed to the darkness, etc., all enter into the cause of error, if not most minutely considered.

But as this field became more developed, it was found that the minute definitions were best studied from the radiograph, and these must be made by an exposure of a few seconds, or else the movements of the chest will destroy all that is to be gained. These are best made without the use of intensifying screens, as they also tend to destroy detail.

Previous to the introduction of these rapid plates it was found that we could study greater detail in the chest with the fluoroscope, and at the same time it was well known that it was an easy matter to overlook a fracture of a bone with this same instrument; this was easily explained by the fact that the fluoroscope lacks minute definition, and when it was necessary to expose a chest five or ten minutes for a picture we obtained even less detail. Yet the fluoroscope still has some use, for even from the best plates, with all possible technical imperfections eliminated, we are unable to study the movements of the different organs and their modifications in disease; at the same time we can not obtain a view of the parts from several different positions in rapid succession, and these points alone open up a field which give a great degree of usefulness.

The objection to the use of the fluoroscope is the risk of burn, and this must be carefully considered and the greatest precaution must be taken for both patient and physician. The former is likely to be given an acute burn, which is by no means agreeable, while the latter is more likely to suffer from what might be termed a chronic burn, which is more insidious and less active, though in the end the result is likely to last a lifetime, if not to terminate the existence of the individual.

To obviate this accident, we have devised a simple screen for the protection of the operator, and at the same time it is used as a recording apparatus. The screen is made of wood in three sections, each section about 24 inches wide and 6 feet high. These hinge together with the ordinary L hinges, so they can be taken apart for convenience and stored. Each section is made to hook rigidly at right angles with its fellow; thus if a fourth side was added it would form a square-shaped pyramid. By leaving one side open the patient can easily be placed in position or removed as desired. Two sides of the screen are covered with metal; thin sheet lead is best. In one is a movable window for the fluoroscope; and it might be here stated that the fluoroscope should be large enough to give a shadow of the whole chest without being moved. Small fluoroscopes

are useless and even dangerous. The third side is not covered with metal, but simply with black paper to enclose the *x*-ray tube and thereby lessen the light in the room, and at the same time to act as a frame for measurements and plumb lines used for centering the *x*-ray tube. The fact that no metal is on this side lessens the danger for puncture. The side directly opposite has the frame for the fluoroscope adjustable for different positions, depending on the patient's condition. Over the fluoroscope is placed a piece of plate glass, which is transparent to light rays, but blocks the *x*-ray to a great extent. At the same time it serves another purpose, in protecting the screen from being scratched by the point of the pantograph, which is used for recording the conditions as they exist. The pantograph is firmly attached to the same side of the screen on a soft piece of wood, so that paper can be easily placed under the pencil by a few thumb tacks. The tracing on the glass over the fluoroscope will be thus easily recorded, about one-sixth its natural size, which is very convenient for records. It is best to have this instrument attached to the side, not to the protecting connecting side, as it will lessen the danger of the operator's coming in the range of the active ray.

To minimize the amount of danger to the patient a cardinal rule must be adopted not to expose the body to the ray longer than is consistent with a thorough examination and not to re-examine at too close range; second, to use only enough energy to penetrate the body, which is much less in a dark room than in one only semi-dark, and at the same time the eye must be accustomed to the darkness; third, to keep the *x*-ray tube at least a foot from the body, and 18 inches is still better. Besides lessening the danger of burn, there is also less distortion of the shadows on the screen. Unfortunately, in heavy subjects it will be found that 18 inches is too far away for a good penetration. The use of a large fluoroscope that will cover the whole chest is here again explained.

II.

Though we have examined a considerable series of cases, a large proportion of which Dr. Musser has put at our disposal from both his ward and his private practice at the Presbyterian Hospital, we do not claim to add anything to the general principles and findings as set forth by others in the same field. We simply wish to add our testimony as to the usefulness of this means of diagnosis in thoracic diseases, to mention our simple means of securing records of fluoroscopic shadows, which Dr. Newcomet has described and pictured above, and to refer to a few cases where this method has shown its superiority either in point of time or precision, or both.

