

Self-Evaluation Report (December 2020)

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NB: The Japanese fiscal year (and academic year)
starts in April and ends in March.

1. The Research Institute for Mathematical Sciences – its past and present

The Research Institute for Mathematical Sciences (RIMS) was established in 1963 as a cooperative research institute affiliated to Kyoto University for the purpose of accelerating research in mathematics and the mathematical sciences. Its aim remains to promote fundamental research in these areas. In order to achieve this, RIMS functions in three ways, namely as a center for cooperative research involving a wide range of mathematicians and mathematical scientists both from Japan and the wider world, as a research base for its faculty members, and as a graduate school.

Facilitating its role as a cooperative research center, for the periods of 2010-2015 and 2016-2021 RIMS was certified as a Joint Usage / Research Center by the Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT). Moreover, RIMS was certified as an International Joint Usage / Research Center in 2018.

RIMS is a research institute that currently employs 36 faculty members (12 professors, 10 associate professors, 3 lecturers and 11 assistant professors) together with 16 post-doctoral fellows. At the same time, it is a national resource offering facilities for use for all Japan-based and overseas mathematicians. RIMS hosts about 80 conferences and workshops every year (Section 5-1 below) and publishes their proceedings (RIMS Kôkyûroku, ISSN: 1880-2818; RIMS Kôkyûroku Bessatsu, ISSN: 1881-6193). Most of the conferences held at RIMS are of an international character. Since its certification as an International Joint Usage / Research Center, RIMS has pursued further internationalization of research by improving the “RIMS Research Project” program, creating a workshops scheme that is open exclusively to researchers based outside of Japan, and opening all of the calls for proposals internationally.

In addition to these research activities, RIMS has been accepting graduate students in the mathematical sciences at the Division of Mathematical Sciences since 1975 (Section 12-1). The activities of RIMS members are highly appreciated in the world, and this fact is endorsed by the awarding of two Fields medals, a Gauss medal, two

Wolf prizes and a Chern medal to current and emeritus members of RIMS. However, Japan's domestic situation and the environment of RIMS in Kyoto University continue to be severe, with huge deficits in national governmental finances and strict limits on the autonomy of the institute. In order to maintain the present international status of RIMS, great improvements in its facilities and systems, as well as a substantial increase in its budget, are urgently needed.

2. Mid-Term Target and Planning (Current Situation around RIMS)

Since the incorporation of national universities in Japan in 2004, the status of each research institute affiliated to a university has been guaranteed only through its citation in the mid-term target of the university. Following its incorporation, Kyoto University established a mid-term target and a mid-term plan as a university, based on which Kyoto University would undergo a corporation evaluation. In line with this, RIMS also established a mid-term plan as a university division.

In the assessment of Kyoto University by the National University Corporation Evaluation Committee based on its performance in the first period of the mid-term plan (fiscal 2004–2009), RIMS was evaluated as having exceeded expectations in its level of research activities and research progress. Among the 11 achievements that RIMS claimed, four cases were admitted as great improvements and seven cases as maintaining high standards.

For the university's performance of the second period of the mid-term plan (fiscal 2010–2015), the National University Corporation Evaluation Committee evaluated Kyoto University, and RIMS was recognized again as having exceeded expectations in its levels of both research activities and research progress. The institute was also recognized as having maintained high standards in terms of research quality. In addition, two cases were evaluated as having achieved noteworthy quality improvement, as follows:

- The establishment of Inter-universal Teichmüller theory within arithmetic geometry, and the consequent papers on the “abc

conjecture” have been covered by the major media both at home and abroad.

- Regarding research in algebraic analysis, innovative performance was demonstrated: the codimension-three conjecture and the semi-simplicity conjecture, both of which were important in the discipline of algebraic analysis, were solved positively. The solution of the Kashiwara conjecture led the relevant researcher to be selected as a plenary speaker at the quadrennial International Congress of Mathematics (in 2014).

While the incorporation of national universities has led each of them to implement projects based on their own mid-term targets and mid-term plans, institutes affiliated to such universities and designated to host joint comprehensive research, are expected to promote nationwide joint usage plans transcending the boundaries of the respective universities. At the point of the incorporation of Kyoto University, there was concern that RIMS, which was merely one of the divisions of Kyoto University, could not fulfil the nationwide expectation sufficiently, i.e., it was not clear whether the administration of Kyoto University was compatible with the aims of Joint Usage/Research Centers.

Fortunately, a framework for Joint Usage/Research Centers was inaugurated a few years later by the Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT). RIMS was certified as the only Joint Usage/Research Center in the fields of mathematics and the mathematical sciences in April 2010, when the institute entered the second period of the mid-term plan. MEXT began to allocate budget related to Joint Usage/Research Projects directly to RIMS, improving the situation around the institute. Furthermore, MEXT established a framework for International Joint Usage/Research Centers in 2018, and RIMS was the only institution that was certified from mathematics and the mathematical sciences. The certification accelerated RIMS’s international collaborative research efforts. On the other hand, the successful operation of RIMS as an International Joint Usage/Research Center is closely linked to the quality of research and educational activities conducted by the institute’s members as part of their regular operations. RIMS would not become an active International Joint Usage/Research Center without maintaining the high quality of such activities. It is also

necessary for RIMS to continually bear in mind the promotion of International Joint Usage/Research Projects, even when operating as a division of Kyoto University, such as when handling issues of improving the library, buildings, and computer facilities. In addition, the Institute of Mathematics for Industry of Kyushu University, which focuses on industrial mathematics, Meiji Institute for Advanced Study of Mathematical Sciences of Meiji University, which focuses on mathematical modeling and applications, and the Advanced Mathematical Institute of Osaka City University, which focuses on collaboration of mathematics and theoretical physics, have all now been certified as Joint Usage/Research Centers (in 2013, 2014 and 2019, respectively). As a result, Japan has four (International) Joint Usage/Research Centers in mathematics and the mathematical sciences, amongst which RIMS is the only one focused on comprehensive mathematical study.

In the assessment of RIMS as a Joint Usage/Research Center by MEXT in 2015, it was commented that RIMS is expected to hire female researchers. In response, RIMS attempted to conduct an open recruitment exclusively for a female researcher, but the headquarters of Kyoto University initially did not admit a gender-limited open recruitment. Then RIMS, taking a long time, persuaded the headquarters to approve the open recruitment. Consequently, RIMS was allowed to conduct this recruitment, and has been hiring a female assistant professor since April 2018. Furthermore, RIMS has been hiring another female assistant professor since September 2019 using a special grant from the university that allows RIMS to hire outstanding young researchers before they obtain a Ph.D.

The development of RIMS as an International Joint Usage/Research Center owes a lot to the experiences and efforts of the administrative staff, including the Cooperative Research Service Section and the International Research Support Office. On occasions of the reformation of the administrative office management systems in Kyoto University, an important issue has been how to encourage administrative staff to adopt a wide perspective and how to support the nationwide promotion of International Joint Usage/Research Projects.

3. Organization and Budget

3-1. Organization

(1) Committees

The policy decisions of RIMS are made by the following committees, the latter two of which include members from outside Kyoto University in order to gain input from researchers in the mathematical sciences more broadly across Japan and the World.

COUNCIL

The Council consists of the Director, the Professors of RIMS, and some other Professors of Kyoto University. The board is chaired by the Director, who is elected every two years by the board from among the Professors of Kyoto University.

RIMS	12	Kyoto Univ.	5	Domestic	0
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INTERNATIONAL ADVISORY BOARD

The International Advisory Board consists of international academic experts who have broad eyes and high insights in mathematics and the mathematical sciences. They are delegated by the Director and provide advice concerning the organization of RIMS.

RIMS	0	Domestic	1	International	3
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SECTION COMMITTEE

The Section Committee consists of the Director, the Professors and some Associate Professors of RIMS. The board is chaired by the section head. The Section Committee reports to the Division to which RIMS belongs on the substance of faculty appointment.

RIMS	15	Kyoto Univ.	0	Domestic	0
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ADVISORY BOARD

The Advisory Board consists of the Director, the Professors of RIMS, and researchers from Kyoto University and other institutions in Japan chosen on the basis of recommendations, such as those from the Science Council of Japan. The number of members from Kyoto University (including RIMS) should not exceed half the number of board members. The Chair is elected by the board. The Board

discusses and makes proposals on basic policies for the cooperative research activities of RIMS.

RIMS	12	Kyoto Univ.	4		Domestic	19
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TECHNICAL COMMITTEE

The Technical Committee consists of the Professors, the Associate Professors and the Lecturers of RIMS, and researchers both from Kyoto University and other institution in Japan chosen on the basis of recommendations, such as those from the Science Council of Japan. The number of members from Kyoto University (including RIMS) should not exceed half the number of committee members. The Chair of the Advisory Board presides at the technical committee meetings. The committee deliberates specific plans for cooperative research activities proposed by researchers in the mathematical sciences from Japan and beyond, and discusses the assignment of the budget once a year.

RIMS	25	Kyoto Univ.	6		Domestic	35
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(2) Faculty members

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3-2. Scale of RIMS

(1) Quota of faculty members

Table 3.2.1: Quota of faculty members

Professors	Associate professors	Lecturers	Assistant professors	Total
12	10	3	11 *(2)	36 *(2)

*(2) indicates the number of Program-Specific Assistant Professors included in the number of Assistant Professors.

(2) Budget (Unit: thousand yen, 1US\$=104yen, 1AU\$=77yen)

Table 3.2.2: Budget

November 30, 2020					
	Labor costs	Instruction and Research costs*	Grant-in-aid (JSPS)	Others	Total
2017	399,307	271,887	115,602	12,716	799,512
US\$	3,839.49	2,614.30	1,111.56	122.27	7,687.62
AU\$	5,185.81	3,531.00	1,501.32	165.14	10,383.27
%	49.9	34.0	14.5	1.6	100
2018	412,545	304,049	108,934	41,935	867,463
US\$	3,966.78	2,923.55	1,047.44	403.22	8,340.99
AU\$	5,357.72	3,948.69	1,414.73	544.61	11,265.75
%	47.6	35.0	12.6	4.8	100
2019	407,115	296,187	110,433	26,498	840,233
US\$	3,914.57	2,847.95	1,061.86	254.79	8,079.16
AU\$	5,287.22	3,846.58	1,434.19	344.13	10,912.12
%	48.5	35.2	13.1	3.2	100

3-3. Issues regarding the budget of RIMS

Since the incorporation of national universities in 2004, the budget allocation rule for the operating expenses of a national university has been an allocation system of government subsidies called “management expenses grants,” which do not specify the detailed items of expenses. The management expenses grants allocated to RIMS mainly comprise the expenses for operating the International Joint Usage/Research Center and the expenses for maintaining an appropriate environment for education and research. However, because of financial difficulties due to the huge deficit of the Japanese government, these government subsidies have been reduced by 1% a year for more than 15 years since the incorporation of national universities. This budget reduction brings about several difficulties, as described below.

The increasing operational cost of the headquarters of Kyoto University is another reason for the reduction of available budget for RIMS. Moreover, the headquarters of Kyoto University has reduced the number of RIMS staff members to make savings in the university budget; the available number of RIMS staff positions in 2013 and 2020 appear in the following table.

