

# **A Historical Sketch of the National Institute of Genetics in Japan**

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## **Abstract**

The National Institute of Genetics was established on June 1, 1949 under the jurisdiction of the Ministry of Education. In 1939, there was an argument for the establishment of a special facility for specific genetic research in Japan by members of the Genetics Society of Japan. In 1994, the National Institute of Genetics was reorganized as an inter-university institute for joint use by universities. I will present a historical sketch of the National Institute of Genetics from 1939 to 1984. First, I will give a brief history of genetics in Japan. Second, I will discuss the idea of the establishment of an institute of genetics. Third, I will introduce the Goldschmidt Collection in the National Institute of Genetics. Finally, I will discuss the careers and personalities of the previous directors of the National Institute of Genetics. In the 1950s, the staff members of the National Institute of Genetics were against Michurin-Lysenko genetics. Conversely, it seems that the National Institute of Genetics gathered the Mendel-Morgan line's researchers. However, the most famous National Institute of Genetics' researcher, Motoo Kimura, was not part of the eugenic movement, though his thoughts on eugenics are found in his essay.

## **Introduction**

In this study, I will describe the history of the National Institute of Genetics in Mishima, Japan. The National Institute of Genetics was established on June 1, 1949, under the jurisdiction of the Ministry of Education, Japan (National Institute of Genetics, 1989). Fig.1 shows the main entrance of the institute.



Fig. 1 Main entrance of the National Institute of Genetics (Photo by the author)

I will discuss three topics in this article. First, I will provide a brief history of genetics in Japan. Second, I will introduce how the National Institute of Genetics was established. Third, I will show the results of the research for the Goldschmidt Collection in the institute. Finally, I will discuss the careers and personalities of the previous directors of the National Institute of Genetics.

Genetics began in Europe after 1900 (Shinoto, 1946; Sturtevant, 1965). It is well known that, at that time, three European scientists, Hugo Marie de Vries (1848–1935, the Netherlands), Carl Franz Joseph Erich Correns (1864–1933, Germany), and Erich Tschermak von Seysenegg (1871–1962, Austria) rediscovered Mendel’s laws of heredity. The term “genetics” became popular after the 1909 publication of *Mendel’s Principles of Heredity* (Bateson, 1913), by British biologist, William Bateson (1861–1926) (Shinoto, 1946; Sturtevant, 1965; The Publication Committee of Mendel Centennial Anniversary in Japan, 1967; Allen, 1978).

## 1. A Brief History of Genetics in Japan

In Japan, the first description of Mendel’s laws of heredity was written by botanist Seiichiro Ikeno (1866–1943). He was known for discovering the ginkgo sperm. In addition, he studied a hybrid of red pepper plants. In 1906, Ikeno

wrote a voluminous book entitled *Plant Phylogeny* (Ikeno, 1906; Shinoto, 1946), in which he introduced Mendel's laws of heredity in section five of chapter four.

Kametaro Toyama (1867–1918) wrote a paper entitled “Mendel's laws of heredity as applied to the silk-worm crosses,” which was published in a German journal in 1906 (Toyama, 1906). This paper was famous for approving Mendel's laws of heredity in animals and was received highly by European biologists (Matsubara, 2004).

Early genetics research in Japan focused on hybrid experiments in silkworms, goldfish, and variegated Japanese morning glories. The focus of early genetics research may be one of the backgrounds of earlier inheritance research in Japan.

Next, I focus on the establishment of societies of genetics and their journals. The Japan Society of Breeding was established in November 1915, but it changed its name to the Genetics Society of Japan in June 1920. The society had 135 members when it began.

The American Genetics Association began as the American Breeder's Association in 1914. William Bateson established the Genetics Society in the United Kingdom in 1919. The *Journal of Genetics*, a British journal, was first published in 1910. In the United States, the *Journal of Heredity* published its first issue in 1910. Another journal, *Genetics*, was first published in the United States in 1916.

In Japan, the *Proceedings of the Japan Breeding Society* published its first issue in 1916. The *Japanese Journal of Genetics* by the Genetics Society of Japan began in 1916. Fig. 2 shows the title page of the first issue of the *Japanese Journal of Genetics*.