The drawbacks to the fluoroscopic work are the necessity of doing it at night to insure a sufficiently dark room, and the pavillion system of hospital construction, which renders difficult or impossible the examination of many acutely ill patients. The Roentgen examination must be considered a supplementary means of diagnosis and its findings interpreted solely in connection with the data obtained by the history and all other means at our disposal. For instance, a shadow showing involvement of a part of one lung may mean tuberculosis, pneumonia, pleurisy, loculated effusion or new growth, and only the history of the case and the other means of diagnosis enable us to say definitely which it is. Thus used, it will put inspection on a level at least with percussion in pulmonary disease. In fact, inspection,

as represented by both fluoroscope and skiagraph, when brought into direct contrast with percussion, in many conditions appears to us to have a decided advantage. It is but the outcome of the higher development of the sense of sight, as compared with the sense of touch, in the ordinary individual. A pneumonia or tuberculosis beginning deep in the chest may be revealed by the x-ray examination before other signs and symptoms are conclusive. A not infrequent type of case is like the following: A woman of 30, anemic looking, troubled with cough and recurring diarrhea, was examined by us. Her general appearance, the cough and the family history strongly suggested tuberculosis, but there was no sputum in which to seek tubercle bacilli and no evening fever. A systematic examination of the chest on two occasions by the ordinary means gave no satisfactory evidence of consolidation, and it seemed necessary to accept the enteritis as probably the only cause of the trouble so far; but it failed to explain the cough satisfactorily. The Roentgen examination with the screen at first showed only a suspicion of a darkening at the level of the inferior angle of the left scapula. Three weeks later, on her return from an outing, this area had increased and was now recognizable by compression and auscultation. In her case the x-ray gave a clue to the spot on which to center the attention before the examiner had been keen enough to light on it by other means.

About a year ago, when typhoid was rather prevalent, a girl of about 18, whose mother had a fibroid process in one lung and whose brother had had incipient tuberculosis, developed a moderate fever after feeling more or less ill for two weeks. A quick and definite decision was imperative, as a journey to the South Pacific had been arranged and the time for sailing was at hand. All known means of differential diagnosis were used except the Roentgen, which, in the light of later experience, would probably have been the most useful. Largely because of the strong family predisposition and the failure of any further typhoidal symptoms to develop, she was allowed to sail. On her return, as she had not gained, and as the right upper lobe now showed slight jerky inspiration, she was subjected to the Roentgen examination. The number of enlarged lymph glands lying beside the middle shadow, which were evident even on the screen, showed at once where the trouble was from the first, and had we used the x-rays at that time we should probably have sent her off with less misgiving. In fact, the detection of enlarged mediastinal glands has seemed to us one of the most useful provinces of the x-ray. In children it is specially applicable because of their thin chests, though we have used both skiagraph and skiagram successfully and frequently with adults. In no class of cases has it served us better than in making an early diagnosis of secondary involvement of the mediastinal glands coming on after the removal of the breast for carcinoma. Within a few weeks in two quite corpulent women, each of whom had a breast removed less than two years ago, by means of skiagrams, we have been able to give a positive diagnosis at a time when the only symptoms were apprehensive nervousness, some pain and slight dyspnea. That we were right the further history is unfolding. At present one case has some facial cyanosis, and the glands of the other are evident to percussion now that we know where to seek most carefully. In Hodgkin's disease we have been able to detect by both screen and skiagram the continuation of the enlarged glands of the neck into the thorax.

As said before, in acute diseases like pneumonia, we have not been able to examine cases as a routine measure. However, a method which presents to the eye both the shadow and the extent of consolidation both before and long after it is discernible by auscultation and percussion, and which alone shows the impaired movement of the diaphragm, is specially serviceable in atypical cases like central and senile pneumonia.

In pleurisy with effusion, the revelation to the eye of the dark shadow with its movable level, the displaced heart and the blotted-out diaphragm on the affected side, must add precision to the diagnosis.

