

# Yukawa Institute Connecting Prewar, Wartime, and Postwar Science in Japan\*

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## 1. Introduction

Hideki Yukawa (1907-1981) was awarded the Nobel Prize for Physics in 1949 for his meson theory research and became the first Nobel laureate in Japan. Commemorating his Nobel Prize, the “Yukawa Hall” was founded at Kyoto University in 1952, and one year later it began to function as the Research Institute for Fundamental Physics (RIFP). The RIFP became a new type of national research center for theoretical physics, and it was a first of the type of “inter-university” research institutes open to all physicists or scientists working on the related topics in postwar Japan. This institute was renamed from RIFP to Yukawa Institute for Theoretical Physics (YITP) in 1990, and it has led the research activity covering a wide range of theoretical physics fields, such as astrophysics, condensed matter physics, nuclear physics, and particle physics, in the world.<sup>1</sup>

In previous studies on the history of science, there have been some researches dealing with Yukawa and his Nobel Prize. Most of researches focused on Yukawa and his friend, Sin-itiro Tomonaga (1906-1979) who became the second Japanese Nobel laureate for Physics in 1965 together with J. Schwinger and R. P. Feynman for their research on the renormalization method in quantum electrodynamics. Both of them grew up in Kyoto and graduated from Kyoto University. Later, they pursued the same theoretical physics careers and became Japanese Nobel laureates. But they had quite different personalities and took different approaches to the theoretical difficulties. Accordingly, science historians such as Morris Low, Takuji Okamoto, and Michiji Konuma have shown interest in the two Japanese physicists and inquired closely into their similarities and differences.<sup>2</sup> By examining these differences, the

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<sup>1</sup> See the website “History of YITP” and “Message from the Director” in the homepage of YITP. [http://www.yukawa.kyoto-u.ac.jp/english/contents/about\\_us/history.html](http://www.yukawa.kyoto-u.ac.jp/english/contents/about_us/history.html); [http://www.yukawa.kyoto-u.ac.jp/english/contents/about\\_us/greeting.html](http://www.yukawa.kyoto-u.ac.jp/english/contents/about_us/greeting.html) (Accessed on August 27, 2014).

<sup>2</sup> Morris Low, *Science and the Building of a New Japan* (New York: Palgrave Macmillan, 2005); Takuji Okamoto, “Yukawa Hideki and Tomonaga Sin-itiro: Interactions and Interchanges,” *Butsuri* 61-12 (2006), 905-911; Michiji Konuma, Chieko Masuzawa, and Yoshio Takada,

historians have tried to explain the different approaches taken by each to theoretical problems and their interesting differences in lifestyles, and, by discussing similarities, they have tried to show their similar leadership in the Japanese science community, and to suggest generally their leading of the social movement and the community culture related to science and technology in prewar, wartime, and postwar Japan. But, here, although it follows in part the previous studies, this paper reconsiders the historical roles of Yukawa and Tomonaga in prewar, wartime, and postwar science community, and then proposes concretely the establishment of RIFP related to Yukawa's Nobel Prize as one of their achievements in creating the new Japanese science systems at that time.

## 2. Prewar: Emerging of the Theoretical Groups in Eastern and Western Japan

In 1926 Hideki Yukawa enrolled in Kyoto Imperial University (Kyoto University since 1947) and Sin-itiro Tomonaga also entered the same university, and they decided to make a specialty of physics under the stimulus of the rise of quantum mechanics in Europe and under the influence of the science boom following A. Einstein's coming to Japan at that time.<sup>3</sup> Yukawa, Tomonaga, and their friends studied quantum mechanics by themselves due to no professors of the new theory, and fortunately took the opportunities of attending the quantum mechanics lectures of Otto Laporte (Kyoto, 1928), Arnold Sommerfeld (Kyoto, 1928), and Paul Dirac and Werner Heisenberg (Tokyo, 1929) in Japan. Experiencing directly the international movement on new theoretical physics through the opportunities, Yukawa and Tomonaga started to make the research on quantum physics and became the unpaid assistants in the theoretical physics laboratory after their graduation in 1929.

