to the organization of his industry; and we may be sure of this, that it will be useless to keep a man on the land, or to bring him back to it, by the inducement of ownership or any other attraction, unless we can educate him to do the best for himself and for the land, in an age which calls for cultivated intelligence and scientific method.—The London *Times*.

CURRENT NOTES ON LAND FORMS

RELATION OF VALLEYS TO JOINTS

THERE have been various articles published on the relation of drainage lines to joints, involving a problem of which the gorge of the Minnehaha below its falls may be taken as an example. It is sometimes pointed out that the course of this gorge has been determined by the arrangement of the joints in the horizontal rock series through which the gorge has been cut. There can be little question that the process of weathering has taken advantage of the joints in the widening of the gorge, and that its walls exhibit joint faces more or less frequently; but it is also evident that the gorge has been cut backward along the course that the stream had on the drift cover up-stream from the falls; and that the relation of the gorge to the joints is therefore one of accidental superposition, and not of submissive guidance.

On the other hand, it is often plain that a group of master joints may guide the development of a new (subsequent) branch stream which grows by headward erosion in the bare walls of a young valley; for in such cases there is no stream falling into the valley from the upland above. Subsequent streams of this origin may be common in some districts; but if they pass into maturity, they will probably wander on their flood plains so as to depart more or less from the guiding joints beneath the valley floor; and if afterwards rejuvenated by elevation, it is eminently possible that they may stray away from the joints that originally led them. The chance of such straying will increase with the lateness of the stage at which the first cycle of erosion is interrupted by rejuvenating elevation.

VALLEYS OF SOUTHWESTERN WISCONSIN

E. C. HARDER presents a discussion of part of this problem in a thesis entitled "The joint system in the rocks of southwestern Wisconsin and its relation to the drainage network" (Bull. Univ. Wisc., no. 138; Science series, iii., 1906, 207–246). He first determined by numerous observations the dominant joint directions in a certain part of the Wisconsin driftless area; he next determined, apparently from maps, the dominant stream directions of the same district. Then he compared these two sets of dominant directions, independently determined, and finds that "the prominent directions of jointing correspond with the prominent drainage directions" (p. 232). "Many other forces [than joints] may have been present to modify the result," but their influence is thought to have been small (p. 234). Further investigation is looked to for additional results.

In all cases of this kind, in which the more or less precise coincidence in the directions of a large number of lines is the chief guide to the conclusion, several critical questions arise. First, what are the limits of error in the determination of the measured directions, and what are the limits of discordance in cases that are classed as coincidences? Second, what are the possibilities of coincidence by chance instead of by causal relation? Third, is the conclusion that a causal relation exists between the two sets of lines whose directions coincide, supported by independent evidence that the supposed cause can produce the inferred effect? Fourth, are other causes shown to be inoperative?

Joint directions are determinable easily within small limits of error; but stream directions are much less easily determined, because stream lines are as a rule so irregularly curved. Moreover the curved streams of the mature valleys of driftless southwestern Wisconsin demonstrably depart to-day from their earlier courses to a greater or less extent; and it is therefore not clear whether the present or the earlier courses are to be regarded as joint controlled. Some close analysis, with a quantitative statement as to the percentage of total

stream length that is reducible to definite directions and with a statement of the amount in tabulating the measures, is here much needed. A quantitative discussion of coincidence is also desirable.

