Science and Society Ⅱ (Geology, Mineral and Environment in the human society)

American geologist who surveyed geology of Mongolia in the 19th century

(1)Outline of Mongolia
(2)History of Geological Survey in Mongolia
(3)Pumpelly's survey

・Mongolia bounds Russia in north and China in south.

・Mining is important in Mongolia.

・Pumpelly visited Japan in end of Tokugawa shogunate. Then he traveled China and Mongolia.

1. Outline of Mongolia

(Image of HP in MonMap)

Mongolia bounds Russia in north and China in south.

Mongolia at a glance

1. Population：3.41 million in 2021
2. Area：1.56 million square kilometers
3. Capital：Ulaanbaatar

   (Population 1.64 million in 2021)
4. Industries：

   Mining (Copper, Gold, Coal etc.)

   Live stock farming,

   Distribution

   Light industry (Cashmere, Leather work)

History of Geological Survey in Mongolia
– Epoch of hero –

R. Pumpelly (USA): A geologist who traversed Mongolia in 1864. Before coming to Mongolia, he surveyed Hokkaido, north island of JAPAN.

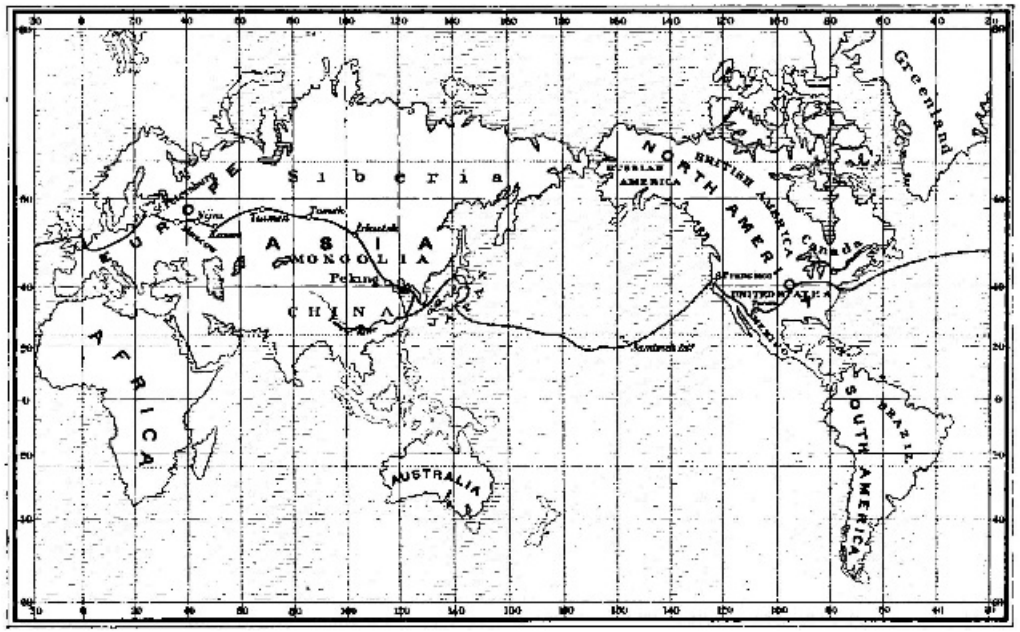
V. A. Obruchev (Russia): Surveyed Mongolia for 60 years since 1892. Published a complete geological map of Mongolia in 1957.

R. Ch. Andrews (USA): Known for leading a series of expeditions into the Gobi Desert and Mongolia in the early 20th century.

Pumpelly, Raphael (1837.9.8–1923.8.10)

- Born; Sep 8, 1837, Owego, New York
- Study; Graduated from Freiberg University of Mining and Technology in 1859
- In 1860, he was engaged in mining operations in Arizona. From 1861 to 1863, he surveyed Yesso Island (Hokkaido) of Japan and coal fields of northern China.
- After this, he surveyed the Gobi desert (Inner Mongolia) and explored Mongolia and Siberia.
- After visiting Mongolia, he became Professor of Mining Science at Harvard University, then, organized the Northern Transcontinental Survey, and then was appointed Director of the US Geological Survey, New England branch , in 1884.