Year	Prof.	Assoc. Prof.	Lecturers	Assis. Prof.*
2013	13	11	3	13
2020	12	10	3	9

*Excluding Program-Specific Assis. Prof.

These circumstances produce some serious problems for RIMS.

(1) Shortage of budget for research activities

In RIMS, the institutional research budget is, in principle, not assigned nor distributed to institute members, each of whom is obliged to negotiate with the deputy director every time they use the budget for their own research. As a result, each researcher is expected to obtain such external funds as a Japan Society for the Promotion of Sciences (JSPS) Grant-in-Aid for Scientific Research to cover individual research expenditures.

On the other hand, although RIMS receives a special subsidy for the International Joint Usage/Research Center, the amount is not enough to cover its operational expense. If, for example, 200,000 JPY per year were distributed to each faculty member, the activity of International Joint Usage/Research Center could not be maintained on its present scale. If it were 500,000 JPY per year, RIMS would face a financial crisis. In the past 5 years, MEXT started to increase the competitive allocation of budget. RIMS responded by applying for competitive project budgets and achieved the certification of International Joint Usage/Research Center in 2018, and won another competitive project budget for Inter-universal Teichmüller theory in 2019. However, we needed to make new appointments in order to carry out these new projects, and the financial situation of RIMS remains quite severe. We further highlight that it is very difficult for mathematicians, especially pure mathematicians to obtain support or donations from private companies, hence it is essential that serious efforts are made to obtain project budgets from the government, and from the university.

(2) Further budget to handle the shortage of space

Although RIMS hosts many visiting professors, project professors, long-term researchers, and visiting international researchers, it is becoming difficult to allocate office space (in laboratories) to them due to the shortage of space at the institute. Besides the main building of RIMS, the headquarters of Kyoto University has assigned to RIMS a part of Research Building No.4, a part of Research Building No.2, and the 2nd floor of Research Building No.15. However, the space of RIMS is still around 70.75% of the university standard, and such shortage of space is a serious problem for RIMS. Accordingly, RIMS now rents a part of the North Comprehensive Education and Research Building from Kyoto University, and uses it as space for graduate students, international researchers, etc. However, this is a lease contract for five years, after which RIMS will face a serious situation. Furthermore, the available space for storage of books in the library is also rapidly decreasing, and therefore the RIMS library will confront a serious space problem in the near future. Since the library is an important feature needed for RIMS to serve as an International Joint Usage/Research Center, a future plan should be made soon for the library of RIMS.

If it is difficult to ensure the necessary space at Kyoto University, the rental of a private office should be discussed to handle the space problem. However, the rental expense would be difficult to cover with the present RIMS budget. In this regard, RIMS should make continuous efforts, such as presenting budget requests for constructing a new building, and using in-house project laboratories established in a common space of Kyoto University. Also, to rent a private office, RIMS should submit an application for outside funding, such as a JSPS Grant-in-Aid for Scientific Research, and ensure the necessary expenses are handled in a well-planned manner.

(3) Employment of and budget for young researchers

Together with the Department of Mathematics (within the Graduate School of Science), RIMS was selected to implement the “21st Century Center of Excellence Program” from 2003 through 2007, and subsequently the “Global Center of Excellence Program (GCOE)” from 2008 through 2012. These programs brought funds to RIMS with which the institute was able to employ many young researchers as post-doctoral fellows.

Since 2014, RIMS, together with Department of Mathematics, has taken charge of the Mathematics Unit of the Kyoto University Top Global University Project (KTGU), which supports graduate students by providing them with the budget for overseas travel, and study in top-class international universities. We can also hire Ph.D. students as special teaching assistants (STA). However, we cannot employ post-doctoral researchers through this grant since it is a grant for educating Ph.D. students, and not for research above Ph.D. level. The institute needs to urgently address the problem of obtaining funding from outside.

Despite the shortage of budget mentioned above, RIMS continues to employ postdocs using its own funds. 3 postdocs are hired as “RIMS Research Fellows” every year and work on their specific field of research (details in Section 12-2.2). A Program-Specific Assistant Professor and 2 postdocs were newly employed by the Inter-universal Teichmüller theory project in 2019. Furthermore, RIMS offers the posts of “RIMS Project Fellows”

associated with the RIMS Research Projects (details in Section 5-1.(2) and Section 12-2.2).

(4) Clerical system reform and expenses for employing part-time-service personnel

As part of Kyoto University's measures for the clerical system reform launched in fiscal 2013 as an integrated reform of its operational, organizational, and personnel systems, Kyoto University established six common clerical work divisions in order to handle personnel, accounting, facility maintenance, and other affairs common to the university's divisions. By centralizing the operational and personnel functions, the university strives to improve each division's specialty and reinforce its structure. Consequently, operations and staff regarding personnel, accounting, and facility maintenance for RIMS were integrated into the clerical work division of the North Campus.

It should be noted that RIMS has been dependent on part-time employees for a significant amount of clerical work for a long time. Such part-time employees will be more indispensable than ever after the clerical system reform, in order to maintain its present high level in providing services as an International Joint Usage/Research Center to outside organizations, accommodating visiting international researchers, and ensuring a research environment for its researchers. It is thus an important matter to secure the necessary budget. To reinforce the functions of the clerical work organizations, which support research and education, and to improve the quality of the organizations' personnel, RIMS needs to consider and redesign how to respond to further reduction of personnel expenses and other budgets (reduction of personnel quotas) and how to realize the sophistication and diversification of its operations. These are serious issues that must be addressed in the near future.

(5) Rise in prices of e-journals and e-books

Good access to e-journals and e-books is clearly indispensable in promoting research. However, the prices of e-journals and e-books are rising at an incredible rate today. As a result, the percentage that

the library expenses of RIMS take up from its gross budget continues to remain high.

Of particular note are e-journal expenses, which should be covered sufficiently as fundamental expenses by the entire university. Although the Kyoto University Library Network has launched a special committee for considering the expansion of its collection of e-journals and is engaged in discussion, the future prospects remain unclear. To reduce library expenses, RIMS reviews the titles of the publications purchased by the institute on an almost annual basis, and reduces the number of the titles to be purchased. This is not a problem that could be solved by a university alone, let alone by a research institute. It is strongly desired that the problem be discussed at the national level, and that the necessary expenses be included in the budget.

(6) Employment of Research Assistants

RIMS employs many Ph.D. students as Research Assistants to support their research activities. The shortage of budget for their employment is covered by the grant of the Chern Medal Award given to Dr. Masaki Kashiwara, professor emeritus of RIMS. However, this grant will be exhausted in 2021, and it will be hard to keep the same scale of such employment in the future.

4. Buildings

4-1. Present state

As of October 2020, RIMS is located in 5 separate places on the campus of Kyoto University. Details are as follows:

Table 4.1.1: Separate locations of RIMS

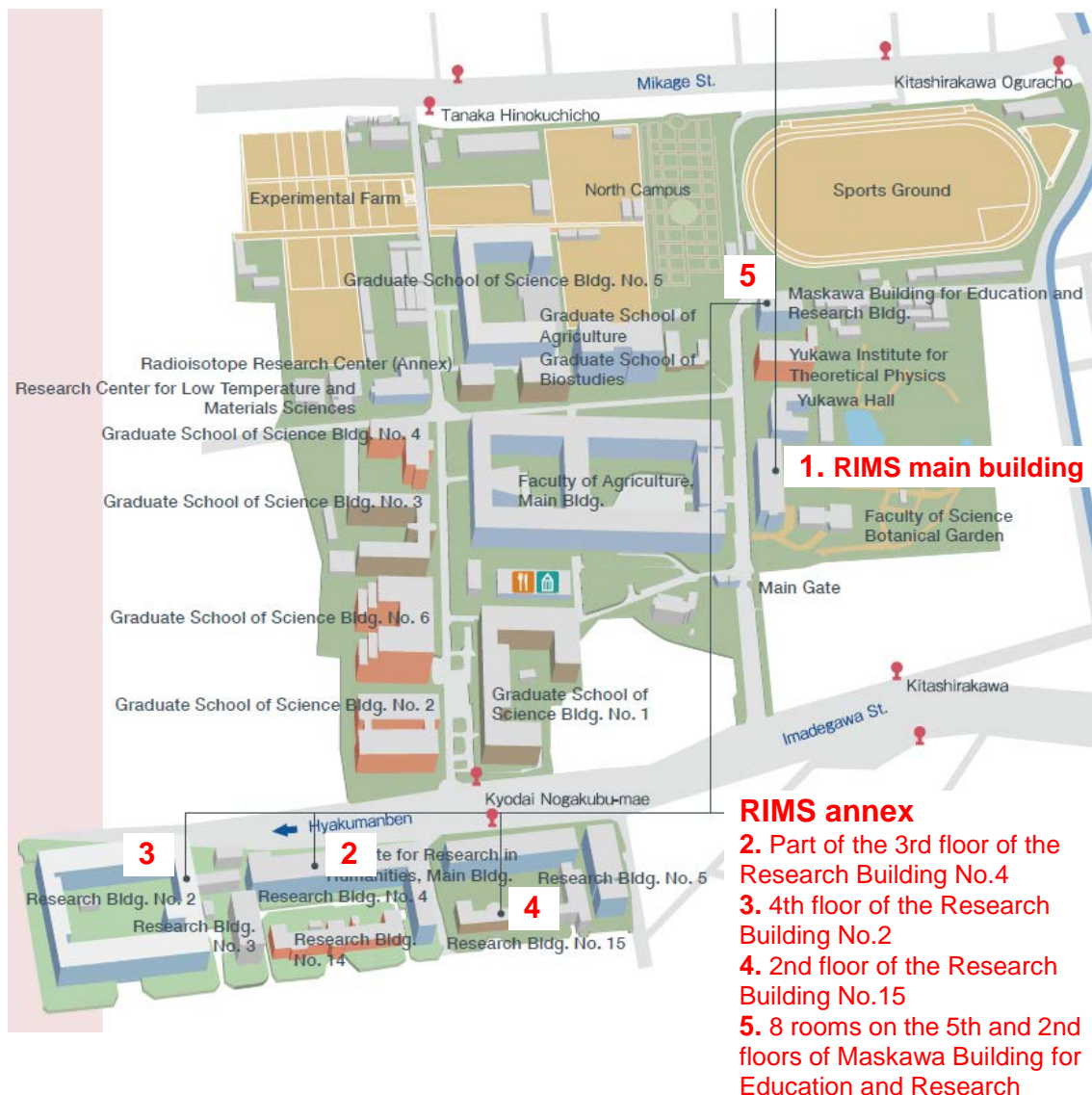
	Building	Use application
1.	The main building ^{*1, *2}	31 rooms for faculty members, 5 rooms for visiting researchers, 4 rooms for masters students, 11 seminar rooms.
2.	A part of the 3 rd floor of Research Building No.4 ^{*2}	4 rooms for faculty members, 2 rooms for visiting / regular researchers, 1 seminar room.
3.	The 4 th floor of Research Building No.2 ^{*3}	4 rooms for faculty members, 2 rooms for visiting / regular researchers, 1 seminar room.
4.	The 2 nd floor of Research Building No.15 ^{*3}	2 rooms for faculty members, 4 rooms for visiting / regular researchers, 2 seminar rooms.
5.	8 rooms on the 5 th and 2 nd floors of the Maskawa Building for Education and Research	3 rooms for visiting / regular researchers, 3 rooms for Ph.D. students, 1 seminar room, 1 laboratory of a faculty member.

