

教授 (Professor)

小林 俊行 (KOBAYASHI Toshiyuki)

A. 研究概要

2023 年度は専攻長・数学科長の業務の忙殺され、創作活動と執筆は限定されたものになった。

2019-2023 の 5 年間に於いては、主に以下の 3 テーマの理論構築を行い、総計で約 1,000 ページの論文を著した。また数学の未解決問題の Special Volume の分担執筆を行った [5]。

1. 緩増加等質空間

リー群 G が多様体 X に作用しているとき、ユニタリ表現 $L^2(X)$ がいつ緩増加表現になるかという問題を提起し、数学の異分野との新しい繋がりを追求した (Y. Benoist と共同)。まず、簡約型等質空間 $X = G/H$ に対して、力学系の手法を用いて、 $L^2(X)$ の行列要素の L^p 評価を与え、 $L^2(X)$ が緩増加となるための判定法を発見した [J. Euro. Math. 2015]。次に、 X が簡約型とは限らない場合に、群作用をもつ測度空間に新しい半順序を導入し、ユニタリ表現論の手法を援用して緩増加性の判定法を証明した (第 2 論文 [Chicago Univ. Press, 2022])。第 3 論文 [J. Lie Theory, 2022] で非緩増加な実簡約型等質空間の完全な分類を与え、第 4 論文 [8] では、緩増加性という解析的な性質、リー代数の極限に関する位相的性質、余随伴軌道の幾何的性質、凸多面体の組合せ論的性質の 4 つが同値であることを証明した。またテンソル積表現への応用を [7] で著した。

2. 対称性破れ作用素の構成と分類問題

簡約リー群の無限次元表現の「分岐則」に関して、定性的理論から定量的理論に深化させるプログラムを提起した ([9])。

2.A. (定性的理論) 離散的な分岐則の理論の要となる K' -admissibility の十分条件 ([Ann. Math., 1998] の主定理の 1 つ) が、実は必要十分条件であることをシンプレクティック幾何の手法を用いて証明を与えた [Kostant 追悼論文, 2021]。

2.B. (定性的理論 2) 無限次元表現を部分群に制限したときの重複度が有限・一様有界になるための判定条件を無限次元表現の“大きさ”の言葉を用いて与え、特に、対称対に周期をもつ表現の別の対称対への表現が有界重複度をもつケースを可視的作用の理論を援用して分類した ([6] 他)。

2.C. (定量的理論 1—対称性破れ作用素) 無限次

元表現に対する対称性破れ作用素を、非局所作用素まで含めて構成・分類するプログラムを提唱し [9]、最初の重要な例として、総計 650 頁の長編論文で共形手平坦な部分多様体の微分形式に関する対称性破れ作用素の分類理論を完成させた

2.D. (定量的理論 2—ホログラフィック変換) 対称性破れ作用素の族の双対として“ホログラフィック変換”の概念を導入した [Ann. Inst. Fourier, 2020]。また擬リーマン空間形の離散系列表現の分岐則における離散スペクトラムをホログラフィック変換を用いて構成し、完全に決定した [単著, Adv. Math., 2021]。

2.D. (微分対称性破れ作用素の母関数) 標題の新しい概念の研究を開始した (文献 [1, 2, 3, 4])。

3. 不連続群

筆者の長年のモチーフである「リーマン幾何学の枠組を越えた不連続群」において、スペクトル理論の構築に踏み込んだ。幾何学的な準備として、離散群の作用の不連続性を量的に評価する sharpness という概念を導入し、高次元タイヒミュラー空間上で安定な離散スペクトラムを構成し、長編の論文 [Adv. Math.] を出版した。さらに、長編の第 2 論文 [JLT2019] および [Progr. Math. 2017] で隠れた対称性を用いた微分作用素環の構造定理を証明し、それを標準的な擬リーマン局所対称空間のスペクトル解析に活用した [10]。

For the last five years (–2023), I have been working on the following research topics.