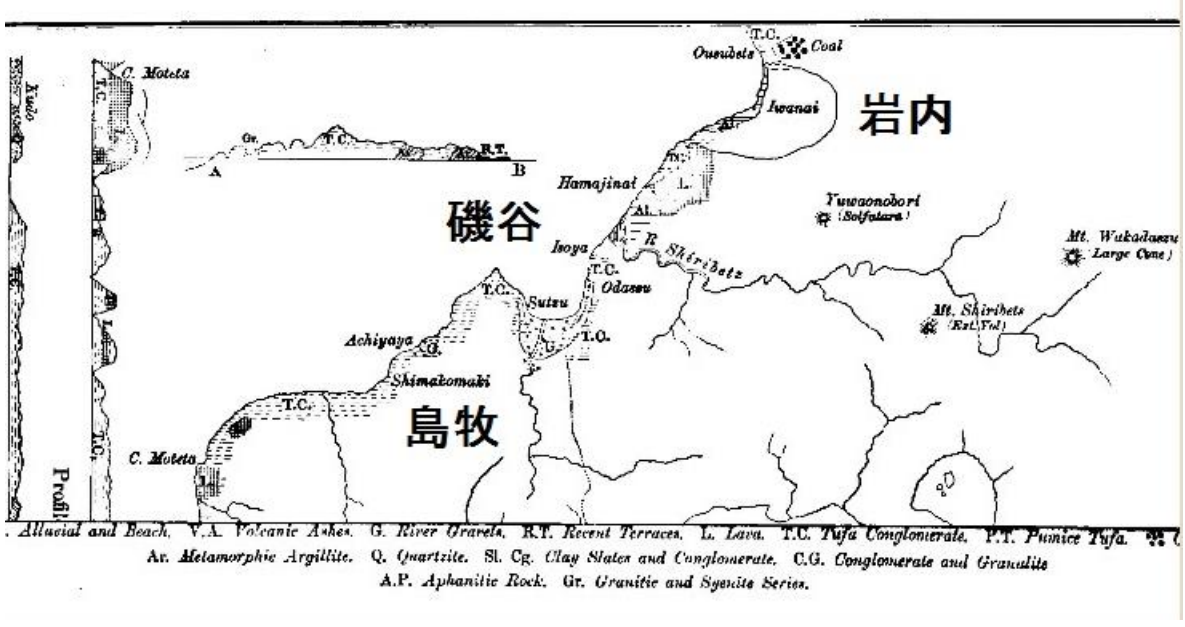
Pumpelly's route from 1861 to 1866



- In 1861, Abraham Lincoln took office as President in US.
- In 1861, American Civil War started. (Until 1865)
- In 1862, Emancipation Proclamation was declared.
- In 1869, Transcontinental Railroad was opened.

Stay in Japan

- On Feb 21, 1862 , Blake and Pumpelly arrived at Yokohama.
- On May 9, 1862, Blake, Pumpelly and Rice(US secretary) arrived at Hakodate.
- Field excursions were done.
- Mining school was opened.
- On Dec 4, 1862, contracts of them was finished.

