Physiological Anthropology in Japan between 1948 and 1982

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In Japan it has long been known from folk loric records that regional differences exist in human physique and daily life patterns. For example, "Hitachi no kuni fudoki," which was published in 713, has been considered to be one of the oldest of the anthropological publications in the world. This book has a detailed record on the shell mound in the "Hitachi" area. In the eighth volume of "Zoku-Nihongoki," which was published in 839, we can find the record concerning such stone implements as a flint arrowhead. The problem of whether these lithic remains were artifacts made by human hands, or merely "naturefacts" formed by wind, waves, or some other natural forces was settled by Hakuseki Arai in 1725. When we compare these early studies with the paleolithic stone axes discovered in Europe in 1859, it may be better understood how early anthropological research began in Japan.

Dr. E.S. Morse, an American born in Portland, Maine in 1838, is considered as one of the early leaders contributing to the development of anthropology in Japan. During his several years' stay in Japan from 1877, he was the first person to teach anthropology at a university in Japan (Tokyo University).

The 1880's mark the dawn of the systematic study of anthropology in Japan. An anthropological society was established in 1884 under the name of "Jinruigaku no tomo." That was just 25 years after Dr. P. Broca had established in Paris the first

anthropological society in the world. The Japanese Anthropological Society began to publish its formal scientific journal in 1886. This publication is the predecessor of the present Journal of the Anthropological Society of Nippon.

In the beginning, anthropology in Japan was not differentiated into physical anthropology, cultural anthropology and prehistory as it is today. The scholar could be a specialist in physical anthropology and in cultural anthropology at the same time. Only a little information about the anthropology of the western world was known in Japan in the late 19th century. Dr. Shogoro Tsuboi was one of the most famous anthropologists at that time. He studied various problems in different fields of anthropology including the problem of the origin of the Japanese. He was a professor at Tokyo University and in 1893 he succeeded in establishing the research department of anthropology at Tokyo University. After Dr. Tsuboi there were contributions by Dr. Buntaro Adachi, Dr. Ryuzo Torii, Dr. Akira Matsumura, Dr. Hikoshichiro Matsumoto, Dr. Kosaku Hamada, Dr. Kotondo Hasebe, Dr. Kenji Kiyono, and others during the period between 1890 and the 1930's. One of the foci of the activities was the study of the origin of the Japanese, though they also had expanded their research to other areas. Among them Dr. Adachi was famous for his achievement in anthropological study on soft tissues in the human body (Anthropologie der Weichteile). Dr.

Matsumura, as the chairman of the research department of Tokyo University, endeavored to introduce natural scientific methodology into anthropology.

In 1939, the Research Department of Anthropology developed into the Department of Anthropology, Faculty of Science, Tokyo University, and began to have undergraduate students who had anthropology as their major. Professor K. Hasebe was the first chairman of the Department of Anthropology. Although his speciality was in the field of osteology, he strove to establish the systematic methodology for the education of anthropology students. Taking note of the education system developed by Professor R. Martin in Germany, he arranged to have physiological anthropology courses in the Department of Anthropology in addition to morphological anthropology courses and prehistory courses. Dr. Toshihiko Tokizane, professor in the Department of physiology, Faculty of Medicine, Tokyo University, became a leader of physiological anthropology in 1942. That was the beginning time of physiological anthropology in Japan. Physiological anthropology is now one of the main fields of anthropology in Japan and is receiving increasing contributions from related fields such as ergonomics, physiology, hygiene, and so on. The current and actual state of physiological anthropology is seen by the number of publications in the Journal of Anthropological Society of Nippon.

The Anthropological Society of Nippon (Japanese Anthropological Society) publishes a quarterly formal magazine, "Journal of Anthropological Society of Nippon," and holds annual joint meetings with the Ethnological Society of Nippon (Japanese Society of Cultural Anthropology) one a year. The papers published in the journal and those read at the annual meetings can be categorized into the branches of physiological anthropology, morphological anthropology, prehistory, ecology, human genetics, demography, primate

Fig. 1 The percentages of the numbers of scientific articles in each category of anthropology which were published in the official journal of the Japanese Anthropological Society. Note the high percentages of physiological anthropology in the 1970s.

studies, cultural anthropology, and miscellaneous. Fig. 1 shows the percentages of the numbers of articles in each of the above categories which were published in the Journal of the Anthropological Society of Nippon from 1948 to 1982. Since the Ethnological Society of Nippon has its own journal, the percentage for cultural anthropology is low in this figure. The most remarkable points in Fig. 1 are that morphological anthropology always shows a high percentage, while physiological anthropology shows an increasing tendency, and prehistory shows a decreasing tendency in the percentage. From the time of Dr. K. Hasebe, morphological anthropology has had a close relationship with anatomy, and this has helped maintain the interest for studying morphological an-

thropology, resulting in the high percentage of publications in this field. This may be similar to the circumstances in physical anthropology in the U.S.A. and European countries. The main society for the researchers of prehistory has gradually changed from the Anthropological Society to the Archeological Society. This may explain the decreasing tendency of the prehistory in this figure. Physiological anthropology has been naturally expected to share the main field of anthropology, so the increasing rate shows some delay in the progress of this field. The difficulty in research methods may constitute some part of the delay. The percentage of physiological anthropology was over 70% in 1978. This phenomenon was caused by the contributions of many young anthropologists. Human genetics shows a similar tendency to physiological anthropology in Fig. 1, though the tendency is less obvious in the former.

