2023

KAKENHI

Grants-in-Aid for Scientific Research

Creating New Knowledge

—For Shaping and Transmitting World-leading Knowledge Assets

MEXT Ministry of Education, Culture, Sports, Science and Technology-Japan

JSPS Japan Society for the Promotion of Science 日本学術振興会

KAKENHI
GRANTS-IN-AID FOR SCIENTIFIC RESEARCH

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2023

*This booklet has been produced based on information as of October 2023, unless otherwise specified.

What is the Grants-in-Aid for Scientific Research (KAKENHI) program?

Universities and research institutions across Japan conduct many different kinds of research. As one means of supporting the research, the Grants-in-Aid for Scientific Research (KAKENHI) program supports scientific research across all fields from the humanities and social sciences to the natural sciences and across the spectrum from basic to applied research. The budget for fiscal 2023 is approximately 237.7 billion yen. In fiscal 2022, KAKENHI supported approximately 83,000 outstanding research projects, including newly adopted proposals and ongoing research projects that have already been adopted. These features make KAKENHI the largest competitive research funds in Japan.

Research activities take many forms, including those in which the researchers carry out their work with curiosity, projects in which the area of concentration and goals are defined in advance, and those intended to lead to specific product development. The starting point for all these activities is scientific research based on the researcher's creative ideas. By broadly supporting this scientific research, which is the foundation of all research activities, the KAKENHI program plays a major role, in the fostering and development of scientific advances.

KAKENHI provides funds necessary for research activities, following adoption based on the rigorous review of research plans submitted by researchers.

■The placement of "KAKENHI" in the policy on the promotion of science, technology and scientific research in Japan

Research type / Funding type	Scientific research based on researcher's creative ideas [curiosity-driven research]	R&D on policy imperatives [mission-oriented research]
Competitive Research Funds (Selected through open calls and review)	**Research supported by Grants-in-Aid for Scientific Research**	**Research funded by open call and selection in line with the missions set by individual Ministries**
Basic funds (Provision of management and operation funds, etc.)	**Research conducted at universities And inter-university research institutes**	**National projects led by the initiative of Government, strategically promoted R&D projects conducted by National Research and Development Agencies**

Research Categories

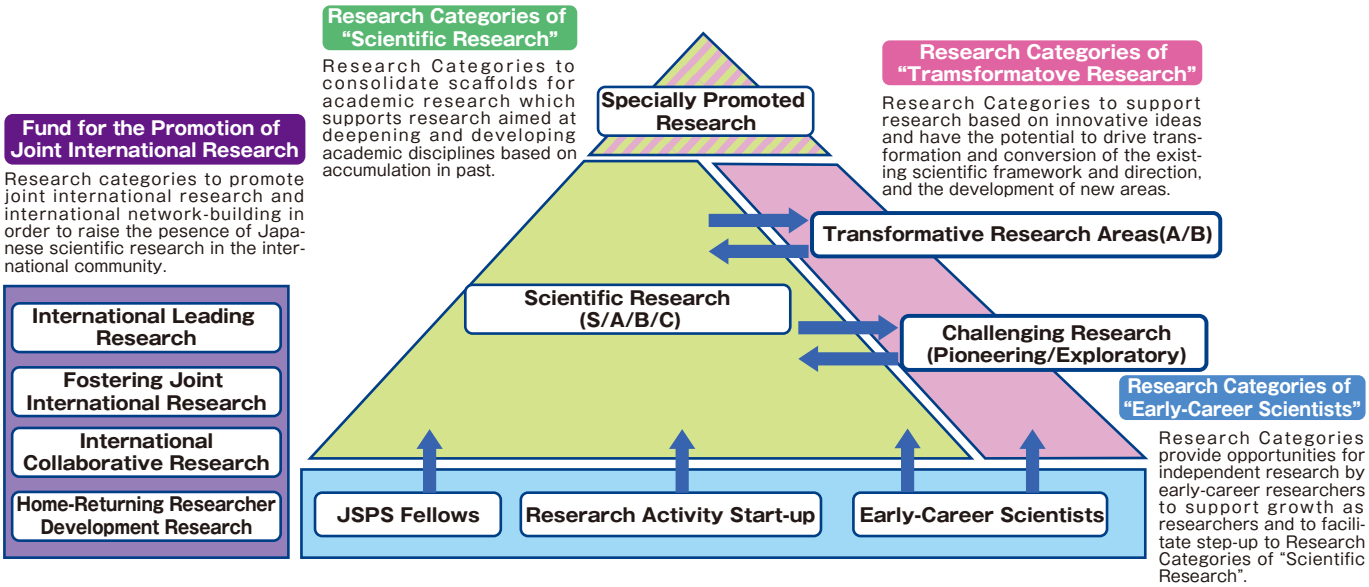
KAKENHI covers all fields of research.

This scheme offers a variety of research categories, depending on the contents and scale.

KAKENHI supports all types of curiosity-driven research (i.e. scientific research based on researcher's creative ideas) from basic research to applied research, covering all fields, from the humanities and social sciences to natural sciences.

Research categories are defined based on the stage and scale of the research. Researchers applying for KAKENHI can select a research category based on the contents and scale of their own research plan.

■Image of research categories in FY2023



Details on each research category are as follows.

As of July 2023

Research categories	Purposes and description of each research category	Type of fund*1
Grants-in-Aid for Scientific Research		
Grant-in-Aid for Specially Promoted Research	Outstanding and distinctive research conducted by one or a relatively small number of researchers expected to achieve remarkably excellent research results that opens up a new scientific field. The research period is 3 to 5 years. (In a truly necessary case, period up to 7 years is acceptable.) The budget ranges from 200 million to 500 million yen per project (Only in a truly necessary case, budget exceeding 500 million yen is asked for.).	SG
Grant-in-Aid for Transformative Research Areas	(A) Research areas proposed through co-creative and interdisciplinary efforts of diverse researchers, which aim to create research areas that will lead the way to radical transformation of and change in the existing framework and/or direction of research as well as upgrade and level-up of scientific research in Ja pan and nurturing young researchers, and will contribute to the development of the proposed research areas through efforts for joint research and shared use of equipment, etc. (5 years; more than 50 million yen and up to 300 million yen per fiscal year per research area (In a truly necessary case, a budget exceeding 300 million yen may be requested.)) (B) Research areas proposed by compact groups of researchers who will be bearers of the next generation of research with a smaller budget scale (about 3 or 4 groups), which aim to create research areas that will lead the way to radical transformation of and change in the existing framework and/or direction of research as well as upgrade and level-up of scientific research in Japan through more challenging and exploratory research, and expected to lead to the Transformative Research Areas (A) in the future. (3 years; 50 million yen or less per fiscal year per research area)	SG
Grant-in-Aid for Scientific Research	(S): Creative/pioneering research conducted by one or a relatively small number of researchers. 5 years (in principle) 50 million to 200 million yen (A), (B), (C): Creative/pioneering research conducted by one researcher or jointly by multiple researchers. (A) 3 to 5 years; 20 million to 50 million yen (B) 3 to 5 years; 5 million to 20 million yen (C) 3 to 5 years; 5 million yen or less	(S) SG (A) SG (B) SG (C) MF
Grant-in-Aid for Challenging Research	Research conducted by a single or multiple researchers that aims at radically transforming the existing research framework and/or changing the research direction and has a potential of rapid development. The scope of the (Exploratory) category encompasses research proposals that are highly exploratory and/or are in their budding stages. (Pioneering) 3 to 6 years; 5 million to 20 million yen (Exploratory) 2 to 3 years; 5 million yen or less	MF
Grant-in-Aid for Early-Career Scientists	Research conducted by an individual researcher (*2) who is less than 8 years after Ph.D. acquisition. 2 to 5 years; 5 million yen or less.	MF
Grant-in-Aid for Research Activity Start-up	Research conducted by a single researcher who has been freshly appointed to a research position, or who has returned from his/her maternity, childcare or other kinds of leave. Up to 2 years; Up to 1.5 million per fiscal year	MF
Grant-in-Aid for Encouragement of Scientists	Research conducted by an individual who is ineligible for application for other KAKENHI categories (e.g., Individuals who belong to educational or research institutions, private companies, etc. and engage in the researches to contribute to the promotion of the science). 1 year; 100 thousand to 1 million yen	SG
Grant-in-Aid for Special Purposes	Research projects of pressing urgency and importance	MF
Grant-in-Aid for Publication of Scientific Research Results		
Publication of Research Results	Subsidy for publication and/or international dissemination of research achievements of high academic values executed by academic associations and other organizations.	SG
Enhancement of International Dissemination of Information	Subsidy for efforts by academic societies and other scholarly organizations to strengthen international dissemination of academic information for the purpose of international academic exchange.	
Scientific Literature	Subsidy for academic publication of research results (books) authored by an individual or a group of researchers.	
Databases	Subsidy for creation and operation of a database open to public use by an individual or a group of researchers.	
Grant-in-Aid for JSPS Fellows	Funding period is up to 3 years for research conducted by JSPS Fellows (including Foreign JSPS Fellows). As for Cross-border Postdoctoral Fellowship (CPD) the period is up to 5 years	MF
Fund for the Promotion of Joint International Research		
International Leading Research	This grant aims to enable research groups led by top-level researchers in our country to play a central role in the international network, thereby achieving research results of high scientific value internationally. With the participation of postdoctoral fellows and graduate students, the grant seeks to foster researchers who can play leading roles in the international research community in the future. (7 years (extendable up to 10 years); up to 500 million yen)	MF
Fostering Joint International Research	Support of joint international research project conducted by a KAKENHI grantee in collaboration with researcher(s) at a foreign university or a research institution over a period of 6 to 12 months. The grant seeks to markedly advance research plans for the root research project and to foster independent researchers who can be internationally competitive. (The budget is up to 12 million yen.) [The category name is changed from FY2023 call for proposals.]	
International Collaborative Research	Support of joint international research project conducted by multiple domestic researchers and a researcher who belongs to overseas research institution. In addition to the development of scientific research, the grant seeks to build out infrastructure of joint international research or further strengthen joint international research and to foster researchers who can be internationally competitive. (The period is 3 to 6 years. The budget is up to 20 million yen.) [The category name is changed from FY2023 call for proposals.]	
Home-Returning Researcher Development Research	Support of research to be conducted by a Japanese researcher with current affiliation abroad who is to be newly appointed at university or research institution in Japan. (The period is up to 3 years. The budget is up to 50 million yen.)	

(*1) SG: Series of Single-year Grants, MF: Multi-year Fund
(*2) Individuals who are in the prospect of acquiring Ph.D. are also eligible. When counting the years after Ph.D. acquisition, the period of maternity leave and childcare leave can be excluded.

Grant Applications

You may apply for KAKENHI grants if you meet the eligibility requirements for KAKENHI applications.

Researchers who meet the eligibility requirements for KAKENHI application may apply for KAKENHI grants. Not only researchers at universities, but also researchers at research institutes of private corporations or other organizations designated by the MEXT Minister may apply for KAKENHI grants.
Any researcher considering applying is kindly requested to check with their research institution for specific procedures.

Under the KAKENHI, the schedule is set up in order to enable research projects to commence from April, the beginning of the fiscal year. Accordingly, a series of calls for proposals start in April or later of the previous year, and after a review process, a notice of review results is sent promptly to each research institution by the end of the previous fiscal year.

Application Procedures for KAKENHI and relevant documents, including the Research Proposal Document, which forms part of the application documents, are available on the respective KAKENHI websites of MEXT and JSPS. English versions of the Application Procedures and the Research Proposal Document forms are available, and applications may be submitted in English.
Applications are accepted online through the electronic application system.

Application Procedures (JSPS)
https://www.jsps.go.jp/english/e-grants/howtoapply.html

Application Procedures (MEXT) (Japanese version only)
https://www.mext.go.jp/a_menu/shinkou/hojyo/boshu/1351544.htm

Flow from Call for Proposals to Provisional Grant Decision

The diagram below describes the flow from call for proposals to provisional grant decision in the 2024 funding year in the case of the most common research categories, "Scientific Research (A/B/C)" and "Early-Career Scientists".

