improvements in ore-dressing machinery used at Ems, by R. P. Rothwell, New York, N.Y.; Determination of manganese in spiegel, by G. C. Stone, Newark, N.J.; Gas analysis, by Magnus Troilius, Philadelphia, Penn.; Determination of copper in steel, by Magnus Troilius; History and statistics of the manufacture of coke, by J. D. Weeks, Pittsburg, Penn.; Notes on settling-tanks in silver-mills, by Albert Williams, jun., Washington, D.C.; Water-gas as a fuel, by W. A. Goodyear, New Haven, Conn.; The occurrence of gold in Williamson county, Texas, by Prof. C. A. Schaeffer, Ithaca, N.Y.; On the utility of the method adopted by the Pennsylvania geological survey of the anthracite fields, by B. S. Lyman, Northampton, Mass.; A new form of hydraulic separation for the mills of Lake Superior, by Prof. R. H. Richards, Boston. Mass.; An accident resulting from the use of blast-furnace slag-wool, by Prof. T. Egleston, New York, N.Y.

On motion of Mr. Bayles of New York, a proposed amendment to rule 6, requiring an additional regular meeting during the year, was laid on the table.

On motion of the same gentleman, a suitable vote of thanks was passed to all the gentlemen in Boston who had put the members of the institute under obligations; and, after a formal surrendering of his charge by the retiring president, Mr. Rothwell, the meeting was adjourned.

SIR CHARLES LYELL.[1]

II.

When he returned from this journey, he entered Lincoln's Inn, and began a rather desultory life in the law; and for the five subsequent years his geology had little growth save in his holiday-time. But his eyes, weak from childhood, gave him more trouble as years went on. He found the studies little to his taste, and each vacation drew him more and more strongly to science. In 1823 he became secretary of the geological society. This seems to mark the turning-point in his career; for, though he nominally kept his place as a student for the bar, we find him more and more separated from it in interest. In this year he published his first geological paper.

Perhaps the most interesting part of his letters, at least to the general reader, are those to his father from Paris in 1823. He had an easy entrance to the society of that day, and his clear pictures of many of the scientific men are extremely entertaining. Humboldt, Cuvier, La Place, Broquiert, C. Prévost, Tromsoe, all came under his trenchant pen. Of these Constant Prévost was doubtless his most effective teacher; for his was a spirit of singular insight, and the lines of his thought somewhat resembled those of Lyell's own mind. He has left a scanty record in his writings, but his power is marked in his effect on all who came within his influence.

In 1825, at his father's request, he once again went about his law; was called, and for two years rode circuit with his mind on older, if less musty, things than Jarndyce *vs.* Jarndyce, and the like. This seems to have been the last chance the law had of winning a very keen intelligence to its fields: henceforth he seems to have left it altogether. In 1828 his Principles of geology first took definite shape in his mind, and until his first edition in 1830 he was busied in many journeys after facts for his work. Central France, Italy, Spain, and Germany gave him the most of his field-matter; endless talks with the workers of those countries, for which his considerable knowledge of modern languages well fitted him, did the rest. In these and other journeys, his letters and journals show his ready understanding of men and their societies. He was never a solitary worker: almost every thing comes out in talks and work with others. Even his journals are always addressed to some one. It was an admirable feature of his character, that he was generally out of himself, and even his antagonisms are sympathetic.

His southern journey carried him to Sicily; but it is curious to note that he was delayed in Naples by need of care in avoiding the Tripolitan pirates, by a steamship-journey. It seems strange, that, in the days of emancipation of British slaves, with all the navies of Europe free from larger calls to action, this nest of pirates should have been tolerated.

In 1831 he was appointed professor of geology in King's College, London. His nomination had to be confirmed by a board of bishops and other church-magnates; and his open opposition to the notion of a deluge and a seven-days' creation made it doubtful if he would receive it. At last, in a fine English way, they declared "that they considered some of my doctrines startling enough, but could not find that they were come by otherwise than in a straightforward manner, and logically deducible from the facts; so that, whether the facts were true or otherwise, there was no reason to infer that I had made my theory from any hostile view towards revelation."