1. Tempered homogeneous spaces

This is a challenge to the global analysis on homogeneous spaces beyond symmetric spaces. Jointly with Y. Benoist [J. Euro. Math. '15], we proved a criterion for L^p -temperedness of the regular representation on G/H in the generality that $G \supset H$ are pair of reductive groups, and in [1] for general H . A complete description of nontempered homogeneous spaces G/H with $H \subset G$ reductive has been accomplished in [JLT2022], and a further connection with other disciplines of mathematics has been explored in [8]. Further references include [7].

2. Restriction of representations: symmetry breaking operators

Branching problems ask the behavior of the restriction of irreducible representations to subgroups. I proposed in [Progr. Math., 2015] a program to advance branching problems for reductive groups, see [9] for further perspectives.

2.A Concerning the discretely decomposability of the restriction of representations, I proved in [Kostant Memorial Vol., 2021] by using symplectic geometry, the converse of one of the main theorems in my earlier paper [Ann. Math., 1998] based on microlocal analysis.

2.B I formulated and proved a criterion for finite multiplicity/bounded multiplicity of the restriction of ‘small’ infinite-dimensional representations to reductive subgroups in a sequence of papers, including [6]. In particular, I established a classification of the triples (G, H, G') such that (G, H) is a symmetric pair and that any irreducible H -distinguished representations have bounded multiplicity when restricted to another symmetric pair (G, G') .

2.C With B. Speh, I classified *symmetry breaking operators* (SBOs) of principal series for a pair of Lorentz groups (Memoirs of AMS 2015 and [Lect. Notes Math. **2234** (2018)]), which give the first successful for the complete classification of SBOs. A part of this work is extended to higher rank case.

2.D As an “inversion” of the symmetry breaking, I introduced the concept of **holographic transform** in [Adv. Math. 2021] and in a joint paper with Pevzner ([Ann. Inst. Fourier 2020]). We also developed the concept of generating operators for SBOs in [1, 2, 3, 4].

3. Analysis on locally symmetric spaces—beyond the Riemannian case

Developing my long motif on discontinuous groups beyond the Riemannian case, I initiated the study on global analysis on locally non-Riemannian symmetric spaces with F. Kassel in [Adv. Math. 2016] and proved the existence of “stable spectrum” under small deformation of discontinuous groups. Further progress includes [Progr. Math. '17], [JLT2019], and [10].

B. 発表論文

(論文は 2023 年以降のものを記載する。2022 年以前の論文は、過去の Annual Report の各年度に記載。)

1. T. Kobayashi, Generating operators of symmetry breaking—from discrete to continuous, 17 pages, accepted for publication in *Indagationes Mathematicae*. Available also at arXiv:2307.16587
2. T. Kobayashi and M. Pevzner, A generating operator for Rankin–Cohen brackets, preprint. 24 pp. arXiv: 2306.16800.
3. T. Kobayashi and M. Pevzner, Generating operators and branching problems, 表現論シンポジウム Symposium on Representation Theory 講演集, pages 111–122, (2023), Eds. Kazufumi Kimoto and Yasufumi Hashimoto.
4. T. Kobayashi and M. Pevzner, A short proof for Rankin-Cohen brackets and generating operators, arXiv 2402.05363, to appear in “Lie Theory and its Applications”, Springer Proc. Math. Stat., Springer-Nature.
5. T. Kobayashi: Conjectures on reductive homogeneous spaces, In J.-M. Morel and B. Teissier, editors, *Mathematics Going Forward: Collected Mathematical Brushstrokes*, Lecture Notes in Mathematics **2313**, pages 217–231. Springer, 2023. DOI: 10.1007/978-3-031-12244-6_17.
6. T. Kobayashi, Bounded multiplicity branching for symmetric pairs, *Journal of Lie Theory*, **33**(1):305–328, 2023. Special Volume for Karl Heinrich Hofmann.
7. Y. Benoist, Y. Inoue, and T. Kobayashi. Temperedness criterion of the tensor product of parabolic induction for GL_n , *Journal of Algebra*, **617**:1–16, 2023. DOI: 10.1016/j.jalgebra.2022.10.029.
8. Y. Benoist and T. Kobayashi, Tempered homogeneous spaces IV. *Journal of the Institute of Mathematics of*