Figure 2 shows the percentage of the papers read at the annual meetings of the society from 1950 to 1982. The category of cultural anthropology has been omitted in Fig. 2, since the meeting has been joined with the Ethnological Society. The annual joint meeting was not held in 1968, because in that year the International Congress of Anthropological and Ethnological Sciences was held in Japan. The relation between the categories in Fig. 2 is not essentially different from that in Fig. 1. The increasing tendency toward physiological anthropology is seen much earlier in Fig. 2. Physiological anthropology has shared the major field with morphological anthropology since the middle of the 1970's as seen in this figure.

There are several research societies in Japan which are closely related with physiological anthropology. A considerable number of physiological anthropologists have published their papers in the Japanese Journal of Hygiene, Japanese Journal of Ergonomics, and others, and have read their articles at the meetings of the Hygiene Society, Ergonomics Society, and the Society of Physio-

Fig. 2 The percentages of the numbers of articles in each category of anthropology which were read at the annual meetings of the Japanese Anthropological Society. Note that a continuous increase has occurred in the percentage of physiological anthropology.

logy. Therefore, the total activity of physiological anthropology should be considered to be larger than that shown in Figs. 1 and 2. In the field of physiological anthropology, the research on physical fitness, thermal adaptability, and posture could be considered to be the largest three themes as shown in Table 1.

During these 30 years, some changes in focus have been experienced in the research theme in the field of physiological anthropology. The changes in subcategories are summarized in Figs. 3 and 4. In the end of the 1940's and the beginning of the 1950's, several performance tests such as measurements of reaction time, and manipulation skill tests were studied to compare the motor

Table 1. APPEARANCE RATE, %

Themes	Papers	Proceedings
Identification of muscle action by EMG	2.4	
Locomotive activity	8.9	8.2
Simple test for motor activity	11.4	5.0
Laterality	1.6	2.5
Muscle strength	2.4	4.1
Muscle fatigue	7.3	7.8
Frequency characteristics in EMG and microvibration	4.1	4.7
Posture	17.9	9.1
Sensory discriminatibility	1.6	2.2
Respiratory function	0.8	1.6
Metabolism	4.1	4.1
Physical work capacity and fitness	8.9	14.7
Circadian rhythm	2.4	3.4
Body temperature	3.3	3.1
Thermal effect	18.7	14.7
Barometric effect	1.6	9.1
Acoustic effect	2.4	0.6
Neural mechanism		4.1
Blood gas		0.6
Voice		0.3

ability between ages, sexes, occupations, etcetera. However, the most remarkable feature in this field at that time was the study of muscular activity with the electromyographic technique. The identifications of active muscles in various kinds of movements, including bipedal locomotion and postural studies, also analysis of fatigability among human skeletal muscles and the relationship between muscular tones and kinetic sensation as well as body surface microvibrations all have become foci of research in Japanese physiological anthropology. For example, shoulder and arm muscles were compared with hip and leg muscles from the viewpoint of comparison of brachiation and bipedal locomotion. The fatigue research followed two approaches, the investigation of differential functions of skeletal muscles which have enabled mankind to perform various movements and the investigation of human adaptability to modern daily lives including labour and working. For the evaluation of muscular fatigue, the method of frequency analysis of a global EMG was developed. This problem was the center of physiological

Fig. 3 Changes in the research thema of physiological anthropology which were published in the journal during these 30 years.

Fig. 4 Changes in the research thema of physiological anthropology which were read at the annual meetings.

anthropology in the 1960's, and was the precursor of succeeding research on physical fitness. The research on physical fitness in the 1970's was concerned with the relation between aerobic work capacity and physiques including body composition. The endurance and cardiovascular capacity to total exhaustion were compared among ages, sexes, and regions. The fatigue research in the 1960's led also to the research on human adaptability to each component of modern life's environment. Although this trend was started with the International Biological Program at the end of the 1960's, the research in this field has continued into the 1970's and 1980's. This problem has been studied in both laboratory works and field surveys. As for the former method, biotronics has been developed as the most anticipative laboratory method for this problem. The number of departments which have added the biotrons (environment-controlling facilities) has gradually increased. A biotron can produce a wide range of environ-

mental conditions by changing air temperature, air humidity, air movement rate, radiation temperature, air pressure, partial gas pressure, noise level, illumination intensity level, and so on, so it allows simulation of various kinds of real environmental conditions in actual daily living. We can evaluate the physiological strain in various kinds of environmental conditions. Furthermore, we can study fundamental characteristics of adaptability by means of the biotron. The study of indices to evaluate thermal stress is an example of an important area of study for understanding human adaptability to the environment, although a sufficient method for evaluating the critical air temperature has not developed.

About one hundred twenty of the members of Anthropological Society of Nippon founded the Research Society of Physiological Anthropology in October 1982. The Research Society has begun to publish *Annals of Physiological Anthropology* as the official quarterly and to held its own annual

meetings. The new journal and new annual meetings are being expected to prompt better progress and development of physiological anthropology.

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