THE IMPERIAL GEOLOGICAL SURVEY OF JAPAN: ITS HISTORY, ORGANIZATION, AND WORK.

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HISTORY.

The first geological examination of Japan (exclusive of Hokkaidō, Ryūkyū, Taiwan, Karafuto, and Chōsen) was made by Mr. T. WADA, in 1878, under the Geographical Bureau (*Chirikyoku*) of the Department of Interior, the provinces of Kai and Izu being then mapped out. At the end of the same year, Dr. E. NAUMANN, then Professor of Geology in the Tōkyō University, advised the establishment of a systematic geological survey of the Empire, and submitted a plan for the same to the Minister of the Department of Interior. Almost at the same time Mr. T. WADA, then Assistant Professor in the Science College, submitted to the Government his plan for the geological survey, which was almost coincident with that of Dr. E. NAUMANN. In May 1879, their plan was adopted and the present Imperial Geological Survey was organized and put into operation under the management of Mr. T. WADA, the scientific staff being placed under the direction of Dr. E. NAUMANN. As much time was spent in making the necessary preparations, the survey itself was not begun till the following year. In 1881, the Government established the Department of Agriculture and Commerce (*Nōshōmushō*), and transferred to it the direction and work of the Geological Survey as a section of its Agricultural Bureau; but in 1882, the Geological Survey was made independent of this Bureau, under the name of *Chishitsuchōsagō* (Imperial Geological Survey). It was now felt, in the interests of industries rapidly developing in the Empire, that, as far as possible, the investigations carried out under the Survey should be directed

to matters promising to be of practical importance, such as the examination of ore deposits, arable soils, and other forms of mineral wealth, with the object of affording assistance to mining, agriculture, and other branches of applied science. The Survey was organized in accordance with this view and Mr. T. WADA was made Director. The work in the Topographical and Geological Sections was placed under the immediate control of Dr. E. NAUMANN, while the Agronomical and Chemical Sections were under the charge of Prof. Dr. M. FESCA and Mr. O. KORSCHOLT respectively. In 1885, Dr. T. HARADA succeeded Dr. E. NAUMANN, in the direction of the Geological and Topographical Surveys, and since 1884, the work of the Chemical Laboratory has been under the direction of Mr. J. TAKAYAMA who succeeded Mr. O. KORSCHOLT. In 1891, ill health obliged Dr. T. HARADA to resign his office. In 1893, Mr. T. WADA having retired, Mr. T. KOCHIBE, then Chief of the Geological Section, was appointed Director. In 1894, Prof. Dr. M. FESCA was relieved of his office and pensioned in recognition of his valuable services extending over a period of twelve years. Thus the work of the Survey, which for a number of years had been carried on with the assistance of foreign experts, came now wholly into the hands of our nationals. In July 1900, the Staff of the Oil Lands Survey was organized as a department of the Survey, and in December 1903, was amalgamated with the Survey. In March 1904, the Agronomical Section was transferred to the Agricultural Experimental Station as a department of the same. In July of the same year, Mr. T. KOCHIBE having retired, Mr. T. SUZUKI, then Chief of the Geological Section, was appointed Director. In the same month the Survey was united with the Mining Bureau. In March 1907, Mr. T. SUZUKI having retired, Mr. K. INOUE, then the geologist and Chief of the Topographical Section, was appointed Director. In April 1910, the Staff of the Mineral Survey was newly organized and has now almost completed the survey of the important mineral lands in Hokkaidō. In July 1913, the Oil Lands Survey which was organized in 1900 was discontinued. As the geological survey as at first proposed had almost been completed, a new plan for a detailed geological survey was adopted in March 1915 and put into operation two years later. In August 1917, the Staff of the Oil Lands Survey was reorganized, and is at present completing the geological survey of the main oil fields in the Prefectures of

Niigata and Akita. In April 1919, the Industrial Mineral Survey was created as a department of the Imperial Geological Survey.

ORGANIZATION AND WORK.

The plan of the Geological Survey, first proposed, was to carry out a topographical, agronomical and geological survey of the whole country, exclusive of Hokkaidō; but later on the agronomical survey was transferred to the Agricultural Experimental Station.

