comparatively new trade in spun silk goes far to compensate for the loss of the older trade, and has enabled the exports of silk manufactures from the country to be at least maintained and to show some signs of expansion. The spun-silk industry has chiefly developed in the Yorkshire and Lancashire textile centres,— Bradford, Halifax, Rochdale, &c. But it is highly significant that, while the exports of British silk manufactures have not decreased, the imports in the meantime have shown a marked expansion ; and unquestionably, although the use of silken goods has increased very greatly within twenty-five years, the expansion of native silk manufactures has not kept pace with that growth.

Favoured by the operation of protective duties ranging from 50 to 60 per cent. *ad valorem,* the native manufacture of silk in the United States has been nursed into considerable activity and expansion, till now well-nigh one-half of the silken fabrics used in

the country are of home manufacture. In 1860 the proportion of native manufacture was 13 per cent., in 1880 it reached 38 per cent., and in 1882 it was 40 per cent. of the entire consumption. Reeled silks are principally manufactured at Paterson and Hoboken, N. J., and Brooklyn and New York City, N. Y., and the spun-silk industry flourishes at South Manchester and Hartford, Conn.

The following estimate of the relative importance of the silk manufacture of various countries was made in 1883 by Mr Peixotto, the United States consul at Lyons :—

|  |  |  |  |
| --- | --- | --- | --- |
| France.............. | $85,000,000 | Russia | 16,000,000 |
| Germany........... | 45,000,000 | Austria | 12,000,000  12,000,000 |
| United States..... | 35,000,000 | Italy |
| Great Britain..... | 25,000,000 | Spain | 5,000,000 |
| Switzerland....... | 18,000,000 | Other countries... | 17,000,000 |

giving a total of $270,000,000.

SILLIMAN, Benjamin (1779-1864), American chemist and geologist, was born in 1779 at Trumbull (then called North Stratford), Connecticut. His father, Gold Selleck Silliman, was brigadier-general in the war of the revo­lution, and had also held important civil positions. The history of the family points to an Italian origin, but Daniel Silliman, the first to settle in the United States, came from Holland. Silliman received his early education at Fair­field, Connecticut, at that time the residence of his father’s family, and in 1792 he entered Yale College, where he graduated in 1796. He then studied law, and was admitted to the bar in 1802, while a tutor in Yale College, to which position he had been appointed in 1799. In 1802 a professorship of chemistry and natural history was established in the college, and he was at once elected to fill it. He spent portions of 1801 and 1802 in Philadelphia in preparation for his work, and the year 1804 he spent in Europe, chiefly in England and Scotland, where he attended the lectures of Hope and Gregory, and also formed the acquaintance of Davy, Wollaston, Brewster, Leslie, and other eminent men of science. As a result of this visit he published *A Journal of Travels in England, Holland, and Scotland, and of Two Passages over the Atlantic in the years 1805 and 1806* (2 vols., 1810), which had a marked success. In 1813 he began service with the medical department of Yale College as professor of chemistry and pharmacy, and continued to give instruction there for many years. In 1818 he founded the *American Journal of Science and Arts,* a periodical devoted to the physical sciences, which has been, and is, the most important American scientific serial. In 1851 he made a second journey to Europe, of which he likewise published an account in two volumes, edited by his son, who had accompanied him. In 1853 he became professor *emeritus,* but he continued to lecture for a year or two longer. His closing years were quietly spent in unabated mental activity at New Haven until his death in 1864. Though devoted to scientific pursuits, he inter­ested himself in the public movements of the time.

One of Silliman’s earliest scientific publications was an account of the famous meteorite which fell in Weston, Conn., December 14, 1807. This account, which excited great public interest in the country, was reproduced abroad, and was read before the Royal Society of London, and also before the French Academy. Among his other scientific labours may be mentioned his experiments upon the fusibility of various substances in the flame of the com­pound blowpipe of Hare, then a novelty in science, and upon the vaporization and transference of the carbon in the voltaic arc from the positive to the negative pole, which he was the first to observe. He also repeated the experiment by which Gay-Lussac had separated potassium from its hydrate, and obtained the element in its metallic form, doubtless for the first time in the United States. Other professional labours were an exploration of the coal formations of Pennsylvania in 1830, and an examination of the gold mines of Virginia in 1836. In 1832 and 1833, by appointment of the United States Government, he made a scientific investigation of the culture and manufacture of sugar, embodying his results in a voluminous report published by the Government. Though Silliman published a large number of scientific papers upon chemical and geological subjects, his reputa­

tion was more especially due to the courses of public lectures which he delivered in the college and in various cities and towns of the United States. The happy combination of a graceful and interesting style with unwonted splendour of experimental illus­tration gave these lectures an unprecedented popularity, and they exerted a powerful influence in awakening and developing a taste for scientific matters throughout the country.

Besides the works already mentioned, Silliman published in 1808 an American edition of Henry's *Chemistry,* with notes, in 1827 an edition of Bakewell's *Geology,* and in 1830 *Elements of Chemistry,* in two volumes. An account of his life, bv Prof. George P. Fisher, of Yale College, was published in two volumes in 1866.

SILLIMAN, Benjamin (1816-1885), American chemist and physicist, son of the preceding, was born in 1816 at New Haven, Connecticut, and educated at Yale College, where he graduated in 1837. He then became assistant to his father in chemistry, mineralogy, and geology, work­ing in his laboratory at the college, and pursuing original investigations. He began teaching in the laboratory soon afterwards. The school thus informally established was shortly afterwards recognized by a formal act of the cor­poration of the college, and ultimately developed into the Sheffield Scientific School of Yale College. In 1838 he became associate editor with his father of the *American Journal of Science and Arts,* and he continued in the editorship of the journal until the close of his life, Prof. J. D. Dana (his brother-in-law) having joined him in 1846. In the winter of 1845-46 he gave a course of lectures on agricultural chemistry in New Orleans, which is believed to have been the first course of lectures upon that subject ever given in the United States. In 1849 he was appointed professor of medical chemistry and toxico­logy in the medical department of Louisville university, Louisville, Kentucky, which position he held for five years. In 1854 he succeeded his father as professor of chemistry, and continued to give instruction in this science, first in the academical and afterwards in the medical department of Yale College, until his death in 1885. In 1853 he was connected with the exhibition at the Crystal Palace in New York, having charge of the departments of chemistry, geology, and mineralogy. As a result of this work he edited a large quarto volume, *The World of Science, Art, and Industry* (1853), followed in 1854 by *The Progress of Science and Mechanism.* He also published in 1846 *First Principles of Chemistry,* a text-book which had a wide sale and passed through three editions. In 1858 he published a manual of physics entitled *First Principles of Physics or Natural Philosophy* (2d ed. 1861). In 1864 and again in 1867 and 1872 Silliman visited Cali­fornia, being engaged in professional work connected with various mines and in mineralogical and geological ex­plorations. Still later he made several visits to the mining regions of the western States and Territories, and the results of his observations formed the subjects of numerous scientific papers. In 1874, the centennial anni­versary of Priestley’s discovery of oxygen, he delivered at Northumberland, Pa., where Priestley had resided during the later years of his life, an historical address on “Amer­