

Externalist Approach of Japanese Historians of Science

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Two generations of science historians

Counting active members in the field of the history of science in Japan, we are immediately struck by the two peaks that stand out in the age-groupings, namely, a generation born in the early 1900's who started their professional careers in the late 1920's and early 1930's (hereafter called the prewar group), and the other group born in the late 1920's which entered the field after World War II (referred to below as the postwar group).

Unlike a mature academic field where a mechanism for recruitment through the higher education system has been established, a brand new discipline like the history of science has no assured way for the continuous production of those professionally committed. Younger scholars have had to commit themselves to the field without guarantees of job prospects, and thus have the possibility of being dropped out of the established academic world. Hence, the rise and fall of the production rate of science historians has necessarily and directly reflected various external causes as well as an overall *Zeitgeist*. It may not be too far-fetched to explain the emergence of these two distinct generations in connection with the two major wars of this century.

Not involved in World War I to any serious extent, Japan reaped a huge economic harvest in the absence of Western competitors. Just after that war the Japanese government in 1919 issued the "University Act" with the stated purpose of expanding higher education to match the now enlarged national prestige and economic capacity of Japan.

The pre-World War II generation of science historians enjoyed the benefits of this Act; numerous students flooded into the expanded system of higher education. When they graduated from the universities in the late 1920's, however, the Great Depression came and a surplus of college graduates suffered from widespread unemployment. This was also the time of a rising Marxist ideological wave. As a matter of course, this generation turned out to be very socially minded and some of them were, no doubt, influenced by the Marxist approach to the history of science, as exemplified by Hessen.

This sketch of the typical Japanese historian of science belonging to the prewar group—albeit an oversimplified one—is superbly confirmed by Tosaka

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Jun, the leading Marxist philosopher in prewar Japan, in his article, "Saikin Nihon no kagakuron (Recent Japanese arguments on science)", in *Yuibutsuron kenkyu* (Studies on materialism, No. 56, 1937) as follows:

"For the last ten years favorable industrial and technological circumstances have led to an increase in the number of young intellectuals who choose careers in science or engineering. This is evident in a comparison of the number of students in higher schools who major in the sciences and humanities. However, even an expanded industrial sector has not in fact been able to absorb sufficiently the rising generation of young engineers and natural scientists. At least this was the situation before the recent passage of the new defense budget, narrowly defined. Hence, young engineers and natural scientists have faced a kind of unemployment problem. Actual unemployment occurs only in extreme cases; in most cases graduates form a quasi-professional class in the natural science field, that is, a reserve supply, or indeed, a congested surplus of those seeking legitimate professional status. This quasi-professional group, unlike established university scientists before them, have been exposed not only to training in post-World War I social thought but also to the various social contradictions directly affecting their personal livelihood and future job prospects. Therefore, they are naturally led to play the role of bringing natural science, heretofore possessed exclusively by bourgeois academies, into the context of social thought. . . . Thus it is that, despite the limitations described above, the quasi-professionals in natural science are destined to perform an extremely useful social function. Their participation in the 'philosophizing' of, or scientific examination of natural science studies is, whether conscious or not, an outcome of this function."

The next occasion of encouragement for scientific careers came just before and during the World War II effort to meet the wartime shortage of scientists and engineers. During the war science majors were regarded as reserve scientific manpower and enjoyed the privileges of exemption from, or postponement of compulsory military service, while students majoring in the humanities were called into service and nearly eradicated from the campuses.

When the war ended the surplus of scientific manpower found it difficult to obtain regular scientific jobs as the whole industrial sector was closed down, university laboratories had been destroyed by sustained bombing, and equipment for carrying out scientific research was not available. Again, in the late 1940's, a generation of frustrated young scientists turned out to be very socially conscious. Such were the shared circumstances of science historians in the postwar generation, to which the present author belongs, though individual motivations to give up a normal career in science and turn instead to its history are complex and varied, and it is not easy to generalize about them.

History of science for the frustrated

Anyone who is content with the practicing of science, more or less taking for granted the conventional value of the professional community to which he happens to belong, can be a good scientist but not always a good critical historian of science. When such a person turns to writing a history of his profession, the work usually turns out to be a self-congratulatory narrative of the orthogenetic evolution of his discipline.

