

Objectives concerning the Administration of the Operations

to be Achieved

National R&D Agency, Institute of Physical and Chemical

Research (RIKEN)

(Mid to Long-term Objectives)

(Draft)

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Ministry of Education, Culture, Sports, Science and Technology

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(Preface)

In accordance with the provisions in Article 35-4, paragraph (1) of the Act on General Rules for Incorporated Administrative Agencies (Act No. 103 of 1999) and Article 5 of the Act on Special Measures Concerning the Promotion of Research and Development by Designated National Research and Development Agencies (Act No. 43 of 2016, “the Act on Special Measures”), objectives concerning the administration of the operations to be achieved (“mid to long-term objectives”) by National Research and Development Agency Institute of Physical and Chemical Research (RIKEN), will be set.

1. Position and role of RIKEN in the policy system

National R&D Agency, Institute of Physical and Chemical Research (“RIKEN”) has a history of over a hundred years of operation since its foundation as an incorporated foundation, and now has grown to the largest and highest-level comprehensive research institute for general natural science in Japan. Based on the long history, RIKEN, promoted as a designated national R&D agency according to the Act on Special Measures, is expected to produce the world’s best R&D outcomes to meet national and social needs with all its strength and serve as a core agency to vigorously drive innovation systems in Japan in this new millennium.

For this purpose, RIKEN is required to make a great leap forward as a designated national R&D agency aiming to create innovation in Japan, namely, new intellectual and cultural values, and connect them to the creation of social, public and economic values in active collaboration with research institutes and other organizations more ambitiously than ever through proactive efforts to achieve outstanding R&D outcomes in various fields of science based on national and social requirements such as the Science and Technology Basic Plan, maintain and share the world’s best research infrastructure, and provide an excellent research environment and advanced research systems serving as the model for other research institutes in this mid to long-term objective period. RIKEN would be regarded as one of the most esteemed research institutes in the world that decide global trends of research and development by pioneering totally new research areas and creating research seeds which would innovate the whole world.

To play such a role, it is important to establish a research management system targeting innovation under the leadership of the president. RIKEN needs to set out a vision for achieving its task, and develop relevant rules and systems. Efforts to make under this research management system include the implementation of strategic R&D, establishment, operation and upgrading of the world’s best research infrastructure, creation of new sciences for supporting innovation in the future, social return of research outcomes in organization to organization collaboration with external agencies, development of an excellent research environment, and recruitment and development of outstanding human resources. In doing so, it is essential to propagate the management policies of RIKEN in

related organizations and staff members, and develop the environment where individual researches can concentrate on their own R&D activities with originality and ingenuity while sharing the vision.

In regard to research misconduct, misuse of research expenses, maintenance of ethics, and adherence to legal requirements, RIKEN is also required to act appropriately as the model for outside researchers and R&D institutes.

(Appendix 1) Policy Chart concerning RIKEN

2. Period for mid to long-term objectives

The period of this mid to long-term objectives is seven years from April 1, 2018 to March 31, 2025.

3. Maximization of R&D achievements and quality improvement of the other operations

Specific objectives are covered in this section according to the position and role of RIKEN in the policy system described in Section 1.

In addition to those described below, efforts will be added later in a flexible manner due to an increasing need for responding in view of various situations. In particular, when innovative insight on science and technology is found, or internal or external situations of science and technology significantly change, and the Minister of Education, Culture, Sports, Science and Technology asks for relevant R&D or other operations, RIKEN will immediately respond to that request pursuant to the Act on Special Measures.

The evaluation criteria and related indicators and indexes in Appendix 2 will be used for evaluating projects.

(Appendix 2) Evaluation criteria

3.1 Establishment and operation of the research institute management system to maximize R&D outcomes and create innovation

The efforts described below will be made to develop and operate an organization required for establishing and strengthening a research institute management system serving as the model for other research institutes under the leadership of the president as a designated national R&D agency for maximizing R&D outcomes and reinforcing the capability of RIKEN as a core agency to create innovation.