On the second point, there is opportunity for a mathematical discussion of the theory of chances, for there may, of course, be a considerable number of accidental agreements in two sets of directions such as are here considered. On the third point, it is only reasonable to ask that joints should be shown competent to determine the direction of the drainage lines under consideration, for if they possess no such competence, then all the coincidences of direction would have to be attributed to chance. The problem here appears to be briefly as follows: Given an ancient land area, subject to normal processes of erosion in many successive (incomplete) cycles of erosion; in what way can the originally consequent drainage be influenced by underground joints? It can hardly be supposed that the joints were at the beginning of such power as to have determined the course of the original drainage—that would be possible only if they were gaping fissures or faults. The original drainage was presumably consequent on the original slopes and inequalities of the land surface. As to streams of later development, it is possibly the case that in a district of resistant rocks, rapidly given great altitude, the headward growth of subsequent streams along joints in the walls of the consequent stream valleys might in time replace the minor consequents; but we have at present no sufficient inductive basis for such a conclusion; perhaps the case brought forward by Iddings may be of this kind, but there the argument of coincidence has not been supplemented by any argument of competence. On the other hand, a region of relatively weak rocks, slowly elevated to a moderate altitude—and this is a supposition appropriate to the Wisconsin district under consideration—the opportunity for the growth of subsequent streams along joint lines would be very poor; the valley sides would usually be cloaked with waste, so that the capacity of the joints to guide the development of new streams would be small as compared with the capacity of the existing streams to persist in their courses. There remains the possible tendency of streams to change their courses by lateral shifting so as to come into relation with underground joint systems; but on this point we have little information. Finally there is the possibility of other causes than joints for stream directions in the district studied. Some other causes certainly have operated in some instances, for there are various streams indicated on Harder's maps, unrelated to neighboring joint directions (for example, Underwoods creek, near Avoca, Pl. III.). In this connection there should be a critical examination of the stage of development of each stream; for while a stream in a vertical-walled gorge might well be closely related to a joint system, it is quite otherwise with a stream that is swinging on the flood plain of an incised meandering valley. Streams of the latter class appear to occur not infrequently in the district studied, but no special mention is made of them in the text: surely the coincidence of an intermeander tangent with a joint direction can mean little; for the tangent has in all probability changed its direction and its location during incision, and these changes have been almost inevitably controlled by the changes in the adjacent meanders rather than by underground joints.

In all these respects additional study is needed before demonstration can be reached. The fact of frequent coincidences, if well attested, is therefore a good first step in an inquiry which we hope Harder may continue to follow.

BLOCK MOUNTAINS IN NEW ZEALAND

THE south-central part of the southern island of New Zealand possesses a group of block mountains, "probably not less remarkable than the ranges of the Great Basin between the Sierra Nevada and the Wasatch," of which a brief description is given by J. Parks, professor of mining in the University of Otago ("The Geology of the Area covered by the Alexandra Sheet, Central Otago Division," N. Z. Geol. Survey, Bull. 2, N. S.,

1906). The older rocks of the district are chiefly deformed mica schists. They have been reduced to a peneplain, which is now uplifted and scored in its seaward portion by deep, narrow valleys. Farther inland, the peneplain has been broken into a number of sub-parallel blocks, of which the higher ones form mountain ranges, generally trending northeast-southwest, and reaching from 5,000 to 6,000 feet altitude; while the relatively depressed blocks are buried under heavy basin deposits of lacustrine, fluviatile and glacial origin. The ranges are not forested and expose a large amount of bare rock; they are as a rule flat topped; "the skyline of the Hawkduns for a distance of twenty miles appears as even as the ridge of a house"; they have no lateral spurs or foothills, but descend to an almost straight base line. The basin deposits have been more or less terraced and dissected. A rough cross-profile suggests that some of the heaved blocks are bounded by faults on both sides, and that, though retaining old forms on their flat uplands, they have lost much of their edges by new erosion.

The few pages from which the above statements are gleaned are only incidental to the chapters on geological and economic problems to which the body of the report is devoted; the student of physiography must, however, be grateful if he gets even so much as these few pages from a professor of mining, whose first responsibilities are elsewhere directed. Yet is it not probable that, if a well-systematized plan for the physiographic description of block mountains were in general use among geographers, there would not so often be occasion to regret that significant physiographic features are passed over without mention in a geological report? To illustrate: When a comet is discovered, it is customary for astronomers to secure at once certain previously planned observations, according to a standardized method; and from these observations the elements of the comet's orbit are promptly calculated according to an accepted scheme. As a result, the chief items which astronomers have come to agree upon as essential regarding comets are immediately determined and placed on record. No such standardized method of procedure is yet adopted by geographers, still less by explorers; and as a result it is largely a matter of chance whether the description of a new member of an already known class of land forms—block mountains, for example—will include its essential elements or not. In a case of the kind above cited, the most important elements would probably be: the general structure of the region, briefly stated at first, with details added later when needed; the stage of erosion that the region had reached when block-faulting took place; the relation of the fault lines to the preexistent structural lines and topographical features; the number and attitude of the heaved and of the thrown blocks; systematic account of the main drainage lines, sufficient to show whether they persist from the previous cycle as antecedent streams in spite of the adverse faulting, whether they are revived into new activity by favoring deformation, whether they are of a new generation consequent upon the slope of the tilted or faulted faces of the displaced blocks, or whether they are developed as subsequent streams by headward erosion along newly exposed weak structures; definite indication of the stage reached in the work of erosion by the several kinds of streams on their valley lines, and in the work of gradation by weathering on the fault faces and valley sides, with particular reference to the manner in which the features produced in the new cycle are related to those still holding over from the previous cycle and to those produced directly by faulting; indication of the stage reached in the work of aggradation (and afterwards of degradation) over the thrown blocks; and finally, as many specific details as possible, not described empirically, but systematically presented as instances of the above-named elements.