Only for those who fail to conform or otherwise accommodate themselves to the norms of the existing scientific community does the gap between one's original image of science (or something within that image to which he cannot conform) and the existing community become the vital source of a critical attitude toward the practice of the contemporary scientific profession. Some of them may seek possible alternate courses of development of science by returning to historical origins, or by examining the later points of divergence precipitated by particular choices as to developmental courses. In such a search history plays at least the role of liquidating the seemingly fixed authority of the scientific establishment and gives one an advantageous height of perspective.

The sources of discontent among reflective scientists can perhaps be classified into three categories: (1) social, (2) institutional, and (3) internal.

Those who cannot find an ideal social milieu in which to carry on their scientific research tend to be critical of their own societies, or of the existing social system as a whole. Such was the case for the prewar Japanese generation. Their frustration often happened early in their scientific careers, if not at the very time when they chose their future careers, that is, precisely when they had reached their most perceptive years. Consequently, they developed an acute sense of problems relative to the social aspect or the social history of science.

Those who are involved in a particular scientific community yet cannot assimilate themselves to the existing institutional setting tend to develop critical attitudes toward the current institutions, such as academic snobbery, university systems, and science policy. In the middle of the nineteenth century, when scientific work was being established as a profession young scientists actively participated in the advancement and formation of their own professions. But in the twentieth century, now that the professionalization of science has been completed, new recruits are inevitably forced to follow readymade courses of prescribed curricula and must adjust themselves to standardized behavior, conventionalized values and customary rules of a given community. Professional behavior is no longer a matter of personal choice. If one fails to conform, he will be labeled as "unqualified" and eventually purged from the professional community. The qualification for a historian of science may well be, on the contrary, independence of such conformism. Lacking the necessary critical stance toward current systems, a historian of scientific institutions merely ends

up as a dull, bureaucratic archivist.

Those who embark upon inherited courses toward normal scientific careers only to reach a deadend may, in desperation, seek a way out through historical reflection on their trade. This sort of internal crisis can be recognized only after one has plumbed the esoteric depths of a discipline, and usually is not reached until the graduate or post-doctoral levels of study. Thus, a critical attitude toward the internal aspects of science often finds support in one's own experience of trouble spots. It is doubtful whether future generations of science historians professionally trained in an American graduate school, and lacking experiences of frustration on the research front, can be effectively critical toward the contemporary frontiers of research. They can hardly be expected to overcome psychological barriers on the front which they have never reached.

Exceptions are most likely to arise from among the recent generation of American historians of science who, despite assured, if not promising, career possibilities, have "dropped out" of established scientific professions and entered the history of science, presumably because they have, self-consciously or otherwise, traversed one or more of the above paths leading to professional frustration. In scientifically less developed countries, like Japan in the past, still another element may come into play, namely, dissatisfaction with the pettiness of the research climate in one's environment that prompts one to seek refuge in the historical moments of great discoveries of the past, rather than in present reality.

To illustrate the activities of the frustrated, let us review briefly three important, consecutive periods of the history of science in Japan.

Beginnings of the Marxist approach to the history of science

It is commonly recognized among the prewar group that the man and the paper that shocked them in their youthful days¹ was Ogura Kinnosuke and his article, "Class society and arithmetics," written in 1929, or two years earlier than Hessen and his group of Russian historians of science produced a similar shock to science historians at the Second International Congress of the History of Science held in London. Stimulated by G. V. Plekhanov's "Art in class society," Ogura published successively a series of articles on the relation between mathematics and social classes,² marshalling historical evidence to demonstrate that even

¹ Kondo Yoitsu, one of his pupils, testified to this shock in his article "Ogura Kinnosuke sensei no sugakushi kenkyu" (Ogura's research in the history of mathematics), *Kagakushi kenkyu* 1963, p. 17.

² They are,

"Kaikyushakai no sanjutsu" (Arithmetics in class society), *Shiso*, No. 1, August, 1929—a treatise on arithmetics in the Renaissance period; No. 2, December, 1929—a treatise on Colonial American mathematics.

"Sanjutsu no shakaisei" (Social character of arithmetics), *Kaizo*, September, 1929—British society and economy in the sixteenth century as observed through books of arithmetics.

