

Creating New Knowledge -For Shaping and Transmitting World-leading Knowledge Assets





MINISTRY OF EDUCATION, CULTURE, SPORTS, SCIENCE AND TECHNOLOGY-JAPAN





KAKENHI

GRANTS-IN-AID FOR SCIENTIFIC RESEARCH

Creating New Knowledge —For Shaping and Transmitting World-leading Knowledge Assets



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*This booklet has been produced based on information as of July 2024, 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 2024 is approximately 237.7 billion yen. In fiscal 2023, KAKENHI supported approximately 81,000 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.

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

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

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 FY2024



Details on each research category are as follows.

	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 areas that will lead the way to radical transformation of and change in the existing framework and/or direction of research areas the use of research as well as upgrade and level-up of scientific 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, 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					

As of July 2024

KAKENH GRANTS-IN-AID FOR SCIENTIFIC RESEARCH

Research categories	Purposes and description of each research category						
Grants-in-Aid for Scientific Research							
	(S): Creative/pioneering research conducted by one or a relatively small number of researchers.	(S)	56				
Grant-in-Aid for	(A), (B), (C): Creative/pioneering research conducted by one researcher or jointly by multiple researchers.	(A)	20				
Scientific Research	(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	(C)					
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	N	F				
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.	N	F				
Grant-in-Aid for Research Activity Start-up	Research conducted by a single researcher who has been newly hired by a research institution, or who has returned from his/her childcare leave, etc. or from the nursing of his/her preschool child(ren). 1 to 2 years; 3 million yen or less (1.5 million yen or less if the research period is 1 year.)	N	F				
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	2 SG					
Grant-in-Aid for Special Purposes Research projects of pressing urgency and importance							
Grant-in-Aid for Publication of Sc	cientific 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.						
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.	SG					
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	Ν	F				
Fund for the Promotion of Joint I	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)						
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.)						
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.)						
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) Including those who are expected to acquire their Ph.D. and those deemed less than eight years after the acquisition of their Ph.D. by exempting the period of maternity leave or the period of raising preschooler(s) following their Ph.D. acquisition.

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 2025 funding year in the case of the most common research categories, "Scientific Research (A/B/C)" and "Early-Career Scientists".



Year-round schedule of KAKENHI process

Schedule for FY2025 Call for Proposals and Notice of Review Results for Main Research Categories

	2024							2025							
	Apr.	Мау	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
Specially Promoted Research	Call for	proposal			Re	eview				• Nc	otice o	f Revie	ew Res	sults	
Scientific Research (S)	Call for	proposal				Rev	view				•	Notice	of Rev	iew Re	sults
Transformative Research Areas (A/B)	Call for	proposal				Rev	view				•	Notice	of Rev	iew Re	sults
Transformative Research Areas (A) (Publicly Offered Research) Scientific Research (A/B/C), Early-Career Scientists				Call	for propos	al	R	leview	1		•	Notice	of Rev	view Re	sults
Encouragement of Scientists				Call	for propos	al	Revi	iew		•	Notic	e of Re	eview	Result	S
Challenging Research (Pioneering/Exploratory)				Call	for propos	al		Re	view		Notio	e of R	eview	Result	5
Publication of Scientific Research Results				Call	for propos	al		Re	view			•	Notice of	f Review F	Results

Schedule for FY2O24 Call for Proposals and Notice of Review Results for Main Research Categories

	2024	2024						2025						
	Apr. Ma	y Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
International Collaborative Research	Call for propos	l Rev	view		• No	tice of	Revie	w Res	ults					
Fostering Joint International Research Home-Returning Researcher Development Research			Ca	ll for prop	osal	F	leview	I		•	Notice	e of Rev	view Re	esults

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 participate in the review of KAKENHI annually as reviewers. A fair and highly transparent review is ensured by such measures as not allowing anyone to review research proposals submitted by interested parties or to divulge any information obtained during the review process, disclosing the results of review to the applicants, and publishing the list of the reviewers who conducted the review (*).

- Date of publication: The fiscal year in which the term of office of all the reviewers who reviewed the research proposals for the year of the call for proposals expires
- * Place of publication: Website of JSPS (List of Reviewers | Grants-in-Aid for Scientific Research | Japan Society for the Promotion of Science (jsps.go.jp))

In addition, since it is necessary to conduct a fair review at all times, the Research Center for Science Systems (P15) within JSPS conducts the selection of reviewers. It also verifies and analyzes whether or not there is a profit inducement and the status of the review based on the review regulations (rules). (It is not involved in the review itself, such as deciding on the adopted research projects.)