It will always be difficult for even the best trained physiographers to secure a complete record of all desired elements of 'land forms; but the knowledge of land physiography will be immensely advanced when work in the field is carried on in view of carefully standardized and generally accepted schemes,

and when published reports are so phrased as to make explicit reference of observed items to their proper class, and explicit statement that such and such elements were not determined. W. M. D.

JAMES CARROLL

MAJOR JAMES CARROLL, Surgeon U. S. A., died at his home in the city of Washington on September 16, after an illness of about seven months.

Major Carroll was born in England June 5, 1854. When about fifteen years of age he emigrated to this country, and on June 9, 1874, enlisted in the United States army, and served as private, corporal, sergeant and hospital steward from that date to May 21, 1898, when he was appointed an acting assistant surgeon.

While still a soldier he began the study of medicine at the University of the City of New York during the session 1886–7. After a break of a year he resumed his medical studies in Baltimore at the University of Maryland, 1889–91, and received his degree from that institution.

He was appointed first lieutenant, assistant surgeon, in the medical corps, October 27, 1902, and promoted to the grade of major-surgeon, by special act of congress March 2, 1907, on account of his services in connection with the discovery of the mode of transmission of yellow fever, and the courage shown by him in subjecting himself to experiment with a view to demonstrating the method of transmission by a mosquito.

Doctor Carroll's was the first experimental case of yellow fever. He suffered a very severe attack to which he attributed a heart trouble, which finally caused his death.

Doctor Carroll's interest in the subject of yellow fever did not cease with the discovery of the method of its transmission, but he continued to make many independent contributions to the literature on the subject.

The Havana Yellow Fever Commission, appointed upon the recommendation of Surgeon General Sternberg, U. S. A., in 1900, consisted of Major Walter Reed, Surgeon, U. S. A.; Dr. James Carroll, Dr. Jesse W. Lazear and Dr. A. Agramonte. The death of Dr. Carroll leaves Dr. Agramonte, a Cuban physician, as the only surviving member of the commission.

The bacteriological and experimental investigations of the commission were to a large extent conducted by Dr. Carroll. During Major Reed's absence in the United States the inoculations by means of infected mosquitoes were begun.

On August 11, 1900, Dr. Lazear made the first experiment, but nine distinct inoculations on persons, including himself and Acting Assistant Surgeon A. S. Pinto, were unsuccessful. We know now that these failures were due to two facts—first, that patients after the third day of the disease can not convey the infection to the mosquito, and second, that after having bitten a yellow-fever case the mosquito can not transmit the disease until after an interval of at least twelve days. On August 27 a mosquito was applied to Dr. Carroll which happened to fulfil both of these conditions. The result was a very severe attack of yellow fever in which for a time his life hung in the balance.

G. M. S.

SCIENTIFIC NOTES AND NEWS

THE Silliman lectures by Professor William Bateson will be given in the Peabody Museum at Yale University on October 8 and the following days. The subject of the course is "The Problems of Genetics."

THE Herter Lectures before the Medical Department of the Johns Hopkins University will be given this session by Edward A. Schäfer, LL.D., F.R.S., professor of physiology in the University of Edinburgh, at the end of April, 1908. The Turnbull Lectures on poetry will be delivered by Professor A. V. Williams Jackson, of Columbia University, on Persian Poetry, probably in February.

PROFESSOR OTTO PFLEIDERER, of the University of Berlin, began a series of six lectures in German on "The German Philosophy of Religion," at Harvard University, on September 30.