Mid-July
"Scientific Research(A/B/C)", "Early-Career Scientists"

Application Procedures are notified to each research institution, and are also made available on the Internet

Meetings explaining Grants-in-Aid for Scientific Research (Early to mid-July)

Decision on screening and assessment rules in Scientific Research Grant Committee

Submission deadline: Mid-September
"Scientific Research A/B/C)", "Early-Career Scientists"

Acceptance of Research Proposal Document

Mid-September to Early October

Preparing for review

Two-Stage Document Review
"Scientific Research (B/C)" and "Early-Career Scientists"

Comprehensive Review
"Scientific Research (A)"

Mid-October to Late January

<Document review>

Results tallied from document reviews

<Panel review>
Grant awardees are adopted bassed on document review outcomes (conducted by same researchers as those involved in the document reviews)

Late January to Early February

Screening results tallied; preparations for informal decision

Late February

Notification of review results to each researcher

Early April

Notification of provisional grant decision and procedures for formal application for grant delivery to each research institution

Mid-October to Late January

<First-stage document review>

Results tallied from first-stage document review

<Second-stage document review>
Borderline proposals are assessed for another round and assigned scores for the second time based on the results of the first-stage document reviews and taking into account the individual comments of other reviewers, in order to determine grant awardees (conducted by same reviewers as those involved in the first-stage document reviews)

■Year-round schedule of KAKENHI process

<Schedule for FY2024 Call for Proposals and Notice of Review Results for Main Research Categories>

Research Category	Start of Call for Proposals	Deadline for Submission of Applications	Timing of Notice of Review Results
Specially Promoted Research	Mid-April 2023	Mid-June 2023	Early January 2024
Scientific Research (S)	Mid-April 2023	Mid-June 2023	Mid-February 2024
Transformative Research Areas (A/B)	Mid-April 2023	Mid-June 2023	Late February 2024
Transformative Research Areas (A) (Publicly Offered Research)	Mid-July 2023	Mid-September 2023	Late February 2024
Scientific Research (A/B/C), Early-Career Scientists, Encouragement of Scientists	Mid-July 2023	Mid-September 2023	Late February 2024
Challenging Research (Pioneering/Exploratory)	Mid-July 2023	Mid-September 2023	Late June 2024
Publication of Scientific Research Results	Mid-July 2023	Mid-September 2023	Late March 2024

<Schedule for FY2023 Call for Proposals and Notice of Review Results for Main Research Categories>

Research Category	Start of Call for Proposals	Deadline for Submission of Applications	Timing of Notice of Review Results
International Collaborative Research (formerly Fostering Joint International Research (B))	Early March 2023	Early May 2023	Early September 2024
Fostering Joint International Research (formerly Fostering Joint International Research (A))、 Home-Returning Researcher Development Research	Mid-July 2023	Mid-September 2023	Late February 2024

For the timeline for research categories not listed above, please refer to the respective Application Procedures and other documents.

Review

Researchers serve as reviewers to support an fair and highly transparent review system.

A peer review* process is carried out in order to select high quality research projects.

*A system in which researchers selected by the scientific community itself mutually evaluate and review the academic value of each research project according to their conscience as scientists.

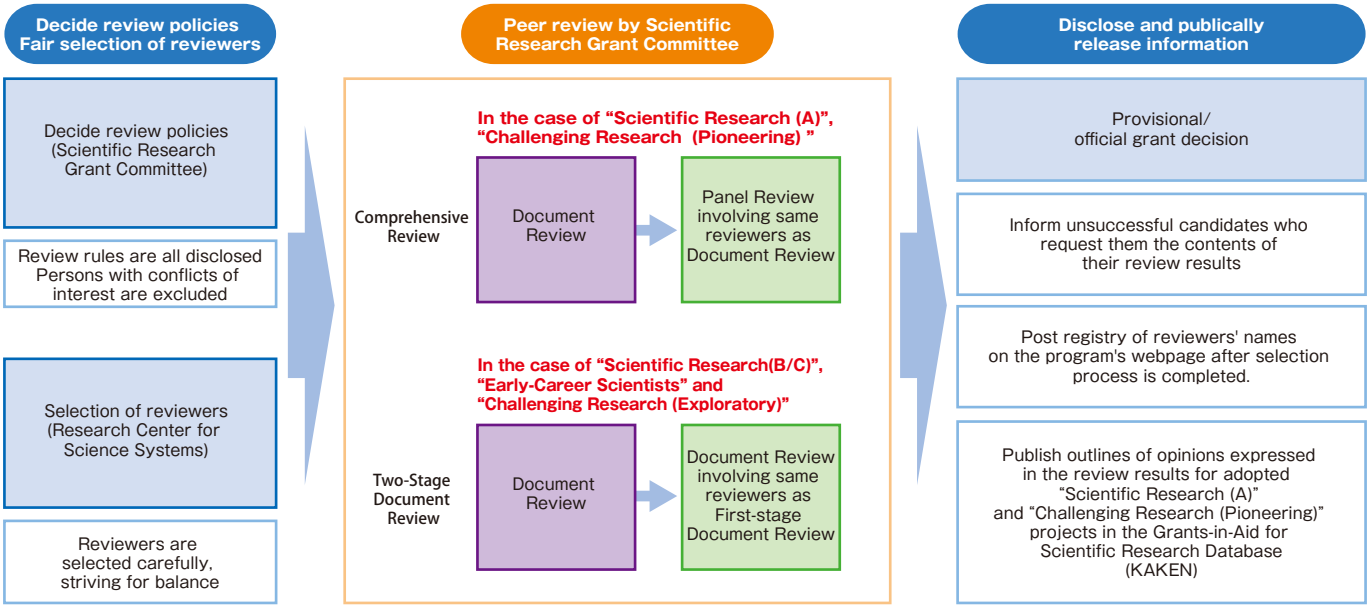
More than 8,000 researchers are involved in the review proess. Review Sections are established for review, and applicants choose their own Review Section for application.

Review methods include “Two-Stage Document Review” and “Comprehensive Review”.
In the “Two-Stage Document Review”, the same reviewers conduct document reviews in two stages and determine adoption.
In the “Comprehensive Review”, adoption is determined pursuant to a document review followed by a multi-faceted review by a panel composed of the same reviewers who conducted the document review.

We ensure the transparency of reviews by disclosing the review results to applicants and by publishing the names and other information of reviewers on the website after the review process is completed. In addition, since impartial reviews are always required, the Research Center for Science Systems in the JSPS verifies and analyzes the status of reviews and other matters.
Details on review policies and criteria, among other things, are available on the MEXT and JSPS websites.

Review Criteria (KAKENHI website)
https://www.jsps.go.jp/english/e-grants/grants03.html

■KAKENHI Review Methods —A Fair, Impartial and Transparent Review Process



Review Process

[Two-Stage Document Review] (Examples)— "Scientific Research (B/C)", "Early-Career Scientists" and "Challenging Research (Exploratory)" —

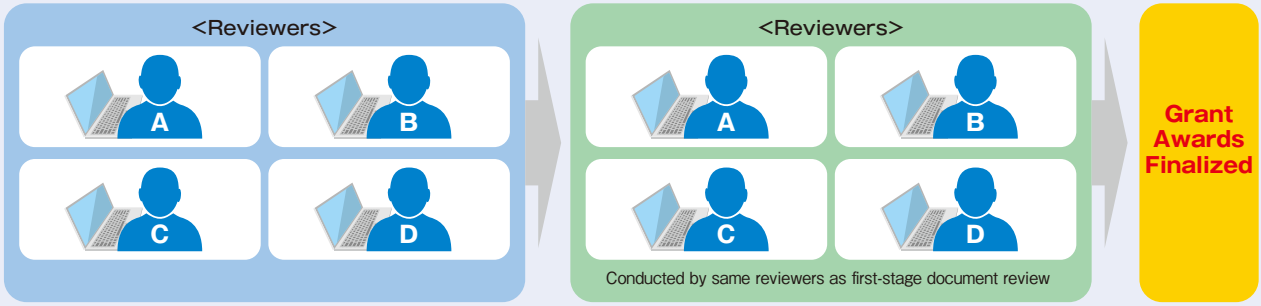
Each "Scientific Research (B)" proposal is reviewed by six reviewers*1; each "Scientific Research (C)" and "Early-Career Scientists" proposal is reviewed by four reviewers; each "Challenging Research (Exploratory)"proposal is reviewed by six to eight reviewers. In the event that the number of proposals received is large, reviews are conducted following a preliminary screening (in the Challenging Research category only).

First-stage Document Review (in each Basic Section*1,2)

Each proposal undergoes a document review (relative evaluation) via the electronic application system, conducted by multiple reviewers appointed in the applicable Basic Section*1,2

Second-stage Document Review (in each Basic Section*1,2)

Proposals mainly close to the borderline are awarded scores for the second time based on the results of the first-stage document reviews and taking into account the individual comments of other reviewers



*1 For Grant-in-Aid for Scientific Research (B), joint reviews will be conducted by consolidating several Basic Sections for which the number of applications is notably small. Joint reviews will be conducted by six to twelve reviewers.
*2 For "Challenging Research (Exploratory)", reviews are conducted in each Medium-sized Section.

[Comprehensive Review] (Examples)— "Scientific Research (A)", and "Challenging Research (Pioneering) " —

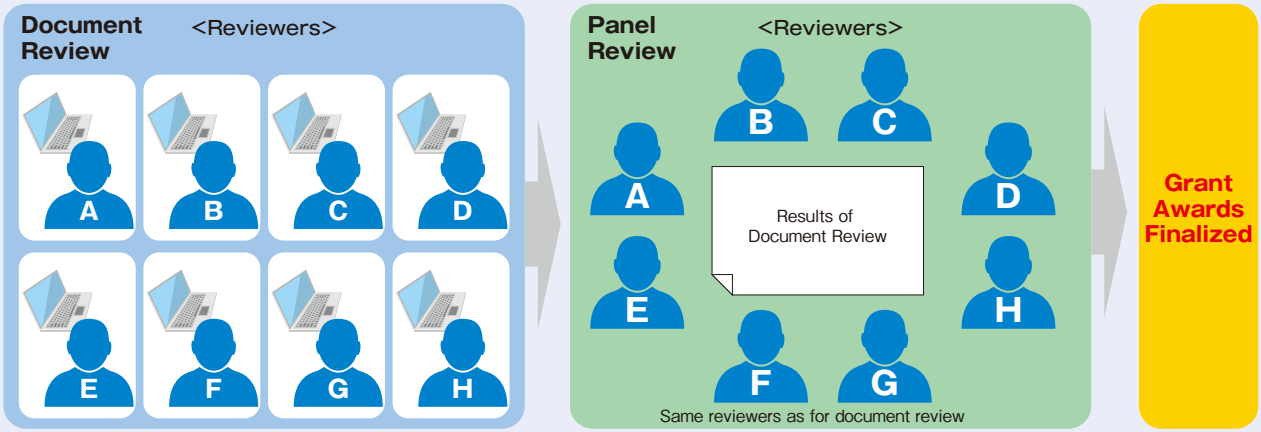
Between six and eight reviewers are appointed for each proposal in the "Scientific Research (A)" and "Challenging Research (Pioneering)", and each proposal is subject to both a document review and a more thorough and multi-faceted panel review. In the event that a large number of applications is received, the review may include processes such as preliminary screening ("Challenging Research" only) or random assignment*3 of research proposals.

Document review (in Medium-sized Section)

The document review (relative evaluation) for each research project is conducted by multiple reviewers assigned (for each Medium-sized Section) across a broader range of disciplines

Panel review (in Medium-sized Section)

Based on the cumulative results of the document review, a panel made up of the same reviewers who conducted the document review will carry out a multi-faceted review, and decide to adopt or not the application.



*3 In order to alleviate the burden on reviewers in sections with large numbers of applications, multiple review groups are established and proposals assigned to them randomly.
*4 For such as "Scientific Research (S)", in addition to the Comprehensive Review, we have introduced a system of review comments produced by researchers in closely-related specializations, taking into account the specialized nature of applications.
*5 "Reviews in the Challenging Research (Exploratory)" category were conducted in a comprehensive review format up to the call for proposals for the 2021 funding year, but the two-stage document review format has been used from the 2022 funding year.

