

Activities of Japan's Group for History of Physics*

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After the Second World War there has been continually, though not very actively, proposed in Japan that the history of science should have certain roles in the education of science. It has been argued that the history of science would contribute to the science education by drawing pupil's attention to the human elements in the development of science and thus by awaking in him the interest in learning science. It has also been expected that the study of history of science might offer useful suggestions about how to teach a particular subject by elucidating where did the psychological and conceptual obstacle in understanding a new scientific fact or concept lie in the actual history. Finally, J. B. Conant's proposal to use the case history in order to make student realize the method of science was also recommended.

These discussions certainly have encouraged some attempts to utilize the history of physics in physics education. For example, Prof. M. Watanabe of University of Tokyo, himself a historian of physics, once made a model of the instrument of Galileo's falling body experiment on an inclined plane. Prof. Watanabe tried to carry out the experiment in his course of general physics at Tokyo Women's Christian College. Another historian of physics, Dr. K. Itakura of the National Institute for Educational Research, proposed a teaching method which he named the hypothetico-experimental teaching. Suggested by his study on the history of mechanics, he selected questions which once puzzled or misled those who first studied the subject. He proposed to pose the same questions to a pupil, and to make him suppose the answer and devise an experiment to test the supposed answer. Then the pupil is required to perform the experiment and to examine his supposition by the result of experiment. Itakura's proposal was earnestly welcomed by school teachers.

In spite of these remarkable attempts, the discussions which have been done about the role of history in science education seems to me, in general, unsatisfactory in two respects. First, while the teaching of science at the primary and secondary schools has been discussed rather frequently, the education at university level have been left untouched. It is true that it has sometimes been tried to replace the course

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of a science for non science-major student by a lecture on the history of that science. But this could not be considered a sound attempt. By the regulation of the Ministry of Education, non science-major students in Japanese universities are required to take certain credits of scientific subject. As they naturally are not willing to attend scientific lectures, the history of science is expected to moderate their reluctance by diluting the science with humanistic factors. Thus the history of science is here only a convention. To be worse, most of those who are making such an attempt are not historians of science, lacking even proper knowledge of the scholarly history of science. I am afraid that their lectures are in many cases kept on a level of popular story.

We are thus led to the second defect of the former discussions about the history of science in science education. It is the lack of the background of the genuine history of science. The reason that the former discussions have been little productive lies, I believe, in the fact that there are, in Japan, few scholarly studies of history of science. Historians of science who are doing scholarly research are so few that we have little textbooks of history of science written on the scholarly basis in Japan.

These experiences seem to suggest that, in Japan, the most urgent thing to do would be to stimulate the scholarly study of history of science. Thus I here propose to report on the activity of historians of physics in Japan.

Studies in the history of physics first appeared, except for the study of Japanese efforts during the seclusion age of learning physics and other sciences through Dutch books, in the first years of 1940's, during the Second World War. In the war time Japanese government attempted to mobilize scientific activity for military purposes like in other countries. As the science in Japan then was, in general, still in poor stage, various efforts were made, though unsuccessfully, to promote the scientific research and education. The history of science was called forth because it was expected to contribute to deepen the understanding of the science which, being of western origin, was thought to have been grasped by Japanese superficially. Being encouraged by such a general tendency the History of Science Society of Japan was founded in 1941. One of the plans which were then attempted in order to promote the history of science was to publish a series of classic papers of various branches of science in Japanese translation. As a part of it, a book entitled *Theory of Heat Radiation and the Origin of Quantum Theory* was published in 1943. This book contained a historical introduction by the late Kiyosi Amano as well as the papers by W. Wien, Lord Rayleigh, and M. Planck. Amano's introduction was in fact an excellent article on the history of the experimental and theoretical researches which led to Planck's discovery of the energy quantum. It is distinguished from many other articles on the birth of quantum theory by its analysis of the experimentation and of the technological background of researches on heat radiation. Speaking of the social conditions which prompted those researches carried out most vigorously at the Physikalisch-Technische Reichsanstalt in Berlin, Amano argued that they were promoted by the technological problems raised by the rapid

development of German industries after the Franco-Prussian War. He himself was a member of the staff of the Central Bureau of Weights and Measures, a Japanese counterpart of the Reichsanstalt in Berlin, and had undertaken the measurement of heat radiation. His article, though written nearly 30 years ago, may still be highly rated because of its uniqueness.