Details of the selection of the reviewers, as well as the policies and standards for the review, can be found on the websites of MEXT and JSPS. [References: Selection of Reviewers] P19][Standards of Review (website of KAKENHI)]

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.

> 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).



*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.



*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.

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 in addition to self-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 certain categories (*) in keeping with the scope and progress stage of research, and makes public all the assessment results on the KAKENHI website and elsewhere.

Please note that, depending on the progress of the research, reduction or termination of research expenses may be considered as a result of the evaluation.

- * The assessment is conducted, in principle, in the interim fiscal year and final fiscal year of the research period for Specially Promoted Research, Scientific Research on Innovative Areas, Transformative Research Areas (A), and Scientific Research (S), and in the third year of the grant period for Enhancement of International Dissemination of Information.
- * 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 newly 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.

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.



Killer T cells

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



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



Example of moth-eve 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.

© ® The Nobel Foundation. Photo: Lovisa Engblom.

KAKENHI financial support

"A study on the History of the Development and Social Functions of Swahili Poetry" (FY2019 - FY2021 (Grant-in-Aid for JSPS Fellows PD)), etc.

Funding by KAKENHI began in 2017

Further developments from research achievements

Project Assistant Professor ONODA is currently researching young female writers in Tanzania, with an interest in the awareness of various issues held by women in her generation. She would like to continue to portray the depth and complexity of writers who write with deep involvement in the ordinary people and plans to publish a booklet in FY2024 that will explain to the general public the history that Swahili poetry has gone through and its characteristics. She intends to continue her activities to promote the world of the Swahili language to the general public through lectures and translations. By shining a light on a world that has not received much attention, and by carefully depicting its charms, she hopes to continue presenting the diversity of the world.



In May 2023, Project Assistant Professor ONODA was awarded the 35th Japan Association for African Studies Research Commendation Award (2023) for "Kezilahabi, the Writer Beyond the Opaque: Provocateur of the Swahili Literary World." In March 2024, she was awarded the 20th JSPS Prize (see left).

ONODA Fuko, Project Assistant Professor, Osaka University

While African literature in English has gained worldwide recognition in recent years, and an increasing number of works have been translated into Japanese and introduced to Japan, literature written in local African languages remains extremely unknown. This study aims to portray writers in Swahili language as creative individuals of their time who face inner conflicts, and to study and introduce Swahili language art to a broader degree.

on the history of development and

social functions of Swahili poetry

A study on writers in Swahili language and

Research Outcome

Project Assistant Professor ONODA conducted research on the E. Kezilahabi (1944-2020), a Tanzanian and one of the leading writers of Swahili literature, and published Kezilahabi, the Writer Beyond the Opaque: Provocateur of the Swahili Literary World in 2022 from Osaka University Press. This book, which confronts the complexity and opacity of the writer, includes, in addition to the research results. synopses of all novels and plays and excerpts of poems. In addition, it describes the history of the development of the Swahili language art in general, including oral literature, poetry, and popular music, along with historical background and conveys a wide range of information from basic information to the depth of the field. In 2023, she introduced short stories written by Kezilahabi translated into Japanese to Japan for the first time in the translation coterie magazine Translated Literature Travelogue V.





Study of past solar activity variations based on analysis of cosmic-ray-induced nuclide concentrations.

MIYAHARA Hiroko, Professor, Musashino Art University

Solar activity exhibits long-term fluctuations spanning hundreds to thousands of years. In order to resolve the underlying mechanism, it is necessary to obtain the history of the basic cycle of about 11 years with a precise one-year resolution, but conventional methods using annual tree rings and ice cores alone have limitations.

Research Outcome

Professor MIYAHARA pioneered a method to reconstruct the history of past solar activity using the cosmic-ray-induced nuclide beryllium-10, which is contained in carbonate sedimentary rocks that form layers year by year and are not easily compressed after formation.

Professor MIYAHARA's method has made it possible to reconstruct 11-year solar cycles and solar flares going back hundreds of thousands of years, well beyond the ages that can be traced by conventional methods using carbon-14 in annual tree rings and beryllium-10 in ice cores (see the diagram on the right).



The conventional method using annual tree rings and/or ice cores, and the newly pioneered method using carbonate sedimentary rocks

KAKENHI financial support

"Development of Methods for Reconstructing Cosmic Ray Intensity Variations Using Tufa Sediments"

(Grant-in-Aid for Challenging Exploratory Research, FY 2015-2017), etc.