Dr. John M. McLean has very kindly just furnished us a case of new growth of the thorax in a young man for examination. The case had been diagnosed by several physicians at first as pleurisy with effusion, as the signs were typical of that condition. The Roentgen examination gives a picture like a large effusion, with wide displacement of the heart. Two points differentiate it from diffusion. First, at rest the dark shadow at the right continuous with the heart gradually decreases in density toward the left. Second, on full inspiration the mass lights up irregularly, one or two areas being quite translucent.

As an example of the usefulness of this method in the exact location of pathologic lesions, we may cite a case of interlobar empyema following pneumonia, which we were able definitely to locate as lying posteriorly between the right upper and lower lobes.

Nowhere does the screen give livelier satisfaction than in the study of the heart and great vessels of the thorax. Here the fluoroscope shows the living, pulsating organ, while the skiagraph reminds one of a composite photograph, the sharpness of outline being lost because of the movement of pulsation. This is lessened in the instantaneous skiagraph, but the screen alone will show us the moving heart. The shape, size and position of the heart we have been able to determine by the skiagraph in at least two cases where the muscular development was so tremendous as to prevent entirely the casting of a sufficiently distinct image in the screen. In these cases, both men, the marked muscularity as well as fat; made percussion and even auscultation of comparatively little use. The absence of shadows suggestive of aneurism, and the normal position of the heart, with greatly increased transverse diameter, taken in connection with the history of the case, made dilatation due to excessive exercise the most probable explanation of the dyspnea and arrhythmia. The examination of the heart by the screen after outlining it by percussion shows the relative limitation of percussion and reveals the greater accuracy of the outline made by the pantographic arrangement above described. Since the heart lies comparatively near the screen, the shadow is relatively accurate, and any increase or decrease in size or change in position can easily be recorded by pantographic tracings at intervals, the technic being constant.

A neurotic young woman from Dr. Mitchell's service was referred to us for examination by Dr. Cornell. There was a history of spells of dyspnea at intervals, which seemed too genuine to be considered simply hysterical. The heart when examined by the usual methods showed only a pulmonic systolic murmur, which was considered functional. There was nothing in the pulmonary, cardiac, renal or blood examinations to explain the attacks. The fluoroscope showed the small-

est heart that we have ever seen in a woman of her weight and physique. Evidently it was a case of congenital hypoplasia. There was enough cardiac energy for existence, but no reserve for the requirements of an ordinarily active life. That anyone would have diagnosed the condition satisfactorily by percussion we doubt. The form of the heart in the organic lesion takes a certain type in one's mind. The wider transverse diameter of the mitral lesions and the elongated shadow of the aortic lesion are really reducible to definite diagrams. The constant darkening of the pulmonary reflex in mitral disease as compared with aortic disease is a diagnostic point between the two conditions. The obstructed pulmonary circulation is the cause. The distended right auricle would come into prominence more often were it not for the fact that in just the conditions where it is most overfilled (except emphysema) the pulmonary shadow is deepest and obscures the auricle. A rather thin boy of ten years afforded us the most prominent left auricle that we have seen. The lesion was evidently mitral insufficiency, but the fullness of the left auricle and the depth of the sulcus between auricle and ventricle we had never seen so marked before both in skiagram and on the screen. A natural deviation of the heart, as well as an over-filled auricle must have been the explanation, as in mitral disease ordinarily no such marked auricular shadow was seen. Changes in position of the heart could not be better demonstrated than in some four cases of mitral diseases with secondary tricuspid insufficiency and enlarged left lobe of the liver. The lateral enlargement of the heart was conspicuous, but the wide change toward a horizontal position supported by the diaphragm and left lobe was remarkable. That the so-called apex could be so far displaced as to cause a diffuse pulsation well up toward the axilla and beyond the anterior axillary line could be understood when a goodly part of the left ventricle was seen to strike the thorax wall at each beat. With the recovery of compensation under rest and digitalis the heart assumed again more nearly the vertical position on full inspiration.