- Jussieu **22**, pages 2879–2906, 2023. DOI: 10.1017/S1474748022000287.
9. T. Kobayashi, Recent advances in branching problems of representations, To appear in Sugaku Expositions, Amer. Math. Soc. arXiv: 2112.00642.
 10. F. Kassel and T. Kobayashi. Spectral analysis on standard locally homogeneous spaces, preprint, 98 pages, ArXiv: 1912.12601.
 11. 小林俊行, リー群とリー代数, 第1回リー群, 数学セミナー, 2024, 4月号, pages 52–57.
- C. 口頭発表
1. (複数のテーマに関する概説講演) (**1.A** と **1.B** は 1 つにまとめる.) **1.A.** Non-commutative Harmonic Analysis, Branching Problems, and Discontinuous Groups. The 7th Tunisian-Japanese Conference: Geometric and Harmonic Analysis on Homogeneous Spaces and Applications in Honor of Professor Toshiyuki Kobayashi. Monastir, Tunisia, 31 October–4 November 2023. **1.B.** On the Crossroads of Global Analysis and Representation Theory. Geometry, Analysis, and Representation Theory of Lie Groups. In Honour of Professor Toshiyuki Kobayashi (organized by Y. Oshima, H. Sekiguchi, T. Kubo, T. Okuda, Y. Tanaka, and M. Kitagawa). The University of Tokyo, 5–9 September 2022.
 2. A Generating Operator for Rankin–Cohen Brackets. (**2.A.** と **2.B.** は内容は異なるが, 大きなテーマとしては繋がっているので1つにまとめる.) **2.A.** 29th Nordic Congress of Mathematicians with EMS. Aalborg, Denmark, 3–7 July 2023. **2.B.** (Plenary Lecture) International Workshop Lie Theory and Its Applications in Physics (LT-15). Varna, Bulgaria, 19–25 June 2023.
 3. “Visible actions” and “only one” — Geometric structure that produces multiplicity-free representations. 東京大学大学院数理科学研究科設立 30 周年記念講演 (The 30th Anniversary Ceremony of the Foundation of the Graduate School of Mathematical Sciences). The University of Tokyo, 15 October 2022.
 4. Multiplicities and discrete decomposability for the restriction. (**4.A.–4.D.** では講演タイトル, 内容は異なるが, 大きなテーマとしては繋がっているので1つにまとめる.) **4.A.** Harish-Chandra’s admissibility theorem and beyond. 18th Discussion Meeting in Harmonic Analysis (In honour of centenary year of Harish Chandra). IIT Guwahati, India, 18–21 December 2023. **4.B.** Harish-Chandra’s admissibility theorem and beyond. Harish-Chandra Centenary Celebrations 2023: Conference on Harish-Chandra. Harish-Chandra Research Institute (HRI) in Allahabad, India, 9–14 October 2023. **4.C.** Representations and Characters: Revisiting the Works of Harish-Chandra and André Weil — A satellite conference of the virtual ICM 2022 (organized by Hung Yean Loke, Tomasz Przebinda, Angela Pasquale, and Binyong Sun). the Institute for Mathematical Sciences, National University of Singapore, Singapore, 9 July 2022. **4.D.** Bounded multiplicity in the branching problems of “small” infinite-dimensional representations, 5 October 2021. リー群論・表現論セミナー (オンライン), 東京大学.
 5. Proper Actions and Representation Theory. (**5.A.–5.I.** では講演タイトル, 内容は個々に異なるが, 大きなテーマとしては繋がっているので1つにまとめる.) **5.A.** Local to Global in Non-Riemannian Geometry, **5.B.** Properness Criterion and its Quantification, **5.C.** Global Analysis on Locally Symmetric Spaces Beyond the Riemannian Case (**5.A, 5.B, 5.C** は 2024 年 1 月 1 日 ~3 日に行った Global Analysis of Locally Symmetric Spaces with Indefinite-metric というテーマの 3 回の連続講演. Zariski Dense Subgroups, Num-