Funding by KAKENHI began in 2009

Further developments from research achievements

Events of extremely reduced solar activity over several decades have an impact on the Earth's climate, making the prediction of their occurrence an important issue. Analysis of carbon-14 has revealed a tendency for the 11-year cycle to be extended just prior to decreases in solar activity, suggesting that a decrease in the meridional circulation rate in the convective zone may have contributed to this phenomenon. This newly developed method is expected to provide more detailed information on many more cases in the future, which will deepen our understanding of the mechanisms of solar activity fluctuations.

The method also allows the detection of large solar flares that occurred in the past and is therefore expected to contribute to the field of space weather.



Professor MIYAHARA was awarded the 43rd Saruhashi Prize (2023) for her "Research on the Mechanisms of Fluctuations in Solar Activity and Their Impact on Climate."



A study on language function in birds

SUZUKI Toshitaka, Associate Professor, The University of Tokyo

How did language evolve? This is a challenging question that spans multiple academic disciplines, including linguistics, evolutionary biology, cognitive science, and animal behavioral science.

Research Outcome

By conducting behavioral and cognitive experiments on wild birds, he was the first in the world to demonstrate that birds can indicate external objects using specific calls and combine different calls into sequences to convey more complex messages (syntax). These abilities are advantageous for survival and reproduction.

Previously, animal communication was viewed merely as expressions of emotions. However, a series of field studies has revealed that avian communication is based on cognitive abilities similar to those used for human language.



Japanese tits respond to snake-specific alarm calls as if they search for snakes



Japanese tits can combine different calls into sequences to create a compositional message

KAKENHI financial support

"Uncovering the Adaptation and Evolution of Linguistic Capabilities using Birds as a Model" (FY2020- (Scientific Research B)) etc.

Funding by KAKENHI began in 2016

Further developments from research achievements

- These results have led to the creation of a new academic discipline (Animal Linguistics) by combining knowledge from linguistics, cognitive science, and animal behavioral science to explore the general principles of language evolution.
- It focuses on the cognitive capabilities that constitute language, conducts interspecies comparisons, and is expected to bring new insights in the universal principles of evolution.
- •Associate Professor SUZUKI is promoting research activities towards the establishment of the field of animal linguistics through such means as writing review papers and giving keynote speeches at international conferences.



Associate Professor SUZUKI received the Young Scientists' Award of the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (FY2021) for his "Animal Linguistic Study of Vocal Communication in Birds."

Other publications of research results can also be found in KAKEN (P26), Research Result Topics (P29) and Abstracts of Large-scale Research Projects (P30).

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

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

Abstracts of Large-scale Research Projects https://www.jsps.go.jp/english/e-grants/lsrp/



Furthermore, we implement an initiative called "HIRAMEKI☆TOKIMEKI SCIENCE" to share the fun and fascination of science with 5th and 6th graders in elementary school, middle and high school students.

Through this program, they can visit research labs at universities and other institutions across Japan and learn firsthand about cutting-edge research embodied in projects funded by KAKENHI. Since its launch in FY 2005, the program has attracted approx. 85,000 students.

We also welcome participation of teachers, parents and other family members of participating students.

> HIRAMEKI☆TOKIMEKI SCIENCE https://www.jsps.go.jp/j-hirameki/ (Japanese version only)

KAKEN

GRANTS-IN-AID FOR SCIENTIFIC RESEARCH

Scenes from HIRAMEKI☆TOKIMEKI SCIENCE



Build your optical transceiver

- Introduction to fiber-optics and free-space optical communication TAKANO Katsumi (Professor, Graduate School of Science and Engineering)



eptember 16, 2023 Hiroshima University

Science in archaeology - Learn isotope analysis and uncover history and culture

ISHIMARU Eriko (Researcher, Hiroshima University Museum)



July 22, 2023 The University of Toyama Let's learn how medicines work!

- The "secret" behind how familiar plant ingredients become medicines

KATO Atsushi (Professor, Laboratory of Biopharmaceutics, Faculty of Pharmaceutical Sciences)



August 20, 2023 Kyushu Institute of Technology Ahead of next-generation voice interface lip-reading technology

SAITOH Takeshi (Professor, Faculty of Computer Science and Systems Engineering)

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 https://www.jsps.go.jp/english/e-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 2023 was 90,089, down 2,381 from the previous year due to the extension of continuing research projects following the COVID-19 pandemic.

The adoption rate for fiscal 2023 stood at 27.5%, showing a decrease year-on-year, and bringing the total number of adopted projects to 81,158, 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 2011 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 budget for FY2023 increased by 49.8 billion yen from the previous fiscal year since the supplementary budget for FY2023 took financial measures to establish the Multi-year Fund for the "Scientific Research (B)". The initial budget for fiscal 2024 is 237.7 billion yen, which is the same amount as the



*1 FY2018 budget includes supplementary budget of 5 billion yen

*2 FY2021 budget includes supplementary budget of 11 billion yen

*3 FY2022 budget includes supplementary budget of 15.6 billion yen

*4 FY2023 budget includes supplementary budget of 65.4 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".