The scale of the topographical and geological maps as published was to be 1:400,000 for reconnaissance division-maps, and 1:200,000 for sheet-maps, while that of the agronomical maps was to be 1:100,000. The reconnaissance division-maps each cover 3° of longitude and 4° of latitude, thus making 5 divisions. The sheet-maps each cover 1° of longitude and 30' of latitude and are in 98 divisions.

The detailed geological survey newly planned, has been at work since 1917, one geologist being required to complete the geological mapping of one sheet-map area in one year. One of these sheet-map areas covers a quadrangle of 30' of longitude and 15' of latitude, and the whole country, exclusive of Hokkaidō, Taiwan, Chōsen and Karafuto, is divided into 320 sheet-map areas. The scale of the sheet-maps when published was to have been 1:75,000, so that four sheet-map areas as issued are equivalent to one sheet-map area as at first proposed.

Furthermore since the agronomical survey has frequently to be carried out to meet the wants of some particular prefecture, these maps are severally made coextensive with the several Ken or Fu (prefectures), instead of being determined by longitudes and latitudes. To each geological and agronomical map, an explanatory text is attached.

Besides, detailed extra-surveys, geological and topographical, are often carried out either in course or by request, the result of these surveys being mostly published as maps and reports. Bullentins and reports are frequently published, giving the results of either geological and geographical surveys or of investigations undertaken in connexion with the chemical investigations conducted by the Survey.

Present Staff of the Survey is 1 Director, 19 Geologists, 2 Collaborators, 2 Chemists, 9 Assistant Geologists, 12 Cartographers, 24 Topographers, 7

Assistant Chemists and 4 Clerks.

The Survey is now divided into six Divisions: viz. those of (1) Geology, (2) Topography, (3) Chemistry, (4) Mineral Survey, (5) Oil Lands Survey and (6) Industrial Mineral Survey, with the Mineral Museum and Library.

1. DIVISION OF GEOLOGY.

TSUTOMU OGURA, Chief.

The reconnaissance geological survey was completed in 1892 and the reconnaissance division-map (scale 1:400,000) of the first division was published in 1886 and that of the fifth or last division in 1895. These maps have since been revised and republished, the first division in 1902 and the fifth or last division in 1916. They are now in course of a second revision, and the division-map of the first division will be ready for distribution in June, 1923.

Mineral division-maps which show the distribution and production of minerals on the above geological maps are also to be published, three such maps having already been published since 1912.

The geological survey first proposed was completed in 1917, and 98 geological sheet-maps (scale 1:200,000), each with an explanatory text, have been published, the first sheet-map in 1885 and the last in 1919. The detailed geological survey, planned in 1915, was begun in 1917, the total number of sheet-map areas already surveyed being 15. Four sheet-maps (scale of 1:75,000), each with an explanatory text, have been published and three sheet-maps are now in press. Special surveys of districts of geological or economical importance are also being carried out in connexion with the geological survey. The results of these surveys are to be published mostly as special geological sheet-maps, each with an explanatory text, or as reports, bulletins etc. The scale of the special sheet-maps varies usually from 1:7,500 to 1:25,000 according to the area of the district surveyed as well as the degree of its importance. The number of special sheet-map areas is not fixed, the total number of the districts specially surveyed being three. The Survey hopes to carry out the geological survey of six geological sheet-map areas each year. Reports, bulletins, memoirs and special reports are to be published mostly in Japanese with contents or abstracts in European languages.

2. DIVISION OF TOPOGRAPHY.

SHINJI YAMANE, Chief.

The object of this Division is to make topographical maps representing the geology and mineral distribution with a reasonable degree of accuracy, and accordingly the field work of the Division has been so conducted as to be one step in advance of that of the Division of Geology.