- ber Theory and Geometric Applications. ICTS, Bangalore, India, 1–12 January 2024.) **5.D.** **9.E.** Global Analysis of Locally Symmetric Spaces with Indefinite-metric. Colloquium. Yale University, USA, 17 April 2019. **5.E.** Properness criterion. **5.F.** Discontinuous group, Weil’s local rigidity, and deformation. **5.G.** Tempered Subgroups and tempered homogeneous spaces. (**5.E.**, **5.F.**, **5.G.** は Representations and Characters: Revisiting the Works of Harish-Chandra and André Weil — A satellite conference of the virtual ICM 2022 の 4 連続講演のうちの 3 つ. The Institute for Mathematical Sciences, National University of Singapore, Singapore, 1–15 July 2022. organized by Hung Yean Loke, Tomasz Przebinda, Angela Pasquale, and Binyong Sun). **5.H.** Discontinuous dual and properness criterion (25 April, 2022) **5.I.** The Mackey analogy and proper actions (2 May, 2022) (**5.H.**, **5.I.** は Proper Actions and Representation Theory. Mini-courses of Mini-lectures (Organizers: Pierre Clare, Nigel Higson and Birgit Speh) における 4 つのテーマの講演の 2 つ, AIM Research Community: Representation Theory & Noncommutative Geometry, online), 25 April–16 May 2022.
6. Tempered Homogeneous Spaces. (**6.A.**–**6.K.** では講演タイトル, 内容は個々に異なるが, 大きなテーマとしては繋がっているので 1 つにまとめる.) **6.A.** Tempered homogeneous spaces and tempered subgroups — Dynamical approach **6.B.** Classification theory of non-tempered G/H — Combinatorics of convec polyhedra **6.C.** Tempered homogeneous spaces — Interaction with topology and geometry (**6.A.**, **6.B.**, **6.C.** は Harish-Chandra’s Tempered Representations and Geometry. 18th Discussion Meeting in Harmonic Analysis (In honour of centenary year of Harish-Chandra): Workshop. IIT Guwahati, India, 12-16 December 2023 における 4 連続講演のうちの 3 つ) **6.D.** Tempered subgroups à la Margulis (9 May, 2022) **6.E.** Tempered homogeneous spaces (16 May 2022) (**6.D.**, **6.E.** は Proper Actions and Representation Theory. Mini-courses of Mini-lectures (Organizers: Pierre Clare, Nigel Higson and Birgit Speh) における 4 連続講演のうち 2 つ, AIM Research Community: Representation Theory & Noncommutative Geometry, online), 25 April–16 May 2022. **6.F.** Symmetry in Geometry and Analysis, In honour of Professor Toshiyuki Kobayashi (organized by M. Pevzner and H. Sekiguchi). Reims University, France, 6–10 June 2022. **6.G.** 緩増加な等質空間 (Tempered Homogeneous Spaces). 日本数学会年会函数解析学分科会特別講演 (慶応大学, オンライン), 16 March 2021. **6.H.** Limit Algebras and Tempered Representations. (opening lecture). RIMS Workshop: Lie Theory, Representation Theory and Related Areas. (online), 10 August 2021. **6.I.** Limit Algebras and Tempered Representations. (plenary opening lecture). XIV. International Workshop: Lie Theory and Its Applications in Physics. Bulgaria (online), 20–26 June 2021. **6.J.** Limit algebras and tempered representation. Lie Groups and Representation Theory Seminar. The University of Tokyo, 15 June 2021. **6.K.** This is What I do: Limit algebras and tempered representations. Representation Theory & Noncommutative Geometry. AIM Research Community (online), 8 April 2021.
7. Schrödinger model of minimal representations and branching problems. Minimal Representations and Theta Correspondence: (Gordan Savin 教授還暦記念研究集会). (online), The Erwin Schrödinger International Institute for Mathematics and Physics (ESI), 11–15 April 2022.