(1) Reinforcing the system and function to support management under the president's leadership

The organization and function of RIKEN will be strengthened and operated for supporting the operational decision of the president to accomplish self-governing corporate operation for creating innovation under the leadership of the president.

Specifically, the function to plan, implement and promote practical R&D projects will be improved by analyzing national strategies and the picture of what society is supposed to be in the future, and consolidating a vision indicating the direction of RIKEN to head for in consideration of research and management resources owned by RIKEN. Efforts towards the identification and resolution of issues on R&D and corporate operation will be promoted from various perspectives within and outside RIKEN, such as recommendations and evaluations by external experts including renowned researchers overseas for R&D activities and corporate operation, and advice from core researchers in RIKEN for the direction of R&D and strategies aiming at developing new research fields. The organization should be improved so that optimum operations will be achieved under the leadership of the president and function to support the president for flexible budgetary steps and optimum budget allocation in the discretion of the president. This includes a horizontal and flexible research system and network structure to promote the creation of innovation.

(2) Improving the research environment and developing outstanding researchers to produce the world's best research outcomes

Various outstanding researchers, including young, female and foreign researchers, will be employed in a positive manner to develop an energetic research environment and urge RIKEN to evolve into a world-leading R&D agency.

In particular, the personnel system will be reformed to include long-term and permanent research contracts so that young researchers can concentrate on their research from the mid to long-term perspective. In this respect, sufficient consideration will be given to the balance between the mobility and stability of human resources in that the function to accept and foster researchers having diversified ideas and insights is important for the vitalization of RIKEN and the growth of the scientific society as a whole. At the same time, the permanent research staff will be encouraged to participate not only in projects for advancing research of their own, but those which are intended for the development of RIKEN for contributing to a broader range of research.

The function and system of clerical and engineering work will be established to support R&D activities, including the assignment of research assistants, such as research clerical personnel and research assistants, and coordinators to promote liaison between RIKEN and outside institutions, and establishment of a suitable clerical work processing system to maximize research outcomes and promote social return of these outcomes while allowing researchers to proceed with their R&D activities effectively and efficiently.

Acceptance and fostering of outstanding human resources in and out of Japan, organizational liaison with universities, proactive acceptance of students from universities in light of research collaboration with universities and development of outstanding human resources, liaison with overseas research institutes, including joint research projects and

personnel interchange, and formation and operation of overseas research centers will be strategically promoted to enable RIKEN to function as a hub of international brain circulation open to the world for improving the scientific and technological levels of Japan and promoting the development of young researchers in Japan.

Systematic promotion of diversity will be taken into account to establish an environment in which female and foreign researchers can engage in their research in an efficient manner.

In addition, it is important to gain a broad understanding and support of the public for the objectives and value of RIKEN by publishing the activities of RIKEN not only in the scientific society but widely in the public as a research institute representing Japan. In this respect, continuous efforts will be made for presenting and introducing research outcomes in the form of papers, in symposiums and public relations magazines in an easily understandable manner. Information on potential social return of research outcomes will also be distributed in an attempt to gain understanding and support from a broad range of people in Japan and abroad.

(3) Promoting social return of research outcomes through close collaboration with related organizations

Social return of innovative research seeds owned by RIKEN will be accelerated for creating innovation. For this purpose, open innovation will be promoted to provide a place for strengthening liaison with external organizations including the industry and universities and promoting collaboration beyond disciplines and categories to put research outcomes of RIKEN to practical use, and co-create new values by related organizations. Accordingly, efforts for improving the planning and implementing function and building a suitable organization will be strategically promoted as well as strategic acquisition, management and use of intellectual properties. An attempt to acquire and use external funds will be made throughout these efforts.

In particular, open innovation will be promoted to improve liaison with external organization not only through joint research by individual researchers but also in collaboration between RIKEN and other organizations to consolidate the knowledge and technologies inside and outside RIKEN.