The scale of the field-sketch maps as surveyed was to have been 1:50,000, but the maps have been published on the reduced scales, one of 1:200,000 and the other of 1:400,000. Both have been constructed after the modified Flamsteed's projection. The middle meridian is laid down at 136° east of Greenwich, and the middle parallel, 36° north latitude. The division is quite the same as that of the geological maps, i. e. 98 sheet-maps on a scale of 1:200,000 and 5 division-maps on a scale of 1:400,000. The contours of the sheet-maps on a scale of 1:200,000 are at equidistant curves of 40 meters and those of division-maps on a scale of 1:400,000 with equidistant curves of 100 meters.

Five of the division-maps have been published, the first in 1884 and the fifth or last in 1894. These first maps were revised and republished, the first division in 1900, and the fifth or last in 1915. They are now in course of a second revision of which the first division has been published last year (1922).

Ninety-eight sheet-maps have been published, the first in 1884 and the last in 1917. Of these sheet-maps five were revised and republished during the years 1913 to 1921.

For the detailed geological survey recently proposed, topographical maps of the Military Land Survey Department (scales of 1:20,000, 1:25,000 and 1:50,000) are to be used as base maps. Maps mostly on scales of 1:20,000 and 1:50,000, surveyed by the topographers of the Division are also to be used. The projection, middle meridian and middle parallel are the same as in the sheet-maps first proposed. The contours are at equidistant curves of 100 meters. For the special sheet-maps, the scale of the field-sketch maps is not fixed, but they will vary mostly from 1:5,000 to 1:15,000. The topographical sheet-maps on a scale of 1:75,000 and

special sheet-maps on various scales are prepared by this Division, but they are not to be published. Topographical maps on various scales, necessary as the base of geological maps are also prepared by this Division.

3. DIVISION OF CHEMISTRY.

SEIGO SHIMIZU, Chief.

The work of this Division is to make analyses of minerals, rocks and useful minerals collected by the officials of the Survey and also experimental trials and investigations on raw materials and their refined products. The results have been included in explanatory texts accompanying the geological maps, in reports and bulletins, or published in bulletins and reports, or in the form of special reports.

4. DIVISION OF MINERAL SURVEY.

Yōzō OKAMURA, Chief.

In 1910 the Staff of the Mineral Survey was newly organized as a department of the Imperial Geological Survey, and the work has since been carried on, first as to the mining districts of Hokkaidō, where it is still in course of operation, though most of the important mineral lands of Hokkaidō have already been geologically surveyed. Formerly five parties were engaged in the survey but at present only one or two parties are at work. The survey is being made on scales of 1:100,000 and 1:200,000 for the general maps, and on scales varying from 1:10,000 to 1:50,000 for the detailed portions. The Mineral Survey Report is to be published, accompanied by the topographical and geological maps.

5. DIVISION OF OIL LANDS SURVEY.

GUICHIRŌ KOBAYASHI, Chief.

In 1876, Mr. B. S. LYMAN submitted a proposition to the Minister of the Department of Interior, respecting the importance of an oil survey for the development of the oil fields of Japan. A Staff was consequently established, then consisting of fourteen persons, Mr. B. S. LYMAN being appointed Director. This survey was continued for the following three years, during

which some of the oil fields in Hokkaidō, as well as in Northern and Central Japan, were explored. Although the survey was roughly executed, yet the maps issued on different scales gave suggestions for the development of the fields. After that time, the oil industry of Japan remained quiet for a long time, yet was steadily progressing. In 1900 the Staff for Oil Lands Survey was newly established as a department of the Imperial Geological Survey, and the work has since then been carried on according to a more advanced scheme. The oil fields of Japan are divided into several sections, according to geographical divisions. A survey of them has been made on scales of 1:10,000, 1:20,000 and 1:30,000 for the general maps, and on scales varying from 1:1,000 to 1:5,000 for the detailed portions.

These geological and topographical maps are published with additional maps and explanatory texts accompanied by many illustrations.

In March 1903 this Staff was amalgamated with the Survey and in July 1913 the survey was discontinued. In August 1917 the Staff for the Oil Lands Survey was reorganized as a department of the Imperial Geological Survey and the work has since been carried on according to the same plan as that of the first Oil Lands Survey. Three parties have been assigned to carry out the survey which has now nearly been completed for the important oil fields of the prefectures of Niigata and Akita.