References and Data
Review Sections P21
Selection of Reviewers P22
Disclosure of Review Results P23

Use of Research Funds

You can use research funds for a wide range of purposes, as long as they are necessary for your research. We are making improvements every day to make the funds easier to use.

Based on requests from researchers and research institutions, we are making various improvements of KAKENHI to facilitate the use of research grants.

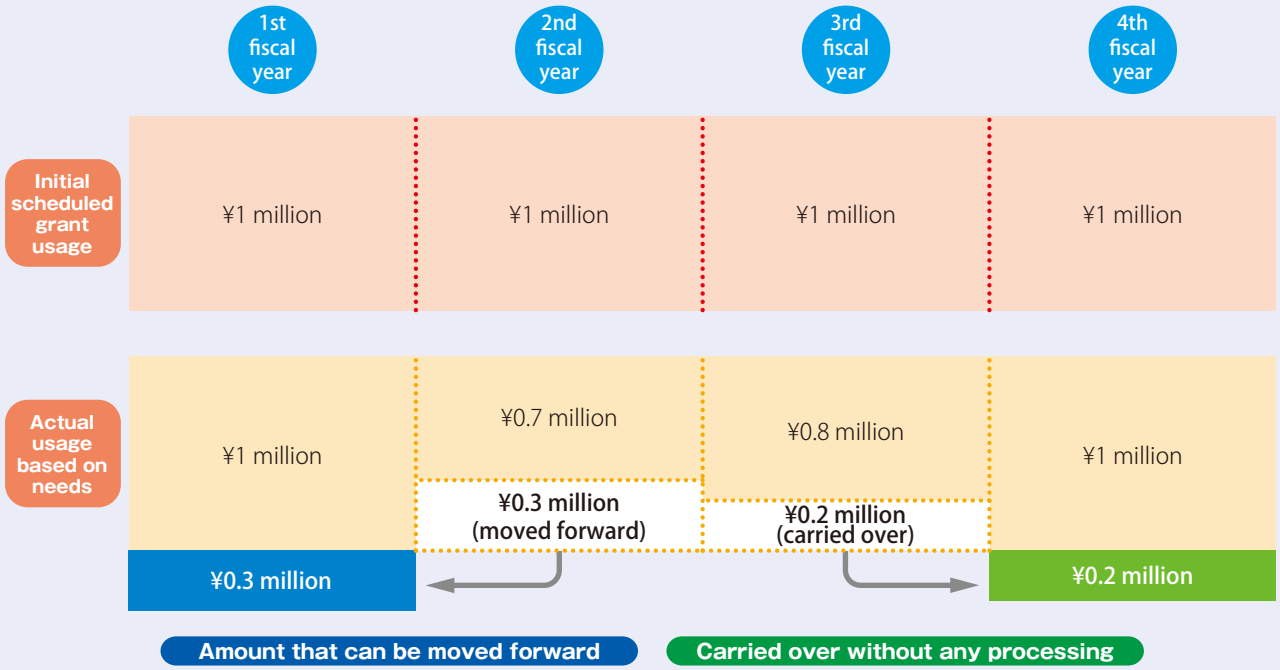
■Examples of major system improvements

■Use of research grants free from the constraints of a single fiscal year system: Introduction of the Multi-year Fund to KAKENHI

JSPS has established the Multi-year Fund to enable the use of research grants over multiple fiscal years. You can flexibly use research grants for the entire research period of multi-year projects under the research categories eligible for the Multi-Year Fund.
For the eligible research categories, please refer to the research category details on page 4.

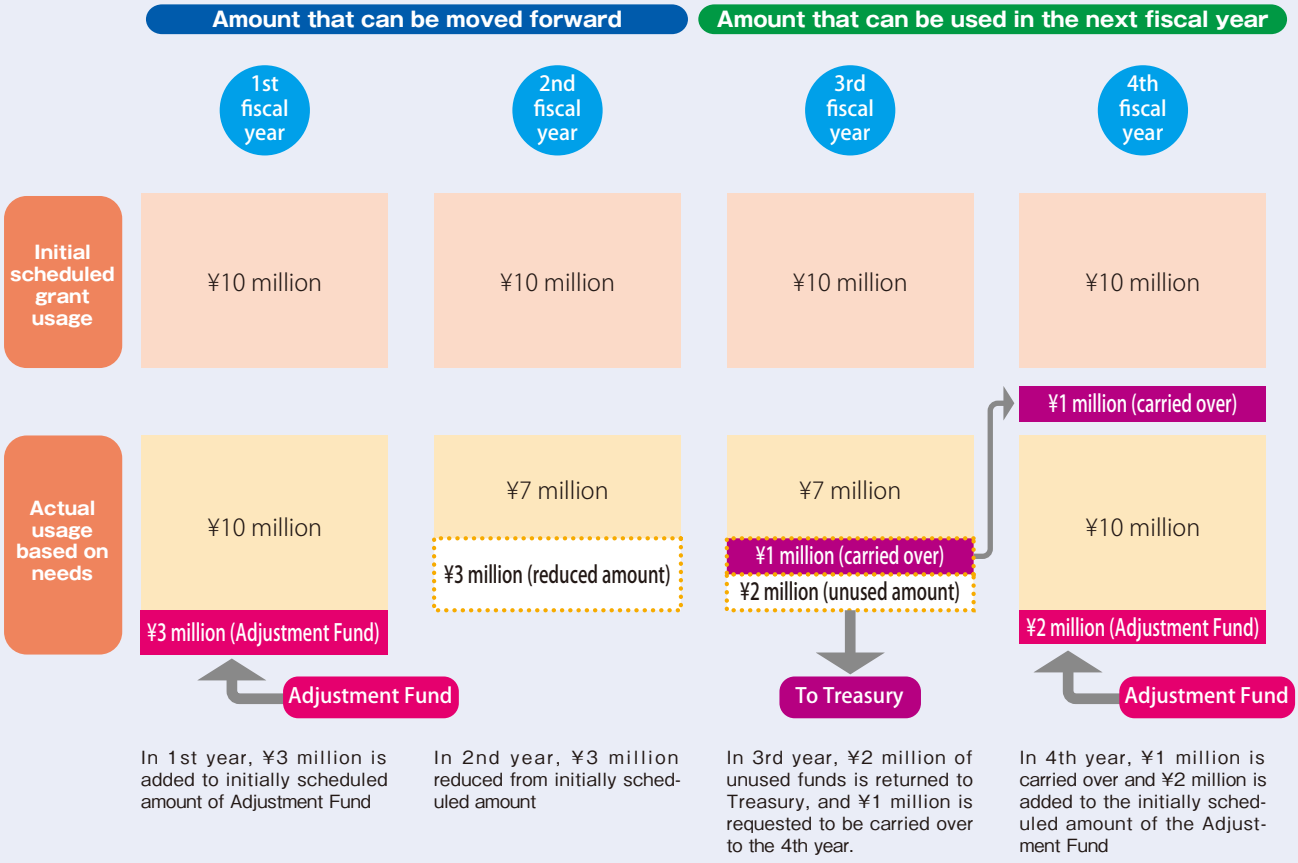
Advantages of Implementing the Multi-year Fund
◆Flexible use of research grants
・In pace with the progress of their research projects, researchers can spend research funds in advance or spend unused funds in the following year or later.
・Researchers can enter into multi-year contracts.
・It is acceptable for goods ordered at the end of one fiscal year to be delivered in the next.
◆No need to request carryover of unused funds
This helps researchers to secure their research time and research institutions to reduce their administrative burden.

■Image of Multi-year Fund grant usage



■Adjustment Funds system of KAKENHI (Series of Single-year Grants)

We have introduced the Adjustment Funds system to enable funds in projects under research categories outside the scope of the Multi-year Fund to be brought forward for use or carried over for use in the next fiscal year, thus realizing flexible use of research grants.



■Extension of research periods in line with interruptions such as maternity/childcare leave and long-term overseas stay

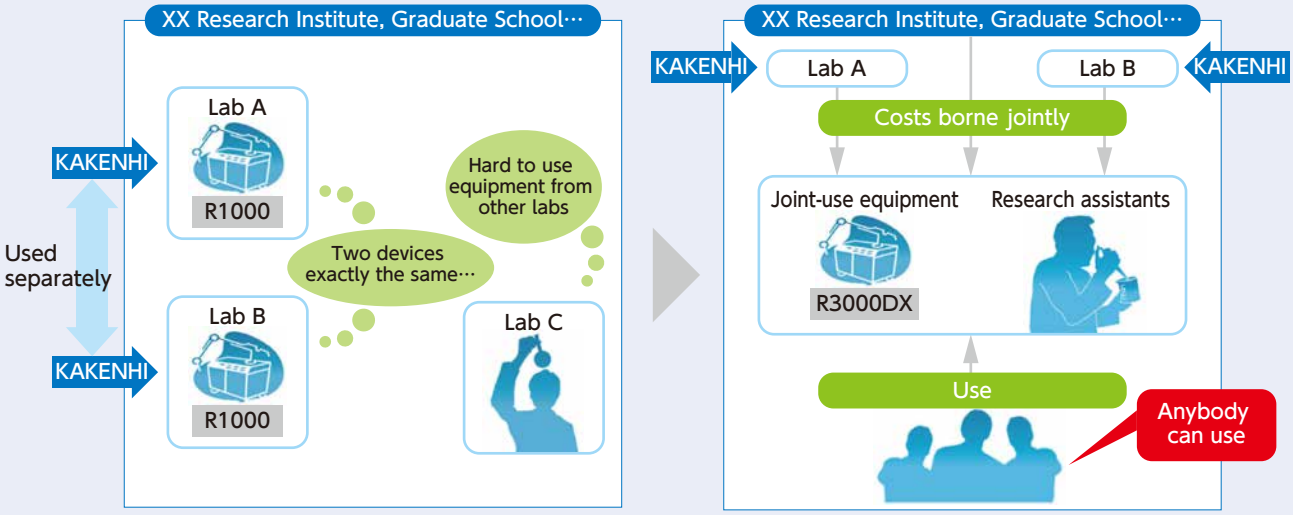
Research can be suspended temporarily when taking leave for maternity, childcare and the like and research periods extended in accordance with their request. And, a system was introduced to enable research to be suspended temporarily during periods of residence outside Japan for research purposes and research periods extended accordingly.

■Purchase of joint-use facility using funds combined from multiple grants

To promote efficient use of KAKENHI grants and joint use of equipment, it has been possible to purchase equipment that is used jointly (joint-use facility) by combining funds from multiple grants.
In addition to combining funds across multiple KAKENHI grants, it is also possible to purchase joint-use equipment using KAKENHI funds in combination with funds from other competitive research funds schemes.
For details of schemes that are eligible for combination, please refer to the MEXT website.

Concerning the purchase of joint-use facilities with funds from different research funds (a combined use) (Japanese version only)
https://www.mext.go.jp/content/20200910-mxt_sinkou02-100001873.pdf

Image of combining KAKENHI funds (in the case of joint-use equipment)



■Ensuring Appropriate Use of KAKENHI Funds and Fair Research Activities

As KAKENHI is funded by taxpayers' money, we must prevent any improper grant spending and research misconduct. To this end, we have made efforts to raise awareness of the KAKENHI rules, including distributing handbooks and holding seminars. At the same time, we demand that each research institution ensure the use of research grants under an appropriate management structure.

■Online application procedures

Applications for KAKENHI grants are accepted online through the electronic application system, rather than on paper, in order to secure research time for researchers and reduce the administrative burden on research institutions.

Assessment Following the Adoption of Research Projects

We conduct assessments after adoption based on the size and progress of the research.

Research funded by KAKENHI undergoes regular assessment by the scientific community, such as when the research results are published as academic papers. A research funding organization, however, also has a crucial role in properly assessing the results of KAKENHI-funded research. For researchers, as well, third-party assessment is useful as a basis for reviewing research conducted up to now or for leading to development into new research.
For these reasons, the KAKENHI program, based on the "General Guidelines for Evaluating Government Funded R&D", carries out assessment in keeping with the scope and progress stage of research, and makes public all the assessment results on the KAKENHI website and elsewhere.