The beginning of the 1930s was the great turning point for Yukawa and Tomonaga. Yoshio Nishina (1890-1951) gave a series of lectures on quantum mechanics at Kyoto Imperial University in 1931. Nishina had stayed at the Bohr Institute in Copenhagen from 1923 to 1928, had returned to Japan in the end of 1928, and then had established his laboratory at the Institute of Physics and Chemical Research (abbreviated in Japanese as "RIKEN") in 1931. Yukawa and Tomonaga were deeply impressed by Nishina's lectures reflecting "Copenhagen spirit" and his warm personality.<sup>4</sup> After his lectures, Nishina proposed Tomonaga to become a research

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"Resumption of International Relationship of Japanese Particle Physicists after World War II," *Historia Scientiarum* 36 (1989), 23-40.

<sup>3</sup> Makinosuke Matsui, ed., *Kaisō no Tomonaga Sin-itiro* (Memories of Sin-itiro Tomonaga) [in Japanese] (Tokyo: Misuzu Shobo, 2006), p. 75 and p. 107.

<sup>4</sup> On the "Copenhagen spirit" or "Copenhagen Geist," Tomonaga explained that this "Geist" came from not each individual unit but a meta-individual thought sharing among many people. See Minoru Kobayashi, Sin-itiro Tomonaga, Shoichi Sakata, Hideki Yukawa, Yoichi Fujimoto, Jiro

associate at his new laboratory in RIKEN, and Tomonaga decided to join the new laboratory and moved to Tokyo in 1932.

The RIKEN, which had been founded at Tokyo in 1917, treated the scientific subjects ranging from pure to applied research in its original institution system that employed the researchers belonging to the different Imperial universities and gave the chief researchers the freehand budget for their own research.<sup>5</sup> In his laboratory at RIKEN, Nishina researched on quantum mechanics and nuclear physics, and he made the active, fresh, and open-minded atmosphere, like the Bohr Institute in Copenhagen. In the Nishina laboratory, Tomonaga met the young active researchers, such as Seishi Kikuchi (1902-1974), Yoshio Fujioka (1903-1976), Minoru Kobayashi (1908-2001), and Shoichi Sakata (1911-1970).<sup>6</sup> For the young physicists, the Nishina laboratory in RIKEN gave an important place incorporating them into the open-minded circle at that time.

In a series of the detections of the positive electron and the heavy hydrogen with atomic weight 2 in 1932, Nishina had much interest in the experimental and theoretical studies on nuclear physics and cosmic rays. Under Nishina's directions, Tomonaga began to lead the theoretical group in the laboratory. In the first years of his RIKEN period, he carried out the calculations on the creation of pairs of positive and negative electrons, and on the collision of the neutron and proton, by joining with Sakata, Hidehiko Tamaki (1909-2013), and other young physicists.<sup>7</sup> After Nishina's concentrating on the experimental researches on cosmic rays and cyclotrons in the mid-1930s, Tomonaga became the reliable leader of the theoretical research group in the Nishina laboratory.<sup>8</sup>

On the other hand, Yukawa also left Kyoto and his new life started in Osaka in 1932. In the next year Yukawa became an assistant professor of theoretical physics at Osaka Imperial University. The Osaka Imperial University was founded in 1931, and, in the fresh department of physics at the new university, Yukawa focused his efforts on his meson theory from 1933, and his laboratory absorbed the young talented theoretical physicists such as Sakata and Kobayashi who had collaborated with Tomonaga at RIKEN in Tokyo. Unfortunately Kajūro Tamaki (1886-1938), a mentor of Yukawa and Tomonaga at Kyoto Imperial University, met his early death

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Koba, Masao Kotani, and Takeo Matsubara, "Kisobutsurigaku-Kenkyūjo wo megutte (Over the RIFP) [in Japanese]," *Shizen* 13-2 (1958), 22-34, on 23. Besides, Dong-Won Kim explained that the term "Copenhagen spirit" used by Japanese writers meant "the milieu of Bohr's Institute, Heisenberg and other Westerners used it to describe a preference for their own interpretation of quantum physics, that is, Bohr's complementarity." See Dong-Won Kim, *Yoshio Nishina: Father of Modern Physics in Japan* (New York: Taylor & Francis, 2007), p. 75.