His experience as a lecturer in Kings College was not such as to procure him much profit or intellectual gain: so, though he deemed his work successful, he soon abandoned it.

[1] Continued from No. 3.

In 1832 he married Miss Horner, daughter of Leonard Horner, one of the best of the geologists of that day. It was a singularly fortunate union, that lasted for more than forty years. In all his subsequent work his devoted wife had a large share of sympathy, and often no small part of actual labor; while, by her rare graces of person and intellect, she made his home more of an intellectual centre than any other of its day in England.

In 1834 he made a careful journey through Denmark and Sweden, to study the phenomena of elevation and subsidence exhibited along their shores. His journals in this expedition show in an admirable way the power of combining rapid travel with clear seeing, that so marked his journeys.

We cannot follow the interesting story of his other journeys on the continent. They were all undertaken with the view of fixing the data for his 'Principles.' There are few books covering so wide a field that has been so patiently, so devotedly labored.

In the summer of 1841 Lyell made his first journey in the United States. He was specially induced to the journey by the offer of a course of lectures in the Lowell institute, a prize that has tempted so many distinguished men to this country. When the history of science in America comes to be written, this institution will have to be credited with much of the best help that has been given to its advancement. Thirteen months of assiduous travel carried him over a large part of the United States and Canada.[1] It is to be regretted that only half a dozen letters touch upon this interesting journey, for they show a singularly clear and just impression of the social conditions of that time. It is curious to notice, that, in the first letter, he indicates his half belief that the negroes should be distinguished as a distinct species from the Caucasian. In these letters as well as in the record of his travels, in the First visit to the United States, he shows always a sense of hopefulness for our future, and delight in our essential, though rather material, success, that is in wide contrast with the other travellers of that day. In the letter to George Ticknor, Esq., written just after his return to Great Britain, he shows a capital power of discrimination between the good and the evil of our land at that time. These letters to Mr. Ticknor are among the most charming in the second volume, showing him at his best; for his correspondent had the admirable power of putting all men to their best in their intercourse with him.

In 1845 we find him, with Faraday, a member of a commission on colliery-explosions. His picture of Faraday is very interesting, and shows a new side of that remarkable character.

In 1845 he again visited the United States, remaining nine months. In this journey he saw the south once again, and found himself much more content with the institution of slavery; for he now saw how much it had done for the people not born in its toils. Unhappily, his letters are not sufficiently numerous to follow him on his geological work: the reader may, however, do this in his Second visit to the United States.[1] He made two other visits to this country, both much briefer than his earlier journeys. One of them was for a general and very successful series of lectures before the Lowell institute; and the last as commissioner to the "world's fair" of New York, of 1853. In 1854 he visited Madeira, the last, and on some accounts one of the most important, of his many journeys; for it completed his admirable studies of volcanoes. From this time on, his work was mainly given to the successive editions of his Manual and Principles, and the Antiquity of man, no memoirs of importance appearing from his pen. To this task of re-editing he added that of adviser to all the rising geologists of England, we may say of the world. His house, at 15 Harley Street, famous in an earlier day as the home of Sir Arthur Wellesley, became the centre of a brilliant society; and in its kindly offices his beautiful life went slowly to its end. In the spring of 1873 his wife died. He struggled bravely against the burden of time and care for nearly two years, until, on Feb. 22, 1875, he passed away; leaving one of the purest memories that was ever gathered in a life of nearly fourscore years, and a place among the students of the earth's structure that can never be filled.

It remains to speak of the work of the editor. This seems remarkably well done. A small and well-considered thread of narrative binds the scattered letters and fragmentary journals into a whole. We see the man, unconsciously pictured by himself, from his youth to his end. An excellent list of his contributions to science accompanies the work.

