Benjamin Smith Lyman and the Geological Survey of Japan (1872-1879) Papers, Maps, and Charts at the American Philosophical Society in Philadelphia

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Benjamin Smith Lyman was born in Northampton, Massachusetts in 1835. He studied law at Harvard University from 1852 to 1855. Lyman's varied and impressive scientific career began with field studies in 1856 and 1857, assisting his uncle, the eminent J. Peter Lesley, Director of the Geological Survey of Pennsylvania. During these years, Lyman went from Philadelphia through the mid-Atlantic and southern states gathering statistics on iron manufacturing for the Iron and Steel Association. After serving with James Hall on the Geological Survey of Iowa in 1858, he attended the School of Mines in Paris from 1859 to 1861 and then transferred to the prestigious Freiburg Mining Academy in Germany. Lyman returned to America in 1862 to work on the geological surveys of Pennsylvania, Virginia, Nova Scotia, California, and Alabama. In 1870 the government of India hired him to provide a geological survey of oil fields in the Punjab.

American scientists had started to investigate the geology of Japan in 1862. William P. Blake and Raphael Pumpelly were engaged to study and develop the mineral resources of Yesso, the ancient name for Hokkaido, the northernmost and second largest of the four main islands comprising Japan. However, Blake and Pumpelly, accompanied by several Japanese students, spent only a few months working on Hakodate, Volcano Bay, and a few other sites on Yesso.

The impact of Western culture on Japanese science has been examined in Science and Society in Modern Japan: Selected Historical Sources (Nakayama and Swain 1974: 312-25). Particularly useful in this volume in James Bartholomew's "An Annotated Bibliography of English Language Works on the Social History of Modern Japanese Science." Simply stated, the Meiji Restoration in 1867 replaced traditional Chinese learning with Western learning. A large number of Japanese students were sent abroad, especially to the United States, Britain, and Germany. In like manner, foreigners--mostly American, British, German, and French--helped establish a modern educational system in Japan, including instruction in Western science and technology.

Amid the intellectual transformation of Japanese science, Lyman was appointed in 1873 to serve the Japanese government as Commissioner of Geology and Mining, having been contracted for this position by the Hokkaido Development Board (Hokkaido Kaitakushi). Upon assuming his post, Lyman gave a series of courses to several students whom he selected from a school run by the Hokkaido Development Board. For the next three years Lyman and his young assistants completed a thorough investigation of Yesso. The survey examined the "lay of the land," encompassing rivers, harbors, towns and their populations, and roads; geology, the structure, composition, and age of the region; mineral resources, especially coal, oil, and iron ore, along with the quality and quantity of these substances. Other "useful minerals" were sampled, such as gold, copper, and sulphur. Timber, water power, and the availability of building materials like gypsum, clay, and limestone were also included in the survey.

In a section of the General Report on the Geology of Yesso (Lyman 1877), there appears the term "political obstacles." Noted here are matters of treaty regulations bearing upon foreigners'
mining, removal of the present prohibition, benefits of associating native and foreign business men, prejudices against foreign capital, and government aid towards mining.

From an economic standpoint, Lyman addressed the results of the Yesso survey by revealing that "there are probably a hundred and fifty thousand million tons of workable coal in Yesso, or about two-thirds as much as the coal of the same thickness of the famous fields of Great Britain, which are such an immense source of wealth to that country, far the largest coal producer in the world. That amount of coal in Yesso would enable the island to yield the present enormous yearly product of Great Britain for nearly a thousand years..."

The scientific impact of the survey had far-reaching ramifications. The Hokkaido Development Board can be credited with beginning and completing the first geological survey of its kind undertaken by a native Asian government and publishing the results for international scrutiny. Another very important result was the training of the twelve young Japanese who had assisted Lyman and had become the first group of western-trained geologists. The training given the Japanese assistants was very basic in nature. The process of surveying and mapping and the mathematics necessary to perform these tasks was undertaken. The students had only just mastered decimal fractions and had little exposure to drawing when they began the Yesso survey. They gained competence in making field observations and measurements and in learning to work out the region's underground geology. Lyman employed a topographical method which he felt was far superior, albeit more laborious and slow, to other methods commonly used by geologists. Lyman proudly noted that his advanced method provided such precise information on the amount of coal in Yesso that not for the next fifty years could this feat be matched using other procedures.

H. S. Munroe, an American assistant on the Yesso survey, calculated that the exactness of the measurements made by the Japanese assistants amounted to less than half a percent; this is indeed a very good showing for any survey, let alone one of this difficulty.