<sup>5</sup> Kagaku Gijutsu Gendaishi Kenkyukai, "Riken kara Kaken e (From RIKEN to KAKEN) [in Japanese]," *Kagaku Asahi*, January 1956, 57-65.

<sup>6</sup> Minoru Kobayashi, "Riken Jidai no Tomonaga san (Tomonaga in the RIKEN period) [in Japanese]," in Daisuke Ito, ed., *Tsuisō Tomonaga Sin-itiro* (Reminisce on Sin-itiro Tomonaga) [in Japanese] (Tokyo: Chuo Kōron Sha, 1981), pp. 67-78.

<sup>7</sup> Dong-Won Kim, *Yoshio Nishina*, pp. 75-79.

<sup>8</sup> *Ibid.*, pp. 80-82.

in May 1938. The Kyoto University selected Yukawa as a successor to him, and Yukawa became a professor of theoretical physics at Kyoto in 1939. When Yukawa moved from Osaka, he transferred his theoretical physics group from Osaka to Kyoto in early 1939. In the late 1930s Yukawa became a leader of the theory group on particle physics in Osaka-Kyoto by showing his original solution to the nucleus problems, joining the young talented physicists, and developing the meson theory together.

Throughout the 1930s, Tomonaga played a focal point of the theoretical group in Tokyo through the research activities in the Nishina laboratory and the RIKEN, and Yukawa became a central physicist of the theoretical group in Osaka-Kyoto through the meson research at Osaka and Kyoto universities. In addition, Tomonaga had gone to Leipzig, Germany from 1937 and spend two years there to study nuclear physics in collaboration with the theoretical group of W. Heisenberg. In 1939 Yukawa also experienced his first visit to Europe and the United States for two months on the invitations to an International Conference of Physics at Zurich in September, a meeting of the German Physical Society at Marienbad in September, and the 8th Solvay Conference on Physics at Brussels in October, though all meetings were cancelled due to the outbreak of World War II. Tomonaga and Yukawa began to have the close connections with the overseas science community throughout the 1930s, and they came to be key international actors in the active theory groups in eastern and western Japan, respectively.

### 3. Wartime and Postwar: Connecting the Theoretical Groups and Overseas Community

In the early 1940s, after Nishina had made a proposal to take a meeting for the discussion on the meson theory in 1937,<sup>9</sup> the experimental and theoretical particle physicists including Yukawa and Tomonaga gathered and discussed about the meson at RIKEN, or at the alumni hall of Tokyo Bunrika University (Tokyo University of Literature and Science, which later became University of Tsukuba in 1973), where Tomonaga had become a professor of physics in 1941. These meetings were named “Meson-Kai (Meson Club)” or “Chukanshi Toronkai (Meson Symposium),”<sup>10</sup> and they functioned as an important tool for connecting the eastern and western research groups in Japan.<sup>11</sup> Although the meson meetings gave the productive opportunities

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<sup>9</sup> Ryohei Nakane, Yuichiro Nishina, Kojiro Nishina, Yuji Yazaki, and Hiroshi Ezawa, eds., *Nishina Yoshio Ōfuku Shokan Shū II* (Yoshio Nishina Correspondence II) [in Japanese] (Tokyo: Misuzu Shobo, 2006), pp. 601-602.

<sup>10</sup> R. Kawabe and M. Konuma, “Chūkansi-ron no Tanjō (The Birth of Meson Theory) [in Japanese],” *Butsuri* 37-4 (1982), 265-275.

<sup>11</sup> Mitsuo Taketani, “Soryūshi-ron Group no Keisei (the Formation of the Research Group on Theory of Elementary Particles and Nuclei) [in Japanese],” in Hideki Yukawa, Shoichi Sakata, and Mitsuo Taketani, *Soryūshi no Tankyū* (Quest for Elementary Particles) [in Japanese] (Tokyo: Keisō Shobo, 1965), pp. 77-240, on pp. 158-159.

to the young active physicists, they were unfortunately closed due to the heavy bombing around 1944.<sup>12</sup> After that, the members of meetings were mostly involved in the military activities. In August 1945, the two atomic bombs tragically destroyed Hiroshima and Nagasaki, and then the war came to an end.