^{*1} Excluding the main lecture hall, library, computer laboratory, and other rooms for administrative use.

^{*2} Belonging to RIMS

^{*3} Temporarily available without rental fee.

Furthermore, jointly with the Yukawa Institute for Theoretical Physics, RIMS manages Kitashirakawa-Gakusha, which provides accommodation for up to 6 visiting researchers.



4-2. Issues regarding buildings

Shortage of space is one of the most severe problems facing RIMS. The main building of RIMS (3,923 m²) was completed in 1968, and designed to be suitable for 36 faculty members. Since then, RIMS has expanded substantially both in its size and its activities, and has now 3 visiting international professors and 2 visiting domestic professors besides regular faculty members. In addition to these faculty members, the number of students and postdocs has also increased, and the number of visiting researchers has risen due to the growth in the international research activities of RIMS. Despite these developments, the building remained unchanged and the shortage of space has become a chronic problem for RIMS.

Around 1992, a plan of building an extension to RIMS was raised. At the same time, the Institute for Fundamental Physics (the Yukawa Institute) was going to integrate with another institute by constructing a new building. Although RIMS had priority for construction of a building because of severe shortage of space, RIMS took a backseat to the Yukawa Institute, which completed a new building in 1995.

In this environment, the headquarters of Kyoto University have allocated to RIMS

- 286 m² on the 3rd floor of the Research Building No.4,
- 417 m² on the 4th floor of the Research Building No.2,
- 714 m² on the 2nd floor of the Research Building No.15.

However, notwithstanding the support of the headquarters, the space available to RIMS is still around 70% of that which should be allocated based on faculty size, according to the university standard.

Sometimes, with this severe shortage of space, we cannot help but ask more than one visiting professors to share a room, and, reasonably enough, we often hear their complaints. We recognize that such a situation jeopardizes the reputation of RIMS as an international cooperative research institute, and RIMS has responded by reducing the office space of full professors to half the standard size. The latter measure was introduced 24 years ago, and considered to be temporary. The cramped working conditions do not provide a good environment for research activity, and an early remedy for the space problem is desired.

Additionally, it should be noted that RIMS is renting:

- 8 rooms (470 m²) of Maskawa Building for Education and Research

on a 5-year contract, and has primarily used them for graduate students, visiting international researchers and post-doctoral researchers. This situation reduces the potential for interactions between such researchers and RIMS faculty, which is a further cost to being divided across buildings.

The construction of a new building with the necessary area is desirable for a truly satisfactory solution to the space problem. RIMS continues to request Kyoto University every year so that at least the

annex, which is currently divided into four, can be consolidated into one.

5. International Cooperative Research

5-1. International cooperative research

Since its establishment, RIMS has served the purpose of accelerating research in mathematics and the mathematical sciences. In 2010, RIMS was certified as a Joint Usage / Research Center by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), contributing to progress of mathematical research by providing researchers in mathematics and the mathematical sciences with various joint research opportunities. In November 2018, RIMS was certified as an International Joint Usage / Research Center by MEXT, that is, an international hub for other research institutes both inside and outside Japan, with the aim of leading international joint research activities and strengthening the research abilities of domestic researchers. At the heart of this mission are joint research activities, which are described in detail below. RIMS publicly solicits proposals for joint research activities from inside and outside Japan once a year, or throughout the year, depending on the type of program. Joint research activities proposed are examined and approved by the Technical Committee and the Advisory Board. RIMS may designate some urgent and important projects as special projects to expedite their efficient implementation.

(1) Several types of joint research activities

1. RIMS Workshops (Type A, B, C)

Open or closed workshops

A: A group consisting of at least two researchers shall be formed. The researchers conduct joint research at RIMS for a few days to two weeks. RIMS starts accepting applications around September each academic year.

B: A group comprising a few researchers, including at least one overseas researcher and one domestic researcher, conducts joint research at RIMS for a few days to about one week. RIMS accepts applications throughout the year.

C: A group comprising a few overseas researchers conducts joint research at RIMS for a few days to about one week. RIMS starts accepting applications around April each academic year.

2. RIMS Symposia

Open symposia

These are open symposia-style joint research events. The program of this joint research shall be notified to organizations/institutions in Japan. RIMS starts accepting applications around September each academic year.

3. RIMS Satellite Seminars

Closed seminars

These are closed seminars where researchers invited from both within and outside Japan stay at a venue outside RIMS and discuss research subjects in mathematics and the mathematical sciences. The purpose of these seminars is to promote rapid progress in target research areas and help fostering future leaders in those areas. RIMS starts accepting applications around April each academic year.

4. RIMS Review Seminars

Open or closed seminars

These are tutorial seminars for researchers. Comprehensive lectures on respective fields are given by one or more tutors for the purpose of sharing new trends and problems among related researchers. RIMS starts accepting applications around April each academic year.

5. RIMS Long Term Researchers

These researchers conduct research as joint usage researchers for two weeks or longer at RIMS. One of the important purposes is to make research exchanges with local researchers around RIMS. RIMS starts accepting only domestic applications around September each academic year.

Table 5.1.1 shows the number of projects run as well as the number of participants who stayed at RIMS in the academic year 2017-2019.

Table 5.1.1: Number of projects and participants

Year	Workshops	Symposia	Satellite Seminars	Review Seminars	Participants	Overseas
2017	21	57	3	-	3,555	257
2018	19	61	4	-	3,874	383
2019	19	64	5	2	4,103	542

(2) RIMS Research Projects

These are international joint research programs implemented in combination with any of the types of joint research activities described above. Leading researchers in their respective fields are invited and stay at RIMS for a medium to long-term visit, working on specific research subjects for a period of several months to one year. RIMS chooses and implements more than one project under this RIMS Research Project program each academic year. The call for proposals is published around April each academic year for projects to be implemented two years later. Each applicant should arrange an organizing committee comprising several members to submit an application. Projects under this RIMS Research Project program are implemented to develop researchers who will lead research projects in the fields of mathematics and the mathematical sciences in the future. The applicant may recommend young researchers who participate, in cooperation with leading researchers, in planning, and implementing international research projects as "RIMS Project Fellows."

For details of RIMS Research Projects in the academic years 1999-2019, see

2019-

<http://www.kurims.kyoto-u.ac.jp/kyoten/en/past.html>

1999-2018

<http://www.kurims.kyoto-u.ac.jp/en/past-01.html>

RIMS Research Projects in academic years 2017 – 2019

2017: Mathematical Analysis of quantum mechanics and related topics

1. Tosio Kato Centennial Conference

Location: Auditorium, Graduate School of Mathematical Sciences, The University of Tokyo

Period: 2017-09-04--2017-09-08

Organizer: Kenji Yajima (Faculty of Science, Gakushuin Univ.)

Participants 141 / Overseas 10

2. Spectral, Scattering Theory and Related Topics

Location: Rm 111, RIMS, Kyoto Univ.

Period: 2017-12-06--2017-12-08

Organizer: Shu Nakamura

(Graduate School of Mathematical Sciences,
Univ. of Tokyo)

Participants 55 / Overseas 4

3. Workshop on linear and nonlinear dispersive equations and related topics

Location: Kansai Seminar House, Kyoto

Period: 2017-05-22--2017-05-25

Organizer: Nobu Kishimoto (RIMS, Kyoto Univ.)

Participants 24 / Overseas 2

4. Harmonic Analysis and Nonlinear dispersive equations

Location: Department of Mathematics 127,
Graduate School of Science, Kyoto Univ.

Period: 2017-08-30--2017-09-01

Organizer: Yoshio Tsutsumi (Graduate School of Science,
Kyoto Univ.)

Participants 53 / Overseas 5

2018: Vertex operator algebras and symmetries

1. 10th CFT Seminar: A Conference on Vertex Algebras and Related Topics (RIMS Research Project 2018)

Location: Rm 420, RIMS, Kyoto Univ.

Period: 2018-04-23--2018-04-27

Organizer: Tomoyuki Arakawa (RIMS, Kyoto Univ.)

Participants 48 / Overseas 26

2. Vertex operator algebras and conformal field theory (RIMS Research Project 2018)

Location: Kansai Seminar House, Kyoto

Period: 2018-07-02--2018-07-06

Organizer: Simon Wood (School of Mathematics, Cardiff Univ.)

Participants 35 / Overseas 23

3. Vertex Operator Algebras and Symmetries (RIMS Research Project 2018)

Location: Rm 420, RIMS, Kyoto Univ.

Period: 2018-07-09--2018-07-13

Organizer: Tomoyuki Arakawa (RIMS, Kyoto Univ.)

Participants 52 / Overseas 29



2019: Cluster Algebras

1. Cluster algebras: theory and applications (RIMS Research Project 2019)

Location: Rm 420, RIMS, Kyoto Univ.

Period: 2019-06-03--2019-06-07

Organizer: Tomoki Nakanishi
(Graduate School of Mathematics, Nagoya Univ.)
Participants 115 / Overseas 58

2. Cluster algebras and representation theory (RIMS Research Project 2019)

Location: Rm 420, RIMS, Kyoto Univ.
Period: 2019-06-10--2019-06-14
Organizer: Tomoki Nakanishi
(Graduate School of Mathematics, Nagoya Univ.)
Participants 125 / Overseas 60

3. Cluster algebras, geometry, and mathematical physics (RIMS Research Project 2019)

Location: Rm 420, RIMS, Kyoto Univ.
Period: 2019-06-17--2019-06-21
Organizer: Tomoki Nakanishi
(Graduate School of Mathematics, Nagoya Univ.)
Participants 121 / Overseas 53



2019: Discrete Optimization and Related Topics

1. Japanese-Hungarian Symposium on Discrete Mathematics and Its Applications (RIMS Research Project 2019)

Location: Sanjo Conference Hall, The University of Tokyo
Period: 2019-05-27--2019-05-30
Organizer: Kazuhisa Makino (RIMS, Kyoto University)
Participants 117 / Overseas 41

2. Discrete Structures in Phylogenetic Networks (RIMS Research Project 2019) (closed)

Location: RIMS, Kyoto Univ.

Period: 2019-07-14--2019-07-20

Organizer: Kazuhisa Makino (RIMS, Kyoto University)

Participants 5 / Overseas 2

3. International Workshop on Innovative Algorithms for Big Data 2019 (RIMS Research Project 2019)

Location: Rm 420, RIMS, Kyoto Univ.

Period: 2019-10-30--2019-11-01

Organizer: Kazuhisa Makino (RIMS, Kyoto University)

Participants 81 / Overseas 8

4. International Workshop on Combinatorial Optimization and Algorithmic Game Theory (RIMS Research Project 2019)

Location: Rm 420, RIMS, Kyoto Univ.