During several years after the end of the war, strong interest in the history of science was again widely spread among scientists and students. This was caused by the reflection on the weakness of Japanese science which was revealed by the war time experience that Japan's scientific mobilization had produced no remarkable result while that of the allied nations produced the radar, the atomic bomb, and so on. Those who were then interested in the history of science were motivated by the intention to seek the roots of the weakness of Japan's science in its historical background which they thought was very meager compared with that of the science in the west. They also expected that they might discover laws of the development of science which would be effectively utilized as a guide in their scientific research. Many of today's active historians of science in Japan were, in their youth, much influenced by this boom of history of science, though they afterward became aware that such a view of history of science was superficial and that in many cases the advocates of history of science of those days were lacking in the scholarly knowledge and practice of the history of science.

Yet there were a few interesting works in the history of physics. Especially noteworthy were Prof. T. Takabayasi's historio-logical analyses of the science of heat and of the old quantum theory. It was with these background that the textbook of the quantum mechanics by Prof. S. Tomonaga, the Nobel prize winner in theoretical physics, was written. Tomonaga's book was first published in 1948 and later was translated into English* so that western readers may also appreciate its excellence. This book is not, naturally enough, a treatise on the history of quantum mechanics. But the author tries there to show how the present quantum mechanics has been built up instead of trying merely to introduce it in its established form. Thus the author traces the historical development of quantum mechanics, though with arbitrary rearrangements of materials so as to fit the purpose of elucidating as clearly as possible the intricate ways of thinking and of raising questions of many geniuses. The author expects in this way that the book be very helpful in guiding scientists, by stimulating their imagination, in their pursuit for a new theory. The elaborate quasi-historical exposition in this book of the old quantum theory indeed makes the reader realize clearly the physical meaning of the theory considered. Tomonaga's book may surely be regarded as successful a suggestion for the application of the history of physics to physics teaching.

There were, however, in those days no historian of physics in proper sense. Those who wrote or talked about the history of physics were usually professional

* S. Tomonaga: *Quantum Mechanics, 1. Old Quantum Theory*, North Holland, Amsterdam, 1962; 2. *New Quantum Theory*, 1966.

physicists. Consequently their discussions of history of physics were biased by their professional interest and mode of thinking. In other words, their arguments either were intended to support their idea in their own field, or rested on an interpretation of historical facts by today's conception disregarding the historical context. With tacit or explicit criticism to these shortcomings the Group for History of Physics emerged.

At the 1955 annual meeting of the Physical Society of Japan a symposium on the history of physics was organized. This was the first opportunity in the history of Japan's physics that historical studies based on the analysis of original sources were reported before physicists. It was therefore the first sign that the history of physics was becoming recognized by physicist as an independent discipline. Those who read papers at this symposium constituted the body which was to be the Group for the History of Physics.

From 1955 to 1963, the symposium on the history of physics had annually been organized on the occasion of annual meeting of Physical Society. It was however still a temporary meeting organized afresh each year. But in 1964 a permanent section for the history of physics was newly set up in the Physical Society. With this, it may be said, the history of physics acquired so to speak the citizenship in the physicists' community.

Six years earlier than this, in 1958, we founded a private journal *Buturigakusi Kenkyu* (Studies in the History of Physics) which have since been published more or less regularly. By private journal is meant that it is published without subsidiary money from any institution, governmental agency or foundation. It is in fact a mimeographed circular opened for articles, preliminary reports, memoranda, book reviews, abstracts, guide to literatures, and so on. Criticism, suggestion, or request to the historian of physics from the part of physicist is also welcomed. To illustrate the general tendency of this journal, titles of articles published in recent numbers are listed below:

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| Y. FUJII: | Hantaro NAGAOKA as a Geodesist. |
| K. YAMADA: | Dr. H. NAGAOKA and the Rise of Optical Industry in Japan. |
| S. SAITO: | Appraisal of the Atom Model of H. NAGAOKA. |
| T. HIROSIGE: | Relativistic Mechanics in Its Early Days—2. |
| I. OHAMI: | A Memorandum on the History of Medieval Mechanics—2. |
| S. KUMOI: | On the Title Page of Newton's <i>Principia</i> —an addendum. |

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| N. HOKKYO: | A Note on the "137" |
| K. USIGOME and | |
| K. IMAIZUMI: | Hantaro NAGAOKA's Relation to the Physics Abroad. |
| S. SETO: | Dr. NAGAOKA and the Electron Microscope. |