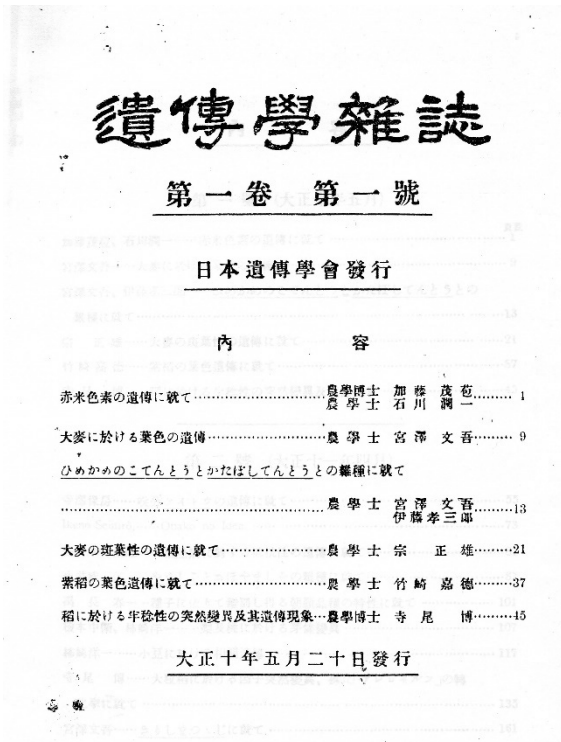


Fig. 2 Title page of the first issue of *Idengaku Zasshi* (*Japanese Journal of Genetics*) (Photo by the author)

The first genetics lecture at a Japanese university was presented by Yoshimaro Tanaka at Hokkaido Imperial University in 1913. The first genetics course, which was sponsored by an enterprise, was taught at the Botanical Institute of Tokyo Imperial University in 1918. Kenjiro Fujii was the first chair of the Botanical Institute of Tokyo Imperial University (Shinoto, 1946).

Four years before Yoshimaro Tanaka's lecture in Japan, William Bateson gave a lecture titled "Genetics" at Cambridge University in the United Kingdom in 1909 (Sturtevant, 1965; Allen, 1978), which is believed to be the first lecture on genetics in the world. Hence, by the early 20th century, Japan had caught up with the United States and the United Kingdom in terms of genetics organizations and research.

## 2. Historical Background of the Establishment of the National Institute of Genetics

The eugenics movement and the enactment of a eugenics law have been discussed since the mid-1930s in Japan. Mamoru Oguma, a professor at Hokkaido Imperial University, promoted genetics to adapt to the human race.

Simultaneously, he also emphasized the need for an institute of genetics and the importance of geneticists. In 1939, he drafted a mission statement for the establishment of an institute of genetics (Oguma, 1939). In 1940, the eugenics law entitled “People’s Eugenics Law” was enacted (Suzuki, 1975). At that time, a minister of state also noted the need to establish an institute of genetics.

At the 12th annual meeting in Tokyo in October 1939, Committees of the Genetics Society of Japan discussed the establishment of an institute of genetics. At the next meeting in Seoul, Korea in 1940, the society unanimously approved the establishment of the institute. In 1941, Mamoru Oguma wrote a booklet entitled *Toward a Promotion of Genetics*, in which he explained that there were many unknown fields in genetics. In addition, he explained that the promotion of genetics led to increased food production and a decrease in superstitions, such as those related to prenatal care (Suzuki, 1975). In the same year, the Special Committee of the Japanese Association for the Promotion of Science supported the decision of the Genetics Society of Japan to establish an institute of genetics. However, the institute was not established until after World War II.

There were three departments in the original vision for the Institute of Genetics:

Racial Genetics (population issues, blood types, fingerprints, twins)

Experimental Genetics (hybridization experiment, pedigree method of breeding)

Cytological Genetics (numbers of chromosomes) (National Institute of Genetics, 1989).

Geneticists insisted that the institute should be an independent organization and should be separate from the Ministry of Health, Ministry of Education, and Ministry of Agriculture.

### 3. Establishment of the National Institute of Genetics in 1947

Shortly following the end of World War II, two geneticists, Mamoru Oguma and Hitoshi Kihara, appealed to the Japanese Government and General Headquarters (GHQ) to establish the Institute of Genetics. They believed this institute would play a part in reconstructing Japanese culture. The following is a chronology of the events leading up to the institute's establishment:

June 1946	The Ministry of Education provided a budget for the Institute of Genetics to the Ministry of Finance.
February 1946	Mamoru Oguma explained the institute to Dr. Henshow of GHQ.
April 1947	The Special Committee of Japanese Association for the Promotion of Science approved the establishment of the Institute of Genetics as a foundational juristic person.
May 1947	The Institute of Genetics was established. The institute was housed in a room rented from the Yamashina Institute for Ornithology. There were twenty-six staff members. Kiyoshi Masuda was the chairperson of the board, and Mamoru Oguma was the director of the institute. The staff intended to change the institute from a foundation to a national institute. The institute had five departments.