Period: 2020-01-13--2020-01-14

Organizer: Kazuhisa Makino (RIMS, Kyoto University)

Participants 41 / Overseas 7

5. Combinatorial Optimization and Algorithms (RIMS Research Project 2019) (closed)

Location: RIMS

Period: 2020-01-15--2020-01-20

Organizer: Kazuhisa Makino (RIMS, Kyoto University)

Participants 7 / Overseas 4



Details of each workshops/symposia are found at;

2019-

<http://www.kurims.kyoto-u.ac.jp/kyoten/en/workshop.html>

1999-2018

<http://www.kurims.kyoto-u.ac.jp/en/pastworkshops.html>

(3) International Advisory Board

When RIMS was certified as an International Joint Usage/Research Center in 2018, it created a new post of International Advisor. The International Advisory Board consists of international academic experts who have broad eyes and high insights in mathematics and the mathematical sciences. They are delegated by the director and provide advice concerning the organization of RIMS. In the latest review of RIMS activities by the International Advisory Board, which took place in 2020, RIMS received high evaluations. However, advisors stated their concerns about the shortage of space and division of the laboratory into 5 buildings, and advised RIMS to promote online styles of joint research in response to COVID-19. RIMS earnestly addressed these important issues.

Table 5.1.3: International Advisors

	Name	Institution	Affiliation
1.	BOURGUIGNON, Jean-Pierre	IHES-CNRS (France)	Professor Emeritus
2.	BARLOW, Martin	University of British Columbia (Canada)	Professor Emeritus
3.	REID, Miles	University of Warwick (United Kingdom)	Professor
4.	KOTANI, Motoko	Tohoku University (Japan)	Executive Vice President

(4) Response to COVID-19

In 2020, it was necessary for a number of joint research activities to be canceled or postponed due to COVID-19. RIMS rapidly took action to support research during the pandemic by making it possible to hold joint research activities online, not only by providing equipment for online workshops/symposia, but also by developing a guide to organizing online events for comfortable hosting. RIMS started hybrid (face-to-face and online) meetings in November. A guide for hybrid meetings is available in Japanese and an English version is in preparation. RIMS's response to COVID-19 is described in more detail in Section 16.

5-2. International visitors

RIMS holds three international Visiting Professor positions, each of which must be taken up for at least three months consecutively by one person. RIMS also invites researchers from abroad as Visiting Research Scholars, and Guest Research Associates, for periods ranging from a few weeks to one year.

Table 5.2.1: List of Visiting Professors (2015-2019)

2015

Name	Home Institute	Research Subject	Period:
SEBBAR, Ahmed	Université de Bordeaux	Research on classical analysis by means of complex analysis and algebraic analysis	2015.02.01 -2015.04.30
HALLDÓRSSON, Magnús Már	Raykjavik University	A study on approximation algorithms for discrete optimization problems	2015.04.06 -2015.07.11
VAN FRANKENHUIJSEN, Machiel	Utah Valley University	Topics related to inter-universal Teichmüller theory	2015.05.04 -2015.08.20
MATSUKI, Kenji	Purdue University	Resolution of singularities in positive characteristic	2015.05.16 -2015.08.16
CADORET, Anna	Ecole Polytechnique	Arithmetic fundamental groups and their representations	2015.05.21 -2015.08.28

KIM, Kyounghee	Florida State University	Pseudoautomorphisms of algebraic varieties, and their entropy	2015.10.05 -2016.01.04
BOROS, Endre	Rutgers, The State University of New Jersey	Combinatorial optimization	2015.09.15 -2015.12.22
CROYDON, David	University of Warwick	Research on the asymptotic behavior of stochastic processes on random media	2015.08.03 -2015.12.21
DEUSCHEL, Jean Dominique	Technische Universität Berlin	Random walk and diffusions on random media	2015.10.26 -2016.01.31

2016

Name	Home Institute	Research Subject	Period:
MATSUKI, Kenji	Purdue University	Resolution of singularities in positive characteristic	2015.12.25 -2016.08.15
MANNEVILLE, Paul	École polytechnique	Turbulence structure from a view point of dynamical systems	2016.04.01 -2016.07.3
MATHIEU, Pierre	Université d'Aix-Marseille	Asymptotic behavior of stochastic processes on random media and groups	2016.04.10 -2016.07.10
OHKITANI, Koji	The University of Sheffield	Mathematical study on turbulence	2016.05.30 -2016.08.31
SAIDI, Mohamed	University of Exeter	Arithmetic algebraic geometry	2016.06.29 -2016.09.16
WILLIAMSON, Geordie	Max Planck Institute for Mathematics	Representation Theory of algebraic groups	2016.09.01 -2016.12.15
LEE, Yongnam	Korea Advanced Institute of Science and Technology	Q-Gorenstein deformation theory and its applications	2016.09.05 -2017.01.04
MICHALEK, Mateusz	Polish Academy of Sciences	Arithmetic fundamental groups and their representations	2016.10.01 -2016.12.31
DOUGLAS, Craig Carl	University of Wyoming	Mathematical analysis of motion of the underground water	2017.01.06 -2017.04.05

2017

Name	Home Institute	Research Subject	Period:
RAO, Anup	University of Washington	Algorithmic studies on communication complexity	2017.04.01 -2017.06.30
WANG, Bai-Ling	Australian National University	Studies on non-commutative geometry and global geometry	2017.04.10 -2017.07.21
CHEREDNIK, Ivan V	University of North Carolina at Chapel Hills	Representation theory	2017.05.13 -2017.08.12
MATSUKI, Kenji	Purdue University	Resolution of singularities in positive characteristic	2017.05.15 -2017.08.14
CADORET, Anna	Ecole Polytechnique	Arithmetic fundamental groups and their representations	2017.06.26 -2017.09.26
SAIDI, Mohamed	University of Exeter	Arithmetic algebraic geometry	2017.06.29 -2017.09.28
SKIBSTED, Erik	Department of Mathematics, Arrhus University	Spectral and scattering theory for Schroedinger operators	2017.08.22 -2017.12.22
RASMUSSEN, Christopher	Wesleyan University	Arithmetic algebraic geometry	2017.09.01 -2017.12.03
PARK, Jinsung	Korea Institute for Advanced Study	Complex volumes for hyperbolic 3-manifolds with conical singularities and rank one cusps	2017.10.01 -2017.12.31
Van FRANKENHUIJSEN, Machiel	Utah Valley University	Topics related to inter-universal Teichmuller theory	2018.01.07 -2018.06.28
JOSHI, Kirti Kumar Narayan	The University of Arizona	The arithmetic geometry of hyperbolic algebraic curves in positive characteristic	2018.01.16 -2018.05.15

2018

Name	Home Institute	Research Subject	Period:
HALLDÓRSSON, Magnús Már	Reykjavik University	A study on approximation algorithms for discrete optimization problems	2018.04.01 -2018.06.30
MATSUKI, Kenji	Purdue University	Resolution of singularities in positive characteristic	2018.05.11 -2018.08.10
CREUTZIG, Thomas	University of Alberta	Vertex algebras and mathematical physics	2018.05.17 -2018.08.16
DONG, Chongying	University of California, Santa Cruz	Vertex operator algebras	2018.06.24 -2018.09.23
CADORET, Anna	Sorbonne University	Arithmetic fundamental groups and their representations	2018.06.27 -2018.09.27
SAIDI, Mohamed	University of Exeter	Arithmetic algebraic geometry	2018.06.29 -2018.09.29
FESENKO, Ivan	University of Nottingham	Topics related to inter-universal Teichmüller theory	2018.09.03 -2018.12.05
MOREAU, Anne	University of Lille 1	Representation theory and algebraic geometry	2018.10.01 -2018.12.31
LAM, Ching Hung	Institute of Mathematics, Academia Sinica	Vertex operator algebras	2018.09.27 -2018.12.26
KHOUSSAINOV, Bakhodir	University of Auckland	Computability on algebraic and geometric structures	2018.12.22 -2019.03.21
ELIASHBERG, Yakov	Stanford University	Study on symplectic geometry and several complex variables	2019.02.19 -2019.05.22

2019

Name	Home Institute	Research Subject	Period:
LECLERC, Bernard	Université Caen Normandie	Combinatorial and geometric aspects of representation theory	2019.04.01 -2019.06.30
GEKHTMAN, Michael	University of Notre Dame	Application of Cluster Algebra to Integrable Systems	2019.05.13 -2019.08.12
SAIDI, Mohamed	University of Exeter	Arithmetic algebraic geometry	2019.06.13 -2019.09.12
CADORET, Anna	UPMC – Sorbonne Universités	Arithmetic fundamental groups and their representations	2019.07.01 -2019.10.01
JORDÁN, Tibor	Eötvös Loránd University	Combinatorial Rigidity and Discrete Optimization	2019.08.01 -2019.10.31
GURVICH, Vladimir	Rutgers, The State University of New Jersey	Algorithmic Aspect of Game theory	2019.10.01 -2019.12.31
POWER, Anthony John	Macquarie University	Category theory and its applications to theoretical computer science	2019.11.17 -2020.02.28
BÉRCZI, Kristóf	Eötvös Loránd University	Minmax Theorem and Algorithms	2019.12.01 -2020.02.29

**Table 5.2.2: Number of (visiting) overseas researchers
(except for students)**

year Country	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19
Australia	9	7	6	0	6	5	14	7	17	7
Canada	9	14	7	12	8	4	12	8	16	23
China	21	12	22	24	23	53	44	36	43	56
Denmark	3	15	0	1	1	0	2	3	2	3
France	55	46	45	41	46	47	40	36	55	57
Germany	25	19	28	18	31	34	37	24	57	31
India	3	2	3	8	6	9	3	2	2	4
Italy	18	19	10	8	10	7	10	7	15	16
Korea	62	70	37	63	31	42	34	33	48	68
Russia	7	5	10	8	26	9	8	4	16	8
Sweden	3	2	4	0	0	0	3	8	2	2
UK	27	27	32	27	35	27	34	28	24	43
USA	118	98	85	95	70	87	98	53	90	111
Other Countries	93	149	109	119	101	95	106	79	120	145
Total	453	485	398	424	394	419	445	328	507	584

5-3. Publication of results of international cooperative research

RIMS publishes a series called Kôkyûroku (ISSN: 1880-2818), which mostly contains proceedings of symposia and workshops supported by RIMS. The series first appeared in 1964, and about 50-60 volumes are issued each year. In total, over the period 1964-2019, 2149 volumes were published. They are all digitized and available (for free) on the Kyoto University Research Information Repository (KURENAI):

<http://repository.kulib.kyoto-u.ac.jp/dspace/>

Another series of lecture notes, RIMS Kôkyûroku Bessatsu (ISSN: 1881-6193), was introduced by RIMS in 2006. Among the conferences held at RIMS every year, the advisory board of RIMS selects a small number of suitable ones to publish their proceedings in this series. Every submitted paper should be in final form and is peer reviewed under the responsibility of the editors, usually the organizers of conferences. About 6 volumes are issued a year, and these are reviewed in the Mathematical Reviews and MathSciNet of the American Mathematical Society. Over the period of 2006-2019, 76 volumes were published in the series. They are all digitized and available (for free) on the Kyoto University Research Information Repository (KURENAI):

<http://repository.kulib.kyoto-u.ac.jp/dspace/>

6. International Academic Exchange Agreements

In order to develop further its capacity as a cooperative research institute open to the world, it is crucial that RIMS makes arrangements with other domestic and international institutions and to makes active mutual exchanges with them. RIMS has made international academic exchange agreements with the following international institutions for mathematical sciences.