6. DIVISION OF INDUSTRIAL MINERAL SURVEY.

NOBUO KIYONO, Chief.

In 1919 the Staff of the Industrial Mineral Survey was newly organized as a department of the Imperial Geological Survey and the work is now being carried out for the important industrial mineral lands of the whole country. The survey is being made on scales of 1:50,000 and 1:100,000 for general maps and also on varying scales of from 1:1,000 to 1:25,000 for the detailed portions. The Industrial Mineral Survey Report is to be published accompanied by these topographical and geological maps. Five parties have been assigned to the survey and most of the important industrial mineral lands have been geologically surveyed.

7. MINERAL MUSEUM:

MASAAKI HOSHINA, Curator.

The Mineral Museum contains collection of rocks, minerals, fossils and useful minerals, collected by the officials of the Survey, and also specimens presented to the Survey or acquired by exchange. They are arranged for exhibit in four rooms, the first room for minerals, fossils and rocks, the second for foreign specimens, the third for metals, and the fourth for non-metals; but the space is too limited to house the exhibits adequately, so that the large collections have been placed in storage. The Museum was opened to the public in 1911.

8. LIBRARY.

YOSHICHIKA ŌINOUE, Librarian.

The Library contains large numbers of books and pamphlets as well as maps, especially the publications of the geological surveys and societies of the world. The Survey exchanges publications with geological surveys and scientific societies or institutions at home and abroad. The Library was opened to the public in 1920.

PUBLICATIONS

(Up to March 1923).

1. TOPOGRAPHICAL MAP.

1. General Map. Scale 1:1,600,000. 1888. Japanese.
2. General Map. Scale 1:1,000,000. Japanese in 1896 and English in 1899.
3. Reconnaissance Division-Map. 5 Divisions (Complete). Scale 1:400,000. 1884-1894. Japanese and English.
4. Division-Map. 5 Divisions (Complete). Scale 1:400,000. 1900-1915. Japanese and English.
5. Division-Map. First Division (Revised). 1922. Japanese and English.
6. Sheet-Map. 98 Sheets (Complete). Scale 1:200,000. 1884-1917.

Japanese and English.

7. Sheet-Map. 5 Sheets (Revised). 1913-1921. Japanese and English.

2. GEOLOGICAL MAP.

1. General Map. Scale 1 : 1,000,000. Japanese in 1899 and English in 1902.
2. General Map. Scale 1 : 2,000,000. 1911. Japanese and English.
3. Reconnaissance Division-Map. 5 Divisions (Complete). Scale 1 : 400,000. 1886-1895. Japanese and English.
4. Division-Map. 5 Divisions (Complete). Scale 1 : 400,000. 1902-1916. Japanese and English.
5. Sheet-Map. 98 Sheets (Complete). Scale 1 : 200,000. 1885-1919. Japanese and English.
6. Sheet-Map. 4 Sheets. Scale 1 : 75,000. 1921-1923. Japanese and English.
7. Special Sheet-Map. Tōkyō. Scale 1 : 20,000. 1889. Japanese.
8. Special Sheet-Map. Yoshioka. Scale 1 : 7,500. 1921. Japanese and English.
9. Special Sheet-Map. Kure. Scale 1 : 15,000. 1923. Japanese and English.

3. MINERAL MAP.

1. General Map. Scale 1 : 2,000,000. 1911. Japanese and English.
2. Division-Map. Third Division. 1914, Fourth Division. 1912, Fifth Division. 1919. Scale 1 : 400,000. Japanese and English.

4. GEOLOGICAL AND TOPOGRAPHICAL MAP OF THE OIL FIELDS OF THE JAPANESE EMPIRE.

1. Section-Map. Section 1-21. Scale 1 : 10,000-1 : 30,000. 1902-1923. Japanese and English.

5. GEOLOGICAL AND TOPOGRAPHICAL MAP OF THE COAL FIELDS AND OF THE MINING DISTRICTS.

1. Aikawa Mining District, Province of Sado. Scale 1 : 6,000. 1889. Japanese.

2. Ikuno Mining District, Province of Tajima. Scale 1:10,000. 1893. Japanese.
3. Chikuhō Coal Field. Scale 1:40,000. 1893. Japanese.
4. Jōban Coal Field. Section I. Scale 1:10,000. 1913. Japanese and English.
5. Karatsu Coal Field. Scale 1:30,000. 1917. Japanese and English.

