sugar plate. The Crookes tube was suspended 6¼ inches above the plates and an exposure of forty minutes was given.

The conditions under which the two sugar plates were placed were therefore identical and the results obtained comparable. On developing the photographic plate it was found that both sugar plates had permitted the X-rays to pass through sufficiently freely to form clear and well defined pictures of the metallic disks.

The figures and inscriptions on the aluminium medals were discernible in both instances, and the outlines of both the aluminium disks and of the silver coins were also well marked.

The negative, however, showed unmistakably that the amorphous sugar is more transparent to the X-rays than the crystalline modification. In the former case the background proved to have an even and darker hue, showing that X-rays had passed through freely and evenly. In the latter case the background was less dark and of a rather mottled appearance, in some places exhibiting apparently a faint outline tracing of the crystalline structure beneath which it had rested. This fact may be of interest in view of the mooted question concerning the power of diffusion and refraction of the X-rays.

In this connection it may not be amiss to also refer, briefly, to some tests made to ascertain whether or no the X-rays exercise any influence on polarized light. To this end a tube was made of aluminium, 200 mm. in length and 31 mm. in diameter; the walls were 2 mm. thick. This tube was filled successively with solutions of sucrose, dextrose, levulose and raffinose.

This tube with its contents was placed in a sugar polariscope; a ray of light was permitted to pass through the tube and the deviation of the polarized light produced by the solutions was noted. The polariscope with the filled tube was then placed underneath a Crookes tube in such a manner that the tube was directly in the path of maximum intensity of the X-rays, *i. e.*, in the path of the cathode rays, so that the rays would pass through the tube practically at right angles to the beam of polarized light which traversed the tube longitudinally.

The times of exposure given varied; seven minutes for the sucrose solution, ten minutes for the levulose and the raffinose solution and fifteen minutes for the dextrose solution, but in no instance was any deviation of the ray of polarized light noticeable. The polarization of the solutions were:

Sucrose,	+49.9
Raffinose,	+15.3
Dextrose,	+ 7.2
Levulose,	− 8.8

Of course these tests alone are not sufficient in number or kind to permit the drawing of any conclusive inference as to whether the X-rays influence the plane of polarized light or not, but they do establish the fact that, under the conditions under which these tests were made, no such influence was exerted. Ferdinand G. Wiechmann.

THE X-RAYS IN MEDICINE AND SURGERY.

On April 22d I succeeded in applying the X-rays to the diagnosis of disease in such a manner as to make it seem that a very wide field was open to medical as well as to surgical investigations by means of the X-ray.

Using a 'focussing' tube powerfully driven, I found it quite possible to cause calcium tungstate to fluoresce, even though a human trunk or head be interposed between the tube and the fluorescing screen.

Further, it became evident that the backbone, the ribs, the bones of the members, and the outline of the skull and of the upper portion, at least, of the pelvis could be

plainly seen as shadows on the screen. The cartilaginous laminæ between the vertebræ could be distinguished. The heart could be seen in faint outline, being slightly more opaque than the lungs, which are very transparent. The liver is very opaque, and its rise and fall as the patient under examination breathed was very easily seen.

I was able to make a diagnosis of cases of tuberculosis, pneumonia, enlarged heart and enlarged spleen without difficulty. The outline of the heart was indicated by me and by Mr. Lawrence, who is working with me almost exactly as it had been mapped out by percussion, our greatest disagreement being about one-half an inch, the diameter of the heart being seven inches. An examination of some five seconds convinced us that a tuberculous patient was at least fairly sound on one side and very bad on the other, and this again agreed with the previous diagnosis at the hospital of which we, of course, were ignorant. The enlarged spleen could be outlined with great clearnesss, it being rather transparent, while the abdomen is ordinarily quite opaque.

A boy of three years, convalescent after an attack of pneumonia, was found to be transparent in that part of the lungs which had been diagnosed as 'clear,' and opaque in those portions which were shown by percussion to be still more or less filled up.

A buckle or a small pellet of lead is easily detected through any part of the body, except the lower part of the abdomen, and buttons and hooks and eyes are easily seen through the more transparent parts.

A patient was brought to us whose arm had been broken by a musket ball, and the exact location of the bullet was desired. After an examination of not more than a minute the bullet could be plainly seen. It had broken the ulna and then imbedded itself on the inner side of the radius about three inches nearer the shoulder. We marked the location of the bullet in two planes, and when the surgeons made an incision it was found that we were not in error by more than an eighth of an inch.

We have taken photographs by means of a Thomson high frequency coil in one-fifth of a second, as it seemed to be desirable to be able to work very rapidly to get photographs of such objects as do not remain fixed in position for any length of time.

The skull is not opaque, and the thicker and thinner positions can be distinguished, but of course no notion can be obtained of the texture of the brain. The detail of the lower jaw, its joint, the teeth, the filling in the teeth, and so on, can be clearly made out. The æsophagus is very transparent, and a foreign metallic body could hardly fail of detection unless well down in the lower part. The cartilaginous rings in the trachea, the glottis and epiglottis can be seen in fair outlines. Younger persons are more transparent than older, but show less differentiation, even the bones being quite transparent in a boy of ten. The brilliancy of the tube is increased many times by grounding the cathode.

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CURRENT NOTES ON PHYSIOGRAPHY.

DE LAPPARENT'S LEÇONS DE GÉOGRAPHIE PHYSIQUE.

THERE is no European text-book that has so fully caught what has come to be called the American method in physical geography or geomorphology, as de Lapparent's *Leçons de géographie physique* (Paris, Masson, 1896, 590 p.). Omitting other divisions of the subject, the whole volume is devoted to the physiography of the land. The work of denuding forces, acting on various initial land forms produced by uplift, deformation, volcanic accumulation or otherwise, is deliberately followed through the geographical cycle to its close in a peneplain of faint relief. Modifications of the general scheme of geographical devel-