	Assessment Method	Details of Assessment (Projects adopted after fiscal 2018)
Grant-in-Aid for Specially Promoted Research	・Document ・Interviews (On-site surveys)	・Self-assessment by researchers themselves as to the progress of their research (each fiscal year) ・Interim assessment (middle year of the research period) ・Ex-post assessment (next fiscal year after end of the research period)
Grant-in-Aid for Scientific Research on Innovative Areas	・Document ・Interviews	・Self-assessment by researchers themselves as to the progress of their research (each fiscal year) ・Interim assessment (third year of a five-year research period) ・Ex-post assessment (next fiscal year after end of the research period)
Grant-in-Aid for Transformative Research Areas (A)	・Document review ・Interviews	・Self-assessment by researchers themselves as to the progress of their research (each fiscal year) ・Interim assessment (third year of a five-year research period) ・Ex-post assessment (next fiscal year after end of the research period)
Grant-in-Aid for Scientific Research (S)	・Document ・Interviews (On-site surveys)	・Self-assessment by researchers themselves as to the progress of their research (each fiscal year) ・Interim assessment (middle year of the research period) ・Ex-post assessment (next fiscal year after end of the research period)

*Researchers themselves conduct annual self-assessments on the progress of their research under the categories of Grant-in-Aid for Transformative Research Areas (B), Scientific Research (A/B/C), Challenging Research (Pioneering/Exploratory), Early-Career Scientists, and Research Activity Start-up.

Research Results of KAKENHI-funded Projects

KAKENHI-funded research projects have produced a wide variety of results, ranging from basic research to those that play a role in our daily lives.

■Introducing Research Achievements Resulting

Development of cancer immunotherapy using PD-1 blockade

HONJO Tasuku, Distinguished Professor, Kyoto University

In 1992, Professor HONJO identified programmed cell death 1 (PD-1), a T cell surface molecule related to T-cell selection in the thymus gland. The function of PD-1 within the body remained unknown for many years thereafter.

Research Outcome

- In 1999, showed in experiments using laboratory mice lacking PD-1 that PD-1 is an inhibitor molecule, acting as a brake on excessive immune reactions.
- Showed that in mice lacking PD-1 there was no brake applied to immune function and this led to auto-immune disease.

- In 2002, proved in laboratory experiments with mice lacking PD-1 or PD-1 blockade that blocking PD-1 can activate killer T cells and thereby inhibit the growth of cancer: a world-first achievement.

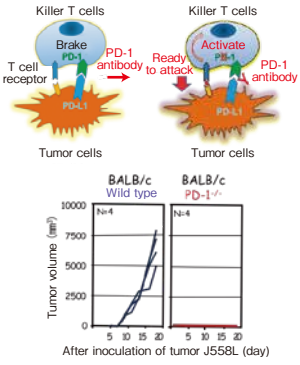


Figure: By blocking the PD-1 brake, the inhibition of killer T-cells can be removed and they can attack the cancer (see figure above). Professor HONJO showed for the first time in the world that stronger antitumor effects were found in mice lacking PD-1 than in wild mice. Iwai et al., PNAS, 2002.

KAKENHI financial support

Mechanism of lymphocyte differentiation, molecular mechanisms of gene rearrangement and clonal deletion by antigens (Grant-in-Aid for Specially Promoted Research, 1992–1994) etc.

Funding by KAKENHI began in the early 1990s

Further developments from research achievements

- Created a human antibody for human PD-1 and conducted clinical trials with Bristol-Myers Squibb and Ono Pharmaceutical. The therapy was effective even in around 30% of stage-4 cancer patients who had no other treatment options remaining.
- Today, this therapy is applied to many types of cancer and used on patients throughout the world.
- Professor HONJO continues to pursue research on causes of non-effective therapy, concomitant therapies to strengthen therapeutic effects, and methods of reducing side-effects.

Professor HONJO was awarded the Nobel Prize in Physiology or Medicine in 2018 for "discovery of cancer therapy by inhibition of negative immune regulation."

Research on Neutrino Oscillations

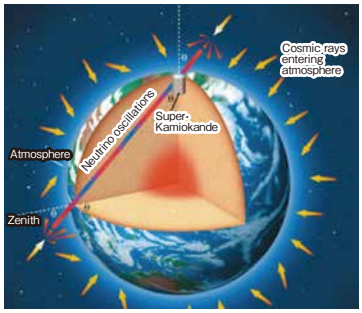
KAJITA Takaaki, Director, Professor, The University of Tokyo

- Neutrinos are elementary particles, of which there are three "flavors"—electron neutrinos, muon neutrinos, and tau neutrinos. Being extremely light, for a long time they were believed to have zero mass.
- Based on the observation that the ratio of the electron neutrino and muon neutrino components of the Kamiokande experiment's atmospheric neutrino data did not agree with expectations, the issue of the "atmospheric neutrino anomaly" was raised. Then the study on atmospheric neutrinos which produced when cosmic rays collide with atoms in the atmosphere was begun.

Research Outcome

- Observations of atmospheric neutrinos using Super-Kamiokande revealed that of muon neutrinos produced on the other side of the Earth, some changed to tau neutrinos as a result of their long journey. Their number was only about half the number of neutrinos that came down from directly above the detector.

- This phenomenon came to be known as neutrino oscillation, neutrinos changing into other types of neutrinos while in flight. This occurs only if neutrinos have mass. The discovery of neutrino oscillations became definitive proof that neutrinos have a mass that is not zero.



Atmospheric neutrinos produced in the atmosphere on the other side of the Earth pass through the Earth and arrive at the detector.

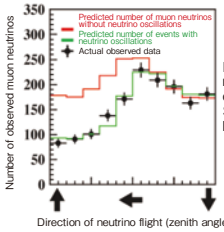
Further developments from research achievements

- Since this discovery, studies of neutrino mass and of elementary particle theory incorporating these findings have progressed, leading to the confirmation of oscillations of all three flavors of neutrinos in solar neutrino, T2K, and other experiments.
- It is hoped that learning about the properties of neutrinos will bring us closer to solving the mystery of how the Universe came to be made only of matter, instead of equal amounts of matter and antimatter that should have existed when the Universe first came into being.

KAKENHI financial support

"Study of atmospheric neutrinos" (from fiscal 1995, Scientific Research (C)), etc.

Funding by KAKENHI began in the 1990s



Muon neutrinos observed with Super-Kamiokande

Inside of Super-Kamiokande
Photo:
Institute for Cosmic Ray Research, The University of Tokyo
Kamioka Observatory

The Nobel Prize in Physics was awarded in 2015 to Prof. KAJITA and Prof. Arthur B. McDonald "for the discovery of neutrino oscillations, which shows that neutrinos have mass."

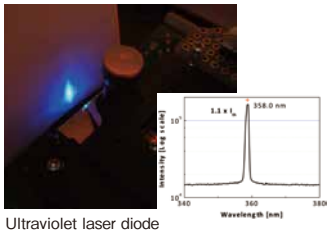
New technology to boost the output power of visible and ultraviolet Light-Emitting Diodes (LEDs)

AMANO Hiroshi, Professor,
Nagoya University

Having a higher efficiency than incandescent or fluorescent lamp, LED lamps are rapidly finding wider use. With earlier device designs, however, light extraction efficiency was too law, requiring development of technology to extract the light more efficiently. Moreover, compared with visible light LEDs, the efficiency of ultraviolet LEDs was extremely low.

Research Outcome

It was discovered that, by forming surface irregularities shorter than the wavelength of the light, the overall reflection of light could be suppressed, enabling the light to extract the device. Using low-energy electron beams, a moth-eye structure was created of regularly arranged cone-shaped structures 500 nm wide. The resulting LED achieved 1.7 to 2.5 times higher light output compared with conventional LEDs. Growing crystals at higher temperatures improved the internal quantum efficiency of the emitting layers of ultraviolet LEDs.



Ultraviolet laser diode

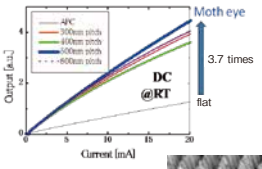
Further developments from research achievements

The technology is applicable to white LEDs and a wide range of other LED products requiring high efficiency and output. Ultraviolet LEDs are also thought to be the key for a variety of environmental friendly products, including those for cleaning air and water. They may also have medical applications such as for treatment of skin diseases.

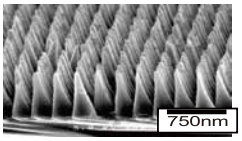
KAKENHI financial support

"Study of a high-performance GaN-based blue LED" (from fiscal 1987, Developmental Scientific Research; Principal Investigator Dr. AKASAKI Isamu)

Funding by Kakenhi began in the late 1980s



Improvement in blue LED light output



Example of moth-eye structure

Dr. AMANO, Dr. AKASAKI Isamu of Meijo University, and Dr. NAKAMURA Shuji of the University of California Santa Barbara, were awarded the 2014 Nobel Prize in Physics for their development of blue LEDs.

Elucidating the Maritime Networks in Prehistoric Southeast Asia from the Perspective of Ear Ornaments

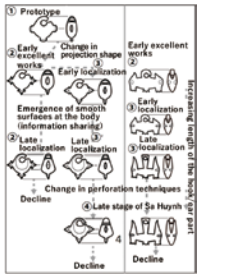
MIYAMA Emily, Visiting Fellow,
Kanazawa University

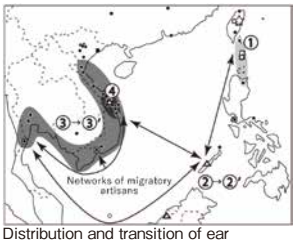
In prehistoric Southeast Asia, ear ornaments of the same shape have been found in various parts of the region and have drawn attention as artefacts showing the existence of maritime networks in the South China Sea. However, they have not been adequately studied.

Research Outcome

This research presents a concept of "production system" that shows how ear ornaments were made, based on the analysis of the morphology, crafting techniques, and material use of the ornaments. At the same time, the study examined how these ornaments were used in order to find out their social functions and roles.

The research revealed that in local communities around the South China Sea, ear ornaments were used for burials and other purposes in different contexts, and that "itinerant artisans" who moved around the region and crafted ear ornaments played a significant role in the maritime networks in prehistoric Southeast Asia.





Distribution and transition of ear ornaments and the overview of the networks

KAKENHI financial support

Transition of social structures beyond prehistoric South China Sea - Study on the spatiotemporal distribution and social use of ear-ornaments- (fiscal 2013~2014, JSPS Fellows, etc.)

Funding by KAKENHI began in the 2013s

Further developments from research achievements

- Dr. MIYAMA newly established a network model of "itinerant artisans," in addition to "migration" and "trade," which have been pointed out in previous studies.
- In order to gain a more multi-faceted understanding of the actual conditions of the maritime networks, Dr. MIYAMA is advancing research by revealing 1) the characteristics of local communities through a comparative study of burial practices and 2) crafting techniques and resource arquisitions through analysis of pottery clay and then examining them with typological features, with the aim of making it possible to differentiate between local and imported pottery.

Dr. MIYAMA was awarded a 19th JSPS Prize and the 12th Young Researcher Award of the Japan Society for the Southeast Asian Archaeology in 2022 for her "Elucidating the Maritime Networks in Prehistoric Southeast Asia from the Perspective of Ear Ornaments."

Exploration of habitability in solar system bodies

SEKINE Yasuhito, Professor,
Tokyo Institute of Technology

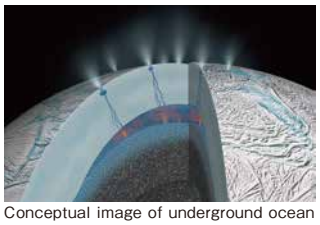
One of the major goals of natural sciences is to answer the questions "How did life come into being?" and "Are there other bodies outside of the earth where life exists? With the progress of solar system exploration, we have discovered one after another piece of evidence that shows a large amount of water, i.e., ocean, exists (or existed) on bodies other than the earth.

Research Outcome

We have focused on the oceans and lakes of early Mars and the underground oceans of the icy moons of Jupiter and Saturn and examined their aqueous environments, or the presence of dissolved chemicals, in particular substances that serve as nutrients and food available for life.