8. Regular Representations on Homogeneous Spaces, (**8.A.**–**8.K.** では講演タイトル, 内容は個々に異なるが, 大きなテーマとしては繋がっているので1つにまとめる.) **8.A.** Is representation theory useful for global analysis on a manifold? — Multiplicity: Approach from PDEs, Harish-Chandra’s Tempered Representations and Geometry IIT Guwahati, India, 12-16 December 2023. (Harish-Chandra 生誕 100 年を記念した 4 回の連続講義の第 1 回目) **8.B.** Is representation theory useful for global analysis on a manifold? — Multiplicity: Approach from PDEs, **8.C.** Tempered homogeneous spaces and tempered subgroups — Dynamical approach, **8.D.** Classification theory of non-tempered G/H — Combinatorics of convex polyhedra, **8.E.** Tempered homogeneous spaces — Interaction with topology and geometry, (**8.B.**, **8.C.**, **8.D.**, **8.E.** は Analysis on Homogeneous Spaces における 4 回連続講演, Noncommutative Geometry and Analysis on Homogeneous Spaces. Williamsburg, USA, 16–20 January 2023.) **8.F.** Basic Questions in Group-Theoretic Analysis on Manifolds. MATH-IMS Joint Pure Mathematics Colloquium Series. The Chinese University of Hong Kong, 25 November 2022. **8.G.** A Foundation of Group-theoretic Analysis on Manifolds. Colloquium di dipartimento. Dipartimento di Matematica, Università di Roma “Tor Vergata” (online), 18 February 2021. **8.H.** Representation Theory of Reductive Groups from Geometric and Analytic Methods (in honour of Simon Gindikin). Kavli IPMU, Japan, 27–28 January 2020; **8.I.** Regular Representations on Homogeneous Spaces. (plenary lecture). International Workshop: Lie Theory and Its Applications in Physics (LT-13). Varna, Bulgaria, 17–23 June 2019; **8.J.** Regular Representations on Homogeneous Spaces. (opening lecture). RIMS Workshop: Developments in Representation Theory and Related Topics (organizer: Yoshiki Oshima). RIMS, Kyoto University, 9–12 July 2019; **8.K.** Regular Representations on Homogeneous Spaces. Dynamics of Group Actions (Yves Benoist 教授還暦記念研究集会). Cetraro, Italy, 27–31 May 2019.
9. Global Geometry and Analysis on Locally Symmetric Spaces—Beyond the Riemannian Case. (**9.A.**–**9.D.** では講演タイトル, 内容は個々に異なるが, 大きなテーマとしては繋がっているので1つにまとめる.) **9.A.** Global Analysis of Locally Symmetric Spaces with Indefinite-metric. Colloquium, National University of Singapore. (online), 13 August 2021. **9.B.** Sound of an anti-de Sitter manifold. (opening lecture). Inaugural Day of the French–Kazakhstan school of Mathematics. (online), 25 June 2021. **9.C.** Global Analysis of Locally Symmetric Spaces with Indefinite-metric. Seminar. University of Padova, Italy, 3 June 2019. **9.D.** Global Analysis of Locally Symmetric Spaces with Indefinite-metric. Colloquium. Oklahoma State University, 3 May 2019.
10. Branching Laws for Infinite Dimensional Representations of Real Lie Groups; Symmetry Breaking Operators. (**10.A.**–**10.D.** では講演タイトル, 内容は個々に異なるが, 大きなテーマとしては繋がっているので1つにまとめる.) **10.A.** Branching Problems and Symmetry Breaking Operators. Geometry, Symmetry and Physics. Yale University, USA, 23 April 2019. **10.B.** A Program for Branching Problems in the Representation Theory of Real Reductive Groups: Classification Problem of Symmetry Breaking Operators. Representation Theory inspired by the Langlands Conjectures, in connection with the AMS-AWM Noether lecture by Birgit Speh. Denver,

USA, 17 January 2020. **10.C.** Finite Multiplicity Theorems and Real Spherical Varieties. 松本久義氏還暦記念研究集会, (opening lecture) Tokyo, March 27–29, 2019. **10.D.** Holographic Transform, 20 August, 2021, Workshop on "Actions of Reductive Groups and Global Analysis (Online Tambara), August 17-21, 2021.