After the completion of the Yesso survey in 1876, Lyman undertook investigations of oil fields in Niigata (Honshu) and in western Japan, as well as mines throughout the country. Officially, Lyman's contract with the Ministry of Industry ended in February 1879. However he remained in Japan until the spring of 1881, completing reports on his explorations. On his return to America in 1881, he settled in Northampton and then removed to Philadelphia in 1887. Until 1895 Lyman held the post of Assistant Geologist of the Pennsylvania Geological Survey. Thereafter he privately engaged in geological investigations in Europe, India, China, the Philippines, and the United States. He was elected a member of the American Philosophical Society in 1869. Many of his articles on geological subjects, 150 papers, were published in the Transactions of the American Institute of Mining Engineers, in the Proceedings of the American Philosophical Society, and in the Proceedings of the American Association for the Advancement of Science. Lyman was a member of twenty-three technical and scientific societies, including an honorary membership in the Mining Institute of Japan. He died unmarried in Philadelphia in 1920 and was buried in Northampton, Massachusetts.

The American Philosophical Society Library holds some 18,000 items (49 linear feet) of Benjamin Smith Lyman papers, spanning the years 1850-1918. These papers were deposited by the Academy of Natural Sciences of Philadelphia in 1942. There are notes, sketches, memoranda, maps, and correspondence made while Lyman directed the geological survey of Japan, with reports on petroleum resources, copper, coal, iron, and gold mines, and other resources of Japan. The collection is contained in 58 Hollinger boxes, 18 of which hold material dealing specifically with Japan. Geological survey material comprises 9 boxes; there are 7 boxes of correspondence for the period, 1872-1883; and 2 boxes of uncataloged material labeled "in Japanese."

Most of the material is in English. There are, however, the maps and charts that are only in Japanese. Two examples of the Japanese accounts are the map of the Tochigiken Shimotsuka-
gun Ashiomura-no-mon (copper mine) and an account of the copper mine's ore quality, the value of the copper, and the refining techniques employed. Although the map of Edo (Tokyo) which was drawn about 1875 and depicts the site as it appeared in A.D. 1458 (Choroku 2) has little to do with the nineteenth-century survey, it certainly demonstrates that among Lyman's papers there are many curious and interesting documents.

The Forbes Library in Northampton, Massachusetts received 40 volumes of letter books, 363 volumes of survey books, scrapbooks, account books, etc., from the Lyman family in 1921. Apparently these materials have been deposited at the University of Massachusetts Library in Amherst. I learned of the transferring of the entire Forbes holdings, including a large collection of books about all aspects of Japanese culture, from correspondence with librarians at the Forbes Library. In any event, researchers should use both collections since they compliment each other.

The collections of the American Philosophical Society Library focus on the history and sociology of science, technology, and agriculture, primarily from the eighteenth to the twentieth century. The Lyman collection reveals much about Japanese-American economic and scientific relations. It can be used to examine the development of the Japanese mining industry and the geologists, managers, and administrators who were proteges of Lyman. E. Yamagiwa and J. Shimada who found the great coalfield at Ikushumbetsu in 1880 and I. Ban who found the Oyubari coalfield in 1888 are among those trained by Lyman. The survey paved the way for the ultimate construction of the great Coal Mines Railways of Hokkaido and the realization that the meager production of 400,000 kiloliters of petroleum by the Nippon Oil Company during 1936 would never meet the needs of Japan.\(^5\)

Lyman's involvement with the Japanese was not solely of a geological nature. He nourished an interest in the Japanese language, history, art, and swords which was facilitated by his fluency in the language. The unique opportunity of a Westerner able to communicate with the residents of the areas off the beaten trail makes Lyman's accounts valuable to anthropologists and sociologists. Manuscript copies of papers on swords and the customs pertaining to them, Ainu language material, and the article "The Character of the Japanese," published in 1885 in the *Journal of Speculative Philosophy* reflect Lyman's non-geological erudition.

Our manuscripts are being entered into the Research Libraries Information Network data base. J. Stephen Catlett's "A New Guide to the Collections in the Library of the American Philosophical Society" in the *Memoirs of the American Philosophical Society* (v. 66s 1987) will provide useful descriptions for researchers. Beth Carroll-Horrocks, the Manuscripts Librarian, should be contacted regarding information about nonprint material. The Library is open Monday through Friday, 9 A.M. to 5 P.M.

Notes


5. Ibid., p. 15.

An artistic rendition of the site in Nagano Prefecture of an American-equipped oil rig.

Details of an ancient method of oil well drilling in the Echigo, Shinano, and other regions.