comprehensive showing of Scotland's geological history and mutations.

Among its extraordinary features he will be attracted to the Heddle collection of cut and polished agates with their labeled parts and exposition. It is well known that Dr. Heddle took a very particular interest in the genesis of agates and related mineral phenomena, and the little leaflet which may be purchased at the door of the museum to-day may be regarded as a complete expression of his opinions—convictions in this matter he conscientiously repudiated—on the subject. It has been prepared by Mr. J. G. Goodchild. The extensive display of cut agates will surprise visitors and seems, perhaps, rather needlessly elaborated. But these small nodules, cut across their longest diameter and polished, are very attractive, and the short attached printed labels reveal differences in structure and composition which are very interesting. It is impossible to even epitomize Dr. Heddle's views on this subject in this article, but it may interest readers to learn that the late Dr. Heddle, of St. Andrews, formed a very large collection of agates, gathered from all parts of Scotland, principally with the view of obtaining definite information as to the developmental history of these forms of silica. This collection, on the death of Dr. Heddle, passed into the hands of Mr. Alex. Thoms, of St. Andrews, who, already a generous donor to the Scottish mineral collection, in 1898 presented to the museum 1,000 of Dr. Heddle's agates, all of them selected and typical examples. It is these specimens which are now carefully exhibited in their surprising variety in the hall of the Edinburgh Museum, enclosing its examples of Scottish geology.

The Edinburgh Museum is a plain and, probably, inadequately equipped museum; it is neither ostentatious nor unimportant, it contains a great accumulation of material, and this brief notice may draw attention to it, amongst the numerous visitors to the Athens of the north. Such sketches of museums, imperfect and fragmentary as they may be, cumulatively help to increase the interest taken in museums by the lay and professional member.

L. P. Gratacap.

ISRAEL COOK RUSSELL.

The senate of the University of Michigan has adopted the following memorial as offered by the committee, Professors Lombard and D'Ooge:

Again and for the third time within the short space of two months, the hand of death has been laid heavily upon us, and we are called to mourn the loss of another honored and beloved colleague.

Professor Israel Cook Russell entered upon his duties as professor of geology in this university in the autumn of 1892, and was stricken down in the midst of his work by an illness which after a few day terminated his life, on May 1, 1906. He was born near Garratsville, N. Y., December 10, 1852, son of Barnabas and Louisa Sherman (Cook) Russell. His ancestors were early settlers in New England. He was fitted for college at the Rural High School, Clinton, N. Y., and Hasbrook Institute, Jersey City. He entered the University of the City of New York in 1869, and was graduated bachelor of science and civil engineer in 1872. After pursuing graduate studies at the Columbia School of Mines, he was given the degree, master of science, by the University of New York in 1875. In 1874 he went to New Zealand as a member of the United States Transit of Venus Expedition, and in this connection made a journey round the world. On his return home in 1875 he was appointed assistant professor of geology in the Co-

lumbia School of Mines, where he remained two years. In 1878 he became assistant geologist on the United States Geological Survey west of the 100th meridian, and devoted one season to field work in Colorado and New Mexico. The following year was spent in European travel. In 1880 he was appointed assistant geologist on the United States Geological Survey. It was not long before his merit was recognized and he was promoted to geologist of the survey, a position which he held throughout the rest of his life.

Professor Russell was more than geologist and geographer, he was an ardent student of physiography. In his preface to 'Rivers of North America' he wrote:

> When investigators of surface geology and geography made their bold explorations into the vast arid region of the southwest, they discovered a land of wonders, where the mask of vegetation which conceals so many countries is absent and the features of the naked land are fully revealed beneath a cloudless sky. It was in this arid region of strong relief that a revival of interest in the surface forms of the earth was engendered. The seeds of what is practically a new science—physiography—gathered in this land by J. S. Newberry, J. W. Powell, G. K. Gilbert, C. S. Dutton and others, when carried to other regions, bore abundant fruit.

Russell belonged to this new school. He studied the surface of the earth as it exists to-day, as a book where one can read not only the past history of the world, but prophecies as to its future destiny. It was the forces which nature uses to mould the world that chiefly interested him, and throughout his books one sees him tracing the transformations of the earth under the influence of ice and water, and the cooling of the earth's crust.