The number of aneurisms at our disposal has been small, but their fluoroscopic study helpful. In at least two cases we have noted an unusual projection to the left of the descending part of the arch of the aorta. They suggested dilatation of the aorta or small aneurisms, though there were no reasons for suspecting either. In one case the thorax was normal, in the other there was fibroid tuberculosis of the right upper lobe. A possible explanation is that the solidified lung offered less opportunity for the vessels to sink into its substance in inspiration. They interested us as illustrating that the part of the descending aorta visible on the screen varies, and one should not be misled into pronouncing such variations aneurisms. In a case of aneurism of the descending aorta there was enough enlargement of outline in pulsation to differentiate it from other possible consolidations, as enlarged glands. The skiagraph was better in detail, but of course could show no pulsation. In case of complete coagulation in the sac the simple movement due to pulsation without enlargement of outline in the shadow makes it difficult, if not impossible, to say decisively whether one is dealing with an aneurism or some other solid body, as an enlarged gland. In such cases the image is helpful, and the differential diagnosis, as before emphasized, must rest on the entire findings of the case.

An aneurism apparently beginning in the innominate

and involving the subclavian was shown by the skiagraph more conclusively than could have been done by percussion, to involve the aorta proper, thus putting operation out of the question.

In conclusion, we believe that a method that is rarely, if ever, inferior to other methods, usually at least equal to them and sometimes superior, is bound to have a wider recognition and use than at present.

THE EFFECTS OF OSMIC ACID INJECTIONS.

JOSEPH RILUS EASTMAN, A.M., M.D.

INDIANAPOLIS.

Billroth and Neuber¹ were the first to employ osmic acid for neuralgia. They used repeated injections by puncture through the skin without exposure of the nerve; as many as twenty injections were given in some cases. Eulenburg,² employing a similar method, had good results in only 3 out of 13 cases, which included neuralgias of the brachial, sciatic and trigeminal nerves. Schapiro,³ who used a 1 per cent. solution of osmic acid in glycerin and water, records 5 successes out of 8 cases at periods of two to six months after injection. Jacoby⁴ claims 8 cases of cure out of 18 sciaticas, and warns us that it is "dangerous to implicate a motor nerve." Cohen⁵ of Philadelphia used repeated injections (without exposure) into the sciatic nerve, using as much as 30 minims of a 1 per cent. solution. Ellis⁶ records the occurrence of some irritation after injection into a thumb in which pain followed a sprain. Mercer⁷ injected deeply and repeatedly into the sciatic region, with temporary relief and no ill effects. Franck⁸ obtained three successes by direct injection. Turner⁷ records a case of trigeminal neuralgia of two years' standing in which he injected into the infraorbital and after ten days relief followed, lasting six months, i. e., to the date when the patient was last seen.

Wright⁸ claims that most surgeons who have used osmic acid have injected it more or less at random without exposing the nerve trunk. He further states that such a method is quite sufficient to account for irregular and defective results and that it is also remarkable that so little is said of any ill effects, considering the very marked changes that osmic acid produces in the tissues, as shown experimentally by Frankel and as seen by himself in a case in which he used injections, and which, on removal of a portion of muscle which had been attacked by the acid, showed marked degenerative myositis. In all his cases Wright had exposed the nerve and had injected a 1.5 or 2 per cent. watery solution into the trunk or into branches; sometimes the injection had been both toward the periphery and toward the center, and the acid had generally escaped more or less freely into the tissues immediately around the nerve. Most of this author's cases were much too recent to justify any conclusion as to the permanent value of the method. He contends that it is impossible to eliminate the effect of the exposure and the mechanical results of manipulation and puncture of the nerve and of occasional unintentional section by the trephine.

He deems it clear that if this method is employed, the nerve should be fully exposed and not merely a

1. *Lancet*, 1885, vol. i, p. 1096.

2. *Lancet*, 1884, vol. i, p. 443.

3. *Lancet*, 1885, vol. ii.

4. *Practitioner*, 1889, vol. ii, p. 373.

5. *Lancet*, 1885, vol. i, p. 58.

6. *Year-Book of Treatment*, 1898, p. 76.

7. *Med. Soc. Trans.*, 1898, p. 357.

8. *Med. Chron.*, Manchester, 1903-1904, pp. 291 to 300.