D. 講義

1. 数理科学概論 I (文科生) (教養学部文科 1,2 年生, S セメスター, 対面): フェルミ推定, 微積分, Taylor 展開, 偏微分, Lagrange の未定乗数法, 近似と概算, 微分方程式の初歩, 多変数関数の積分を講義した.
2. 数物先端科学 IV/幾何学 XE (数理大学院・4 年生共通講義, A セメスター, 対面): Inspired by the traditional concepts of generating functions for orthogonal polynomials, I have introduced a novel notion called "generating operators" for a family of differential operators between two manifolds. In the lecture, I started with classical examples like the generating functions for Catalan numbers, Jacobi polynomials, and heat kernels. Next, I presented a new explicit formula for the generating operators of Rankin–Cohen brackets using higher-dimensional residue calculus. Subsequently, we delved into some classical analysis of Hilbert spaces of holomorphic functions, including the Hardy space and weighted Bergman spaces. Following that, I explained fundamental ideas of analytic representation theory, using the infinite-dimensional representations of $SL(2, \mathbb{R})$ as an example, and examined intertwining operators and symmetry breaking operators between representations. Finally, I discussed the generating operators for the Rankin–Cohen brackets from the viewpoint of representation theory based on [1, 2, 3, 4].
3. 数学講究 XB (数理科学概説) 「対称性の数

学」, (理学部数学科 4 年生), 2023 年 5 月 9 日.

4. Harish-Chandra's Tempered Representations and Geometry IIT Guwahati, India, 12–16 December 2023. (Harish-Chandra 生誕 100 年を記念した 4 回の連続講義)

I delivered four lectures on some foundational progress in recent years about "Analysis on homogeneous spaces" to graduate students, posdoc researchers, and experts. We discuss what kind of geometry X guarantees a good control of the transformation group on the function space, and the answer brings us naturally to the notion of spherical varieties/real spherical manifolds in f Lecture 1 by using PDEs. In Lectures 2-4 we discussed spectrum of the unitary representation $L^2(X)$ with emphasis on the temperedness criterion. We employ "dynamical approach" in Lecture 2, combinatorics approach in Lecture 3, and "limit algebras" and viewpoints from "geometric quantization" in Lecture 4.

5. Global Analysis of Locally Symmetric Spaces with Indefinite-Metric. Zariski Dense Subgroups, Number Theory and Geometric Applications. ICTS, Bangalore, India, 1–12 January 2024 (1 月 1 日から 3 日にわたる 3 回の連続講義).

Summary: The local to global study of geometries was a major trend of 20th century geometry, with remarkable developments achieved particularly in Riemannian geometry. In contrast, in areas such as pseudo-Riemannian geometry, familiar to us as the space-time of relativity theory, and more generally in pseudo-Riemannian geometry of general signature, surprising little was known about global properties of the geometry even if we impose a locally homogeneous structure. This theme has been developed rapidly in the last three decades. In the series of lectures, I discussed two topics by the general theory and some typ-

ical examples.

(a) Global geometry: Properness criterion and its quantitative estimate for the action of discrete groups of isometries on reductive homogeneous spaces, existence problem of compact manifolds modeled on homogeneous spaces, and their deformation theory.

(b) Spectral analysis: Construction of periodic L^2 -eigenfunctions for the Laplacian with indefinite signature, stability question of eigenvalues under deformation of geometric structure, and spectral decomposition on the locally homogeneous space of indefinite metric.

6. Analysis on Homogeneous Spaces at minicourse. Winter School: Noncommutative Geometry and Analysis on Homogeneous Spaces. Williamsburg, USA, 16–20 January 2023.

I delivered four lectures on some foundational progress in recent years about "Analysis on homogeneous spaces" to graduate students, posdoc researchers, and experts. We discuss what kind of geometry X guarantees a good control of the transformation group on the function space, and the answer brings us naturally to the notion of spherical varieties/real spherical manifolds in Lecture 1 by using PDEs. In Lectures 2-4 I discussed spectrum of the unitary representation $L^2(X)$ with emphasis on the temperedness criterion. We employ "dynamical approach" in Lecture 2, combinatorics approach in Lecture 3, and "limit algebras" and viewpoints from "geometric quantization" in Lecture 4 based on Benoist–Kobayashi [8].