Social return of research seeds of RIKEN will be promoted as well as the acquisition and use of external funds to reinforce liaison with the industry by increasing organized, large joint research projects. In light of promoting and taking the lead for the creation of innovation, organizational efforts will be accelerated to manage and use intellectual properties of RIKEN, and nurture and support RIKEN-originated ventures.

In collaboration with universities, a hub function for interconnecting organizations and keeping up the mobility of researchers in different fields will be established mainly by RIKEN to provide a place for expanding integrative research projects beyond the walls of

organization and disciplines and sharing tasks in their respective realms of expertise. This may result in the creation of seeds for new, innovative fields of research by RIKEN and collaborating universities, and strengthening of collaboration with local governments and industries with the hub function as the core, accelerating social return of outcomes.

In the health and medical sectors, efforts for creating innovative drug discovery or medical technologies will be promoted in collaboration with the government. This includes the support for commercializing innovative seeds inside and outside Japan using the research infrastructure of RIKEN in a cross-sectoral manner as a contribution to promoting commercialization of a national (ALL-JAPAN) project research outcomes.

(4) Exploiting and creating new science to support sustainable innovation in Japan

It is important to exploit and create new fields of research and produce highly impact, new and innovative research seeds for achieving science, technology and innovation.

In this respect, new fields of research will be exploited or created through R&D based on a wealth of knowledge and imagination by researchers having outstanding research performance, in-depth insights and ability for leadership irrespective of research fields, and cross-sectoral, integrative research projects in RIKEN.

To promote these efforts, researchers will undertake research beyond their specialty, target setting and progress management of R&D will be strictly associated with scientific and social significance of relevant research themes, and constant improvement will be made according to situations, including priority given to the themes of increasing importance or necessity in a flexible manner, or review of the themes of decreasing importance or priority with disposal in mind.

3.2 Promotion of strategic R&D based on national strategies, etc.

RIKEN will deal with national and social demands included in national strategies such as the Science and Technology Basic Plan as a core research institute for science, technology and innovation in Japan, and undertake strategic R&D in the fields listed below for creating and maximizing outstanding R&D outcomes.

To accomplish objectives defined in each R&D field, RIKEN will set up major R&D themes by field each ranging from the creation of new insights to final propagation of research outcomes into society based on national strategies, and provide the procedure and outcomes expected to be obtained according to the progress of R&D in the mid to long-term and annual plans.

According to these plans, progress management and evaluation of R&D projects, and necessary improvement and review will be carried out every fiscal year in the integrated operation system in RIKEN described in 3.1 for promoting cross-sectoral collaboration within RIKEN and individual R&D management according to the relevant fields to maximize R&D outcomes.

(1) Advanced intelligence projects

While application of IoT and AI technologies is on the increase with the development of ICT, Japan must be first to realize a “super smart society” in the world, and produce added values from big data. Efforts to achieve this include theory construction for clarifying the principle of deep learning, and R&D of core technologies applicable to highly complicated and incomplete data the current AI technologies cannot solve, and using these core technologies in part, scientific research of the fields Japan has advantages, such as regenerative medicine, will be further reinforced to produce research outcomes for resolving social issues in Japan, such as disaster management. The ethical, legal and social issues in using AI technologies will also be studied, the results published. These efforts will enhance advanced R&D and human resource development, and steadily proceeded in close collaboration with related ministries, government agencies, institutions and private enterprises and in consideration of global trends.

(2) Theoretical and mathematical sciences

Importance of interdisciplinary research in natural and social sciences is increasing and methods based on theoretical and mathematical sciences are sought after for sharing and integrating scientific methods developed separately in various fields, extracting information from large data, and controlling highly complicated systems. Theoretical and computational sciences in physics, chemistry and biology, etc. will be integrated with mathematics and mathematical sciences as the core to find mathematical science based fundamental questions in natural science (e.g. origin of universe and life) and a number of issues to meet national and social needs (e.g. progress of mathematical modeling technologies for natural and social phenomena). Looking at these fields and layers in a cross-sectoral manner, social issues that can be clarified will be identified and human resources to promote the work will be developed.