As a result, for instance, we revealed that hydrothermal vents which could harbor life existed on Enceladus, Saturn's satellite, and that lakes on early Mars were rich in minerals and had water quality suitable for life.

(Illustrations of research results)



Conceptual image of underground ocean and hydrothermal vents of Saturn's satellite Enceladus (by courtesy of NASA)

Mars Curiosity rover traveling on a former lake (by courtesy of NASA)

KAKENHI financial support

Aqua planetology
(fiscal 2013~2014, JSPS Fellows, etc.)

Funding by KAKENHI began in the late 2000s

Further developments from research achievements

- These results have received wide coverage on TV and in newspapers, with a growing recognition among the general public that we have entered the era of searching for life in outer space. The publication of many related books has served as a catalyst for elementary, junior high, and senior high school students to develop interest in and dreams for natural sciences.
- Knowledge of the water quality of lakes on early Mars and the chemical composition of underground oceans of icy moons will give us the idea of how much life can survive there. As future developments, these can lead Japan to conduct its own exploration activities and make its presence felt in large-scale international exploration of life.

Professor SEKINE was awarded a 19th JSPS Prize in 2022 for his "Study of the Atmospheres, Oceans, and Habitability of Icy Bodies in the Solar System."

Research to protect the brain from ultrafine particles in the air pollution

ONODA Atsuto, Assistant Professor,
Sanyo-Onoda City University

Ultrafine particles (nanoparticles) of 100 nm or smaller in the environment, particularly those suspended in the air, have properties not seen in coarse particles and have specific effects on living organisms. In order to prevent health hazards caused by ultrafine particles, it is now an important global challenge to unravel how they induce their unique effects not found in other pollutants.

Research Outcome

Animal experiments revealed that cells around cerebral blood vessels (CBVs) were highly responsive to exposure to even a small amount of particles that stopped short of causing inflammation or acute response (Fig. 1).
They also revealed that, in spite of the young age of the animals, the cells around cerebral blood vessels in charge of waste clearance, showed an increasing resemblance to those of old animals in terms of their conditions.
However, ultrafine particles themselves were not localized around those blood vessels.

Our results suggested the following adverse outcome pathway: exposure to ultrafine particles generated and increases abnormally structured proteins in the brain, which are then released and accumulate around brain perivascular area, leading to injuries to the surrounding cells (Fig. 2).
The study indicated that conformational changes in proteins that occur on the surface of particles may be especially important in understanding the principles by which the ultrafine particles impact on the brain.

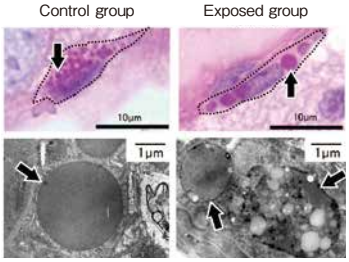


Fig. 1: Example of abnormalities of cells around CBVs
caused by exposure to ultrafine particles
Denatured digestive granules (arrow) of brain perivascular macrophages (dashed line) in charge of removing waste materials

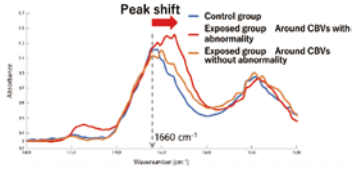


Fig. 2: Part of infrared spectra around CBVs
Peak shift suggesting conformational changes in proteins observed only around CBVs with abnormalities.

KAKENHI financial support

Mechanism of abnormal brain development induced by nanoparticle: protein conformational changes associated with surface interactions
(Scientific Research (B) from fiscal 2022), etc.

Funding by KAKENHI began in the 2015s

Further developments from research achievements

- Each of the findings in this study turned out similar to initial lesions commonly observed in neurodegenerative diseases including dementia. This points to the importance of understanding from a new perspective, namely, the interaction of proteins with ultrafine particles in the environment, as one of the strategies for preventing neurodegenerative diseases.
- These outcomes led to the adoption for the JST FOREST program, resulting in research toward the "identification of brain proteins whose abnormal structures are induced by ultrafine particles and their effects on the brain" and "elucidation of characteristics of particles that tend to induce abnormal structures of proteins."
- In the future, Assistant Professor ONODA aims to develop models for predicting the impacts of particles in the environment without using animals or cells, and create technical knowledge that will be conducive to the design and rapid screening of medical-use nanomaterials to improve their biocompatibility.

Assistant Professor ONODA was awarded a JSPS Ikushi Prize in FY2017 for his "Mechanisms and Effects of Maternal Exposure to Ultrafine Particle on the Central Nervous System of Offspring."

Furthermore, we offer HIRAMEKI☆TOKIMEKI SCIENCE, an initiative to share the fun and fascination of science with students through the KAKENHI scheme.
This is an experiential program that allows students to visit research laboratories at universities and other institutions across Japan, gain first-hand experience in experiments and other activities, and come into direct contact with the results of cutting-edge research. Since its launch in fiscal 2005, the program has attracted the participation of a total of approximately 81,000 students.

We welcome participation and visits by teachers from schools with students who wish to participate in HIRAMEKI☆TOKIMEKI SCIENCE and other nearby schools. We also take care for parents, family members, and other relatives of participating students to visit and observe the program.

https://www.jsps.go.jp/j-hirameki/
(Japanese version only)

■Scenes from HIRAMEKI☆TOKIMEKI SCIENCE

September 19, 2022 Hokkaido University of Science

What is metal?
- Let's look, touch, and do experiments!

TATSUNAMI Ryosuke (Professor, Pharmaceutical Sciences)

August 13, 2022 Hokkaido University

What is a survey?
Approaching how river fish live by individual tracking

KISHIDA Osamu (Associate Professor, Field Science Center for Northern Biosphere)

October 22, 2022 Kanazawa Medical University

Let's make the body transparent and look inside
-Can we make an invisible man? -2022

HATTA Toshihisa (Professor, Faculty of Medicine)

July 24, 2022 Osaka Kyoiku University

Let's experience history, architecture, and daily life in a minka private house designated as an important cultural property, and think about how to pass on the minka to the next generation.

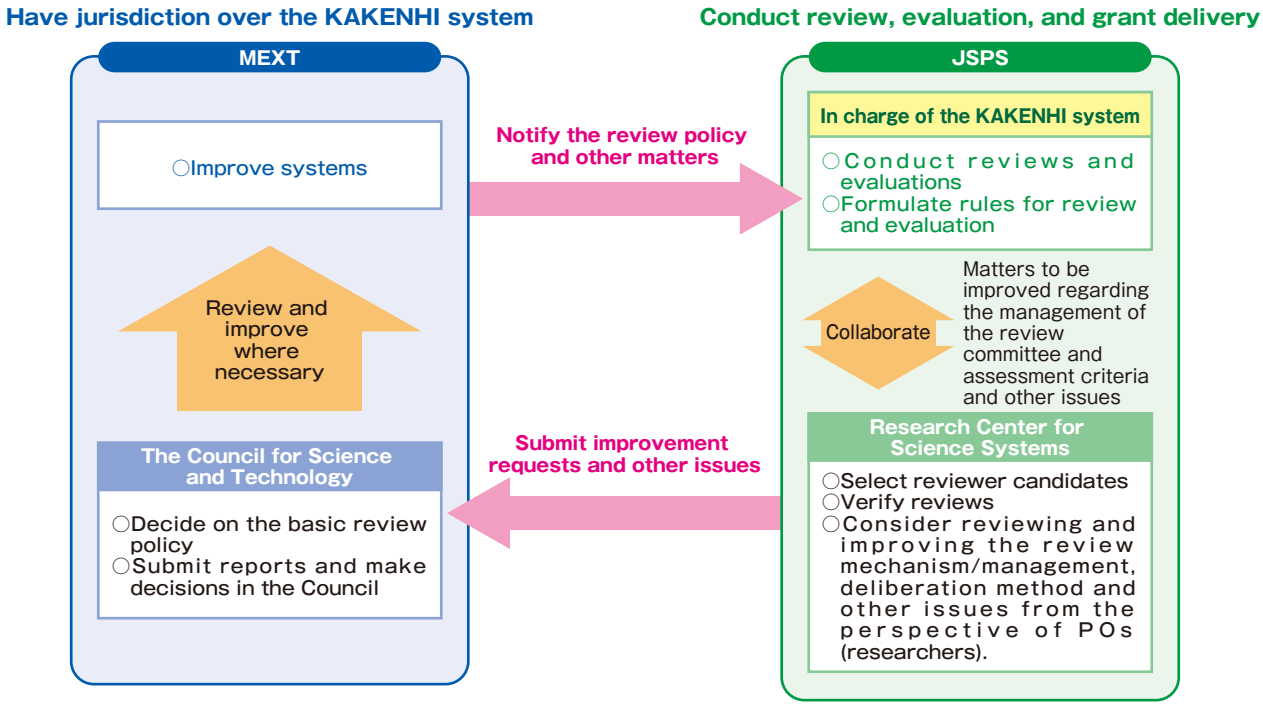
USUDA Tomoko (Professor, Faculty of Education)

References and Data | Public Release of Research Results P26

Supplementary Material and Data

Management of the KAKENHI System

MEXT and JSPS operate the KAKENHI program under their cooperation and collaboration. While MEXT decides the basic policy of the program, JSPS conducts reviews in many research categories and grants all research funds. Sections under the Science Subdivision of the Council for Science and Technology as well as the Research Center for Science Systems* are working to improve the system based on the insights of currently active researchers.



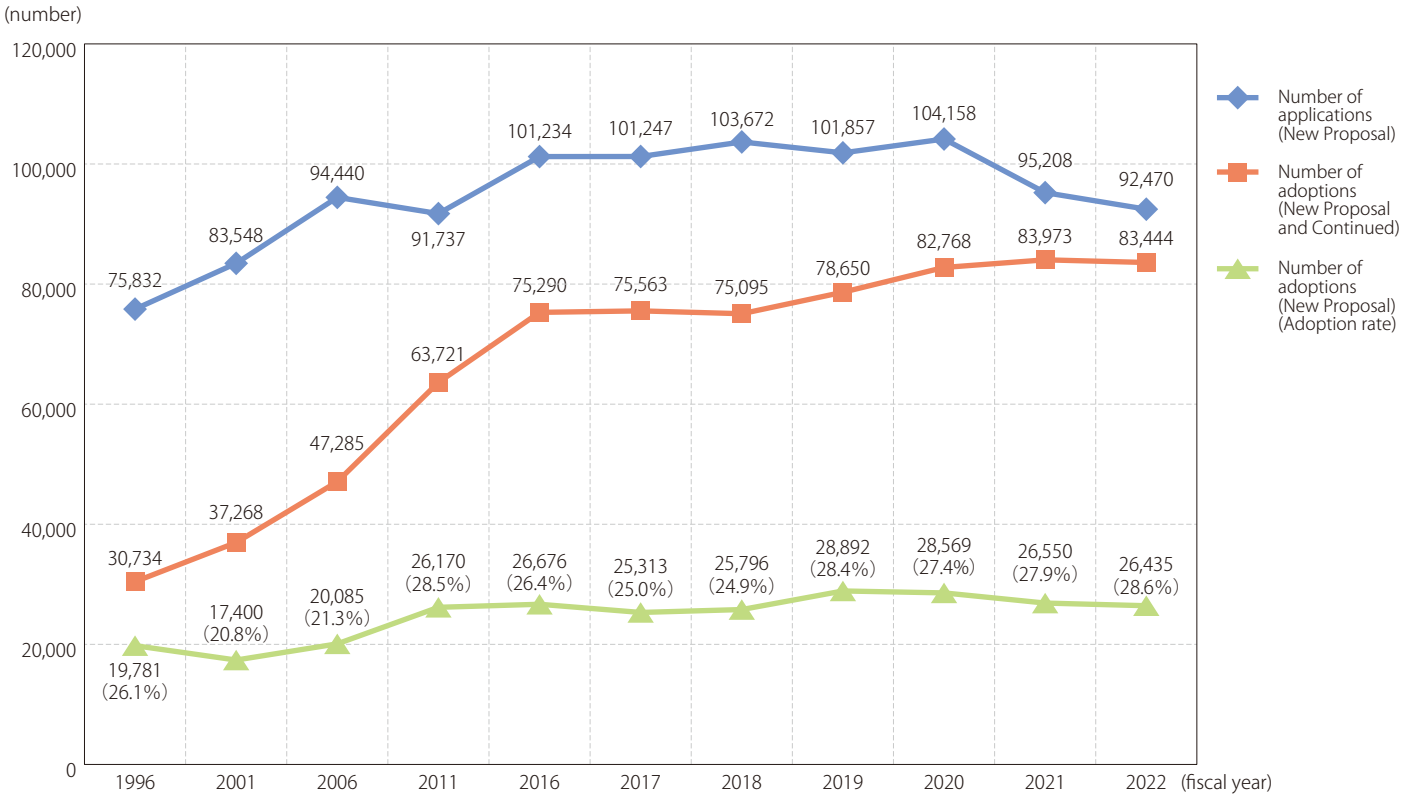
*The Center was established in the JSPS in July 2003, mainly based on the "System Reform in Competitive Research Funds" decided by the then Council for Science and Technology Policy. It plays a wide range of roles aimed at establishing an impartial and highly transparent review and evaluation system.

