## SIR CHARLES LYELL.

*Life, letters, and journals of Sir Charles Lyell, Bart.*, Author of Principles of geology, etc. Edited by his sister-in-law, Mrs. Lyell. In two volumes, with portraits. London, *Murray*, 1881. 457, 489 pp. 8vo.

I.

ALTHOUGH it has been more than a year since these volumes appeared, they have remained without any critical presentation to the American public. Science, like the rest of our modern life, goes so fast that there is scarce time for us to remember the dead of a decade ago. Thus it has seemed perhaps hardly worth while for our American journals to notice these admirable volumes. But it is not well for Americans lightly to pass by an admirable life of one who not only laid the solid foundations of the science in whose paths they have done so much good work, but who gave to their land and their people a patient study and a sympathetic understanding in days when other foreigners denied them both. Those who know the field of American travels will all agree that this country never had a juster or more loving critic than Charles Lyell. His two series of travels in this country, descriptive of his first and second visits to the United States, remain the best picture of American life in those years of imperfect promise, the fifth and sixth decades of this century. He made third and fourth voyages to this country, and on each of his journeys travelled extensively in the region east of the Mississippi. His papers on the geology of this country are among the most valuable contributions made by any European to the understanding of American geology; while the frequent references to American geology in his 'Principles' have served to make other parts classic localities in the science. These acts should be enough to warrant us in giving a careful study to his life, even if his peculiar place in the history of his science did not make him the most notable among all the great laborers in its fields.

It is, however, when we consider the place of Charles Lyell in the combination of sciences we call geology, that we find his true interest for all those who care for the progress of learning. No one conversant with the development of geology during this century, which includes its growth from the very germs of the science, can hesitate to give him the very first place among its many strong leaders, — a place that is unique in the history of the several sciences. The peculiarity of his position consisted in the fact that he was, during the forty years in which the science was taking its shape, an admirable critic of its work, — one who, from the circumstances of his position, his large social power, his penetration, sympathy, and capacity for individual research, was able to enforce moderation and judgment on all the workers on two continents.

When Lyell began to write the first of the eleven editions of his 'Principles' in 1828, geology was still contending with those prejudices which had retarded its progress, barriers which he, with the acumen of Bacon in dealing with the 'idols,' managed so well to overcome. In the immeasurable past which the recent researches of geologists had revealed, all sorts of speculations had been carried: vast deluges, periods of intense volcanic activity, epochs of sudden destruction and re-creation of animal life, were given room there. The aim of naturalists seemed to be to create a world as unlike that of to-day as it was possible to have it. The critical humor of Hutton or of William Smith had given place to a rage for speculation. On the other hand, the church, especially in England, had set its face against all theories that promised to weaken the dogmas of seven days' creation or the Noachian deluge. Lyell was the only geologist of his day who could have saved the science from the dangers of vagariousness that promised it a long period of trouble. Circumstances had favored his early training for the peculiar work he was to accomplish. His father was a Scotch gentleman of fortune, who had a strong taste for natural history, and made something of a name as a botanist. In his early youth Charles Lyell became deeply interested in collecting insects, — a taste which he seems to have kept during his life. As this collecting was done with discretion and study, it developed in him a power of close discrimination that was the foundation of much of his good work: no other study is so well fitted as is entomology to develop this capacity for details which is the condition of all good work in science.

After the usual rough training in humanity and the humanities in the preparatory schools, — a training that fortunately awaits every well-born British youth, — he went to Oxford, at the age of seventeen, and matriculated at Exeter College. There he laid the foundations of that excellent knowledge of the classics for which during his whole life he was distinguished above all of his scientific brethren. At every step in his future work we see the admirable results of this broad culture, this sense of perspective in the intellectual history of mankind, which is perhaps more necessary for the well-developed man of science

than for the student in any other field. It is this sense of the oneness of human history, this sympathy and understanding of men of all times, that gives the charm to his immortal Principles of geology; and in this day, when we are debating as to the use of classical training, it is well to ask what this book would have been if the Oxford element had not been there. It would perhaps have an equally valuable body of fact, but the informing spirit would have been wanting.