E. 修士・博士論文

1. (課程博士) ベレズ ビクトール (VÍCTOR PÉREZ-VALDÉS): Construction and classification of matrix-valued differential symmetry breaking operators from S^3 to S^2 (3

次元球面から 2 次元球面への対称性破れの行列値微分作用素の構成と分類について).

2. (修士) 青山天馬 (Temma AOYAMA): Deformation of the heat kernel and Brownian motion from the perspective of the Ben Saïd–Kobayashi–Ørsted (k, a) -generalized Laguerre semigroup theory.
3. (修士) 村上怜司 (Reiji MURAKAMI): Branching problem of tensoring two Verma modules and its application to differential symmetry breaking operators (ヴァーマ加群のテンソルの分岐則と微分対称性破れ作用素への応用).

F. 対外研究サービス

1. 日仏数学連携拠点 FJ-LMI (French-Japanese Laboratory of Mathematics and its Interactions), 設立および日本側代表 (vice director) (2023 年 9 月 1 日–).
2. Kavli IPMU(数物宇宙連携機構), 上席科学研究員併任 (2009.8–2011.5); 主任研究員 (Principal Investigator) 併任 (2011.6–2022.3); 連携研究員 (2022.4–).

[ジャーナルのエディター]

3. Editor in Chief, Japanese Journal of Mathematics (日本数学会, Springer-Nature) (2006–)
4. Editor, International Mathematics Research Notices (Oxford 大学出版) (2002–2021)
5. Editor in Chief, Takagi Booklet, vol. 1–22 (日本数学会) (2006–)
6. Editor, Geometriae Dedicata (Springer) (2000–)
7. Editor, Advances in Pure and Applied Mathematics (de Gruyter) (2008–)
8. Editor, International Journal of Mathematics (World Scientific) (2004–)
9. Editor, Journal of Mathematical Sciences, The University of Tokyo (2007–)
10. Editor, Kyoto Journal of Mathematics (2010–)
11. Editor, Representation Theory (アメリカ数学会) (2015–2019)

12. Editor, AMS Translation Series (アメリカ数学会) (2016–)
13. Editor, Tunijian Journal of Mathematics (2017–)
14. Editor, Special Issue in commemoration of Professor Kunihiko Kodaira's centennial birthday (J. Math. Sciences, The University of Tokyo).
15. Editor, Special Issue in honor of Professor Masaki Kashiwara's 70th birthday (Publ. RIMS) 2017–2021.
16. Chief Editor, Mikio Sato's Collected Papers, (Springer-Nature).
17. 共立出版, 『共立講座 数学探検 (全 18 巻)』, 『共立講座 数学の魅力 (全 14 巻 + 別巻 1)』, 『共立講座 数学の輝き (全 40 巻予定)』の 3 シリーズ編集委員
18. 編集委員, 数学の現在 i, e, π , (with 斎藤毅, 河東泰之), 東京大学出版会.
[学会・他大学の委員など]
19. ある国際賞 (数学部門) の授賞委員会: Prize Committee (mathematics), 2020–2021, 国外.
20. ある国際賞の授賞委員会: Prize Committee (mathematics), 2019 および 2020, 国外.
21. ICM2022 における招待講演者および Plenary lecturers の Selection Committee の責任者 (Chair, Lie Theory and its generalizations, ICM2022), 2019–2022.
22. ある国際数学者賞の授賞委員会: Prize Committee (International Prize, 数学部門) 2018, 国外.
23. ある国内の数学の賞 (複数) の授賞委員会 (anonymous, various years).
24. 京都大学数理解析研究所運営委員 (2015–2017; 2017–2019).
25. 京都大学数理解析研究所専門委員 (2007–2009; 2009–2011; 2015–2017; 2017–2019; 2021–).
26. 科学研究費等の審査委員: 日本 (JSPS), 米国 (NSF-AMS), EU, ドイツ, ルクセンブルク, 中華人民共和国・香港 (various years).
27. OIST の数学部門における国際 Advisory Board (2021–).
- [国際研究集会のオーガナイザーなど]
28. オーガナイザー, 日仏数学連携拠点開設記念コンファランス (Opening Conference of French-Japanese Laboratory of Mathematics and its Interactions), April 4–5, 2024 (with M. Pevzner).
29. オーガナイザー, Periods and Branching Problems for Representations of Real, p -adic and Adelic Groups, BIRS Conference, Canada, July 2024 (with M. Pevzner, B. Speh).
30. オーガナイザー, Summer School on Representation Theory, リー群の群作用と大域解析に関するセミナー, (virtual 玉原国際セミナーハウス), August 19–23, 2023 (オンライン).
31. オーガナイザー, Summer School on Representation Theory, リー群の群作用と大域解析に関するセミナー, (virtual 玉原国際セミナーハウス), August 17–21, 2022 (オンライン).
32. オーガナイザー, Summer School on Representation Theory, リー群の群作用と大域解析に関するセミナー, (virtual 玉原国際セミナーハウス), August 17–21, 2021(オンライン).
33. オーガナイザー, Integral Geometry, Representation Theory and Complex Analysis, Kavli Institute for the Physics and Mathematics of the Universe, 27–28 January 2020.
34. オーガナイザー, 高木レクチャー, 第 24 回 (東京大学 IPMU, 2019 年 12 月); 第 23 回 (京都大学数理研, 2019 年 6 月) (with Y. Kawahigashi, T. Kumagai, H. Nakajima, K. Ono and T. Saito).
35. オーガナイザー, Summer School on Representation Theory, リー群の群作用と大域解析に関するセミナー, (virtual 玉原国際セミナーハウス), 18–22 August 2020 (オンライン).
36. オーガナイザー, Summer School on Representation Theory, リー群の群作用と大域解析に関するセミナー, 玉原国際セミナーハウ