Research Center for Science Systems (Japanese version only)
https://www.jsps.go.jp/j-center/

Application/Adoption Numbers and Annual Budgets

■Trends in KAKENHI Applications, Adoptions, and Adoption Rate

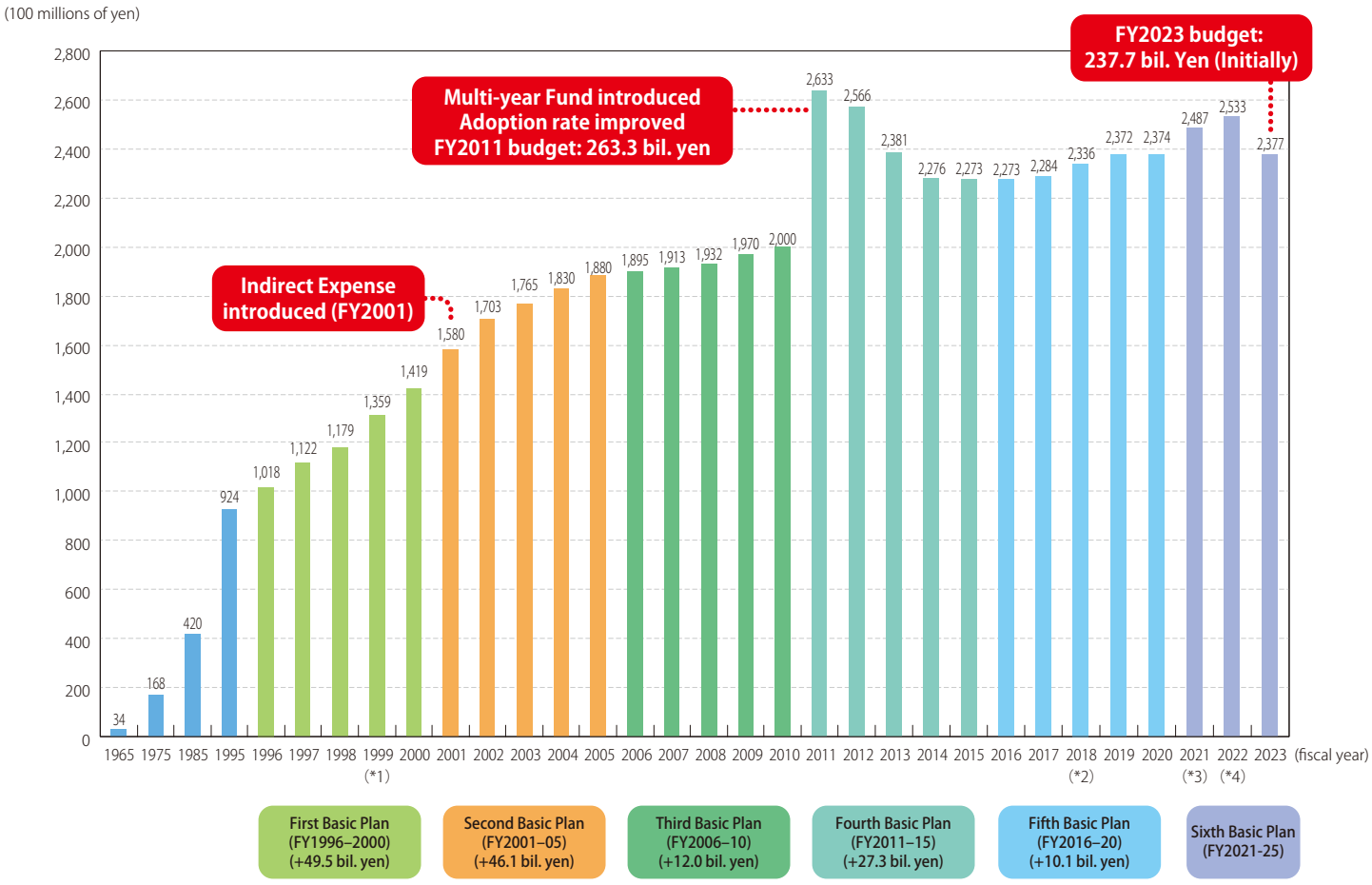
Although the number of applications for KAKENHI has been on the increase in recent years, the number of new applications in fiscal 2022 was 92,470, down 2,738 from the previous year due to the extension of continuing research projects following the COVID-19 pandemic.
The adoption rate for fiscal 2022 stood at 28.6%, showing an increase year on year, and bringing the total number of adopted projects to 83,444, including ongoing projects.



* Data for main research categories only.

■Budget Transition

The amount budgeted for KAKENHI increased significantly during the periods of the First and Second Basic Plans for Science and Technology. However, growth was more gradual in the Third Basic Plan period due to national budgetary constraints. fiscal 2021 saw a major improvement in the adoption rate, along with the introduction of the Multi-year Fund, which allows the budget to include funds for the entire research period of adopted projects. These changes resulted in an increase in the budget of 63.3 billion yen compared to the previous fiscal year.
The initial budget for fiscal 2023 is 237.7 billion yen, which is the same amount as the initial budget for the previous fiscal year.



*1 FY1999 budget includes supplementary budget of 4.5 billion yen
*2 FY2018 budget includes supplementary budget of 5 billion yen
*3 FY2021 budget includes supplementary budget of 11 billion yen
*4 FY2022 budget includes supplementary budget of 15.6 billion yen

Review Sections

■Review Sections Tailored to Research Categories

The Review Section Table is made up of an “Overview”, “Table for Basic Sections”, and “Table for Medium-sized and Broad Sections”. The overview allows applicants to grasp the overall picture of the review sections. The Basic Sections have been established to take into account the diversity of scientific research and address the varied themes cultivated to date. They comprise research categories which attracted large numbers of applications per research field in the review system that operated up to the 2017 funding year, such as “Scientific Research (B/C)” and “Early-Career Scientists”. The Basic Sections are not rigidly defined, but rather expressed as “-related” so they can flexibly encompass new advancements and diverse expansions in scientific research.
Several Basic Sections are brought together under each Medium-sized Section for use in the “Scientific Research (A)” and “Challenging Research (Pioneering/Exploratory)” research categories. These enable selection of outstanding research proposals in a competitive environment employing a broader scope in line with the aims and character of the research category in question. The content of each Medium-sized Section is not limited by the content of the Basic Sections it contains : applicants need not feel bound by the Basic Sections listed when choosing a Medium-sized Section.
Broad Sections bring together multiple Medium-sized Sections to enable selection of outstanding research proposals in a competitive environment under the “Scientific Research (S)” category.
Applicants should select a review section under which to apply after checking the examples of related research content shown in the “Table for Basic Sections” and “Table for Medium-sized and Broad Sections”.

The Broad Section applies to “Scientific Research (S)”. Applicants for this category select one of the Broad Sections listed, from A through K.

The Medium-sized Section applies to “Scientific Research (A)” and “Challenging Research”. Applicants for these categories select one of the Medium-sized Sections listed.

The Basic Section is the fundamental unit, and used in the “Scientific Research (B/C)” and “Early-Career Scientists”. Applicants for these categories select one of the Basic Sections listed.

Each item of Basic Section offers some examples related research contents. They help applicants understand the concrete contents.

■The Review Section Table(Overview Excerpt)

Broad Section A		
Medium-sized Section 1：Philosophy, art, and related fields		
	Basic Section	
	01010	Philosophy and ethics-related
	01020	Chinese philosophy, Indian philosophy and Buddhist philosophy-related
	01030	Religious studies-related
	01040	History of thought-related

■The Review Section Table(Table for Basic Section Excerpt)

Basic Section	Examples of related research content	Medium-sized Sections and Broad Section corresponding Basic Sections	
		Medium-sized Section	Broad Section
01010	[Philosophy and ethics-related] Philosophy in general, Ethics in general, Western philosophy, Western ethics, Japanese philosophy, Japanese ethics, Applied ethics, etc.	1	A
01020	[Chinese philosophy, Indian philosophy and Buddhist philosophy-related] Chinese philosophy/thought, Indian philosophy/thought, Buddhist philosophy, Bibliography, Philology, etc.	1	A

■The Review Section Table(Table for Medium-sized and Broad Sections Excerpt)

Broad Section A		
Medium-sized Section 1：Philosophy, art, and related fields		
	Basic Section	Examples of related research content
	01010	[Philosophy and ethics-related] Philosophy in general, Ethics in general, Western philosophy, Western ethics, Japanese philosophy, Japanese ethics, Applied ethics, etc.
	01020	[Chinese philosophy, Indian philosophy and Buddhist philosophy-related] Chinese philosophy/thought, Indian philosophy/thought, Buddhist philosophy, Bibliography, Philology, etc.

Selection of Reviewers (in the case of Scientific Research category)

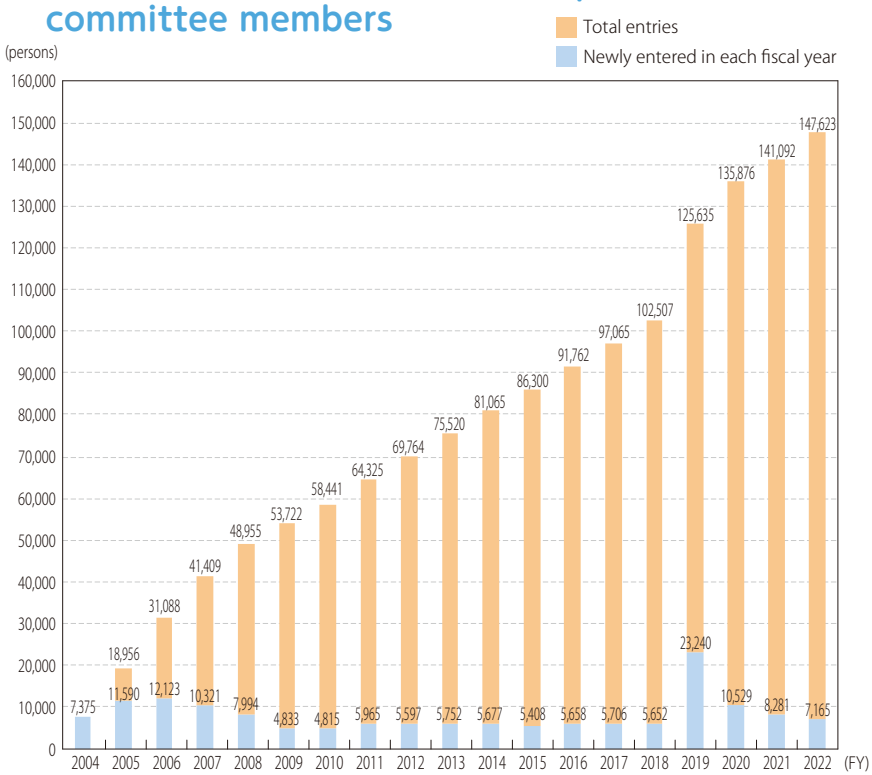
Efforts are made to ensure that reviewers are selected fairly and appropriately, to choose outstanding, high-quality research projects, and to raise the reliability of the KAKENHI review process. Program officers at the Research Center for Science Systems create a list of reviewer candidates from those in the database of potential review committee members. The reviewers are then selected by the JSPS. (Until fiscal 2004, the selection was based on recommendations by the Science Council of Japan.)