It was his desire to study the forces of nature where they are most clearly revealed that led him to endure the hardships of the mountains and the deserts of the west. In order to visit these regions he attached himself to the United States Geological Survey, and while he did the work of the government, he gathered the rich harvest of scientific data which he gave to the world in his many publications. But he was interested not alone in the processes which are wearing away and building up the surface of the earth; the conditions which exist to-day, and how they may be utilized for the good of mankind, were carefully observed. This is evidenced by his thoughtful study of the water supply of the arid regions of the west, and his conscientious work on the water supply of our own community. Ann Arbor owes him a debt of gratitude for the earnest attention and large amount of time which he so freely gave for the benefit of his fellow-citizens.

Many of his expeditions were of the nature of a reconnaissance of the surface geology of regions which had never been traveled by any trained observer. In 1889 he was sent by the United States Geological Survey on an expedition up the Yukon and Porcupine rivers, Alaska, a journey of about twenty-five hundred miles through an almost unknown wilderness. In 1890 and 1891 he conducted two important explorations in the region about Mount St. Elias, under the joint auspices of the United States Geological Survey and the National Geographical Society, during which special attention was given to the study of glaciers and to geographical explorations.

It is hard to think of the quiet, modest, somewhat frail-looking man, our colleague and friend, as the celebrated 'pioneer explorer' of the wilds of Alaska. Yet all who have accompanied him on his expeditions bear witness to his boundless energy and tenacity of purpose, his strength and endurance, and his resourcefulness in

grappling with the difficulties with which nature guards the secrets of her fastnesses.

During his connection with the University of Michigan, he carried on extensive explorations for the United States Geological Survey in many of the western states, and for the past five years of his work for the survey has given especial attention to the question of the water supply and irrigation of those vast areas, which need only water to be converted into fruitful fields. In these expeditions he explored northwestern Nevada, the Mono Valley of California, central Washington, the Cascade Mountains of northern Washington, southern Idaho, the south and southeastern part of Oregon, central Oregon, Nez Perces County of Idaho, and the Snake River Valley of Idaho.

Eighteen of the annual reports of the United States Geological Survey contain papers by him, these papers covering more than fifteen hundred pages, and being richly illustrated by photographs, maps and diagrams, picturing the topography of the country through which he traveled. The 'Geologic History of Lake Lahontan, a Quaternary Lake of Northwestern Nevada,' is a monograph of nearly three hundred pages, and his paper 'The Newark System' is a still more extensive monograph.

Glaciers had for him, as for every true mountain climber, a fascination. In 1883 he wrote a fifty-page paper on the 'Existing Glaciers of the United States.' It was in 1890 and 1891 that he made two expeditions to Mount St. Elias, where he nearly lost his life, first attempting to land on the wild coast of Alaska, and, later, on the mountain itself.

Professor Russell, in writing of the first expedition, says: 'The country visited proved of such great interest both to geologists and geographers that it was decided to review the study of the various problems it offered during the following year.'' The way in which he carried through the second expedition is perhaps as good evidence as we have of the character of the man. The decision to send the expedition was not reached until May 17. That night Russell left Washington for Seattle. On arriving there he found that the revenue cutter *Bear* would leave for Alaska May 23. This gave him a week, but in that time he engaged his men and secured all the instruments, camp equipment and provisions needed for a prolonged stay in the wilds. He went without any trained assistants, only taking six camp hands, three of whom fortunately had been with him the year before. As the land was approached, Mount St. Elias could be seen one hundred and fifty miles away. The sea was calm, but the huge rollers of the Pacific were breaking on that rugged coast, which made landing exceedingly dangerous. In the successive attempts to land the outfit, the boats were repeatedly capsized, and a lieutenant, four sailors and one of the men of the expedition were lost. A delay necessarily resulted, and this delay prevented Professor Russell from reaching the top of the mountain. There is only a short interval when the mountain is free from snow-storms, and he was caught in the first storm of the year. Most of us know the story of how, when within striking distance of the top, he found that his men had failed to bring certain instruments and how he sent them back to the base camp, remaining alone on the glacier. Then came the snow. He saved himself by digging a hut in the side of a drift and there he stayed for three days, until the storm cleared. He has said that he could have reached the top of the mountain, but that he knew if he did he would never return; so he was forced to retrace his steps. The knowledge

which he gained of the mountain in these two expeditions he freely imparted to Prince Louis of Savoie, Duke of Abruzzi, and thus ensured the success of the Italian expedition. The reports of his expeditions to Mount St. Elias are found in a paper printed in the *National Geographic Magazine*, and in the reports of the United States Geological Survey. In these papers the glaciers of Mount St. Elias are described, and he has written at least ten other papers on glaciers of North America and on glacial action, besides his well-known book on these subjects.