His power to make avail of his Oxford life was doubtless due to his keenness of appreciation of all forms of intellectual stimulus, though he took a fair rank in his college, winning second honors in classics. We see in his letters home that he has a lively interest in music, which had been an early-developed taste; for in his schoolboy days he had been the leader of a schoolboy orchestra. He is also something of a versifier; and some of his verses show a delicate fancy, though by no means a strong wing.

His first acquaintance with geology seems to have been made through Bakewell's Geology, which he found in his father's library; and that author's account of the earth's antiquity appears to have first aroused his curiosity to know more of the subject. While he was at Oxford, Buckland was at the height of his singular popularity. His lectures affirmed this early-acquired taste. His first geological journey was to Yarmouth, where he saw the great cutting power of the sea on that soft-cliffed coast. In the same year a journey to Staffa, of which his journal is given, served to possess him of the love for field-work. In 1818, when he was just of age, he made a tour through France, Switzerland, and Italy as far as Rome. His journal showed the keenest appreciation of the ordinary nature of travel, but as yet but little interpreting power. He appears, as were all others of his time, strangely blind to the structure of the Alps: even the parallel moraines on the glaciers puzzle him, — a matter that is one of the most transparent things in their history. The motion of the glaciers is not seen to be a problem: yet his critical spirit is awake; for, one of his party finding in an album the lines, —

> "Mont Blanc is the monarch of mountains:
> They crowned him long ago,
> Enthroned in ice, with robes of clouds,
> And diadem of snow," —

he well says, "It contains more real poetry than I thought could be found in all the albums of Europe." He did not recognize that they, a little garbled, were from Byron's Manfred, which had been published the year before. It may be that it shows us the place of birth of these the finest lines in that strange dramatic poem. Despite the veil that hid the deeper secrets of the Alps from his eyes, his good fortune showed him many things which served to lead his mind to the notion that the present forces of the earth are strong enough to explain the past. He saw the Goldau *éboulement*, or landslide, then but a dozen years old; and in the Rhone valley he beheld the frightful marks of the flood which poured from the lake formed by the Glacier de Bagne but six weeks before his coming.

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## *WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.*

### GEODESY.

**Length of a nautical mile.** — In common parlance, the length of a nautical mile is considered as a 'minute of latitude,' without any consideration of the range of value included within this definition. A paper upon this subject by Prof. J. E. Hilgard, superintendent of the Coast and geodetic survey, has just been published. It gives the values of one minute under nine different definitions. The values are based upon the elements of the Clarke spheroid. One minute of latitude at the poles = 1,861.655 metres = 6,107.85 feet; one minute of latitude at the equator = 1,842.787 metres = 6,045.95 feet; one minute on the equator (considering it as a circle) = 1,855.345 metres = 6,087.15 feet.

As adopted by the Coast and geodetic survey and by the Hydrographic office, a nautical mile is *one-sixtieth part of the length of a degree on the great circle of a sphere whose surface is equal to the surface of the earth.* Using the Clarke spheroid, this definition gives a nautical mile = 1,853.248 metres = 6,080.27 feet. This value closely corresponds with the English admiralty knot of 6,080 feet. — (*Rep. U.S. coast surv.*, 1881, app. 12.) H. W. B. [172

**Night signals for geodetic work** (by Mr. O. S. Wilson of the N.Y. state survey). — Owing to the small number of days during any season when the air is in good condition for sighting points more than twenty-five miles distant, and the few hours during even good-seeing days available for such geodetic work, especially in measuring horizontal angles, it is important not only to use to the best advantage what daylight is available, but also if possible to lengthen every good-seeing day. Hence any device for continuing work during clear nights is of great value. For this purpose electric lights were used on the triangulation carried across the Mediterranean in 1879 by the French and Spanish governments, with remarkably good results; the error of closure of a triangle being but a trifle over one second of arc. Some of these lines were the longest ever sighted for geodetic purposes, one of them being 167.7 miles. The burning