【GlobalMathNetwork】 -- See Section 14

- Hausdorff Center for Mathematics, University of Bonn
- Department of Mathematics and their Applications,
École Normale Supérieure

- Courant Institute of Mathematical Sciences, New York University
- Beijing International Center for Mathematical Research, Peking University

【Canada】

- Pacific Institute for the Mathematical Sciences

【Federal Republic of Germany】

- Hausdorff Center for Mathematics, University of Bonn

【Japan】

- Advanced Institute for Materials Research, Tohoku University
- Advanced Mathematical Institute, Osaka City University
- International Institute for Advanced Studies, Kizugawa, Kyoto

【Republic of Korea】

- Korea Institute for Advanced Study
- Department of Mathematical Sciences, Seoul National University
- National Institute for Mathematical Sciences
- The CAU Nonlinear PDE Center, Chung-Ang University
- The Center for Geometry and Physics, Institute for Basic Science, Pohang

【Russian Federation】

- Higher School of Economics, National Research University

【Taiwan】

- National Center for Theoretical Sciences, Taipei

【United Kingdom】

- University of Edinburgh

【United States of America】

- College of Science, University of Utah

7. Affiliated Research Centers

7-1. Center for Research Interaction in Mathematical Sciences

In April 2006, the Center for Research in the Frontiers of Mathematical Sciences was established within RIMS in order to meet recent trends in mathematics and the mathematical sciences. Since then, many visiting researchers have been engaged in research activities as Project Professors.

The Center was renamed the “Center for Research Interaction in Mathematical Sciences” when the “Research Center for Quantum Geometry” was established in April 1, 2012. The Project Professors, the number of which is at most 5, may or may not be paid, and their terms are more than 2 months and less than 5 years. The visiting researchers may come to RIMS on their sabbatical leave, for example, for joint research with RIMS faculty members.

7-2. Center for Research in Next-Generation Geometry

The Center for Research in Next-Generation Geometry was established within RIMS on April 1, 2019, for the purpose of promoting research in a broad range of areas of next generation geometry, with a special emphasis on arithmetic geometry in general and inter-universal Teichmüller theory in particular. The Center consists of both RIMS faculty members and Project Professors. On the occasion of the founding of this Center, the Preparatory Center for Research in Next-Generation Geometry was abolished; moreover, one year subsequent to its founding, the Center for Research in Next-Generation Geometry was merged with and subsumed the activities of the previously established (on April 1, 2012) Center for Research in Quantum Geometry. The Project Professors associated with the Center (at most 6 in number) are employed, sometimes with and sometimes without pay, for periods ranging from half a year to 6 years. The center aims to support breakthroughs in research in next-generation geometry through numerous collaborative research activities involving both domestic and international researchers.

7-3. Liaison Center in Mathematics

In order to enhance cooperation with other research areas and with industry, the research cooperation center was established within RIMS in May 2013. The aim of this Center is to explore applications of mathematics to other fields. The Center organized a joint conference on applied mathematics with the Advanced Institute for Mathematical Research (AIMR) of Tohoku University, which is one of centers established within the World Premier International Research Centers Initiative (WPI) program supported by MEXT. The Center and AIMR have also pushed joint research in new fields of geometry and applications to technology. The Center cooperated with KTGU (see Section 14), has invited professors from the unit of KTGU in the Medical department to be members of the Center, and organized joint seminars. The Center will continue these projects and also look to develop other activities through which it can contribute to the innovation of mathematics.

8. Computer Laboratory

Applications of theoretical results in the mathematical sciences are studied in this laboratory, which provides computer facilities for use in research fields such as fluid mechanics, numerical analysis, mathematical physics and pure mathematics. Advanced software technology is also studied on the basis of research results in Computer Science. Computer facilities at RIMS were renewed in 2016 and will continue to be updated.

The computer laboratory is operated by 2 full-time technical staff. Access to the computing system of RIMS is strictly limited in terms of security by a fire wall. The staff regularly improve protection against vulnerabilities and maintain the operating system. Hence the computing system of RIMS is stable and well supports its research activities.

9. Kyoto University Mathematical Sciences Research Fund

On June 1, 2017, the Kyoto University Mathematical Sciences Research Fund was launched in order to promote research in mathematics and the mathematical sciences, and to foster young researchers for the next generation. Indeed, for the development of mathematics and the mathematical sciences, it is essential that an institution such as RIMS provides an unconstrained research environment where young researchers can show their creativity. For this purpose, the Fund will be applied as described below.

Category	Content
Support for education and research	<ul style="list-style-type: none">● Provide support and training to young researchers and graduate students● Promote international joint research
Social contribution	<ul style="list-style-type: none">● Introduce findings in mathematics and the mathematical sciences

10. Library

RIMS is equipped with its own library, which is located on the third floor, and look out on Mt. Daimonji and Mt. Hiei from the browsing room. The library possesses a total of 105,992 books and 1,596 journals to meet the needs of mathematicians, theoretical physicists, computer scientists, and others. The library also functions as an information center for literature in the mathematical sciences.

The books and journals are placed in the reading room on the 3rd floor and in the stacks in the basement of RIMS. They can be searched using the Kyoto University search system KULINE.

In addition to the above, librarians at RIMS are responsible for making the database of publications of RIMS, producing the electronic version of “RIMS Kôkyûroku” and looking after historically valuable documents such as the Itô-Archive, which contains documents related to Prof. Kiyosi Itô.

RIMS library is faced with serious problems concerning the recent rapid rise in the prices of journals and books. As mentioned above, the library functions as an information center, so visitors and participants of conferences use the library. Hence it is expected that the library has a variety of books and journals in all areas of the mathematical sciences. However, due to the rapid rising of prices, we had to cut journals significantly. Indeed, at the time of the self-evaluation in 2012, the library purchased 608 journals, but during the last 8 years the number has gradually reduced by about a half to 308 journals. We note that RIMS library does not receive any special financial support to maintain the library despite its importance in the community.

11. Publications of the Research Institute for Mathematical Sciences (PRIMS)

The aim of the Publications of the Research Institute for Mathematical Sciences (PRIMS) is to publish original research papers in mathematics and the mathematical sciences. Occasionally surveys are included at the request of the editorial board. From Volume 37 (2001) on, four issues of PRIMS have been published each year. In recent years, Special Issues have also been published (see the list attached below). Up to 2019, there were 56 PRIMS volumes published.

Until 2009, RIMS outsourced the printing of PRIMS to local printing companies and entrusted sales to Kinokuniya, a major Japanese bookstore. In May 2009, RIMS concluded a five-year contract (effective from January 2010 to December 2014) with the European Mathematical Society Publishing House (EMS-PH). EMS-PH managed, in accordance with this five-year contract, printing and proofreading for PRIMS volumes up to and including volume 46 (2010). The contract was extended indefinitely (effective from January 2015), in accordance with Clause 15 of the original five-year contract concluded in May 2009. EMS-PH and RIMS started discussing a contract revision on details including publishing ethics when EMS-PH moved from Zurich to Berlin and its new administration was established in 2019.

Research papers of PRIMS published from EMS-PH are subject to a 5-year embargo, after which they are made available, free of charge, along with papers published prior to 2010, on the homepage of EMS-PH and partially on the homepage of RIMS.

As a result of this major change in 2010 in the way in which the printing and sales of PRIMS are conducted, lists of institutes with which journals are exchanged or donated have been re-examined. At the present time, 190 copies of PRIMS are provided to institutes abroad and approximately 150 copies to institutes in Japan.

PRIMS Special Issues:

- 40th Anniversary Commemorative Articles (Vol.40 (2004), No.3 & No.4)
- Thirty Years of the Double Exponential Transforms (Vol.41 (2005), No.4)
- Dedicated to Professor Heisuke Hironaka on the Occasion of His "Kiju", that is, His 77th Birthday (Vol.44 (2008), No.2)
- Arithmetic Algebraic Geometry (Vol.45 (2009), No.1)
- The Golden Jubilee of Algebraic Analysis (Vol.47 (2011), No.1 & No.2)

12. Fostering of Young Researchers

12-1. Graduate School (Mathematical Sciences Course)

The Mathematical Sciences Course is administratively a course of the Division of Mathematics and Mathematical Sciences within the Graduate School of Science and, as such, follows the rules of the School as to the acceptance of students, course requirements and degrees. RIMS offers graduate programs leading to M.Sc. and D.Sc. degrees in the field of the mathematical sciences. RIMS also accepts overseas researchers at the graduate and post-graduate levels as research students or research fellows. In 2020, 21 students are registered in Masters courses and 24 in Doctoral courses; further data is given in the following Table 12.1.1.

Table 12.1.1: Student Numbers

Month/ Year	Master	(International Students)	Doctor	(International Students)	Research Student	(International Students)
April 2015	21	(0)	17	(2)	0	(0)
April 2016	19	(1)	21	(2)	0	(0)
April 2017	20	(2)	23	(1)	0	(0)
April 2018	21	(2)	25	(1)	1	(1)
April 2019	21	(3)	20	(0)	4	(3)
April 2020	21	(3)	24	(1)	4	(3)

The numbers of International Students are **numbers shown in parentheses**

Table 12.1.2: Careers of Students (following a Masters Course)

Academic Year	Doctoral Course	Companies	Teachers (excluding Faculty Members)
2015	8	1	1
2016	6	4	0
2017	7	2	0
2018	7	3	0
2019	9	1	0

Table 12.1.3: Careers of Students (following a Doctoral Course)

Academic Year	Faculty Members	Postdoctoral Fellows	Companies	Others
2015	0	2	1	0
2016	0	2	1	1
2017	0	2	1	0
2018	2	7	0	1
2019	1	0	3	0

12-2. Young researchers at RIMS

The shortage of research positions for the post-doctoral period is a serious problem both in Japan and in other countries. To foster the next-generation of researchers, RIMS launched and continues to hold several positions for young researchers:

1. “Sendan” Project

RIMS hires outstanding young researchers as an assistant professor before they obtain a Ph.D. In this way, we expect that they can work on challenging research topics rather than producing short-term results. Assistant professors at RIMS are basically allowed to be exempt from teaching duties and can concentrate on research.

2. RIMS Research Fellows

RIMS calls for this position publicly regardless of the research areas of applicants. Successful applicants are employed and can work solely on their own research for 2 years.

3. RIMS Project Fellows

Following a recommendation from the chairperson of a RIMS Research Project (as described in Section 5-1), RIMS hires young researchers as RIMS Project Fellows. They participate in the planning and implementing of the RIMS Research Project.

The number of post-doctoral fellows hired at RIMS in recent years is shown in Table 12.2.1.

Table 12.2.1: The Number of Post-doctoral Fellows hired at RIMS

	Total number	Total number of International fellows in parentheses
Assistant Professors on “Sendan” Project	2	(0)
Program-Specific Researchers (2017-2020)	6	(1)
RIMS Research Fellows (2017-2020)	12	(1)
Research Fellows (2017-2020)	20	(1)
RIMS Project Fellows*	4	(1)

*Duplicated count in Program-Specific Researchers and Research Fellows

RIMS also accepts JSPS post-doctoral fellows. These are funded by the Japan Society for the Promotion of Science (JSPS) and have faculty members at RIMS as their mentors. RIMS provides a top research environment for them.

