CLIMATE AND RAILROADING.

As the subject of a thesis in the course in General Climatology in Harvard University, Mr. Robert M. Brown took 'Climatic Factors in Railroad Construction and Operation,' and some of the results of the study are embodied in an article under the above title in a recent number of the *Journal of Geography* (Vol. II., pp. 178–190). For purposes of classification the different districts of the world are arbitrarily grouped as regions of heavy precipitation; of moderate precipitation; of light precipitation; of high altitudes and of severe winters. In each of these regions there are climatic difficulties which must be solved by the engineers and operating officials during construction, and after the road has been built. Where the rainfall is heavy there is decay of ties, sleepers and bridges; there are floods and landslides. In regions of light rainfall there is great danger of fire; water must be piped for long distances or else carried in tanks; labor is often difficult on account of the heat; sand is blown by the wind, accumulating on the rails, blinding the drivers, and injuring the machinery. When the altitude is high, mountain sickness, snow blockades and snow-slides must be overcome. In regions of severe winters ice breakers may be needed to keep open lakes and rivers, or temporary rails may be laid on the ice; snow and ice hinder construction and operation, and the number of working days may be seriously reduced. Mr. Brown mentions specific instances to illustrate these various climatic controls, and the article is a distinct contribution, albeit an incomplete study in itself, on the human side of climatology. It so happens that three railroads now building, or projected, furnish numerous excellent examples of the kind of control considered in Mr. Brown's paper. These are the proposed Trans-Canada and Trans-Australian lines, and the Uganda Railway. The former is interesting because of the high latitudes which it is to traverse; the second, because its route lies across the central arid portion of Australia, and the third by reason of its being in tropical Africa.

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RADIUM AND HELIUM.

A paper bearing in a remarkable way on the connection between these two elements, which is now exciting so much interest, has been received for publication by the Royal Society from Sir W. and Lady Huggins. Prompted, in fact, by theoretical ideas, they attacked the problem of the spectroscopic analysis of the light emitted directly by a radium salt at ordinary temperatures. Preliminary visual observation seemed to show traces of bright lines in a continuous spectrum. Preparations were accordingly made for photographic record by means of a small quartz spectroscope constructed some years ago for use on very faint celestial objects. After several trials, a spectrum, consisting of eight definite bright lines in the ultra-violet, entirely different from the spark spectrum of radium, and some faint lines together with a very faint continuous spectrum, was obtained by 72 hours' exposure to the glow. The lines were of some breadth, on account of the wide slit that had to be employed in order to admit sufficient light; but it was found possible to measure their wave lengths within an error of two in the fourth figure. On a comparison of this spectrum, so different in type from an ordinary phosphorescent spectrum, with the recorded measurements for helium, it appeared at once that four, and perhaps five, of the eight lines agreed with lines of helium within the uncertainty of the measurements. Another line, that of the highest refrangibility, agrees with a line in the spark spectrum of radium itself, which, however, has not been recorded by other observers; the two other lines, the lowest, have not yet been traced.

It will be remembered that last year Professor Rutherford produced striking evidence for the view that, in the very slow break-up of radium that is concomitant with its radio-activity, the inert gas helium is one of the products formed. Recently Sir W. Ramsay and Mr. F. Soddy have succeeded in detecting helium by the spectroscope in the gases extracted from a radium salt. If, as the present observations indicate, the radium salt shines spontaneously in the dark largely by light belonging to the different element helium, an-

other important step is gained in elucidating the nature of the instability of such chemical elements of high atomic weight and the radio-activity associated with it.—The London *Times*.

The possibilities of such mysterious forces as those possessed by radium present an attractive field of speculation for the physician. May not the radiant energy emitted by radium possess pathogenic as well as curative, destructive as well as stimulating, powers on cells and cellular processes? Perchance, it may be forces of this kind that upset physiologic laws of cellular activity, and lead to abnormal proliferations of various kinds? But questions of this kind are not yet ripe for discussion. Actual experimental studies must furnish the necessary basis of facts from which it may be permitted to draw further deductions. Danysz found that radium destroys the skin of guinea-pigs and rabbits, but subcutaneous and muscular tissue do not seem so sensitive as skin. The nervous tissue is also sensitive to its action. A sealed glass tube with salts of radium placed against the skin over the spine is followed by death in young animals. In older animals the osseous tissue seems to protect the spinal cord against the radiations. The effects of rays of radium on bacteria have not been studied extensively as yet, but both Danysz and Bohn show that various larvæ and embryos are profoundly modified in their growth, many being killed when subjected to the radiations; others developing into monstrosities because of unequal stimulation. Bohn further finds that radium exercises an especially intense action on tissues or cells in proliferation; non-fertilized eggs may undergo more or less parthenogenetic development and give rise to atypical formations. It has been found, too, that in animals whose skin was burned by the rays, the hair, in some cases, appeared to be forced into rapid growth. It seems that various effects are obtainable, depending on the tissue or cell exposed, as well as on the quantity and quality of the rays. Further experiments, no doubt, will yield even more interesting and conclusive results. We have commented on the announcement that in Vienna cancer has been cured by means of radium. In this particular direction much work will surely be done, and we may expect interesting developments.—*Journal of the American Medical Association.*

SUMMER WORK OF THE GEOLOGICAL SURVEY.

THE preliminary arrangements for the present season are as follows:

Adams, Dr. George I., assistant geologist, will complete study of northern Arkansas lead and zinc district, with some revision of Yellville and Fayetteville quadrangles. On its completion, associated with Dr. Erasmus Haworth, will make an areal and economic survey of Iola thirty-minute quadrangle, Kansas. Later will make reconnaissance of stratigraphy of Coal Measures and Permian in northern Texas.

Alden, Wm. C., assistant geologist, will continue work on Pleistocene geology of quadrangles in southeastern Wisconsin.

Arnold, Dr. Ralph, geologic aid, will assist Dr. Wm. H. Dall in completion of monograph on southeastern and Florida Tertiaries, and Dr. J. C. Branner on the paleontology of the Santa Cruz quadrangle, California.

Ashley, Dr. George H., assistant geologist, will complete, under supervision of M. R. Campbell, study of Cumberland Gap coal field, in cooperation with state of Kentucky.

Atwood, W. W., assistant geologist, will assist Professor R. D. Salisbury in glacial work west of one-hundredth meridian.

Bain, Dr. H. Foster, geologist, will begin systematic study of lead and zinc deposits of Mississippi valley. Will make detailed surveys in southern Illinois and in Galena district in northwestern Illinois; and will visit points in Wisconsin and Missouri for cooperation with state surveys.

Bascom, Dr. Florence, assistant geologist, will complete necessary field work and prepare for publication the Philadelphia Special folio, embracing four fifteen-minute quadrangles.