This database lists KAKENHI Principal Investigators and other potential reviewers, and continues to grow each year. (Number of candidates as of fiscal 2022: approx.148,000.) To keep the database entries up to date, the researchers themselves are able to check and update their registered information when necessary.

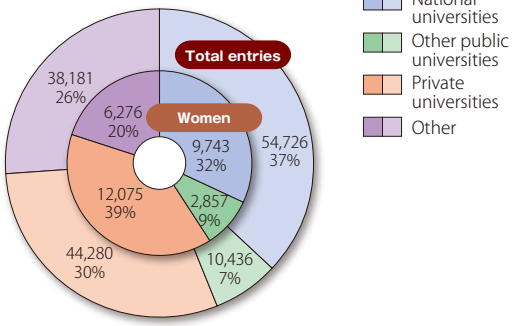
In the Research Center for Science Systems, several program officers in each field are responsible for preparing lists of potential reviewers, based on their discipline, published papers to date, awards received, and other factors. In putting together the list of candidates, the emphasis is on finding persons who are fully conversant in the field, fair, and sufficiently capable of conducting evaluations, while also enabling review to take into account a broad range of viewpoints. Moreover, from the standpoint of allowing for diversity of reviewers, program officers endeavor to make use of women researchers and those from public and private universities, independent administrative agencies, private enterprises and the like, ensuring that reviews are free from any bias in light of applicants' attributes.

In addition, with a view to cultivating the next generation of review committee members, from reviews conducted in fiscal 2019 the database is being expanded to include researchers who have received "Early-Career Scientists" and "Young Scientists (B)", and the assignment of first-time reviewers of a relatively young age (49 and under) is being pursued proactively for reviews in the "Scientific Research (B/C)" and "Early-Career Scientists categories".

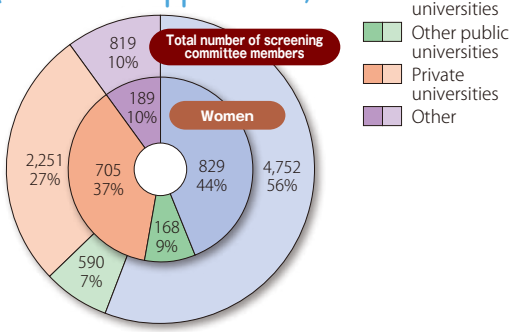
■Trend in entries in database of potential review committee members



■Status of database entries (FY2022)



■Number of review committee members (for FY2022 applications)



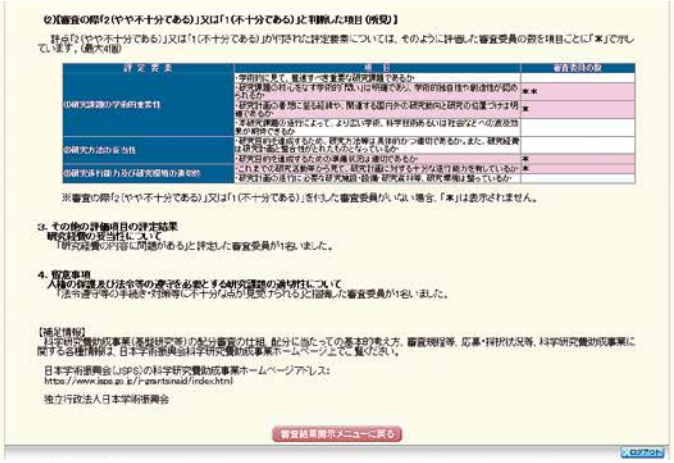
Disclosure of Review Results

Review results are disclosed to the applicants themselves to make the review process more transparent. Researchers whose proposals were not adopted can make use of the review results in devising their future research plans.

The opinions expressed in the review results are disclosed for each unsuccessful research project or area for which proposals were invited, in the case of the categories of “Specially Promoted Research”, “Transformative Research Areas (A/B)”, “Scientific Research (S)” , “Scientific Research (A)”, “Challenging Research (Pioneering)” , “Publication of Scientific Research Results (Publication of Research Results, Enhancement of International Dissemination of Information (A), Open-Access Publication Support, Scientific Literature, and Databases)” and “Fund for the Promotion of Joint International Research (International Leading Research)”.

Moreover, in the categories of “Specially Promoted Research”, “ Transformative Research Areas (A/B)”, “Scientific Research (S)”, “Scientific Research (A)” and “Challenging Research (Pioneering)”, “Fund for the Promotion of Joint International Research (International Leading Research) ” and “opinions expressed in the review results for adopted projects are also disclosed, and outlines of opinions expressed in the review results are made public in the Grants-in-Aid for Scientific Research Database (KAKEN).

■Example of Document Review Results Disclosed on Internet (Excerpt)



Initiatives for Ensuring Appropriate Use of KAKENHI Funds and Fair Research Activities

○To prevent any improper grant spending and research misconduct, related to KAKENHI, every effort has been made to increase awareness of the rules, including distribution of handbooks and holding of explanatory meetings. At the same time, each research institution, rather than the individual researcher, is asked to perform the management of KAKENHI grants and various procedures, under an effective management structure in accordance with the "Guidelines on the Management and Audit of Public Research Funds at Research Institution (Implementation Standards)".
Through this policy we are working to reduce the burden on researchers while helping to prevent inadvertent rule violations.

○We have introduced a mechanism in the electronic application system, which requires that before a formal application for grant delivery can be filed, the applicant must not only pledge to use the KAKENHI grant fairly and efficiently and not to commit any research misconduct, but must also complete a checklist of the minimum items necessary regarding the conduct of KAKENHI-funded research.

■Development of Structures and Mechanisms based on the Guidelines on the Management and Audit of Public Research Funds at Research Institutions and Guidelines for Responding to Misconduct in Research

Research institutions are required to comply with the "Guidelines on the Management and Audit of Public Research Funds at Research Institution" (Decision of the Minister of Education, Culture, Sports, Science and Technology, revised February 1, 2021) and the "Guidelines for Responding to Misconduct in Research" (Decision of the Minister of Education, Culture, Sports, Science and Technology, August 26, 2014). Such institutions are now expected to set up structures and mechanisms in line with these guidelines.

Outline of Initiatives
- ○Initiatives for preventing misconduct in advance
- ○Making clear the management responsibilities in the organization
- ○Supervision and support by the national government

■Measures Taken against Researchers Who Commit Misconduct

Researchers who commit misconduct in KAKENHI projects may be required to return the research funds, as well as being barred from receiving KAKENHI grants for a set time period. Moreover, the nature of such researchers' misconduct will be made public.
Also researchers who commit misconduct in a project supported by competitive research funds other than KAKENHI (including those administered by other government al organs) and are barred from receiving grants under that program for a set time period will also be barred from receiving KAKENHI grants for the same period.

Period of KAKENHI suspension "Improper Grant Spending and Fraudulent Grant Acquisition of KAKENHI"

Subject of Measures	Extent of the improper grant spending and Period of KAKENHI suspension
Researchers who committed improper grant spending of KAKENHI and researchers who conspired in such fraudulent act	Misappropriation of KAKENHI for personal gain ; 10 years
	Other than misappropriation of KAKENHI for personal gain { (1) Cases of major seriousness and maliciousness ; 5 years (2) Cases other than (1) and (3) ; 2 to 4 years (3) Cases of minor seriousness and mailiciousness ; 1 year
Researchers who acquired KAKENHI by deception or other fraudulent means and researchers who conspired in such acts	5 years
Researchers who were not directly involved in the improper grant spending of KAKENHI, but failed to exercise due care	The upper limit is 2 years and the lower limit is 1 year depending on the degree of the breach of duty by the researchers who have the duty of care as a good manager.

*A "Sharp Reprimand" shall be issued to researchers instead of KAKENHI suspension in the event that the influence on society and the maliciousness of the conduct are judged to be insignificant and the amount of money involved is small.

"Research Misconduct"

Subject of Measures			Negative Impacts on Science and on Public at Large Degree of Maliciousness and Period of KAKENHI Suspension
Subject of Research Misconduct	(a) Particularly malicious individual(s) who, for example, had intention of research miscondust from the very beginning of the research		10 years
	(b) Author(s) of paper(s), etc. related to the research in which research misconduct (s) have been identified (other than(a) above)	Responsible author(s) of the paper(s) in question (corresponding author, lead author of other authors bearing equivalent responsibilities)	(determined in accordance with the impact on the progress of the sclence in the field in question and the social impact, and on the level of maliciousness involved in the acts) ; 3 to 7 years
		Authors(s) of the paper(s) in question other than the responsible author(s) described above	2 to 3 years
	(c) Individual(s) involved who are not the authors of the research paper (s) for which research misconduct(s) are identified		2 to 3 years
Responsible authors(s) of paper(s), (corresponding author, lead author or other authors bearing equivalent responsibilities) for which research miscondunt(s) are identified, but not involved in the alleged research misconduct			(determined in accourdance with the impact on the progress of the science in the field in question and the social impact, and on the level of maliciousness involved in the acts) ; 1 to 3 years

Public Release of Research Results

The results of research supported with KAKENHI are made widely available to the public through the Grants-in-Aid for Scientific Research Database (KAKEN) in an effort to promote their application in society as well as to deepen the public's understanding of the KAKENHI program.

From fiscal 2019 we have been pursuing further enhancements of the information made available on KAKEN, as follows.

○To enable users to see what kind of research is being conducted using KAKENHI from the start of projects (after official grant decisions have been made), outline of the research has been added to information already published in the database such as project title and budget amount.

○In the Report on the Research Achievements published after project completion, we have newly added content explaining the academic and social significance of the research results in simple terms, in addition to the pre-existing specialist explanation of the results. This move both raises researchers' awareness of their accountability, and enables people to know what kinds of research results are generated through the KAKENHI system.

Research using KAKENHI funds should be carried out based on researchers'own self-awareness and responsibility. Therefore the publication on the implementation of the research or research achievements, etc. should not come from the government request and the views and responsibilities on the research achievements should be attributed to the researchers themselves.

■About the Grants-in-Aid for Scientific Research Database (KAKEN)

○This database posts information on projects adopted for KAKENHI (from 1965 to date) and summaries of the Report on the Research Results (from 1985 to date).
○Information in the database can be searched by research category, researcher name, discipline, and a variety of other items. The latest research results can therefore be accessed by wide-ranging keyword searches.
○ In December 2021, the search function was improved to make it easier to find information on international joint research. A search function for research projects that have resulted in international co-authored papers was added. A search function for partner nations etc. for international joint research projects was also added.
○Moreover, DOIs (digital object identifiers) of research papers in journals are published along with other information on research results, making it possible to access published papers directly from KAKEN.

KAKEN(National Institute of Informatics)
https://kaken.nii.ac.jp/en/index/

■GRANTS (Integrated Research Project Search)

GRANTS Integrated Research Project Search is a service that enables users to perform integrated searches for research projects conducted as part of national government programs for the promotion of research and development and the like, beyond the boundaries of any single program or implementing institution. The service came into operation in the 2021 fiscal year. Its search functions currently cover data held in both the Grants-in-Aid for Scientific Research Database (KAKEN) and the JST Project Database.

https://grants.jst.go.jp/
(Japanese version only)

■Acknowledgements and Financial Support for Publishing Research Results

Researchers are asked to acknowledge the KAKENHI program when reporting their research results in papers, conferences, and other fora.
The program also allows researchers to use direct expense to cover the cost for publicizing their research results widely to the public.

■Promotion of “Open Access (OA)” to the research papers supported by KAKENHI grants

Open science initiatives, including OA of research papers and data, which promote the sharing and publication of research results and encourage the acceleration of research and the creation of new knowledge, have gained momentum worldwide.
In line with government policies, JSPS promotes OA by requiring research papers funded by research funds granted by JSPS, including KAKENHI, to be opened to the public in principle.