Table 12.2.2: The Number of JSPS Post-doctoral Fellows

	Domestic	International
2017	3	7
2018	7	5
2019	9	4
2020	5	1*

*New entries are postponed due to COVID-19.

In the career paths of young researchers, positions of post-doctoral fellows are bridges to university professorships. Decreases in the number of post-doctoral fellows will bring about serious problems for the future of education and research. It is an urgent issue to secure an increase in the post-doctoral researcher employment budget. It is important for RIMS to offer an excellent academic research environment for young researchers.

13. Activities of Faculty Members

Professors

KUMAGAI, Takashi (Director)

Takashi Kumagai is working on probability theory. In particular, he has been working in the field of stochastic processes and analysis on disordered media such as fractals, and has obtained anomalous properties of the heat transfer on the media. This is a fundamental research in order to understand physical phenomena on them. Jointly with his collaborators, Kumagai has established robust methods that are applicable to various disordered media. Moreover, these methods are used to prove anomalous heat transfer on random media such as percolation clusters at critical probability. He has also analyzed wide class of jump processes (non-local operators) and has made contributions on related areas.

ARAKAWA, Tomoyuki

Tomoyuki Arakawa is interested in representation theory and the theory of vertex algebras. He has been especially working on W -algebras for many years, but still there are a lot of related interesting problems.

HASEGAWA, Masahito

Masahito Hasegawa has been working on semantic models of computation, with particular emphasis on the analysis of programming languages. His research topics include lambda calculi, type theory, functional programming, operational semantics, denotational semantics, and category theory.

MAKINO, Kazuhisa

My research interests are in the areas of discrete mathematics, optimization and algorithm theory. In particular, I am interested in design and analysis of efficient algorithms for discrete optimization, and applications of those techniques to the areas of artificial intelligence, game theory, and data mining.

MOCHIZUKI, Shinichi

Shinichi Mochizuki's main research interest is the arithmetic of hyperbolic curves. During the early and mid-1990's, his research

centered upon the p -adic anabelian geometry and p -adic Teichmüller theory of hyperbolic curves. Since the late 1990's, however, he has also been concerned with developing a global arithmetic version of Teichmüller theory for pairs consisting of a number field equipped with an elliptic curve and understanding the numerous interesting connections between this theory and the absolute and combinatorial anabelian geometry of hyperbolic curves.

MOCHIZUKI, Takuro

Takuro Mochizuki is working on complex differential geometry, algebraic geometry, and algebraic analysis. One of his main themes is to pursue correspondences between objects in algebraic geometry and differential geometry. For example, he established an equivalence between semisimple algebraic holonomic D-modules and pure twistor D-modules, which he applied to prove the decomposition theorem for the projective push-forward of semisimple algebraic holonomic D-modules, conjectured by Kashiwara. More recently, he is interested in equivalences between monopoles with periodicity and various types of difference modules. Another central theme is the irregular singularity of D-modules. For example, he recently obtained a characterization for a complex of enhanced ind-sheaves induced by a holonomic D-modules, called the curve test.

NAKANISHI, Kenji

Kenji Nakanishi's research subject is mathematical analysis of partial differential equations, mainly of those called nonlinear wave equations or nonlinear dispersive equations, which describe space-time evolution of waves with strong interactions, arising in several physical contexts, such as plasma, superfluid, and water waves. Depending on the competition between the dispersion and the nonlinear interactions, a single equation can typically produce many types of solutions, such as scattering, solitons, and blow-up. In recent years, the ultimate goal of his research has been to grasp the entire picture of all general solutions to some equations. He is particularly interested in understanding and describing possible transitions in time between various types of solutions, as well as in the intermediate or threshold solutions in the phase space.

NAMIKAWA, Yoshinori

Yoshinori Namikawa is working on algebraic geometry. He is especially interested in algebraic varieties with trivial canonical class. They include Calabi-Yau 3-folds, compact hyperkaehler manifolds and symplectic singularities. Recent his theme is birational geometry and Poisson deformations of symplectic singularities.

OHTSUKI, Tomotada

Tomotada Ohtsuki mainly studies quantum topology; in particular, invariants of knots and 3-manifolds. Recently, he studies perturbative invariants and the LMO invariant of 3-manifolds, and the asymptotic expansion of the Kashaev invariant of some knots. He has edited lists of some open problems in low-dimensional topology (see his webpage;

<http://www.kurims.kyoto-u.ac.jp/~tomotada/index-e.html>).

ONO, Kaoru

Kaoru Ono is working on symplectic geometry, in particular Floer theory and holomorphic curves in symplectic manifolds. In a joint work with K. Fukaya, he constructed Floer cohomology of Hamiltonian diffeomorphisms on arbitrary closed symplectic manifolds as well as Gromov-Witten invariants. Using Novikov-Floer cohomology, he proved the C^1 -flux conjecture. In recent years, he has been collaborating with Fukaya, Oh and Ohta in Floer theory for Lagrangian submanifolds and its implications in symplectic geometry and homological mirror symmetry.

OZAWA, Narutaka

Narutaka Ozawa is working on theory of operator algebras on Hilbert spaces and on the functional analytic aspects of the group theory, with an emphasis on the interplay between these subjects. His recent works focus on the study of various (functional analytic) approximation properties for (mainly discrete) groups and their applications to the study of group operator algebras (C^* -algebras and von Neumann algebras). They include amenability, exactness, and Kazhdan's property (T), for groups such as lattices of semi-simple Lie groups, (relatively) hyperbolic groups, and the automorphism groups of the free groups.

TAMAGAWA, Akio

Akio Tamagawa is mainly working on covers and fundamental groups of algebraic varieties (especially, curves and their moduli spaces) from the viewpoint of arithmetic geometry. In this direction, he is particularly interested in anabelian geometry and, among other things, he has proved the Grothendieck conjecture for affine curves over finite fields and over fields finitely generated over the rationals. Recently, he is studying various types of refinement of anabelian geometry jointly with Mohamed Saidi, l -adic and modulo l representations of fundamental groups jointly with Anna Cadoret and Chun Yin Hui, and a certain finiteness conjecture for abelian varieties (motivated by Yasutaka Ihara's question about the outer Galois representation on the fundamental group of the projective line minus three points) jointly with Christopher Rasmussen.

Associate Professors**CROYDON, David**

David Croydon works in probability theory, with his main research interest being in diffusions on random fractals and how such processes can be constructed as scaling limits of related random walks on random graphs. He also has a growing interest in the behaviour of discrete integrable systems started from random initial conditions.

HOSHI, Yuichiro

Yuichiro Hoshi is mainly working on fundamental groups, from the viewpoint of anabelian geometry, of algebraic varieties related to hyperbolic curves. He has obtained some results concerning Grothendieck's anabelian conjecture and section conjecture. He is also studying p -adic Teichmüller theory. He has attempted to understand various objects studied in p -adic Teichmüller theory by means of more explicit objects.

ISHIMOTO, Kenta

Kenta Ishimoto is working on fluid mechanics of low-Reynolds-number flow, dynamics of swimming microorganisms, and related applied mathematics. His research includes theoretical and numerical biofluid mechanics, data analysis of biomedical images, and mathematical modelling of related phenomena.

KAWAI, Toshiya

Toshiya Kawai is working on both physical and mathematical aspects of quantum field theory and string theory. He likes algebraic and enumerative approaches to these subjects preferably with relevance to geometrical problems. Over the last years he has been studying string duality phenomena. These dualities predict interesting correspondences between seemingly disparate geometric objects. In particular, there are interesting relations between physics and enumerative geometry of Calabi-Yau manifolds. Some key words of his current research are: 2d CFT, Gromov-Witten invariants and their reformulation in terms of brane counting, elliptic genus and elliptic cohomology, Jacobi forms, Borcherds products.

KAWAKITA, Masayuki

Masayuki Kawakita is working on algebraic geometry in the view of birational geometry. His early work is the explicit classification of three-fold divisorial contractions. Currently he investigates singularities in the minimal model program towards the termination of flips, by focusing on minimal log discrepancies.

KAWAMURA, Akitoshi

Akitoshi Kawamura works on the theory of computation (Computability and Computational Complexity, Algorithm Design, Computational Geometry).

KOBAYASHI, Yusuke

Yusuke Kobayashi is working on combinatorial optimization, algorithm theory, and discrete mathematics. He is interested in designing efficient algorithms for graph problems such as network design problems, disjoint paths problem, and generalizations of the matching problem.

NAKAYAMA, Noboru

Noboru Nakayama is working on the birational geometry of algebraic varieties and the bimeromorphic geometry of complex analytic varieties. He is interested in elliptic fibration, torus fibration, Zariski decomposition, numerical Kodaira dimension, endomorphism, and some special surfaces.

TAKEHIRO, Shin-ichi

Shin-ichi Takehiro is working on geophysical fluid dynamics. His research interest covers all kinds of problems related to fluid motions in planetary surfaces and interiors (atmospheres, mantles and central cores), as well as problems of the Earth's atmosphere and ocean. He also develops technique and software of numerical methods in order to deal with various problems in geophysical fluid dynamics.

Recent topics of his research are as follows:

- 1) Penetration of convection into a stable layer in general. Typical cases include vigorous mixing by turbulent convective motion, and slow penetration of columnar motion affected by rotation.
- 2) Thermal convection and MHD dynamos in rotating spherical shells.
- 3) Fluid motions in the Earth's inner core.
- 4) Two-dimensional turbulence on rotating spheres.

TERUI, Kazushige

Kazushige Terui is working on mathematical logic and its applications to computer science. He is in particular interested in (i) proof theoretic and algebraic aspects of nonclassical logics, and (ii) logical systems for implicit computational complexity. As to (i), he is trying to algebraically reformulate proof theoretic techniques such as cut-elimination and interpolation, and also to delineate the power of proof theory based on algebraic considerations. As to (ii), he has worked on logical systems which implicitly capture complexity classes such as P, and is recently proposing a new framework in which various metatheorems in complexity theory can be logically analyzed.

Lecturers

KISHIMOTO, Nobu

Nobu Kishimoto is working on nonlinear partial differential equations, especially nonlinear dispersive equations. Mainly using harmonic analysis and real analysis tools, he studies various properties of solutions to the initial value problems such as well-posedness (i.e., existence, uniqueness of solutions and continuous dependence on initial data), scattering to linear solutions, and finite time blowup. He has a particular interest in the effect of the resonant nonlinear interactions in spatially periodic setting.

TAN, Fucheng

Fucheng Tan's research interests lie in Arithmetic Geometry and Number Theory. He studies p -adic Hodge theory, anabelian geometry, and modularity of Galois representations, as well as p -adic automorphic forms. His works are centered in the comparison between étale cohomology and crystalline cohomology. More recently, he has been led to the investigations into Simpson correspondence and Inter-universal Teichmüller theory, both of which are related to the comparison theorem in p -adic Hodge theory.