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 JSPS.

This database lists KAKENHI Principal Investigators and other potential reviewers, and continues to grow each year. (Number of candidates as of fiscal 2023: approx.153,000.) 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".



19 Creating New Knowledge – For Shaping and Transmitting World-leading Knowledge Assets

Disclosure of Review Results

Review results are disclosed to the applicants themselves to make the review process more transparent. Applicants 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 Online (Excerpt)



Aiming for easy-to-use research grants

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 pages 3 to 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

Carryover" system for the Grants-in-Aid for Research

In the event that a research project is not, as opposed to its original schedule, expected to be completed by the end of the fiscal year due to factors that could not be foreseen at the beginning, the research period may be extended and the grant may be carried over to the following fiscal year through the prescribed procedures.

In addition, if the requirements of the carryover system are not met, an application for use in the next fiscal year may be made through the "Adjustment Fund" system.

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.



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.

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.

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



OWe 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

Olnitiatives for preventing misconduct in advance

OMaking clear the management responsibilities in the organization

OSupervision 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 ministries) 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
Pasaarshars who committed improper	Misappropriation of KAKENHI for personal gain; 10 years
Researchers who committed improper grant spending of KAKENHI and researchers who conspired in such fraudulent act	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 spend- ing 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.

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

Research Misconduct"

Public Release of Research Results

The achievements 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.
- OIn 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)

- OThis 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).
- Olnformation 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.
- OMoreover, 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.

> GRANTS (Integrated Research Project Search) https://grants.jst.go.jp/ (Japanese version only)

Acknowledgements and Financial Support for Publishing Research Achievements

Researchers are asked to acknowledge the KAKENHI program when reporting their research achievements in papers, conferences, and other forms.

The program also allows researchers to use direct expense to cover the cost for publicizing their research results widely to the public.

Open Science Initiatives in KAKENHI

Open science initiatives, including open access (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.

JSPS also promotes proper management and use of research data.

The JSPS Policy for Implementing Open Access to Research Papers https://www.jsps.go.jp/file/storage/open_science/policy_open_access.pdf



Basic Policy for the Handling of Research Data in JSPS Programs https://www.jsps.go.jp/file/storage/open_science/basic_policy_research_data.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

OApplication Procedures, Research Proposal Document form

- ORegulations on assessment in funding of scientific research
- OList 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

OKAKENHI funding results

OReports 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

> Grants-in-Aid for Scientific Research (KAKENHI) (MEXT) https://www.mext.go.jp/a_menu/shinkou/hojyo/main5_a5.htm (Japanese version only)

- 2. JSPS provides information like the following, mainly concerned with the research categories for which JSPS performs review and assessment, on its KAKENHI website OApplication Procedures, Research Proposal Document form
 - ORules Concerning the Review and Assessment for Grants-in-Aid for Scientific Research
 - OJSPS rules on the use of funds (for research institutions and for researchers)
 - OKAKENHI Handbooks (for research institutions and for researchers)
 - OList of reviewers
 - OSummary of KAKENHI review
 - OInformation on electronic application

OFAQ

Grants-in-Aid for Scientific Research (KAKENHI) (JSPS) 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.



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

2. Research Results Topics

Renewed from the previous KAKENHI NEWS in March 2020, this page presents outstanding research results generated through KAKENHI grants in an easy-to-understand way, with content created and provided by researchers and research institutions themselves. We plan to increase the number of articles, allowing even more researchers and research institutions to share the results of their research with greater outreach.



Research Results Topics 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.



Abstracts of Large-scale Research Projects https://www.jsps.go.jp/english/e-grants/lsrp/





Contact information for KAKENHI:

Scientific Research Promotion Division, Research Promotion Bureau, Ministry of Education, Culture, Sports, Science & Technology

3-2-2 Kasumigaseki, Chiyoda-ku, Tokyo 100-8959, Japan Tel: +81-3-5253-4111 (Reception) (ex. 4087, 4094) (Scientific Research Funding, etc.) URL: https://www.mext.go.jp/a_menu/shinkou/hojyo/main5_a5.htm



Research Aid Planning Division, Research Program Department, Japan Society for the Promotion of Science

5-3-1 Kojimachi, Chiyoda-ku, Tokyo 102-0083, Japan Tel: +81-3-3263-0964 URL: https://www.jsps.go.jp/english/e-grants/index.html

*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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