These were the five departments of the Institute of Genetics in 1947:

- Department of Genetics (Director: Yoshimaro Tanaka)
- Department of Physiological Genetics (Director: Taku Komai)
- Department of Cytology (Director: Kihito Shinohara)
- Department of Breeding (Director: Hitoshi Kihara)
- Department of Human Genetics (Director: Tanemoto Furuhashi)

Finally, after many twists and turns, the National Institute of Genetics was established in Mishima in central Japan on June 1, 1949. However, because new construction was not allowed, the National Institute of Genetics was housed in the buildings of another company. The institute had sixteen staff members and was composed of three departments in 1949. The departments

are as follows:

First Research Department (Morphological Genetics) (Director: Yoshimaro Tanaka)

Second Research Department (Cytological Genetics) (Director: Mamoru Ogura)

Third Research Department (Physiological Genetics) (Director: Taku Komai)

These departments were reorganized into the Department of Morphological Genetics, Cytological Genetics, and Physiological Genetics on January 1, 1953. Before the National Institute of Genetics was reorganized as an inter-university research institute on October 1, 1976, the National Institute of Genetics had one facility and eleven departments: Department of Morphological Genetics, Cytological Genetics, Physiological Genetics, Biochemical Genetics, Applied Genetics, Induced Mutation, Human Genetics, Microbial Genetics, Population Genetics, Molecular Biology, and the Gene Stock Center.

#### **4. Research for the Goldschmidt Collection**

The National Institute of Genetics used a quarter of its budget in 1951 (20.98 million yen) to purchase approximately 50,000 copies of reprints that the Jewish German geneticist, Richard Goldschmidt (1878-1958), had owned. The Goldschmidt Collection in the building of the institute was opened in February 1951 (Fig. 3).



Fig. 3 Goldschmidt Collection in the National Institute of Genetics (Photo by the author)

I checked the actual situation of the remnants of the reprints with the collection cards of the collection. There are twenty-one foreign researchers with over one hundred academic papers and articles in the Goldschmidt Collection. I list five of the foreign researchers in the order of the number of academic papers and articles in the collection:

1. Lipschütz, Alexander (1883-1980) Latvia, endocrinology, 273 in total
2. Muller, Hermann Joseph (1890-1967) USA, genetics, 178 in total
3. Parker, George Howard (1864-1955) USA, comparative physiology, 161 in total
4. Blakeslee, Albert Francis (1874-1954) USA, botany, 156 in total
5. Dobzhansky, Theodosius (1900-1975) Russia Raw USA, genetics, 156 in total

There are only fourteen Japanese researchers with twenty or more reprints whose reprints have been saved. The top three are the fifty-eight reprints of Akira Kihara (1893-1986, major in genetics), the fifty reprints of Sajiro Makino (1906-1989, major in cyto-genetics), and the forty-three reprints of Hiroshi Oshima (1885-1971, major in zoology). In addition, Goldschmidt became acquainted with many researchers before he started his genetic research, and he knew many American biologists since he lived in Germany.



Some Japanese researchers became acquainted with Goldschmidt during their stay in Germany, and some Japanese researchers became acquainted with him here in Japan before the establishment of the National Institute of Genetics. Many of these Japanese researchers continued to communicate with him.

The Goldschmidt Collection was extremely attractive as well as supportive to researchers after World War II, when it was difficult to access the latest foreign literature. From today's viewpoint, although it may seem like the Goldschmidt Collection has actually completed its mission, the material value and educational significance of the collection have not diminished at all.

## 5. Former Directors of the National Institute of Genetics

Below is a list showing the first five directors of the National Institute of Genetics.

	Name	Period	Graduated from
First	Mamoru Oguma	1948-1955	Hokkaido, Agriculture
Second	Hitoshi Kihara	1955-1969	Hokkaido, Agriculture
Third	Daigoro Moriwaki	1969-1975	Tokyo, Zoology
Fourth	Yataro Tajima	1975-1983	Kyushu, Agriculture
Fifth	Ei Matsunaga	1983-1989	Tokyo, Medicine

This study will discuss the first three directors. Mamoru Oguma (1885–1971) was the first director (Fig.4). He was born in Tokyo and graduated from the Department of Agriculture at Hokkaido Imperial University in 1911. He was a pupil of entomologist Shonen Matsumura (1872–1960). From his childhood, insects fascinated Oguma. Matsumura's book, *Japanese Entomological Souvenirs* (1898), impressed him to a great extent. Matsumura also wrote a book, *Evolution and Idea* (1925), in which he described the necessity of the struggle for existence between human races. In 1919, Oguma received a doctorate degree in agriculture. His thesis was a histological study of insect organs.



Fig. 4 Mamoru OGUMA  
(From the 25<sup>th</sup> anniversary book published by the National Institute of Genetics)

Thereafter, Oguma studied the number of chromosomes in humans. He had assumed that there were many places to teach in Japan. However, few places allowed researchers to study as freely as he had wished. Thus, he established two institutes related to Hokkaido Imperial University in 1943: the Institute of Low Temperature and the Institute of Catalysis. These, I believe, served as a background for the establishment of the National Institute of Genetics.