ス, 20–24 August 2019.

37. オーガナイザー, リー群論・表現論セミナー (2007–present 東大; 2003–2007 RIMS; 1987–2001 東大)
38. オーガナイザー, 日仏数学連携拠点, FJ-LMI セミナー, 2023.10– (with M. Pevzner).
39. 群馬県立太田高等学校の大学訪問, 模擬講義, 2023年11月8日.
40. Scientific Committee, “Representation Theory and Non Commutative Geometry” at IHP 2025, Paris, France.

G. 受賞

1. Doctrat Honoris Causa (University of Reims), 2022, France.
2. 日本数学会出版賞 (2019) 『数学の現在 i, e, π 』東京大学出版会, (斎藤毅氏, 河東泰之氏との共同受賞).
3. アメリカ数学会フェロー (2017) 「簡約リー群の構造論と表現論に対する貢献」(Contribution to Structure Theory and Representation Theory of Reductive Lie groups).
4. 紫綬褒章 (Medal with Purple Ribbon)(2014) 「数学研究」.
5. [学生の受賞] 東京大学学位記授与式における総代, Víctor Pérez-Valdés (2023年度 (2024年3月), 総代), 東京大学学位記授与式における総代, 甘中一輝 (2020年度 (2021年3月), 総代・答辞), 田森宥好 (2019年度 (2020年3月), 総代).

H. 海外からのビジター

1. M. Pevzner (University of Reims, France), September 2023–, French-Japanese Laboratory of Mathematics and its Interactions, director.
2. Wen Tao Teng (JSPS PosDoc), October 2023–. He is working on the (k, a) -generalized Fourier transforms.
3. 郡山幸雄 (エコールポリテクニーク, France), (2024.3.31–2024.4). Giving an invited lecture at Opening Conference of French-Japanese Laboratory of Mathematics and its Interactions における招待講演 (Deriving Egalitarian and Proportional Principles

from Individual Monotonicity) を行う.

4. Étienne Ghys, (CNRS, École Normale Supérieure de Lyon, France), (2024.3.31–2024.4). Giving an invited lecture at Opening Conference of French-Japanese Laboratory of Mathematics and its Interactions における招待講演 (Linking numbers of modular knots) を行う.
5. Jean-Pierre Bourguignon (IHES, France), (2024.3.31–2024.4). Giving an invited lecture at Opening Conference of French-Japanese Laboratory of Mathematics and its Interactions における招待講演 (Mathematicians and Spinors) を行う.