- T. HIROSIGE: Introduction to the History of Physics. A Suggestion of Reading—3.
- K. TSUNEISHI: A Reflection on the Occation of the 10th Aniversary of *Buturigakusi Kenkyu*.
- Article Review: P. FORMAN, "The Doublet Riddle and Atomic Physics, circa 1924", *ISIS*, vol. 59, pt. 2. (S. NISIO)

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Abstracts of the Papers read at the 1969 Annual Meeting of the Physical Society of Japan

- I. OHAMI: A Flying Instrument in Medieval India.
- T. HIROSIGE: Reception of the Theory of Relativity.
- T. OGAWA: Historical Description of the Mechanics and its Analysis.
- T. TSUJI: Introduction of the Relativity and the Quantum Theory into Japan.
- T. KIMURA: Distribution of Ages of the Professors at Physics Departments of the Imperial Universities in Pre-war Japan.
- E. YAGI: Development of NAGAOKA's Atom Model—3.
- M. WATANABE: Recent Trend in the Newtonian Study.
- M. HASHIMOTO: Physics in Japan in the Early Years of Meizi.
- T. HIROSIGE: Introduction to the History of Physics. A Suggestion of Reading—4.

Vol. 5, No. 4 (Dec. 1969)

- Y. FUJII: Torahiko TERADA's Philosophy of Science.
- K. TERAMOTO: Aikitu TANAKADATE and the Measurement of Gravity in the Early Years of Meizi.
- E. TAKAHARA: Aikitu TANAKADATE's Geomagnetic Study.
- K. HINOTANI: Aikitu TANAKADATE's Work in the Aeronautics.
- S. TAKADA: The Life of Max Born.
- M. WATANABE: Recent Trend in the Newtonian Study—2.
- Article Review: E. A. MOODY, "Galileo and his Precursors" in *Galileo Reappraised*, California, 1966 (M. YOKOYAMA).

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- K. SUGAWARA: Japanese Chemists in the Early Years of Meizi.
- T. HIROSIGE: Relativistic Mechanics in Its Early Days—3.
- J. TAKADA: The Life of Max Born—2.
- M. YOKOYAMA: S. STEVIN and the Impossibility of Perpetual Motion.
- T. HIROSIGE: Concerning the Hypothesis of van den Broek.

Vol. 6, No. 2 (June 1970)

- T. KIMURA and
E. YAGI: NAGAOKA's Laboratory in the Institute of Physical and Chemical Research.—an Interview with Mr. T. Misima.

- K. SUGAWARA: Japanese Chemists in the Early Years of Meizi (1850's to 1880's).
- T. HIROSIGE: Introduction to the History of Physics. A Suggestion of Reading—5.
- S. NAKAYAMA: Invasion of Astronomy by Physics.
Book Review: *Historical Studies in the Physical Sciences*, Vol. 1, Philadelphia, 1969 (S. NISIO).

Vol. 6, No. 3 (Sept. 1970)

- M. FUKUSHIMA: Makita GOTO—Science Education in the Early Meizi Era.
- T. HIROSIGE: Introduction to the History of Physics. A Suggestion of Reading—6.

What I Study in the History of Physics:

- I. OHAMI: Physics in the Ancient India
- K. TSUNEISHI: Wave Optics from E. Abbe to D. Gabor
- M. YOKOYAMA: Huygens and the Law of Falling Body
- M. YOSHINAKA: Mechanical Investigations of Galileo

When we first published this journal, we named ourselves Group for History of Physics. The Group therefore manifestly took shape in 1958. The boundary of the Group, however, is not definitely clear. There has been no attempt to define its membership either. It may therefore tentatively be said that those who contribute something to our journal constitute the Group for History of Physics. But the number of historians of physics in a strict sense is smaller than the size of this group. It is larger than one dozen but does not exceed, say, twenty. This is indeed a negligibly small number compared with over eight thousands of members of the Physical Society of Japan. Today the Group for History of Physics, however, has relatively wide influence among physicists. This is because it gathers around it physicist sympathizers of history of physics who pay the subscription for *Buturigakusi Kenkyu*. This journal therefore serves as a medium through which the history of physics is diffused into physicists. Thus far been described only the activity of the Group for History of Physics in the physicists' community. It may also be added that it is one of the most active groups in Japan among the historians of science general.