After the war, Yukawa and Tomonaga resumed their attack on problems in the quantum field theory together with their young physicists in western and eastern Japan, and they thought about the future infrastructure for the promotion of physics and science research under the poor economic conditions in Japan. In the summer of 1946 Yukawa succeeded in founding *Progress of Theoretical Physics* by the support of the Kyoto branch of Publisher *Akita-Ya* in Osaka.<sup>13</sup> Yukawa became the first editor of this journal, and Tomonaga, Sakata, Koki Husimi (1909-2008), and Masao Kotani (1906-1993) were the editorial members. This journal contributed to showing the unknown Japanese achievements during the war to the international physics community.

Yukawa also directed energy to bridging directly the gap between the Japanese and overseas science community. Yukawa sent a letter to J. Robert Oppenheimer (1904-1967), a Director of Institute for Advanced Study (IAS) at Princeton, in July 1947.<sup>14</sup> In the letter he asked Oppenheimer about the “resumption of international association between physicists of the United States and of Japan, and he also eagerly requested an offer of information on research.”<sup>15</sup> After receiving this letter, Oppenheimer replied to it in September, and he invited Yukawa to stay at the IAS. On the Yukawa’s visit to Princeton, Oppenheimer had to ask it to General Douglas MacArthur of the Supreme Commander for the Allied Powers in Japan, and he wrote in a letter to the General, “it is our opinion that Professor Yukawa’s visit may be regarded by the whole scientific community in Japan as an evidence of friendship and that this may be one step to further the solidarity of the democratic forces of Japan.”<sup>16</sup> In prospect of the great contributions of Yukawa’s case to the fresh “cooperative study with American workers in the fields of fundamental theoretical physics,” the Yukawa’s visit was smoothly approved in the occupation policy of the General Headquarters of the Allied Powers. Finally Yukawa went to the IAS at Princeton in September 1948 and, after one year stay, became a professor at Columbia University. Tomonaga also was invited to Princeton and spent an academic year in 1949-1950.

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<sup>12</sup> Masakatsu Yamazaki, *Nihon no Kaku Kaihatsu: 1939-1955* (Atomic Power History in Japan: 1939-1955) [in Japanese] (Tokyo: Sekibunbō, 2011), pp. 44-53.

<sup>13</sup> On the details, see Konuma et al., “Resumption of International Relationship,” 23-41, on 24-26.

<sup>14</sup> See Konuma et al., “Resumption of International Relationship,” 27-28, and carbon copy of a letter from H. Yukawa to R. J. Oppenheimer on July 1, 1947 in s03-21-003, Yukawa Hall Archival Library at Kyoto University (YHAL).

<sup>15</sup> See Konuma et al., “Resumption of International Relationship,” 27.

<sup>16</sup> See Konuma et al., “Resumption of International Relationship,” 27 and copy of letter from J. R. Oppenheimer to D. MacArthur (April 26, 1948) in s04-14-044, YHAL. Besides, Morris Low mentioned a program of “Utilization of Japanese Scientist by the United States,” in Morris Low, *Science and the Building of a New Japan* (New York: Palgrave Macmillan, 2005), pp. 109-110.

#### 4. Yukawa, Tomonaga, and the Establishment of the Research Institute for Fundamental Physics

On November 3, 1949, it was announced that Yukawa would be awarded the Nobel Prize for Physics. The Japanese academic community responded quickly to his award. In early November the President of Kyoto University, Risaburo Torikai (1887-1976), asked a professor of physics at the university to organize a project commemorating his award, and then the President received a plan to make a research institute for fundamental physics. At the same time the Science Council of Japan (SCJ) also discussed a commemorating project mainly among the members of the natural science section (section IV) of SCJ. The SCJ, an organization representing Japanese scientists, had been established in January 1949 “as a ‘special organization’ under the jurisdiction of the Prime Minister.”<sup>17</sup> After that, the SCJ proposed to collaborate with Kyoto University on the project. In late November Kyoto University set up the committee for the making of Yukawa Hall. Through the discussion of the committee, the university decided to put the location for this Hall, and to appoint an architecture professor at Kyoto University to be the designer of the Hall.