(3) Medical sciences

Various therapeutic methods including innovative immunotherapy have been developed for treating cancer and adult lifestyle-related diseases, but issues such as individual variability for drug efficacy and side effects hinder the propagation of these treatments. Selection of optimum treatments for individual patients by stratification of diseases at genetic level and comprehensive clarification of pathogenic mechanism is required. Accordingly, outcomes obtained from fundamental R&D for clarifying the basic principles of human immune system, development of core technologies of humanized mice, etc., comprehensive identification of disease-related genes, and functional genomic analysis and research using single-cell technology will be developed and integrated for promoting research to achieve individualized and preventive medicine in cancer immunotherapy.

(4) Bio-functional science

In a super aging society like Japan, prolonged healthspan is in high demand, and it is imperative to keep people healthy and clarify aging mechanisms. Efforts to find solutions to these issues include the development of non-invasive visualization techniques and prediction and search methodologies for establishing cellular state diagnosis and evaluation procedures, clarification of 3D mechanisms of organ formation and control principles for establishing next-generation regenerative medicine, and development of non-/low-invasive techniques for measuring health/normal state. Using these techniques, mechanisms of maintaining biological functions at various levels from molecular to individual study throughout generation, growth, development and aging will be clarified to promote research for overcoming age-related dysfunction.

(5) Brain and neuroscience

In a super aging society like Japan, clarification of high-order function of human brains is in high demand for analyzing the pathogenic mechanisms of mental and nerve diseases, developing diagnostic and treatment methods, and upgrading AI. Accordingly, research for understanding the structure and function of human brain will be promoted based on the insights obtained so far. This includes research of imaging for high-order cognitive functions of human brain, cross-cutting brain research at all levels from genic to phenotypic levels, research of calculation principle relating to high-order cognitive functions, research of data driven brain, and R&D of diagnostic and treatment methods for mental and nerve diseases.

(6) Sustainable resource science

To solve global issues such as resource depletion, climate change and food insecurity, development of innovative technologies for efficient production of food, biomass, pharmaceuticals, and chemical industry materials with less environmental load is in high demand. Accordingly, improvement of plant character, synthesis of useful materials of plants and microorganisms, development of high-order functional recycling catalysts using earth resources, and development of high polymer materials having useful functions will be promoted by integrating plant science, microbiology and chemistry, adopting data science using genome information and environmental data.

(7) Emergent matter science

R&D of environment and energy saving related technologies, such as ultralow power consumption devices, is in high demand to realize an environment-conscious, sustainable society. Accordingly, previous and current R&D will be integrated and accelerated to tackle four research themes, namely, energy functional emergent matter, emergent

functional soft materials, quantum information electronic technologies and topological spin electronics, and the development of new materials for collecting heat and light in the environment highly efficiently and converting them to energy, and the establishment of a new doctrinal structure and development of proof of concept devices to implement innovative hardware with ultrahigh speed and ultrahigh efficiency information processing technologies and ultralow power consumption energy technologies.

(8) Advanced photonics

Optical and quantum technologies are core technologies Japan has advantages for realizing a “ultra-smart society,” and need to improve innovative measuring, information and energy transfer and processing technologies. Accordingly, R&D of new optical and quantum beam technologies will be promoted with the most advanced optical and quantum generation, control and measuring such as extremely-short optical pulse generation and measuring technologies, ultra-precision laser control technologies, and nondestructive testing techniques using insights obtained so far to solve important social issues including the development of innovative materials and maintenance of infrastructure structures in addition to the most advanced academic studies such as the clarification of ultrahigh speed physical phenomena and super-resolution imaging of living organisms.