"Kaikyu shakai no sugaku" (Mathematics in class society), *Shiso*, March, 1930—a treatise on the history of mathematics in France.

in mathematics, supposedly the most abstract branch of knowledge, class structures are reflected. This thesis created quite a sensation and was widely acclaimed by Marxist-oriented intellectuals in Japan.

When he wrote his first article, Ogura was not too familiar with Marxist doctrine, as he later confessed.³ In a private conversation with the present writer, he said that his research just happened to coincide with the Marxist approach. Later, after more conscious study of Marxist literature, he extended his research beyond Japan to China, as he felt at a serious disadvantage with respect to Western mathematics due to the inaccessibility of original source materials. My own view, however, is that he remained throughout his life a liberal democratic thinker and an outspoken critic of authoritarianism, rather than a committed dogmatic communist. This may be one of the sources of his personal attraction and power of persuasion.

His influence was certainly widespread. After the war he was installed as the first president of Minshu-shugi kagakusha kyokai (Society of democratic scientists, a nationwide movement of Japanese scientists), and also as the second president of the History of Science Society of Japan. His most direct influence was exerted on the prewar group of historians of mathematics, such as Kondo Yoitsu and Mita Hiroo, who soon after the war published their works on the social history of mathematics, in a more elaborated and systematic fashion.⁴

Actually, Ogura was a bit older than pre-war Marxist generation which included J. D. Bernal, J. G. Crowther, and Joseph Needham—men who were heavily influenced by *Science at the Crossroads* (Account of Russian delegates to the Second International Conference on the History of Science). This work was, of course, welcomed in Japan by the prewar group (being put into two different translations), but the way toward development of the social history of science was already paved in Japan by Ogura's earlier works.

Ogura's interpretation of Japanese science, based on his own historical research, can be summarized as follows:

1. While science in Western Europe played a crucial role in the development of political liberty, Japanese science does not have such a glorious tradition. It was an imported product, and hence naturally imitative and superficial.
2. Since Japanese science has been placed under the heavy protection of feudalistic and bureaucratic governments, scientists are cowardly, uncreative, and dependent.
3. Governmental institutions monopolize all learning, and hence even natural science retains a strong feudalistic and bureaucratic flavor.
4. The scientific community is controlled by feudalistic academic cliques,

³ Ogura Kinnosuke, *Ichisugakusha no kaiso* (Reminiscences of a mathematician), p. 102.

⁴ For instance, Kondo Yoitsu, *Sugaku shisoshi josetsu* (A history of mathematical thought; a preliminary study, 1947, Sanichi).

minimizing mutual criticism.

5. Scientists are lacking in social consciousness.

These affirmations may appear hypercritical of his own tradition, while uncritically laudatory toward modern European science (Ogura was a great admirer of the French Revolution and its scientific institutions). But they can be understood as one of the best possible forms of resistance against the background of an authoritarian nationalistic bias in the 1930's and early 1940's in Japan. This way of understanding provided the basis of the postwar leftist science movement, and was adopted as the official interpretation of the Japanese communists.⁵

Wartime activities

From the late 1920's on, the communist party and its sympathizers suffered both police persecution and public condemnation. Their open activities were outlawed, so many scholars concentrated their energies on the analysis of the philosophical implications of Marxist doctrine rather than indulge in concrete realities. The "Yuibutsuron kenkyukai" (Society for materialistic studies, 1932–1938) was most active in such philosophical affairs. Ogura was one of the founding members, and Saigusa Hiroto, who after the war succeeded Ogura as president of the History of Science Society, was an original organizer.

Saigusa, after his arrest for an offense involving 'dangerous thought' in 1933, devoted himself to working on past Japanese thought and to editing a number of Japanese scientific classics. Ostensibly objuring Marxist belief, he maintained and defended rationalistic thought. History was a safe ground—the older, the safer—to explore even amid current repressive measures to control thought. In the late 1930's it became difficult to employ Marxist terms outspokenly, and they were gradually replaced by the vocabulary of 'science'. Inside the cover of 'science,' which could not easily be penetrated even by fascist demagogues, the history of science provided for leftist liberals a shelter from the eyes of governmental censorship and from the arms of police thought-control.