YAMASHITA, Go

Go Yamashita is working on arithmetic geometry. Especially, he is interested in the following topics:

- p -adic Hodge theory and its related areas ((φ, Γ) -modules, p -adic differential equations, etc.),
- Iwasawa theory and Tamagawa number conjecture of Bloch-Kato,
- Multiple zeta values, Tannakian fundamental groups, and mixed Tate motives,
- Shimura varieties (and Drinfel'd modular varieties, and moduli of shutkas), and Langlands correspondence,
- Automorphy lifting ($R=T$) and p -adic Langlands correspondence,
- Algebraic cycles, mixed motives, and algebraic K -theory,
- Inter-universal Teichmüller theory and its related areas (anabelian geometry, p -adic Teichmüller theory, and Hodge-Arakelov theory etc.).

Assistant Professors

HELMKE, Stefan

Stefan Helmke is working on algebraic geometry. His main interest is the study of base points of linear systems. It has been conjectured, that the existence of such base points always have a geometric reason, namely it should imply the existence of subvarieties of very small degree containing the base point. A special case of this conjecture is the famous Fujita Conjecture.

Another research interest is the relation between deformations of singularities and certain groups, generalizing a celebrated construction due to E. Brieskorn, A. Grothendieck and P. Slodowy. This construction was successfully worked out in the case of simple elliptic singularities of degree up to 4. Recently, the construction was extended to degrees 5 and 6, which are not complete intersections.

HIKITA, Tatsuyuki

Tatsuyuki Hikita is working on geometric representation theory. Especially, he is interested in certain duality called symplectic duality between representation theory of quantizations of conical symplectic resolutions. He made a conjecture that describes cohomology ring of conical symplectic resolutions in terms of the symplectic duality. He is also interested in the geometry of affine Springer fibers and their relation to the combinatorics of parking functions.

ISHIKAWA, Katsumi

Katsumi Ishikawa is interested in low-dimensional topology. In particular, he studies invariants of knots and 3-manifolds. Many of his works are related to quandles and applications of them. Recently he is also interested in quantum topology and working on Vassiliev invariants.

ISHIKAWA, Suguru

Suguru Ishikawa is studying Floer homology of symplectic manifolds and contact manifolds. Recently, he constructed symplectic field theory (SFT) in general case. He is going to study about the calculation and application of SFT. He is also interested in Floer homology of families and its applications.

KOSHIKAWA, Teruhisa

Teruhisa Koshikawa's interest is number theory, especially arithmetic geometry and the so-called Langlands program. He studied heights of pure motives, integral p -adic Hodge theory, K3 surfaces, and torsion cohomology classes of Shimura varieties. More recently, he is studying a logarithmic version of prismatic theory of Bhatt-Scholze.

MUROYA, Koko

Koko Muroya's research is based around semantics of programming languages, in particular those for various properties of programs, including evaluation results, efficiency and computation processes represented by programs. Using a combination of two semantical methods, network rewriting and information flow, she is aiming at both an execution model and a language design for computation that involves not one but several properties of programs.

OOURA, Takuya

Takuya Ooura is interested in algorithms on numerical computation. His main interest is numerical integration, and he has proposed a new double exponential formula to compute the Fourier type integrals. Recently, he also has proposed a continuous Euler transformation which accelerates the convergence of the integrals with slowly decaying integrand.

TSUJIMURA, Shota

Shota Tsujimura is working on anabelian geometry and its application. Especially, his main research interest is generalizations of various Grothendieck Conjecture type results and applications of anabelian geometry to group-theoretic/arithmetic issues surrounding the Grothendieck-Teichmüller Group.

YAMASHITA, Mayuko

Mayuko Yamashita is studying differential geometry and topology, in particular Atiyah-Singer index theory and Operator K-theory. She is also interested in its applications to mathematical physics. Recently she has been working on geometric quantization and a physicists-friendly re-formulation of Atiyah-Patodi-Singer index theorem.

Project Assistant Professors

ISONO, Yusuke

Yusuke Isono is working on operator algebra theory and particularly interested in the classification of non-amenable von Neumann algebras. Recently this area is active and a lot of progress have been made by S. Popa's deformation/rigidity theory, which has important connections with measured group theory, discrete group theory, ergodic theory etc. His work always focuses on type III von Neumann algebras. This is the most difficult class of von Neumann algebras and Tomita–Takesaki theory is a fundamental tool for this subject. The aim of his research is to understand structures of type III von Neumann algebras using the deformation/rigidity theory and Tomita-Takesaki theory.

YANG, Yu

Yu Yang works in arithmetic geometry. Recently, his research focuses on curves and their moduli spaces in positive characteristic from the point of view of fundamental groups. He introduced a topological space which he calls the moduli space of admissible fundamental groups of curves in positive characteristic, and posed the so-called "Homeomorphism Conjecture". This conjecture says that the moduli spaces of curves in positive characteristic can be reconstructed group-theoretically from the geometric fundamental groups of curves as topological spaces. Moreover, the Homeomorphism Conjecture gives us a new insight into the theory of the anabelian geometry of curves over algebraically closed fields of characteristic p based on the following philosophy: The anabelian properties of pointed stable curves over algebraically closed fields of characteristic p are equivalent to the topological properties of the moduli spaces of admissible fundamental groups.

14. Kyoto University Top Global University Project

The Japanese Government launched a funding project that aims to enhance the international comparability and competitiveness of higher education in 2014. Within this program, Japan Gateway: Kyoto University Top Global Program (KTGU) was selected as one of the projects to lead the internationalization of Japanese universities. Since then, RIMS has, together with the Department of Mathematics, been in charge of the Mathematics Unit of KTGU. Through KTGU, RIMS provides graduate school students with an international research environment by, for example, giving them opportunity to receive instruction from first-class researchers from abroad.

An outline of the project activities and achievements are presented as follows:

- The Math. Unit invites excellent researchers from abroad, including Fields Medalists, as Distinguished Visiting Professors of Kyoto University. (As of September 2020, the number of such researchers is 26.) Staying at Kyoto University for at least one month, these Distinguished Visiting Professors provide intensive lectures, each of which gives a student one credit, and instruct students extensively. Furthermore, as of September 2020, there have been 10 Distinguished Visiting Project Professors and 36 Project Professors who have instructed Ph.D. students here.
- Sub-supervisors are selected from abroad as appropriate professors for instructing Ph.D. students. Supervision of the students is made during visits to or from the supervisors. The numbers of Ph.D. students who completed the course in the years 2015-19 were 3, 7, 5, 9, and 1, respectively. The overseas sub-supervisors belonged to UCLA (U.S.A.), Stanford University (U.S.A.), the University of Bonn (Germany), Imperial College London (U.K.), amongst other universities.
- The Math. Unit provides support for graduate students to travel abroad (for discussions and receiving supervisions), which improves significantly the international research environment for Ph.D. students. The unit provided such support for 7 students (11 universities in 6 countries); 22 students (21 universities in 9 countries); 17 students (22 universities in 12 countries); 19 students

(23 universities in 7 countries); 13 students (18 universities in 7 countries); and 15 students (23 universities in 13 countries) in the years 2015-2019, respectively. Moreover, one workshop is organized every year to promote interaction with overseas young researchers, and also KTGU accepts students from abroad (2 from France, 4 from the U.K., 1 from Spain, and 1 from Finland over the course of the program).

The other activities of the Unit have included international symposia, special lecture meetings, and a MOOC (Massive Open Online Course) “Fun with Prime Numbers.”

In July 2017, we concluded the Global Math Network between the University of Bonn, ENS Paris, Kyoto University, New York University and Peking University) – see Section 6. It is expected that further interactions will be promoted between Ph.D. students in these universities.

In August 2018, we launched a cotutelle double-degree program with École Normale Supérieure de Lyon, and a graduate student started the program from September 2018. He undertakes graduate research in Lyon for half of the year, and the rest of his time is spent in Kyoto.

15. Awards

2012, May, **Kazushige TERUI** (Associate Professor)
RTA 2012 - 23rd International Conference on Rewriting Techniques
and Applications Best paper award

2012, November, **Takuro MOCHIZUKI** (Professor)
Osaka Science Award

2013, March, **Tomoyuki ARAKAWA** (Associate Professor)
Mathematical Society of Japan, Algebra Prize

2013, October, **Shinichi TANIGAWA** (Assistant Professor)
Hiroshi Fuiwara Encouragement Prize for Mathematical Sciences

2014, March, **Hisashi OKAMOTO** (Professor)
JMSJ Best Paper Award 2014

2014, June, **Hiraku NAKAJIMA** (Professor)
Kyoto University Shishi Prize

2014, July, **Hiraku, NAKAJIIMA** (Professor)
Japan Academy Prize

2014, September, **Michio YAMADA and Kenta ISHIMOTO**
(Professor & graduate student)
Award for Outstanding Paper in Fluid Mechanics 2013

2015, March, **Shin HITOTSUMATSU** (Professor Emeritus)
Mathematical Society of Japan, Publication Prize 2015

2015, June, **Kazuhisa MAKINO** (Associate Professor)
JSAI Incentive Award 2014

2015, June, **Masatake MORI and Takuya OOURA** (Professor
Emeritus and Assistant Professor)
4th JSIAM Achievement Award

2015, September, **Kazuhisa MAKINO** (Associate Professor)
FIT2015 Funai Best Paper Award

2016, March, **Kenta ISHIMOTO** (Project Assistant Professor)
Young Scientist Award of the Physical Society of Japan 2016

2016, April, **Ryoki FUKUSHIMA** (Associate Professor)
Young Scientists' Prize for Science and Technology by MEXT 2016

2016, October, **Hisashi OKAMOTO** (Professor)
Hiroshi Fujiwara Prize for Mathematical Sciences

2016, December, **Kazuhisa MAKINO** (Professor)
The 27th International Symposium on Algorithms and Computation
Best Paper Award

2017, January, **Hiraku NAKAJIMA** (Professor)

The Asahi Prize

2017, February, **Takashi KUMAGAI** (Professor)
Inoue Prize for Science

2017, February, **Tatsuyuki HIKITA** (Assistant Professor)
Inoue Research Award for Young Scientists

2017, February, **Kenta ISHIMOTO** (Project Assistant Professor)
Inoue Research Award for Young Scientists

2017, May, **Shigefumi MORI** (Project Professor)
Foreign Member of the Russian Academy of Sciences

2017, May, **Shigefumi MORI** (Project Professor)
National Academy of Sciences members and Foreign Associates

2017, May, **Shigefumi MORI** (Project Professor)
Honorary Doctor of Science, University of Warwick

2017, September, **Yutaka YOSHIDA** (Project Assistant Professor)
Particle Physics Medal: Young Scientist Award in Theoretical Particle Physics

2017, September, **Tomoyuki ARAKAWA** (Associate Professor)
Mathematical Society of Japan, Autumn Prize

2017, November, **Takashi KUMAGAI** (Professor)
Osaka Science Prize

2017, November, **Takashi KUMAGAI** (Professor)
Humboldt Research Award

2018, August, **Masaki KASHIWARA** (Project Professor)
Chern Medal Award

2018, November, **Masaki KASHIWARA** (Project Professor)
Kyoto Prize

2019, April, **Tomoyuki ARAKAWA** (Professor)
Prize for Science and Technology by MEXT 2019

2019, September, **Kazuhisa MAKINO** (Professor)
39th Operations Research Society of Japan Case Study Award

2020, February, **Suguru ISHIKAWA** (Assistant Professor)
Inoue Research Award for Young Scientists

2020, April, **Yusuke KOBAYASHI** (Associate Professor)
Young Scientists' Prize for Science and Technology by MEXT 2019

2020, July, **Masaki KASHIWARA** (Project Professor)
The Order of the Sacred Treasure, Gold and Silver Star

16. RIMS's Response to the Novel Coronavirus (COVID-19)

In 2020, like other institutions around the world, all activities of RIMS have been seriously affected by COVID-19. From March 2020, all the joint research activities were canceled or delayed, and we had to shut down the institute and control access in April, when the Japanese Government declared a state of emergency. RIMS responded to this situation by supporting internet environments and facilities for members and students, and then switched seminars, lectures and meetings to online and promoted teleworking.