(9) Accelerator science

Fundamental understanding of matters and solving a mystery of matter creation, and by applying the outcomes, solutions for issues concerning food, health, environment, energy and resource are in high demand. Accordingly, enhancement of accelerators at the RI beam factory, which constitutes a research infrastructure, will be promoted, and basic research of atomic nuclei including nucleosynthesis processes will be extensively proceeded in addition to the active commercial application of heavy ion beams in agriculture, industry and RI pharmaceuticals. Establishment of nucleosynthesis technologies will be promoted for achieving an “island of stable nucleus,” in which the life of nucleus is expected to be significantly prolonged, by challenging the synthesis of new elements beyond atomic number 119.

3.3 Establishment, operation and upgrading of the world’s most advanced research infrastructure

As the world’s best research and development agency, RIKEN will steadily improve and share the most advanced research infrastructure including ultrahigh speed computer, bio-resource infrastructure, and large-scale synchrotron radiation facility, as described below, and create and maximize outstanding R&D outcomes inside and outside the agency by promoting studies on enhancement and application.

To accomplish the objectives set forth for individual fields of research infrastructure, RIKEN will identify specific issues concerning the operation, enhancement and application of research infrastructure by research field, and predict potential outcomes in the mid to long-term and fiscal year plans according to the way of proceeding and progress of projects, while noting the creation of R&D outcomes inside and outside the agency. Based on these, annual progress management and evaluation for individual fields of R&D infrastructure, accompanied improvement and review, and utilization of cross-sectoral collaboration will be promoted under the operation system for the entire agency, described in 3.1, as well as individual R&D management according to the associated fields to maximize the research outcomes.

(1) Computational science

Shared use of supercomputer “K” will be steadily continued pursuant to the Act on the Promotion of Public Utilization of the Specific Advanced Large Research Facilities (Act No. 78 of 1994, “Public Utilization Act”) and according to the extremely stable operational results. Post “K” will be developed to start operation early, and computational resources will be provided for researchers as common resources after a smooth transfer from “K” to post “K.” In addition, insights of computational science and computer science obtained from “K” and post “K” will be developed for creating outcomes and propagated for solving social and scientific issues.

(2) Synchrotron radiation science

Stable operation of large-scale synchrotron radiation facility (SPring-8) and X-ray free electron laser (SACLA), both of which have been widely used for academic research and industrial application, will be promoted for continuing shared use pursuant to the Shared Use Act, and not only academic research but also industrial use will also be promoted through enhancement of application technologies including high-speed and large-capacity data processing, expansion of user support systems, and improvement of facility performance etc. Core technologies for structural analysis complementary to SPring-8 and SACLA using insights obtained so far.

(3) Bio-resource research

The world’s best bio-resources will be strategically developed in terms of utility value, additional information and quality, and offered according to social and research needs for research ranging from basic and fundamental research to development and research for solving social issues. Core technologies for preservation and application will also be developed for providing effective and efficient bio-resources. R&D for using streamlined bio-resources will be promoted by accurately understanding research trends. In addition, development of human resources who will get engaged in bio-resource projects, and

technical training and dissemination for transferring technologies to research communities will also be promoted.

4. Matters concerning efficient operation and management

4.1 Streamlining and improving efficiency of operational expenses

Operational expenses will be streamlined to increase efficiency by reviewing the organization, streamlining procurement, and assuring efficient operational systems.

For the projects supported by operating expenses grant, efficiency for the total amount of general administrative expenses (excluding personnel expenses and public dues) and other operating expenses (excluding personnel expenses) will be improved by xx% on an average in every fiscal year compared with the preceding fiscal year with newly added or expanded expenses and special expenses (e.g. xx) excluded. The newly added and expanded expenses will be contained in this calculation from the next fiscal year.

4.2 Appropriateness of personnel expenses

Necessary measures for fostering and securing outstanding researchers and research assistants will be taken by reserving a suitable amount of personnel expenses according to the government policies. Wages of administrative and general staff including allowances will be strictly examined with reference to the wage level of national public officers to maintain an appropriate level based on the specific characteristics of assigned tasks, and examination results and process of examination will be made public.

To obtain internationally outstanding human resources, their wage will be set as required in a flexible manner, and satisfactory explanation will be provided to the public.