The President of Kyoto University asked Yukawa’s advice on the blue print for the founding of Yukawa Hall. Yukawa discussed it with Tomonaga in New York. Tomonaga stayed at IAS at that time. After their discussion, Yukawa replied by letter in June 1950.<sup>18</sup> According to their idea, Yukawa Hall might be designed to be like the IAS to function as “a center for theoretical physics research” in Japan.<sup>19</sup> Through their experience at the IAS, they grasped the advantage of it and hoped to introduce it into the newly planned institution. What they had found as the advantage was, for example, the system to keep an inspiring atmosphere.<sup>20</sup> In the institute, only some members were full-time professors such as A. Einstein and J. R. Oppenheimer, and most other members were visiting researchers from around the world. Many temporary researchers gave and took the fresh stimulus to and from each other and contributed to keep a fresh atmosphere.

During that planning, “Yukawa” worked effectively as a symbol scientist in Japan, but he was actually not back in Japan until July 1953. In contrast to Yukawa, Tomonaga, after he stayed at the IAS in Princeton, returned to Japan in July 1950.

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<sup>17</sup> See the website “About Science Council of Japan (SCJ).” <http://www.scj.go.jp/en/scj/index.html> (Accessed on July 31, 2014).

<sup>18</sup> Letter from H. Yukawa to R. Torikai on June 10, 1950 in d48-021, YHAL. See also Michiji Konuma, “Daigaku ni okeru Kenkyūjo Kaikaku,” in Masaru Osawa, Ken Ogata, Masao Terasaki, Masao Hamabayashi, and Masayuki Yamaguchi, eds., *Kōza: Nihon no Daigaku Kaikaku 4* (University Reform in Japan 4) [in Japanese] (Tokyo: Aoki Shoten, 1982), pp. 299-324, on pp. 304-306.

<sup>19</sup> Ibid., p. 305.

<sup>20</sup> Sin-itiro Tomonaga, “Princeton no Kōkyu Kenkyūjo (Institute for Advanced Study at Princeton) [in Japanese],” in *Tomonaga Sin-itiro Chosaku Shū 6* (Sin-itiro Tomonaga Collected Works 6) [in Japanese] (Tokyo: Misuzu Shobo, 1982), pp. 331-334.

Nishina's death in January 1951 led to leadership roles for Tomonaga, and he succeeded Nishina as the chairman of the Special Committee of Nuclear Physics (SCNP: the precedent committee was the National Committee for Nuclear Physics) of the SCJ. The SCNP had been organized for the peaceful management of nuclear research. In establishing of Yukawa Hall, Tomonaga, as a chairman of the SCNP, discussed the ideal institute design with other physicists and negotiated with the administration of Kyoto University and the bureaucrats of the Ministry of Education, Science and Culture, together with other central scientists such as Seiji Kaya (1898-1988), the vice president of the SCJ. Tomonaga also acted as a leader of young researchers group such as the "Soryūshi-Ron Group (SG)," <sup>21</sup> and he took into consideration the opinions of young researchers hoping that Yukawa Hall would be accessible to them and provide grants and posts for them. After these discussions and negotiations, Yukawa Hall was finally established at Kyoto University in July 1952, and one year later it began to function as the RIFP. Thanks to the hard work of Tomonaga and other key scientists, RIFP was not simply an institution commemorating Yukawa's Nobel Prize, but the first new type of research institute in Japan.