The History of Science Society in Japan was founded in the same year that the Pearl Harbor Incident occurred. Why so? There was at the time a boom in the history of science in the popular reading world. One of the main causes of this popularity was the effort to enhance and glorify the scientific achievements of the ancestors in Japan's past, by which it was intended to wipe out the inferiority complex of the Japanese toward Western science and to encourage self-confidence in their cultural heritage.

This boom had a parallel in the enhancement of Aryan scientific contributions in the Nazi ideology, but it does not appear to have been directly connected to the latter. Japanese scientists, even on the extreme right, were not so irrational

⁵ Hiroshige Tetsu, "Ogura Kinnosuke to Nihon kagakushi" (Ogura Kinnosuke and the history of Japanese science), *Kagakushi kenkyu*, 1963: 9–16.

as to accept Nazi science at face value, and moreover, the latter was too ethnocentric to be adopted by non-Aryan races. Adolf Hitler in *Mein Kampf* defined Japanese science as culture-supporting rather than culture-creative. This part was omitted from the prewar Japanese translation and revived only in the postwar version.⁶

According to the editorial notes of the first issue of *Kagakushi kenkyu* (official journal of the History of Science Society), the society was founded in order to correct uncritical popular versions of the history of science current at that time and to demonstrate the genuine standards of scholarship in the field. This principle has been well maintained, as testified by the wartime issues of the journal, which was continued up to the end of the war despite various difficulties. It was not affected by any nationalistic bias, as other semi-popular journals were obliged to be.

It is apparent, nonetheless, that founding the society did depend somewhat on taking advantage of popular support. Parallel to that, an extensive series on the history of Japanese science before the Meiji era (*Meiji-zen Nihon kagakushi*) was projected to commemorate the 2,600th year in the Japanese chronology in 1940. The editing of this series was seriously interrupted by the war and its publication was postponed to the postwar period, when it finally appeared in 1954–1968 in twenty-six volumes.⁷

The postwar heyday

Postwar Japan has been characterized by the triumph of Marxist doctrines. Primarily because of the prewar persecutions suffered by Marxist ideology, its postwar prestige has run extremely high among intellectual circles as a counteraction. Many Marxist-oriented authors writing on science who had been suppressed during the war years, now found opportunities for uninhibited expression in postwar literature. Some examples include Kondo's history of mathematics, Taketani Mitsuo's three-stage scheme of scientific development, and Hara Mitsuo's advocacy of Engel's dialectics of nature. As a result, Marxist doctrine became established orthodoxy in the period 1945–1950, gaining hegemony especially in the fields of economics and history.⁸

The postwar generation of science historians received the full impact of the postwar version of Marxism in their youth, but their reaction to it differs somewhat from that of the prewar generation. While for the earlier generation Marxism meant a new scientific outlook, a new world-view to be advocated and diffused, it was the academic establishment for the second generation. Once

⁶ *Nihon kagaku-gijutsushi taikai, kokusaihen* (Compendium of the history of Japanese science and technology, international relations), edited by S. Nakayama *et al.*, 1968, p. 333.

⁷ See S. Yajima's review in *Japanese studies in the history of science*, No. 7, p. 159 (1968).

⁸ *Nihon kagaku-gijutsushi taikai, Shisohen* (Compendium of the Japanese history of science and technology, ideology), edited by T. Tsuji, p. 396.

established, it tended, because of trying to exterminate unorthodox views, to become stereotyped and to lose its creativity. Hence, the new generation shared with the old a deep sense of problem but is often inclined to be critical toward the code of the established "Marxist."

For instance, Hiroshige Tetsu criticized Ogura and his followers on the basis of his own analysis that the postwar leftist movement in science depended too heavily on their assessment of the historical conditions of Japanese society in the late 1920's and early 1930's, and thus failed to face squarely the newly arisen postwar factors; the earlier group had adhered faithfully to the formula that science is a superstructure determined by its social base, but overlooked the new phase of science established now as a "social institution."⁹ Nakamura Teiri made a critical appraisal of the Japanese version of the Lysenko controversy,¹⁰ and Yamada Keiji has tried to find a new perspective on science in New China under the Cultural Revolution as a sign of the bankruptcy of modern Western science.¹¹

Generally speaking, though, Japanese historians of science are stronger in the externalist rather than the internalist approach. While a great deal of Marxist and externalist literature in Western languages—such as works of J. D. Bernal, J. G. Crowther, D. Struik, Franz Borkenau, and even Sir Eric Ashby—is available in Japanese version, no work of Alexandre Koyré has yet been fully translated. (So far only an article by him in the *Journal of the History of Ideas* has been translated as a part of a collection of essays by many authors.) This externalist characteristic necessarily originates in the historical recollection of the Japanese.