Professor Russell became an authority not only on glaciers and the effects of ice and water upon the configuration of the earth, but an authority also on the forces which are the cause of earthquakes and volcanic action. When the Island of Martinique and St. Vincent were visited by the terrible eruptions of Mt. Pelée and La Soufrière in 1902, he was asked by the National Geographical Society to go to the islands and observe the phenomena. In addition to his report to the society, and his book on volcanoes, he is the author of ten or more papers on volcanic phenomena and their results.

During the summers of 1904 and 1905, Professor Russell worked for the Michigan State Survey in the southern part of the northern peninsula of Michigan. The report of the work of 1904 has been published, but that of 1905, although finished, is still unprinted. It is entitled 'Surface Geology of Menominee, Dickinson and Iron Counties of Michigan.'

Another paper on the geology of Michigan, entitled 'On the Drumlin Area of Northern Michigan,' was read convocation week, 1905, before the Geological Society of America at Ottawa. It was at that meeting that Professor Russell was chosen president of the society. We are all familiar with his work on the water supply of Ann Arbor, the report of which was published by the city council, 1905.

There remain three unpublished papers to be mentioned. One of these is the folio to accompany the map of the United States Survey of the Ann Arbor Quadrangle. This deals with the marl deposits and the hard rocks of the region. Another is the paper on 'Ideals Concerning Municipal Water Supplies,' which he read at the meeting of the Michigan Academy of Science, March, 1906, and which will appear in the reports of the academy. And finally there is a paper of 12,500 words in typewritten form, which he probably intended to use after revision as his presidential address at the next meeting of the Geological Society of America. It is entitled 'Concentration as a Geologic Principle.' In addition to these there remains a large amount of manuscript on the volcanoes of Martinique and St. Vincent, apparently designed to be used in book form.

In addition to his many scientific reports, papers and monographs, represented by more than one hundred titles, he published five books: 'Lakes of North America,' 1895; 'Glaciers of North America,' 1897; 'Volcanoes of North America,' 1897; 'Rivers of North America,' 1898; 'North America,' 1904.

His first book, aside from the monographs which have been mentioned, was not written until he had passed fifteen summers in the field, studying nature face to face. His books, therefore, embody the mature judgment of a man who through long years of work in the laboratory of the geologist had become a trained observer, and acquired a personal knowledge of the facts of which he was to treat. A naturally keen insight into physical problems had been strengthened by his early training, and he was able to study the earth as

one would examine a vast machine, and to check the speculations suggested by his fancy, by sound common sense and good judgment. The modesty which was so characteristic shows itself everywhere in the tone of his writings, at the same time that his self-reliance and the earnestness of his convictions led him to express himself with definiteness, and to impress his readers with the justness of his conclusions. His writings are widely known and frequently quoted abroad as well as in this country. They are wonderfully even; they are all good; and it is hard to assign to any one of them a special preeminence.

In 1886, he visited the Mono Valley region of California, and made a preliminary examination of its geology for the United States Geological Survey. In his library there is a reprint of his report of this expedition—'Quaternary History of the Mono Valley, California'—and on the reprint there is the word 'incomplete' in his handwriting. The Mono Valley region is a charming mountainous country, to the south of the Yellowstone Park, resembling Switzerland except for the lack of snow on the mountains. The country is now being rapidly opened up, and the enthusiastic alpine climbers there are anxious that it should be explored and made known to tourists. The first report of Professor Russell was so excellent that he was to have been sent by the survey this summer to complete the work which he began so well twenty years ago.

The best evidence of the success of a scientific man is to be found in the esteem shown him by men of his own branch of science. This Professor Russell possessed to a high degree, and evidence of their recognition of his ability is to be found in the honors which they paid him.