4.3 Streamlining of procurement and appropriateness of contract

Efforts for assuring fair contact and transparency will be promoted pursuant to the “Policy for Streamlining Procurement by Incorporated Administrative Agencies” (decided by the Minister of Internal Affairs and Communications on May 25, 2015) to improve the efficiency of operation.

Auditors or accounting auditors shall completely check the appropriateness of bidding and contract during audits.

5. Matters concerning improvement of financial conditions

RIKEN will strive to reduce expenses through efficient budget implementation, and actively obtain, increase and utilize self-generated income such as external funds facility usage fees, contributions and patent licensing fees, and external funds such as competitive funding while considering the appropriateness of the beneficiaries-pay principle of patent licensing fees.

Budgets will be implemented according to plan by considering outstanding obligation of operating expenses grant. The assets recognized as unnecessary will be disposed in a proper way, and critical properties transferred systematically.

6. Other important matters concerning administrative operations

6.1 Enhancement and strengthening of internal control

Internal control will be enhanced and strengthened by improving the effectiveness of compliance systems under the leadership of the president, in close collaboration with auditors based on the audit plan from mid to long-term perspectives, and by carrying out systematic and efficient internal audits and utilizing audit results effectively pursuant to the “Internal Control and Evaluation of Incorporated Administrative Agencies” (Research Report on the Internal Control and Evaluation in Incorporated Administrative Agencies in March 2010), etc.

In particular, evaluation and analysis of risks causing obstructive factors for the agency to accomplish missions, and appropriate measures including prevention of research misconduct and illegal use of research funds will be promoted.

6.2 Legal compliance and maintenance of the ethics

Awareness of legal compliance and the ethics will be improved in carrying out missions to return R&D outcomes to society to maintain reliability by the public.

In particular, complete observation of the “Guidelines for Responding to Misconduct in Research” (decided by the Minister of Education, Culture, Sports, Science and Technology on August 26, 2014), etc. will be promoted to prevent research misconduct and illegal use of research funds in research activities, and appropriate operations will be continued according to the action plan launched by RIKEN for recurrence prevention. Efforts serving as the model for other research institutes will be proceeded by improving researchers’ awareness of research misconducts and disclosing RIKEN’s efforts to prevent research misconducts to the public.

6.3 Securing safety in work

Safety will be sufficiently taken into account during work, and occupational safety and health management will be thorough according to related laws and regulations to prevent accidents caused by work and carry out operations safety and smoothly.

6.4 Promoting information disclosure

Information will be disclosed properly and actively pursuant to the “Act on Access to Information Held by Incorporated Administrative Agencies” (Act No. 140 of 2001) to maintain appropriate operational management and public reliability.

6.5 Improving information security

Based on the “Common Standards of Information Security Measures for Government Agencies” (decided by the Cybersecurity Strategic Headquarters on August 31, 2016) developed pursuant to the Basic Act on Cybersecurity (Act No. 104 of 2014), ability of RIKEN to respond to external attacks and internal information leaks will be improved with concerted efforts throughout the agency by improving a system of taking suitable measures and providing information security measures according to this system to strengthen the capability of defense for the cyberattack to the information system.

The implementation status of measures will be reviewed every fiscal year, and issues pointed out in audits conducted by the Cybersecurity Strategic Headquarters will be steadily solved by means of constant improvement of information security measures using the PDCA cycle.

6.6 Matters concerning facilities and equipment

RIKEN will effectively utilize the existing research facilities and those which are scheduled to be developed in the mid to long-term objective period to maintain a good research environment in light of the future development of research and long-term perspectives on demand, and systematically modify, upgrade and maintain its facilities and equipment including countermeasures against their deterioration.

6.7 Matters concerning personnel affairs

The term of fixed-term staff and personnel system reformation will be steadily promoted with the balance between the mobility and stability of human resources in mind to maximize R&D outcomes and conduct work effectively and efficiently. A cross-appointment system will be used to keep diversified and outstanding talents, improve capability of staff and increase incentives of staff for assignment with appropriate evaluation and treatment.