RIMS's response to COVID-19 as of September 2020 is summarized as below. The response is available on the website of RIMS and will be updated when it is changed.

16-1. Summary and guidelines

Based on the university's policy and guidelines, RIMS is taking measures to prevent the spread of the Novel Coronavirus (COVID-19) such as practicing thorough disinfection of hands and cough etiquette, ventilating, restricting nonessential visits to the institute in order to reduce close contact with others, conducting remote work and encouraging staggered working hours.

- Wearing masks inside RIMS
- Disinfecting hands regularly
- Practicing cough etiquette
- Providing hand sanitizer
- Ventilating regularly
- Keeping the door of the men's room slightly open
- Self-isolation to monitor health conditions for 2 weeks after arriving in Japan from overseas
- Holding lectures or conferences online
- Restricting nonessential visitors to the institute
- Restricting visitors who have fever
- Restricting visitors from regions under mobility restrictions by authorities
- Conducting remote work
- Encouraging staggered working hours

About preventive measures for infection

RIMS is following the guidelines below.

- Guidelines for the Restriction of Activities to Prevent the Spread of the Novel Coronavirus (Ver.3)
https://www.kyoto-u.ac.jp/en/about/safety/documents/200930_2.pdf
* The level of activity restriction is Level 1 from October 1.
- Manual of Measures to Prevent the Spread of the Novel Coronavirus (COVID-19)
- “Precautions to be Taken Regarding Classes in the First Semester of 2020 (Ver.1)”
https://www.kyoto-u.ac.jp/en/about/safety/documents/201113_2.pdf
* Updated in November 13.
- Restrictions of visitors who have fever over 37.5 °C or 1 °C higher than normal temperature
<http://www.kurims.kyoto-u.ac.jp/~kenkyubu/covid/4.pdf>

In the cases of the COVID-19 infection at RIMS

If members of RIMS or visitors to RIMS are confirmed to be infected by the novel coronavirus, they have to inform General Affairs Section of RIMS promptly. In case visitors of RIMS feel sick, RIMS will provide a place to rest, contact their affiliation or give information of medical facilities. However, RIMS cannot take responsibility beyond this. RIMS asks visitors to come in fully good condition as per the Restrictions of visitors above.

RIMS announces the “Procedures to be followed at RIMS” (see the following URL) to all members. It is available both in Japanese and English, and will be updated depending on the situation.

<http://www.kurims.kyoto-u.ac.jp/en/2020Oct8covid.html>

16-2. For the resumption of RIMS Joint Research Activities

RIMS has made the following guidelines for meetings (workshops, symposia and seminars) hosted as part of its Joint Research Activities. The format of each meeting depends on the Level of Activity Restriction of Kyoto University, which can be checked in the following URL:

<https://www.kyoto-u.ac.jp/en/about/safety/coronavirus.html>

When the Level of Activity Restriction is 2– or higher, the meeting shall be either canceled, postponed to a later date in the same academic year, or held entirely online using Zoom.

When the Level of Activity Restriction is 1, we recommend an online meeting using Zoom. A online hybrid meeting (namely, partly face-to-face meeting) is also possible with capacity restrictions and adequate hygiene measures.

When the Level of Activity Restriction is 0, the meeting may take place physically as usual.

Our staff will ask organizers to decide, at least one month before the first day of the meeting, whether and in which format the meeting shall take place.

RIMS's infection prevention measures

Inside RIMS buildings

- Hand sanitizer is available at the building entrance, at the doors of seminar rooms, and near shared equipment.
- Our staff will clean room equipment (desks, chairs, audio/video devices, door knobs, etc.) daily.
- The capacities of seminar rooms are reduced so that sufficient distance between participants can be maintained.
- Doors and windows are regularly held open for increased ventilation.

- To further reduce the risk, we ask participants to follow some restrictions on the usage of shared equipment and areas within the building.
- The lobby space on the 1st floor will be closed and the tea/water dispensers are not available.

Guidelines for RIMS meetings (Joint Research Activities)

- Daily temperature checks for participants are required, and those exhibiting a symptom are asked not to attend the meeting physically.
 *Note that under our health policy, persons with some typical symptoms (continued cough, fatigue or temperature 1°C higher than normal) are not allowed to participate physically.
- Participants are encouraged to wash hands frequently, and wear a mask.
- Keep a distance of two meters between each other.
- No beverage or snacks should be served in meetings.
- Refrain from dining out as a large group during the period of meetings.
- We provide larger rooms as much as possible for meetings hosted at RIMS.
- Participants from regions under mobility restrictions by authorities are not allowed to participate physically.

Guide to organizing an online event using Zoom

RIMS has made these guides for participants and has put them on the website. Only Japanese versions are available so far, however English translations are in preparation and will be available before long.

- RIMS Guidelines for Organizing Online Joint Research Meetings using Zoom
- Operation Manual for Hosts
- Operation Manual for Guests

Guide to organizing a hybrid (face-to-face and online) meeting at RIMS

RIMS has made an environment for hybrid (face-to-face and online) meetings by using Zoom Video Webinars and the first meeting was held in November. A guide for hybrid meetings is available in Japanese and an English version is in preparation.

As described above, the environments were improved and some online meetings have been held since May. However, host researchers have tended to postpone the meetings and the number of online meetings has not increased as we expected. RIMS will keep on promoting online and hybrid meetings in order to adjust to the new style of research activities that COVID-19 demands.

17. Summary of “Report of the External Review of RIMS” in 2018

Executive Summary

A General Comment

In recent years, more than ever, research in mathematics has shown its relevance to a broad spectrum of issues, some scientific with new interactions with the Physical Sciences, the Life Sciences and in particular with Medicine, and some in direct contact with societal issues through the generalised use of “big data” and machine learning in a number of economically significant activities.

One should not be led to believe that this was possible just through routine applications of longestablished mathematics that one can take off the shelf. To the contrary, it is striking to see how the most abstract branches of fundamental mathematics, resulting from a purely curiosity-driven process, impact a number of recent developments in a completely unpredictable way. This leads to transforming society as a whole and gives an enhanced value both to mathematical knowledge, in particular to recently developed theories, and to people with a solid mathematical training.

Findings

1. Research conducted at RIMS cover several of the most active branches of mathematics, and has even broadened further in recent years. Professors at RIMS are leaders in their fields and recent appointments have strengthened further the Institute. RIMS remains a key asset for Japanese mathematical research.
2. RIMS continues to enjoy a high international recognition and this can be used as the basis for further steps in the internationalisation efforts presently made in Japan in higher education and research.
3. The recruitment of graduate students at RIMS remains selective, especially at the doctoral level. They seem conscious of the high level environment they are exposed to. RIMS also hosts a number of post-docs, some international. To attract more international students would require finding a solution to their funding problem.

4. RIMS operates as a Joint Usage/Research Centre (JU/RC) for the organisation of numerous workshops which are increasingly international. This action, which takes considerable resources, is very much appreciated by the Japanese mathematical community.
5. The 10-year tenure given to assistant professors now in place at RIMS guarantees a flow of junior appointments, which is a very valuable asset. Nonetheless, the Committee noticed that about half of people recruited were already at Kyoto University.
6. The office facilities at the disposal of RIMS remain very inadequate by lack of space and fragmentation. This is unfortunately a long standing problem which, because of its impact on the development of the Institute, was already considered to be a serious impediment in previous evaluation reports.
7. The administrative and technical staff working at RIMS are competent and efficient, and their service is highly valued by the mathematicians at the Institute and visitors.

Recommendations

1. Kyoto University bidding for a new building for RIMS should be reactivated. In the mean time, rationalising the space made available to RIMS to reduce fragmentation between different sites should be addressed as a matter of urgency.
2. RIMS should seek new avenues of funding to support its international mission on the basis of the know how it has accumulated.
3. In its effort for internationalisation, RIMS should bid also for the organisation of international conferences.
4. RIMS should continue to pursue intensively its international search for very high potential mathematicians when posts are vacant.
5. It is advisable for RIMS to continue the diversification of topics, gender and origins represented in its faculty.

NOTE: Full text of “Report of the External Review of RIMS” in 2018 is found on:

<http://www.kurims.kyoto-u.ac.jp/~kenkyubu/RIMSreport2018.pdf>

Current Situation in response to the Recommendations

1. Kyoto University bidding for a new building for RIMS should be reactivated. In the mean time, rationalising the space made available to RIMS to reduce fragmentation between different sites should be addressed as a matter of urgency.

Whilst RIMS has submitted repeated requests to the university for a new building, unfortunately there has been absolutely no progress due to the budget deficit of the government. On the other hand, Kyoto University allowed RIMS to utilize the 2nd floor of the Research Building No. 15 in April 2018, which has slightly eased the shortage of space. As a result, RIMS is currently spread across 5 separate sites. RIMS continues to make efforts to gather the separate sites to one or two buildings.

2. RIMS should seek new avenues of funding to support its international mission on the basis of the know how it has accumulated.

RIMS can report satisfactory progress here in the form of two substantial new grants. With these grants, RIMS activated its International Cooperative Research program, as discussed in Section 5-1, and founded the Center for Research in Next-Generation Geometry, as discussed in Section 7-2.

3. In its effort for internationalisation, RIMS should bid also for the organisation of international conferences.

RIMS has major progress here as well. As discussed in Section 5, RIMS activated the International Cooperative Research program in 2018, and for all the projects (except the long-term researchers one) applications are opened internationally. Moreover, RIMS Workshops of Type C, which is a new category, are exclusively for international researchers.

4. RIMS should continue to pursue intensively its international search for very high potential mathematicians when posts are vacant.

RIMS had two open positions for associate professors and one for an assistant professor this year. In each case, RIMS made the application documents available in both in Japanese and English, announced them through HP, and asked professors to announce them in related international mailing lists.

5. It is advisable for RIMS to continue the diversification of topics, gender and origins represented in its faculty.

As mentioned in Section 2, RIMS hired another female assistant professor from September 2019. (She was recruited directly from a Ph.D. program at the University of Tokyo.) In 2019, RIMS hired one British national (who obtained a Ph.D. at the University of Oxford) for an associate professor position, and one postdoc from Armenia. In the whole area of recruitment, RIMS is very careful about the diversification of topics. RIMS continues to make efforts towards diversification.