He was a fellow of the Geological Society of America, and was elected its president for 1906; a fellow of the American Association for the Advancement of Science, and vice-president in 1904; a fellow of the National Geographical Society, and a member of its board of directors (twice this society sent him on important expeditions); a member of the Michigan Academy of Science, and its president in 1902; a member of the Congrès Géologique Internationale; and of the American Alpine Club, of which he was one of the directors. He was honorary member of the Appalachian Mountain Club, and corresponding member of the Geographical Society of Philadelphia, and of the Scottish Geographical Society. He was chairman of the section of geography and a speaker in the section of physiography at the Congress of Arts and Science, held in St. Louis in 1904. He received the degree of doctor of laws from the University of New York, his alma mater, in 1897. He was generally recognized as among the foremost of the geologists of the country, and had just received an advantageous call to a prominent university. The University of Michigan has been most fortunate to have been able to have had his valuable services for so long, and has met with an irreparable loss.

He was a scientist of international renown, whose writings and explorations were constantly increasing the reputation of this university. He was a scholar of high ideals, whose interest in research work was great, and whose example as a devoted student and tireless worker made itself felt in all our circles. He was a teacher who made his students feel the importance of scientific methods and true knowledge. He was a high-minded, modest, true gentleman, who made himself beloved by all who learned to know him, and most by those who knew him best. His kindly manner, his sense of humor, his playful wit, dry

and droll, but never caustic, and his chivalrous spirit, will always linger in our memory.

We desire to tender to the bereaved family of our lamented colleague our profound sympathy, and we order spread upon the records of the senate this minute, in remembrance of our appreciation of his work and life among us.

WARREN P. LOMBARD,
MARTIN L. D'OOGE,
Committee.

May 7, 1906.

SCIENTIFIC BOOKS.

Les Révélations de l'écriture d'après un controle scientifique. ALFRED BINET, Docteur ès Sciences, Directeur du laboratoire de psychologie physiologique. Librairies Félix Alcan et Guillaumin réunies. Paris, 108 Boulevard St. Germain. 8vo. Preface. March 24, 1906.

Dr. Binet continues his excellent work, beginning with the 'Philosophie du raisonnement' and 'Recherches experimentales par l'hypnotisme' (1886), which preceded 'Animal Magnetism' (1888), 'Psychic Life of Micro-organisms' (1889), and 'Les altérations de la personalité' (1892); by commencing a new series of studies of certain fetishes which have become rooted in the beliefs of a large number of people.

These are graphology, phrenology and chiromancy. A study of such subjects by a master is of the greatest value to the world, and hence a considerable space is given to the review of the first on the list in order that the reader may judge of both methods and conclusions.

The book of 257 pages is a résumé of a series of tests applied by the author to 'Graphologists' as well as lay experimenters (the latter of all ages and degrees of intelligence) as to their ability to determine the sex (first part, 4 chapters, 21 pages), the age (second part, 5 chapters, 15 pages); the intelligence (third part, 11 chapters, 124 pages); and the character (fourth part, 7 chapters, 77 pages); of a writer by his or her chirography.

Part I.: By what marks can sex be determined in writing?

Dr. Binet proceeds on the ground that if those professing to be graphologists can determine the sex from writing in more than 50 per cent. of cases it raises their ability above that of pure chance, which (*in a large series*) is just 50 per cent.

To avoid suggestion he decided to use the addresses on envelopes. Even here the percentage of error of his experts rises materially when the addresses are from a person of one sex to one of another. The two experts were M. Crépieux-Jamin, of Rouen, and M. Eloy, of Paris.

Amusing experiments to ascertain how much more reliable were professional graphologists than 'ignorants' (those ignorant of the so-called art of 'graphology') resulted as follows. In 180 addresses M. Crépieux-Jamin, by far the most skillful graphologist, was correct in 78.8 per cent. of the cases. He divided his determinations into 'certain' and 'probable.' Of the former were 129 and of the latter 51, that is, he was uncertain twice in seven times. Of his fifty-one mistakes he had marked 28 'certain' and 23 'probable,' while of the 129 correct replies he had marked but 27 replies 'probable' and 102 'certain.'

Those ignorant of graphology gave nearly as great a proportion of correct answers. For instance, a studious girl of seventeen was correct in 70 per cent. of her replies. Four instructors and instructresses in the schools of France reached percentages of 72.9, 73, 73 and 73, though quite ignorant of graphology.

The author concludes with astonishing seriousness, "The gift of recognizing sexual character in writing belongs to nearly everybody, but the ablest of the 'ignorants' are still below the best graphologists"—(by less than 2 per cent. *P. F.*).

Chapter III. is devoted to photo-reproductions of addresses of which some specimens revealed the sex of the writer to all who examined them (18); others were doubtful; and still others were purposely falsified. One