Fig. 5 Hitoshi KIHARA  
(From the 25<sup>th</sup> anniversary book published by the National Institute of Genetics)

Hitoshi Kihara (1893–1986) was the second director (Fig. 5). He was born in Tokyo and graduated from the Department of Agriculture at Hokkaido Imperial University in 1917. He studied plant physiology under the direction of Kan Koriba (1882–1957). Koriba moved to the Faculty of Science at Kyoto Imperial University in 1920, and Kihara accompanied him. Thereafter, Kihara studied the genome analysis of wheat. He studied abroad from 1924 to 1927 and then studied under C. Correns, one of the rediscoverers of Mendelian inheritance, at the Kaiser Wilhelm Institute. He attended the 8th International Congress of Genetics in Stockholm in 1948. Kihara was the first Japanese scientist to move abroad after World War II.



Fig. 6 Daigoro MORIWAKI  
(From the 25<sup>th</sup> anniversary book published by the National Institute of Genetics)

Daigoro Moriwaki (1906–2000) was the third director of the National Institute of Genetics. He was born in Osaka and graduated from the Zoological Institute at Tokyo Imperial University in 1929. He was a pupil of Naohide Yatsu (1877–1947). Yatsu studied at Columbia University and was acquainted with Thomas Hunt Morgan. Yoshitaka Imai, who was a pupil of Morgan, was a teacher at Tokyo Metropolitan High School. At that time, Moriwaki was a teacher at the same high school as Imai. Thus, Yatsu recommended Moriwaki to study genetics under the direction of Imai. Imai studied the genetics of morning glories, and just like Morgan, Moriwaki studied the genetics of *Drosophila*. Fig. 6 shows a photograph of Daigoro Moriwaki.

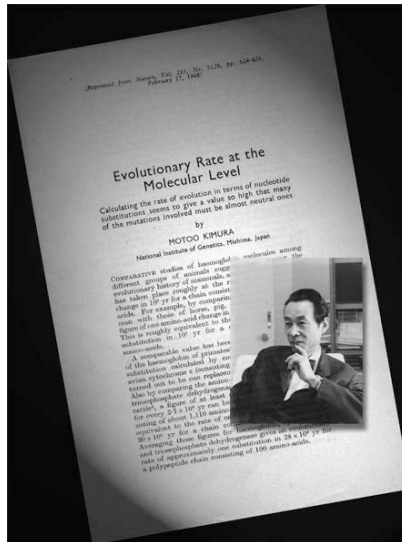


Fig. 7 Motoo KIMURA and the title page of his most famous paper (<https://www.nig.ac.jp/museum/> accessed April 16, 2019)

Clearly, Motoo Kimura (1924–1994) was the most famous researcher in the National Institute of Genetics (Fig. 7). He was born in Okazaki, in central Japan, and he graduated from the Department of Botany in the Faculty of Science at Kyoto University. Just after graduation, he accepted the post of research associate under Hitoshi Kihara in the Faculty of Agriculture at Kyoto University.

Kimura moved to the National Institute of Genetics from Kyoto University in 1949.

First, he belonged to the Department of Cytological Genetics, where he initially studied mathematical models of population genetics. Then, he conducted research with James F. Crow at Wisconsin University from 1954 to 1955. Kimura moved to the Department of Human Genetics in 1961 and to the Department of Population Genetics in 1964. It is often said that in the 1960s and 1970s, Kimura was peerless in the field of population genetics models. His most renowned paper, “Evolutionary rate at the molecular level,” was published in *Nature* (Volume 217) in 1968. The Royal Society of London awarded him the Darwin Medal in 1992.

## 5.1 Discussion

To conclude this study, I will make a few observations. Genetics began at the beginning of the 20th century, and since then, genetics has been closely related to political ideas. During World War II, genetics was connected to the eugenics movement and food production. Some geneticists claimed the need to establish the National Institute of Genetics as a research center.

After World War II, the Michurin-Lysenko vs. Mendel-Morgan controversy confronted genetics. Taku Komai, a staff member of the National Institute of Genetics, was a pupil of Morgan. Daigoro Moriwaki, the third director of the National Institute of Genetics, also studied Morgan's line of *Drosophila* Genetics. Staff members of the National Institute of Genetics were against Michurin-Lysenko genetics, and the National Institute of Genetics seemed to attract Mendel-Morgan's line of researchers.

However, the most famous researcher of the National Institute of Genetics, Motoo Kimura, was not part of the eugenics movement, although his beliefs on eugenics were included in his essay. The promotion of human genetics inaugurated by Taku Komai is likely the most notable contribution of the National Institute of Genetics.

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