

evidence as to the coal supply of the area, and the memoir quotes the estimate of Dr. Dixon and Mr. John Gemmell that, at the present rate of consumption, there is sufficient coal in seams of one foot or more in thickness to last for another two thousand years.

The Edinburgh area is rich in fossils, and the interesting palæontological sketch and the tables by Dr. Lee are among the most useful contributions in the volume. There is a detailed bibliography by Mr. Tait. One remarkable omission from the literature of the areas is the absence of reference in any of the Survey memoirs to Bertrand's papers on the structure of the Scottish oil shale.

The third memoir deals with the geology of East Lothian, the district to the east of Edinburgh. Its geology includes part of the Silurian tableland of the Southern Uplands, of which the account is mainly taken from Peach and Horne's monograph on the Silurian rocks of Scotland. At the eastern foot of the Silurians is a wide plain of upper Old Red Sandstone, including at the base conglomerates containing such large boulders that Sir Andrew Ramsay regarded them as of Glacial origin. No support to this view has been obtained, and there is much more probability in Goodchild's view that the sandstones of the upper part of this system are a desert formation stained by the infiltration of iron from some once overlying beds of New Red Sandstone. The largest part of this sheet is occupied by rocks including two varied igneous series; the first consists of the lavas of the Calciferous sandstone series, and their associated necks, including trachytes, banakites, and mugearites, and the rare hornblende trachy-dolerites—to use that misleading term—known as kulaites. Bass rock is a neck belonging to this division, and the exposure of some fresher samples from it enables its rock to be identified as a phonolite-trachyte. The second igneous series includes the quartz-diabase, teschenite, and essexite, intrusive into the Carboniferous limestone series. The lowlands contain a varied series of Glacial deposits and some dry valleys described by Prof. Kendall and Mr. Bailey, cut during the recession of the ice (see Fig. 2).

Mr. Bailey contributes an interesting summary of the history of the scenery, and shows there is good reason to believe that the Midland Valley of Scotland originated as a true rift-valley, and that the scenery, though greatly modified during Glacial times, is mainly due to pre-Glacial denudation.

The areas described in these publications are of especial importance in Scottish geology owing to their varied problems, and the Geological Survey is to be congratulated on these valuable maps and memoirs, with the large amount of new evidence now so well placed at the public disposal. J. W. G

PHYSIOLOGICAL APPLICATIONS OF RADIOGRAPHY.

IT is a matter of common knowledge that the introduction of X-ray examinations of patients was a boon and a blessing both to patients and surgeons. The localisation of foreign metallic objects, such as bullets and needles, and the exploration of fractured bones and disorganised or dislocated joints, have been thus rendered both easy and certain.

It may not, however, be so generally known that it is also possible to render visible the movements of certain internal organs, which are sufficiently opaque to cast their shadow on the photographic plate or the fluorescent screen; it need scarcely be

pointed out that in this way much more accurate information can be obtained of the movements of the heart and diaphragm than what was previously inferred from the examination of the cadaver, or the inspection of the exposed parts in anæsthetised animals.

Notable among the recent achievements in this direction are researches which have for their object the investigation of the digestive canal. Cannon's work in the Harvard laboratory a few years ago showed that in animals the journey of a meal mixed with bismuth salts can be followed with a nicety never before experienced. Valuable as this pioneer work was, it is comparatively unimportant from the human and practical point of view, when compared with the investigations which, by similar means, are possible in man. Here Dr. Hertz and his colleagues at Guy's Hospital have done yeoman service; and Dr. Hertz has embodied the bulk of his work in a very readable volume, entitled "Constipation and Allied Disorders" (London: Hodder and Stoughton, 1909). It is possible to administer to human beings sufficiently large doses of bismuth carbonate (2 to 6 ounces) without any detriment either to digestive processes or to the well-being of the subject of the experiment. Without going into the details of the time occupied in the various parts of the alimentary tract, and the nature of the peristalsis which is the cause of the downward progress of the food, it will be sufficient to say that we now possess trustworthy data on these and many other points, and the events from swallowing onward to defæcation have been examined and registered.

We have been led into these references by a reprint now before us by Dr. A. C. Jordan, who holds the office of Medical Radiographer to Guy's Hospital. It is entitled "Radiographic Demonstration of Lane's Heel Kink," and this, to the non-medical reader, will not convey much. When man adopted the upright posture, the advantages he gained were, to a certain extent, counterbalanced by some disadvantages and a liability to certain troubles. One of these is that the abdominal viscera either drop, or tend to drop. The stomach, for example, has its greater curvature in the pelvis when a man stands upright, and the transverse colon (a part of the large intestine) hangs in a great loop, the middle of which accompanies the stomach into the pelvis. Mr. Arbuthnot Lane has shown that Nature attempts to diminish these changes of position of the viscera by the formation of adhesions, which form supplementary mesenteries to hold them up. But this attempt at a remedy is not entirely adequate, and kinks in the bowel may be produced, which lead to obstruction, giving rise to pain, to many days' delay in the passage of food, and severe constitutional changes, due to the absorption of toxic materials from the intestine. A part of the intestine called the ileum is particularly apt to be kinked in this way, and its surgical treatment will relieve the patient of all symptoms. A bismuth meal and subsequent radiographic examination will reveal the situation of the kink, and so the surgeon knows exactly where to cut down, and the patient has only to suffer from a comparatively small abdominal wound.

We may take such work as an admirable example of the practical and beneficent application of the X-ray method to structures which are neither bones nor foreign objects such as bullets. The members of the Guy's Hospital staff responsible for these results are to be heartily congratulated on the outcome of their researches, and the public at large owe them a deep debt of gratitude in addition.