Retrospecting the past fifteen years, we may summarize the effort of the Group for History of Physics as being directed to two main objects. The first is to develop the scholarly study of history of physics and the second is to promulgate the result of recent studies in the history of physics. As for the first object, number of articles have been published in the *Buturigakusi Kenkyu*, *Kagakusi Kenkyu* (Journal of History of Science, Japan. Official journal of the History of Science Society), and *Japanese Studies in the History of Science* (also official journal of the History of Science Society in western languages). It is however regrettable that many of them are written in Japanese so that it is difficult for western colleagues to read them.

Of the journals named above, the first, the *Buturigakusi Kenkyu*, is also intended to serve for the second object of the Group for History of Physics. This object has been pursued also by meetings at the occasion of each annual meeting of the Physical Society, where we usually have, besides the formal session of history of physics, an informal gathering for free talkings about the history of physics and the physics itself.

The emphasis of our effort has, however, been laid rather on the study of history of physics itself. This is partly because layman's understanding of history of science is generally vulgar and shallow, and on such an understanding they speak of utility or inutility of the history of science. We believe that scholarly history of physics should first be developed before the role of history in physics research or education could effectively be considered. Another reason is that many a physicist shares the prejudice that there is no need to make scholarly study in order to acquire a knowledge of history of physics. They believe that the history of physics could easily be understood without special effort if one has an adequate understanding only of physics. Consequently they would not admit that the history of physics itself is an independent subject of research. Surrounded by such a prejudice, we have decided, instead of begging sympathy or good will of the physicist, to do genuine, scholarly study of history of physics and to make the result of our study speak for itself. Such an effort of the Group for History of Physics has proved to be not fruitless. Recently the history of physics, it seems, has become to receive a certain respect as an independent field of research.

Now through over ten years experience of our activity among physicists, we have learned that most physicists, especially when they are young, could not find adequate means to make approach to the history of physics if they get interested in learning something about history of his own discipline. Lectures given at today's university usually make no reference to the historical background of the subject. Professors themselves, in general, are so busy in following recent publications in their own field that they scarcely have time to read and think about the history. The library of their institute is always troubled with the flood of recent literatures, and consequently historical materials such as old journals and classical books are liable to be piled up disorderly in a distant storeroom. Thus both the scientist and the student are removed away from historical materials. Moreover there is very few universities in Japan which offer a scholarly course of history of physics or other science. The position which the historian of physics holds today is in most cases that for teaching physics. To ameliorate the situation, it therefore seems necessary above all to provide physicists and students with historical materials in a form which is easy for them to approach. As one of the measures to be taken for this purpose the Group for History of Physics has recently edited a series of books which are collection of classic papers translated into Japanese. The series is named *Buturigaku Koten Ronbun Sosyo* (Classical Papers in Physics) and consists of twelve volumes. Its scope is restricted to the generative period of the

twentieth century physics. The titles and contents of each volume were described in the previous issue of this journal.* Thus far 11 volumes have already been published until this December. The remaining, last volume is to be published in the beginning of 1971.

Though this series was first intended for the readings of student, the volumes which were thus far published have been unexpectedly welcomed by physicists. This probably indicates that the interest in history of physics is being aroused among physicists. This interest seems to be rooted in their anxiety. They recently seem to be meditating or skeptical about the significance of their daily practice of investigation, because they feel themselves too busy in pursuing immense but fragmentary data and informations. They want to obtain an integral grasp of their field of research. This tendency has also been strengthened certainly by students' revolt which since 1968 raged through most of Japanese universities. The students' revolt occasioned vigorous discussions about the university reform. These discussions in their turn have motivated some few scientists to reflect on the present situation of their own special field of research against its historical background. Students too have begun to demand that the university education should give them a broad scope of science, not a mere knowledge of detailed technicalities. To meet such a demand a special course of lectures of history of physics is tentatively introduced in some universities. These trends are still in germ, but significant enough.

If in Japan the role of history of physics in physics education is to be considered seriously, it would be expected from now on. But our worry is that we the historians of physics in Japan are too small in number to meet the demand which will probably be made upon us in the near future. The most important problem for us now seems therefore how to attract talented students to the history of physics.

* T. Hirose, "Source Books in the Modern Physics," *Jap. Stud. Hist. Sci.*, No. 8 (1969), 17-20.