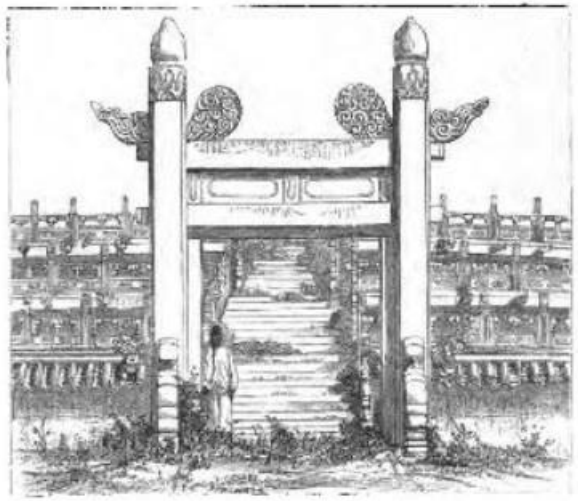


Kayanuma Coal Mine

1856 Local people discovered occurence.
1862 Pumpelly confirmed that the coal in Kayanuma was good quality.
This mine closed in 1969.

Pumpelly's Stay in China

In1863, he surveyed the coal mines because of demand of Chinese government.

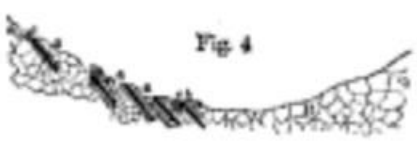


... Geological researches in China, Mongolia, and Japan, during the years 1862 to 1865 – Raphael Pumpelly

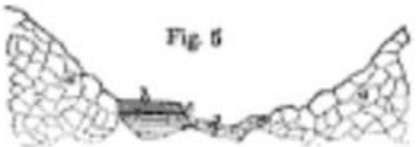
the hollowed out steps c, and raising the water from its step to the one above him.

The coal is drawn out on sleds, by men, through *b* and *a*, only one-half the breadth of *b* being cut into steps for drainage.

Chingshui Mines.—These mines are in a narrow valley, about five miles W. N. W. of Chaitang, in the midst of the porphyry mountains. There seem to be several seams, but the confusion caused by the numerous dykes of porphyry is very great. In two of the seams the roof is formed by these dykes, at least for a considerable distance, while others are cut through by them, and in places only fragmentary portions of a seam, and its accompanying beds are left. Fig. 4 gives a general idea of the relation between some of the seams, and the porphyry as seen in the side of a mountain valley. Fig. 5 is a section of a fragment of the coal series only a few square



a. Porphyry. b. Coal series. c. Coal seams.



a. Porphyry. b. Coal series. c. Coal seam. d. Creek rubble.

rods in extent, cut off on one side by the porphyry, and on the other by the creek. The coal of this locality is very bituminous, and I failed, during my short visit, to find any indications of the metamorphism, often observed in the action of dykes on coal, especially where basalt has broken through tertiary brown coal formations.

Chiguhui Coal Mine

Toward Mongol Plateau in snowstorm

- At four PM, November 21, they departed to Mongol Plateau. Weather was snowstorm.
- This party was composed of 26 camels and 4 carts. They used 17 hours for moving in a day. Carts were used for sleeping space in night. A cart had two wheels and no spring. It was 3 feet (0.9 m) in width and 7 feet (2.1 m) in length. The cart was covered with many blanket. It was supported with saddle of a camel.

Transport with camels
(Photo by Takahashi.)

Battle with terrible cold on Mongol Plateau

- On the first few days, he was not familiar with coldness in this time. He battled with coldness. (-12℃ at Kargan)
- Within a cart, temperature was almost same as outside. The cart only shut off the wind. His naked hands could not touch the blanket and furs due to their coldness.

Winter view of Mongolia,
in December, 2013.
Photo by Takahashi.

- The passports were examined by Chinese officials, then they were permitted to pass the wall which separated the two towns.
- On the one side (Khyakhta) of stockade wall, houses, churches, and people were European.
- They passed really from Asia. Pumpelly felt change of Asian customs and languages into a refined European society.

Khyakhta in 1891

Pumpelly's route in 1864

(Map image is from HP of MonMap)

Video for understanding nowadays Mongolia

Mongolia, with Japanese backing, to focus on renewable energy （2min 31sec）

https://www.youtube.com/watch?v=nmg6iyyml2w