In Western history, historians of science almost unanimously agree that modern science was founded at the time of the Scientific Revolution in the seventeenth century. But this is true only from the viewpoint of intellectual history. The Scientific Revolution was only an intellectual movement of a handful of scientific intellectuals. Institutionally, modern science was founded, on the other hand, in the nineteenth century when scientists tried to advance their social status and eventually succeeded in establishing themselves, when their uninterrupted reproduction through a recruitment mechanism based in institutions of higher education was accomplished, and thus when science was fully professionalized. Some people therefore call the nineteenth century of the Second Scientific Revolution. The nineteenth century gave birth to the present day behemoth scientific establishment, and hence it is worthwhile to examine the historical origins of the various complex problems existing between contemporary science and society.

When we try to locate the point of departure for modern science in Japanese history, our attention is riveted to a big revolutionary break at the Meiji Resto-

⁹ Hiroshige, "Ogura Kinnosuke to Nihon kagakushi", p.

¹⁰ Nakamura Teiri, *Ruisenko ronso* (Lysenko controversy), Misuzu, Tokyo, 1967.

¹¹ Yamada Keiji, *Mirai e no toi* (Question for the future), Chikuma, Tokyo, 1968.

ration in the latter part of the nineteenth century when Japan embarked on its wholesale importation of Western science and related institutions. Prior to that time there had been, of course, Japanese scientific endeavors; but it is totally anachronistic to think of Japanese participation in the seventeenth-century Scientific Revolution. Premodern Japanese had nothing whatsoever to do with the Scientific Revolution in the internal sense. The Japanese encountered modern science from the very beginning as the developed Western institution of the nineteenth century. Thus, this century is doubly important to the Japanese since both the internal and the external Scientific Revolutions coincide in the same period in their history. Hence, the Japanese may have a keener sense of the problems of external history of science in recent history than the average Western historians of science who tend to be concentrated in the seventeenth century or even before.

In the historical recollection of the Japanese, the term 'modern' may summon up the image of American gunboats anchored in Tokyo Bay in 1853; or it may be synonymous with the economic capacity and technological innovation—products of the Industrial Revolution—that supported the military superiority of the West. To the contemporary-minded Japanese, technology has almost equal status with science and therefore the Japanese History of Science Society has a stronger complement of historians of technology than is found in its Western counterparts.

This outlook was materialized in the recently completed 25-volume *Nihon kagaku-gijutsushi taikei* (Compendium of the history of science and technology in Japan, 1964–1971), which deals with Japanese scientific development since the middle of the nineteenth century. It is, at least in bulk, an astonishing achievement; though judgements as to its quality are in the hands of future historians of science.

Nouvelle vague in the history of science?

Which way the future generation of Japanese historians of science will proceed is not easily predicted. We have seen few fruits from the labors of the "mid-war" generation who came between the prewar and postwar groups, because the devastations of war sapped their youthful energies. We find still less harvest from the new recruits in more recent days, who thanks to the science and technology boom, have been unwilling to follow such a precarious career as that of a historian of science. Such new recruits as do in fact appear tend to commit themselves to the field only when conditions of worldly and academic success are assured them.

Only very recently, however, can there be seen symptoms of a new generation coming forth—due perhaps to recent university struggles and environmental problems. They will face science with entirely new perceptions and preconceptions.

For the prewar generation science was the last gleam of rational thinking to be defended from stormy wartime demagoguery. For the postwar group science still stood at the center of the democratization choir. For the new generation science may appear as a monolithic establishment not easily to be undermined; it is no paradise to be discovered, but only a harsh and inescapable reality. What new picture of science, then, may come out of this "paradise-lost" generation? In the cold war atmosphere two sciences have prevailed: Japanese science has in actuality consistently and definitely accommodated itself to the American model, contested without much success by adhere in some circles to the socialist version of science. Now that the American model has faltered seriously, are there any frustrated youth searching for a third model of science, and if so, will they find a new paradise?

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