6. MAP OF APPLIED GEOLOGY.

- Coal of Japan. Scale 1:3,000,000. 1921. Japanese and English.
 Iron of Japan. Scale 1:3,000,000. 1922. Japanese and English.
 Copper of Japan. Scale 1:3,000,000. 1922. Japanese and English.

7. EXPLANATORY TEXT.

1. Text of the General Geological Map (Scale 1:1,000,000). Japanese in 1899 and English in 1902.
2. Explanation of the General Geological Map (Scale 1:2,000,000). 1911. Japanese and English.
3. 98 Texts of the Geological Sheet-Maps (Scale 1:200,000). (Complete) 1887-1919. Japanese.
4. 7 Texts of the Geological Sheet-Maps (Scale 1:75,000). 1922-1923. Japanese with English Abstracts.
5. Text of the Special Geological Sheet-Map. Tōkyō. 1888. Japanese.
6. 2 Texts of the Special Geological Sheet-Maps. 1922-1923. Japanese with English Abstracts.
7. Explanation of the General Mineral Map. 1911. Japanese and English.
8. 16 Texts (Sections 1-16) of the Section-Maps of the Oil Fields of the Japanese Empire. 1902-1921. Japanese.
9. 5 Texts (Sections 17-21) of the Section-Map of the Oil Fields of the Japanese Empire. 1922-1923. Japanese with English Abstracts.
10. 2 Texts of the Coal Fields. 1893-1917. Japanese.
11. Text of Jōban Coal Field, Section I. 1914. Japanese with English Abstracts.
12. 2 Texts of the Mining Districts. 1889-1893. Japanese.
13. Explanation of the Map of Applied Geology. Copper of Japan, Iron of Japan. 1922. Japanese with English Statistics.

8. MEMOIRS.

Numbers 1-2. 1907-1910. English.

9. BULLETIN.

Vol. I	Numbers 1-2. 1886.	}	Japanese.
Vol. II	Numbers 1-4. 1887.		
Vol. III	Numbers 1-4. 1888.		
Vol. IV	Not Published. 1889.		
Vol. V	Number 1. 1890.		
Vol. VI	Number 1. 1891.		
Vol. VII	Number 1. 1892.		
Vol. VIII	Number 1. 1893.		
Vol. IX	Not Published. 1894.		
Vol. X	Number 1. 1895.	}	Japanese with English Contents..
Vol. XI	Numbers 1-2. 1896.		
Vol. XII	Numbers 1-2. 1898.		
Vol. XIII	Number 1. 1899.		
Vol. XIV	Number 1. 1901.		
Vol. XV	Number 1. 1902.		
Vol. XVI	Numbers 1-3. 1903.		
Vol. XVII	Numbers 1-3. 1904.		
Vol. XVIII	Numbers 1-2. 1905.		
Vol. XIX	Number 1. 1906.	}	Japanese with English Abstracts.
Vol. XX	Number 1. 1907.		
Vol. XXI	Number 1. 1908.		
Vol. XXII	Number 1. 1910.		
Vol. XXIII	Number 1. 1913.		
Vol. XXIV	Number 1. 1914.	}	
Vol. XXV	Numbers 1-4. 1915-1922.		

10. REPORT.

Numbers 1-82. 1907-1921. Japanese.

Numbers 83-88. 1921-1923. Japanese with English Abstracts or Contents.

11. MINERAL SURVEY REPORT.

Numbers 1-32 1911-1922. Japanese.

Numbers 33-34. 1922. Japanese with English Contents.

12. INDUSTRIAL MINERAL SURVEY REPORT.

Numbers 1-6. 1921. Japanese.

Numbers 7-15. 1922-1923. Japanese with English Abstracts or Contents.

13. MISCELLANEOUS REPORTS AND PAPERS.

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