The JSPS policy for implementing OA to research papers (Japanese version only)
https://www.jsps.go.jp/file/storage/general/data/Open_access.pdf

Information Dissemination and Public Relations Activities

Please view the following webpages and web contents for various information on the KAKENHI program

■KAKENHI Websites

1. MEXT provides information like the following, mainly on the research categories for which MEXT performs review and assessment, on its KAKENHI website
   ○Application Procedures, Research Proposal Document form
   ○Regulations on assessment in funding of scientific research
   ○List of reviewers
   ○Profiles of research in “Scientific Research on Innovative Areas (Research in a proposed research area)” and “Transformative Research Areas (A/B)”
   ○Overview of review for “Scientific Research on Innovative Areas (Research in a proposed research area)” , “Transformative Research Areas (A/B)” and validation results
   ○KAKENHI funding results
   ○Reports by the Subdivision on Grants-in-Aid for Research, and Research Grant Screening Section of the Academic Deliberation in the Subdivision on Science, Council for Science and Technology

https://www.mext.go.jp/a_menu/shinkou/hojyo/main5_a5.htm
(Japanese version only)

2. The JSPS provides information like the following, mainly concerned with the research categories for which the JSPS performs review and assessment, on its KAKENHI website
   ○Application Procedures, Research Proposal Document form
   ○Rules Concerning the Review and Assessment for Grants-in-Aid for Scientific Research
   ○JSPS rules on the use of funds (for research institutions and for researchers)
   ○KAKENHI Handbooks (for research institutions and for researchers)
   ○List of reviewers
   ○Summary of KAKENHI review
   ○Information on electronic application

https://www.jsps.go.jp/english/e-grants/

■Public relations contents

MEXT and JSPS publish the following contents, which can be downloaded from their websites.

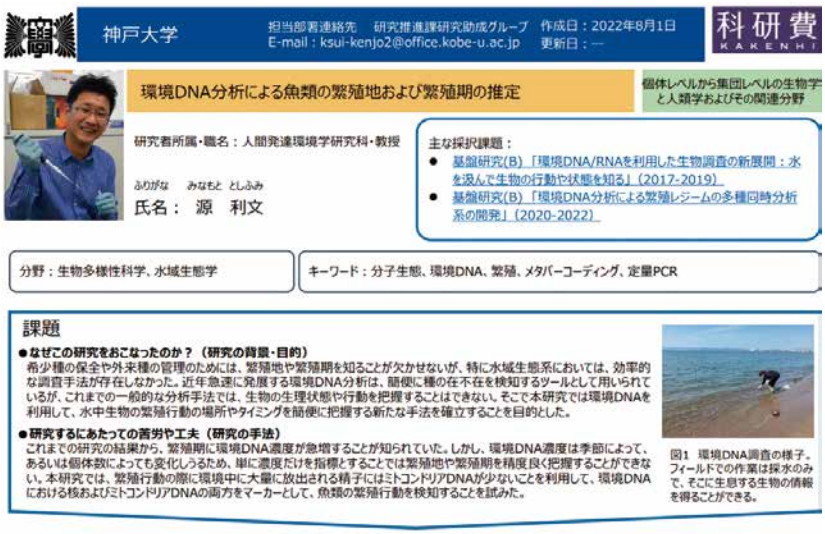
1. “KAKENHI Handbook” (for researchers)

This Handbook, prepared primarily for researchers, provides an easy-to-understand description of the basic contents of the KAKENHI program.

https://www.jsps.go.jp/english/e-grants/handbook

2. Research Results Topics

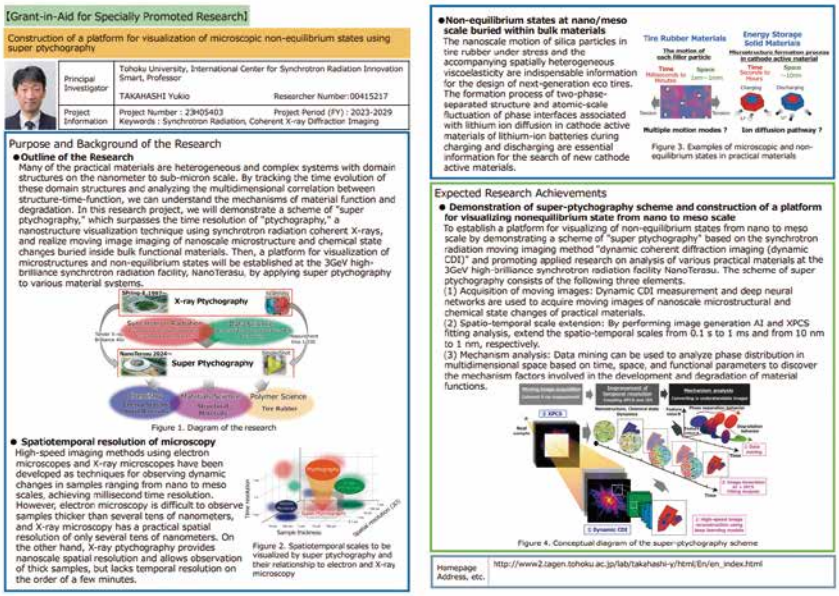
This page showcases outstanding research results generated through KAKENHI grants, with content created and provided by researchers and research institutions themselves. It is the result of a renewal in March 2020 designed to bring research activities and results, which were previously introduced in KAKENHI NEWS, to a wider audience in a more accessible format. We plan to increase the number of articles and enhance search functions on this page, allowing users to browse more research results and an even larger number of research institutions and researchers to share the outcomes of their research.


神戸大学
担当部署連絡先　研究推進課研究助成グループ　作成日：2022年8月1日
E-mail：ksui-kenjo2@office.kobe-u.ac.jp　更新日：—
科研費 KAKENHI
環境DNA分析による魚類の繁殖地および繁殖期の推定
個体レベルから集団レベルの生物学と人類学およびその関連分野
研究者所属・職名：人間発達環境学研究科・教授
ふりがな　みなもと としふみ
氏名：　源　利文
主な採択課題：
基盤研究(B)「環境DNA/RNAを利用した生物調査の新展開：水を汲んで生物の行動や状態を知る」(2017-2019)
基盤研究(B)「環境DNA分析による繁殖レジームの多種同時分析系の開発」(2020-2022)
分野：生物多様性科学、水域生態学
キーワード：分子生態、環境DNA、繁殖、メタバーコーディング、定量PCR
課題
●なぜこの研究をおこなったのか？（研究の背景・目的）
希少種の保全や外来種の管理のためには、繁殖地や繁殖期を知ることが欠かせないが、特に水域生態系においては、効率的な調査手法が存在しなかった。近年急速に発展する環境DNA分析は、簡便に種の在不在を検知するツールとして用いられているが、これまでの一般的な分析手法では、生物の生理状態や行動を把握することはできない。そこで本研究では環境DNAを利用して、水中生物の繁殖行動の場所やタイミングを簡便に把握する新たな手法を確立することを目的とした。
●研究するにあたっての苦労や工夫（研究の手法）
これまでの研究の結果から、繁殖期に環境DNA濃度が急増することが知られていた。しかし、環境DNA濃度は季節によって、あるいは個体数によっても変化しうるため、単に濃度だけを指標とすることでは繁殖地や繁殖期を精度良く把握することができない。本研究では、繁殖行動の際に環境中に大量に放出される精子にはミトコンドリアDNAが少ないことを利用して、環境DNAにおける核およびミトコンドリアDNAの両方をマーカーとして、魚類の繁殖行動を検知することを試みた。
図1　環境DNA調査の様子。フィールドでの作業は採水のみで、そこに生息する生物の情報を得ることができる。

https://www.jsps.go.jp/j-grantsinaid/37_topics/
(Japanese version only)

3. Abstracts of Large-scale Research Projects

Includes the titles of newly adopted projects under such categories as “Specially Promoted Research”, “Scientific Research (S)”, “International Leading Research”, and “Transformative Research Areas (A/B)”, along with the names of their principal investigators and summaries of their research content.


[Grant-in-Aid for Specially Promoted Research]

Construction of a platform for visualization of microscopic non-equilibrium states using super ptychography

Principal Investigator: Tohoku University, International Center for Synchrotron Radiation Innovation Smart, Professor
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Researcher Number: 00415217

Project Information: Project Number : 23H05403 Project Period (FY) : 2023-2029
Keywords : Synchrotron Radiation, Coherent X-ray Diffraction Imaging

Purpose and Background of the Research

●Outline of the Research

Many of the practical materials are heterogeneous and complex systems with domain structures on the nanometer to sub-micron scale. By tracking the time evolution of these domain structures and analyzing the multidimensional correlation between structure-time-function, we can understand the mechanisms of material function and degradation. In this research project, we will demonstrate a scheme of "super ptychography," which surpasses the time resolution of "ptychography," a nanostructure visualization technique using synchrotron radiation coherent X-rays, and realize moving image imaging of nanoscale microstructure and chemical state changes buried inside bulk functional materials. Then, a platform for visualization of microstructures and non-equilibrium states will be established at the 3GeV high-brilliance synchrotron radiation facility, NanoTerasu, by applying super ptychography to various material systems.

X-ray Ptychography
Super Ptychography
Polymer Science
Tire Rubber

Figure 1. Diagram of the research

● Spatiotemporal resolution of microscopy

High-speed imaging methods using electron microscopes and X-ray microscopes have been developed as techniques for observing dynamic changes in samples ranging from nano to meso scales, achieving millisecond time resolution. However, electron microscopy is difficult to observe samples thicker than several tens of nanometers, and X-ray microscopy has a practical spatial resolution of only several tens of nanometers. On the other hand, X-ray ptychography provides nanoscale spatial resolution and allows observation of thick samples, but lacks temporal resolution on the order of a few minutes.

Figure 2. Spatiotemporal scales to be visualized by super ptychography and their relationship to electron and X-ray microscopy

●Non-equilibrium states at nano/meso scale buried within bulk materials

The nanoscale motion of silica particles in tire rubber under stress and the accompanying spatially heterogeneous viscoelasticity are indispensable information for the design of next-generation eco tires. The formation process of two-phase-separated structure and atomic-scale fluctuation of phase interfaces associated with lithium ion diffusion in cathode active materials of lithium-ion batteries during charging and discharging are essential information for the search of new cathode active materials.

Tire Rubber Materials
Energy Storage Solid Materials
Multiple motion modes ?
Ion diffusion pathway ?

Figure 3. Examples of microscopic and non-equilibrium states in practical materials

Expected Research Achievements

● Demonstration of super-ptychography scheme and construction of a platform for visualizing nonequilibrium state from nano to meso scale

To establish a platform for visualizing of non-equilibrium states from nano to meso scale by demonstrating a scheme of "super ptychography" based on the synchrotron radiation moving imaging method "dynamic coherent diffraction imaging (dynamic CDI)" and promoting applied research on analysis of various practical materials at the 3GeV high-brilliance synchrotron radiation facility NanoTerasu. The scheme of super ptychography consists of the following three elements.

(1) Acquisiton of moving images: Dynamic CDI measurement and deep neural networks are used to acquire moving images of nanoscale microstructural and chemical state changes of practical materials.

(2) Spatio-temporal scale extension: By performing image generation AI and XPCS fitting analysis, extend the spatio-temporal scales from 0.1 s to 1 ms and from 10 nm to 1 nm, respectively.

(3) Mechanism analysis: Data mining can be used to analyze phase distribution in multidimensional space based on time, space, and functional parameters to discover the mechanism factors involved in the development and degradation of material functions.

Figure 4. Conceptual diagram of the super-ptychography scheme

Homepage Address, etc. http://www2.tagen.tohoku.ac.jp/lab/takahashi-y/html/En/en_index.html

https://www.jsps.go.jp/english/e-grants/lsrp/

科研費
KAKENHI

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URL: https://www.mext.go.jp/a_menu/shinkou/hojyo/main5_a5.htm

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*The Japan Society for the Promotion of Science welcomes feedback and suggestions regarding KAKENHI.
Please access the online portal shown below.
(URL for feedback and suggestions on KAKENHI:
https://www.jsps.go.jp/j-iken_youbou/index01.html)

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