In this new type of research institute, RIFP, no members were tenured. For example, the full professors and associate professors basically had five-year contracts. As an exception, Yukawa would be the permanent director. The institute was managed by a core staff including Yukawa, together with the RIFP management committee composed of the physicists belonging not only to Kyoto University but also to other Japanese universities. The RIFP had the research workshops for some months, treating broad "hot" topics, such as meson theory and nuclear theory, and also for some weeks, treating special new topics such as astrophysics, high-energy physics, and biophysics. And these topics were discussed and deliberated among the RIFP research committee composed of the physicists related to each topic in all Japanese universities and institutes. Unlike other older institutes at Japanese universities, the management and research of RIFP was open to all physicists or scientists working on the pertinent topics, and it made the research institute more active and more attractive to young physicists. This was because Yukawa and Tomonaga in part modeled on IAS at Princeton in the making of RIFP, and young Japanese physicists hoped new research systems adapted for the postwar democratic society.

## **5. Establishment of the followers of the Research Institute for Fundamental Physics**

The SCJ and its SCNP succeeded in establishing the RIFP as the first "inter-university" research institute in 1953. In the same year, the SCJ together with its

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<sup>21</sup> The SG means in Japanese the Research Group on Theory of Elementary Particles and Nuclei in Japan.

SCNP and section IV proposed the foundation of the Institute of Nuclear Study (INS), as a succeeding new type of national research institute, to the Japanese government.<sup>22</sup> The INS was for high-energy physics research and for using high-cost experiment facilities such as cyclotrons. But it happened that the hydrogen bomb test was carried out by the US in the Bikini Atoll in March 1954 and the crew of a Japanese fishing vessel was exposed to the radiation from the test. The Bikini incident made it difficult to push the INS project at that time.

In this difficult situation, Tomonaga was the chairman of SCNP and also became a member of the preparatory committee for the establishment of INS at the University of Tokyo. While he contributed to the hard discussion for and against the establishment of INS, the Japanese government finally approved the budget for INS in July 1954.<sup>23</sup> According to the plan, the INS would be located at Tanashi in western Tokyo, so that the Tanashi town council voted to protest against its establishment,<sup>24</sup> and the inhabitants of the town hoped to form a thorough debate on the INS and its future researches and to discuss the problem with Tomonaga and other key physicists including S. Kikuchi, later the first director of INS. Actually the central physicists including Tomonaga more than 20 times have participated in difficult discussions on the subject by the beginning of 1955. One of the inhabitants asked Tomonaga about the difference between nuclear physics research and atomic energy research, and another inhabitant put a question to him as to why the government would put so much money to the INS research in spite of the poor conditions following the war. Although these discussions were difficult, Tomonaga, as a leader of the physics group and the chairman of SCNP, replied to these questions sincerely, together with other respondents. At one of these discussions Tomonaga's following words gained partial acceptance. He said that scientists' work, which consumed so much money, was not certain "to connect to the welfare of society," but "scientists study freely" and their achievements were sometimes useful for human life. "That is scientists' job."<sup>25</sup> These dialogues had not reached general agreement among the participants in the discussions, but it could have been an important process in the making of INS at Tanashi. In 1955, finally the INS of the University of Tokyo was established as one of the new type of "inter-university" research institutes.<sup>26</sup>

In 1957, after the recommendation of the SCJ together with its section IV to the government in April 1956, the Institute for Solid State Physics (ISSP) of the University of Tokyo was established for basic research in condensed matter

<sup>22</sup> Nihon Gakujutsu Kaigi (SCJ), *Nihon Gakujutsu Kaigi 25 Nen-Shi* (25 Years of SCJ) [in Japanese] (Tokyo: Nihon Gakujutsu Kaigi, 1974), p. 32 and p. 435.

<sup>23</sup> The History of Science Society of Japan, *Nihon Kagaku-Gijutsu-Shi Taikei*, vol. 5 [in Japanese] (Tokyo: Dai-ichi Hoki Shuppan, 1964), pp. 366-367.

<sup>24</sup> Yasuo Shizume, "Kagakusha ni Sekinin ga aruka [in Japanese]," *Shizen* 10-8 (1955), 16-21, on 19.

<sup>25</sup> *Nihon Kagaku-Gijutsu-Shi Taikei*, vol. 5, p. 393.