It is to be regretted that the letters are not twice as numerous. There are none to C. Prévost or to Deshayes, and scarcely any to

[1] Travels in North America, with geological observations. 2 vol., London, 1845.

[1] A second visit to the United States of North America. 2 vol., London, 1849.

his other continental correspondents. There are none to Agassiz, with whom he was in correspondence. It is to be hoped that in another edition some of these omissions may be supplied. They afford the best keys to the history of scientific opinions in the vigorous years of this century that have yet been given to us. Unfortunately, the most instructive part of his intercourse, that with his companions in his own society, did not, of course, find this form of expression; but there is enough in these two volumes to show the peculiar charm of his character and to explain his wide influence. It has been the good fortune of the writer to use the Principles for nearly twenty years as a 'compend' for lectures to a class of university students. The beauty of their spirit has served to enchain near a thousand students in the study of the science, while the recollection of instructive days with their author has freshened the labor of teaching. His was a pure, strong spirit, well pictured in his own charming account of the spirit of man, as free: —

"ire per omnes
Terrasque tractusque maris coelumque profundum."

ASTRONOMICAL LITERATURE.

Bibliographie générale de l'astronomie, ou Catalogue méthodique des ouvrages, des mémoires et des observations astronomiques, publiés depuis l'origine de l'imprimerie jusqu'en 1880. Par J. C. Houzeau et A. Lancaster. Tome Second: *Mémoires et notices insérés dans les collections académiques et les revues.* 1er fascicule, déc., 1880; 2e fasc., mars, 1881; 3e fasc., juin, 1881; 4e fasc., avril, 1882. Introduction, (?), 1882 [the whole volume consisting of 2,225 col., or about 1,100 p.]. l. 8°.

Before the publication of this work, there were three general scientific bibliographies of importance to astronomers, — Reuss' Repertorium, the Royal society's Catalogue of scientific papers, and Poggendorff's Handwörterbuch. The first two related only to memoirs, and not to separate books: the third included the most important books and memoirs of each author. Reuss (vol. v., Astronomy) was very far from complete to 1800; the Royal society's catalogue omitted whole series of journals from its plan, so that the work of MM. Houzeau and Lancaster has over forty per cent more entries for the corresponding period. Poggendorff's excellent work will always be useful. Of special astronomical bibliographies there are several; the two most important being Lalande's and the Catalogus librorum of the Pulkova observatory. These will always have a peculiar value; but for practical purposes these and almost all other special bibliographies will be superseded as soon as M. Houzeau's work is completed.

Vol. ii. (the only one yet published) consists of references to all memoirs, etc., in the transactions of learned societies and in journals. These are classified by subjects, — somewhat minutely, as may be seen by the following extract, which contains all the divisions of celestial mechanics: —

Section V. — *Mécanique céleste.*

The authors have added to very many of the references a brief note of the contents of the paper. These notes will often appear too brief and inexact to the specialist in each department (who will, however, be grateful for them when he is looking up some unfamiliar subject), and it would not be hard to find some misconceptions recorded in them; but they double the value of the book to the working astronomer, and are priceless to the pupil.

The best indication of the way in which the work is done is to be had by quoting one or two extracts at random: —

"Baily (F.): On a remarkable phenomenon that occurs in total and annular eclipses of the sun. Londres, MAS., X, 1838, 1. [etc.] Les grains blancs, le peigne et la goutte noire."

"Wurm: Merkur. Ba J, Sup, II, 1795, 4. Diam. apparent."

"Secchi, A. Saturne, Le soleil, [etc.] p. 395, avec 1 dessin, p. 255."

It may be noted here, that there are only some score of drawings of Saturn referred to: the list might be trebled easily. The registers of authors, etc., are most full and valuable; and every aid is provided for a quick consultation of the authorities.

It has been considered necessary to limit the scope of the work to astronomy proper, and sometimes this limitation is quite inconvenient. For example: measures or computations of the compression of the earth deter-