<sup>26</sup> See the website "History" of the homepage of the High Energy Accelerator Research Organization in Japan. <http://legacy.kek.jp/intra-e/Introduction/enkaku.html> (Accessed on August 28, 2014)

physics.<sup>27</sup> The first three of “inter-university” research institutes, RIFP, INS, and ISSP, were all related to the physics research activity,<sup>28</sup> because the SCJ and its SCNP and section IV led by the physicists members contributed to form a model of new type research institutes in the first half of the 1950s. Following the establishment of the precedent physics research institutes, the other field scientists and SCJ also requested the national “inter-university” research institutes, and then some of these institutions were established in the late 1950s and the 1960s, such as the Institute for Protein Research at Osaka University in 1958 and the Research Institute for Mathematical Sciences at Kyoto University in 1963. After that, the type of research institutes were partly developed into the national institutes independent of the individual universities, such as the National Laboratory for High Energy Physics in 1971 and the Institute for Molecular Science in 1975. The formation of the “inter-university” research institutes had been led mainly by the physics community in postwar, and it also contributed to the newly reformed institutions from the 1970s.

## 6. Concluding Remarks

Yukawa and his Nobel Prize in 1949 had the attention of Japanese people hoping for the rebirth of their nation by the development of science and technology. Although this event occurred in postwar, it followed after the related history in prewar, wartime, and postwar science community in Japan. The establishment of RIFP commemorating his award could be just a symbolic event showing the connections between the physics community movements around Yukawa and Tomonaga during the different periods.

In the 1930s, Yukawa became a young leader of the theoretical physics group on his meson research in western Japan, absorbing other young active physicists at Osaka and Kyoto Imperial Universities. At the same period, Nishina and his RIKEN laboratory carried out the experimental and theoretical studies on nuclear physics and cosmic rays, and Tomonaga played the role of a young leader in the theoretical group at RIKEN in Tokyo. Under Yukawa’s and Tomonaga’s research activities supported by older eminent physicists such as Nishina, the western and eastern theory groups emerged in Japan throughout the 1930s. In the early 1940s, Yukawa, Tomonaga, and their related groups had some opportunities to work together through the meson meetings originated from Nishina’s idea. Although the meetings were unfortunately closed for a few years due to the heavy bombing in Tokyo, they gave the physicists groups some important opportunities of connecting the two separate groups in western and eastern Japan during the war. Through the wartime and postwar periods, the two groups worked together and they could be large and

<sup>27</sup> See SCJ, *Nihon Gakujutsu Kaigi 25 Nen-Shi*, pp. 61-62.

<sup>28</sup> The Cosmic Ray Observatory of the University of Tokyo established in 1953 was also taken to be one of the first “inter-university” research institutes.

flourishing by focusing their efforts on bridging the gap between the Japanese and overseas science community and corresponding with the democratic society after the war.

In that period trajectory, Yukawa's meson theory research and relative activities were performed, and the establishment of RIFP (YITP since 1990) also was made as a symbolic result of the related history in prewar, wartime, and postwar science community in Japan. Therefore, the Japanese physicists and scientists could create a new research institute from the various experiences, and the RIFP succeeded in becoming a first model of the new type research institutes and had a great influence on the following establishment of new institutions such as the Institute of Nuclear Study and the Institute for Solid State Physics in postwar Japan.

## Abstract

There were many historical studies on Hideki Yukawa and his Nobel Prize in 1949 for his meson theory, but they mainly paid attention to his research and its related relationship between Yukawa and his friend Nobel laureate Sin-itiro Tomonaga in order to clarify the process of their scientific and social achievements including the two Nobel Prizes and the peace activities. Although it depends partly on the previous studies, this paper focuses on, as one of their achievements, the establishment of the Research Institute for Fundamental Physics (RIFP which later became the Yukawa Institute for Theoretical Physics in 1990) at Kyoto University in commemoration of Yukawa's Nobel award, shows the trajectory to its establishment around Yukawa and Tomonaga between the 1930s and the early 1950s, and finally examines the historical context of it in the Japanese science community and the role of RIFP in postwar Japan.

**Key words:** Hideki Yukawa, Sin-itiro Tomonaga, theoretical physics, research institute, science system, Kyoto University, postwar Japan