❀ 日 本 数 学 会

2023年度年会

英 文 サ マ リ 集

2023年3月

於　中央大学

2023 日本数学会
年会プログラム

	第 I 会場 5号館5階 5533教室	第 II 会場 5号館3階 5333教室	第 III 会場 5号館3階 5335教室	第 IV 会場 5号館3階 5336教室	第 V 会場 5号館2階 5233教室	第 VI 会場 5号館2階 5234教室	第 VII 会場 5号館2階 5235教室	第 VIII 会場 5号館2階 5236教室	第 IX 会場 5号館1階 5138教室
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	企画特別講演　13:00～14:00								
	特 別 講 演 15:00～16:00 16:15～17:15	特 別 講 演 16:15～17:15	特 別 講 演 14:20～15:20	特 別 講 演 16:30～17:30	特 別 講 演 14:15～15:15 15:30～16:30	特 別 講 演 16:30～17:30	特 別 講 演 15:45～16:45	特 別 講 演 14:15～15:15 15:30～16:30	特 別 講 演 10:30～11:30 17:00～18:00
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	日本数学会賞授賞式 （5号館 5階 5534教室） ·· (14:30～15:05) 総 合 講 演（ 〃 ） 日本数学会賞春季賞受賞者 ············· (15:20～16:20) 日 比 孝 之（阪　大*）············· (16:35～17:35)								
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	企画特別講演　13:00～14:00								
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	企画特別講演　13:00～14:00								
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総 合 講 演

3月16日(木) 総合講演会場

2023年度日本数学会賞春季賞受賞講演
日本数学会賞春季賞受賞者 ·· (15:20〜16:20)
Spring Prize Winner

日 比 孝 之 (阪　　　　大*)　多面体と単項式 ······································· (16:35〜17:35)
Takayuki Hibi （Osaka Univ.*)　Polytopes and Monomials

概 要　The theory of convex polytopes, which has its origins in Euler's theorem (1752) and Pick's formula (1899), is one of the traditional areas of combinatorics. It underwent a dramatic change in trend around 1970. Backed by the trend from abstract to concrete, a fascinating contact of convex polytopes with commutative algebra was discovered, and a bridge was built from the abstract theory of commutative algebra to the concrete theory of convex polytopes. The bridge simultaneously fostered a movement to reimport combinatorial techniques back into commutative algebra, inviting the birth of the rich soil of so-called "commutative algebra and combinatorics" from the mid-1980s, which led to a historic development of commutative algebra for monomial ideals. Later, in the 1990s, with the rapid development of computers and the evolution of software, the theory of convex polytopes took on the color of computational algebra and benefited from Gröbner bases, which is a treasure trove of techniques. This plenary talk will overview the trends in convex polytopes and commutative algebra in the last half-century since 1970 and furthermore report on current of study for reflexive polytopes and Castelnuovo polytopes.

企 画 特 別 講 演

3月15日（水）

第 I 会場

特別招待講演（日本応用数理学会）

吉 田 真 紀（情報通信研究機構）　NewSpace セキュリティ ―民間事業者による宇宙開発のための暗号理論― ··· (13:00〜14:00)

Maki Yoshida
(Nat. Inst. Information Comm. Tech.)　NewSpace security ―Cryptography for space development by private companies―

概 要　In the recent NewSpace era, many small satellites have been launched on various academic or commercial missions. A low cost yet highly secure wireless communication has been desired for small satellites and small launch vehicles, for protecting their critical commands and valuable data transmissions. I would like to first explain requirements that are indispensable in such context and whether the various types of cryptography used in existing network systems satisfy them or not. I will then show our approach and results that establish high security and low implementation cost. The latest flight test conducted on July 31, 2021 achieves successful downlink transmission of 34Mbytes at a practical effective bandwidth of 512kbps.

第 VI 会場

横 山 啓 太（東 北 大 理）　自然数論のモデルと逆数学 ···························· (13:00〜14:00)

Keita Yokoyama (Tohoku Univ.)　Models of arithmetic and reverse mathematics

概 要　Reverse mathematics is an ongoing program in the field of mathematical logic whose aim is to classify mathematical theorems by their logical strengths. Then, how can we say that one theorem τ is logically different from another theorem σ? One way to show this is to construct a mathematical structure which satisfies τ (together with some basic axioms) but not σ. In this talk, I will introduce several types of structures (models) of axioms for the natural number systems (arithmetic) and show some examples of classifications of mathematical theorems from the viewpoints of model theory.

3月17日（金）

第 I 会場

平 岡 裕 章（京 大 高 等 研）　パーシステントホモロジー: 理論と応用 ················ (13:00〜14:00)

Yasuaki Hiraoka (Kyoto Univ.)　Persistent homology: theory and application

概 要　Topological data analysis (TDA) has emerged in this century and shed new light on data science. A particularly important tool in TDA is persistent homology, which can provide useful information about ”shape of data” in a multi-scale way. Much of the development of theoretical research on persistent homology has been motivated by applications. This talk will survey the progress of persistent homology from the perspective of both mathematical and applied research.

第Ⅲ会場

石 橋 　 典（東 北 大 理）　クラスター代数と曲面のトポロジー ····················· (13:00〜14:00)
Tsukasa Ishibashi (Tohoku Univ.)　　Cluster algebras and the topology of surfaces

概 要 Since its foundation by Fomin–Zelevinsky (2001), the study of cluster algebras has been developed with fruitful connections with various areas of mathematics, such as topology, representation theory, integrable systems, mirror symmetry, and so on. It focuses on a common combinatorial structure, called cluster transformations, which typically arises as coordinate transformations on a certain space, such as the decorated Teichmueller space of Penner (1987). Its geometric aspect is formulated as cluster varieties by Fock–Goncharov (2006). One of the motivating examples is the moduli space of decorated (twisted) G-local systems on a marked surface, which includes the decorated Teichmueller space in the case G=SL(2).
In this talk, I would like to talk on the interplay between the cluster algebras and the topology of surfaces, with a focus on the geometry and cluster structure of the moduli space mentioned above. I also mention recent developments on its quantization via the quantum cluster algebra and the relation to the skein theory.

第Ⅴ会場

小 川 卓 克（東 北 大 理）♭ 端点最大正則性と臨界型非線型問題への応用 ············· (13:00〜14:00)
Takayoshi Ogawa (Tohoku Univ.)　　End point maximal regularity and its application to a critical nonlinear problem

概 要 Maximal regularity for the abstract Cauchy problem of evolution equations is well developed in the Lebesgue-Bochner space $L^\rho(I;X)$, where $1 < \rho < \infty$, I is a time interval and X is the UMD Banach space. If X is UMD then it is necessarily reflexive and maximal regularity in non-reflexive Banach spaces is depending on each setting. In this talk, we consider the end-point case $\rho = 1$ in the homogeneous Besov space $X = \dot{B}^s_{p,1}(\mathbb{R}^n_+)$ in the half Euclidean space. We then apply it to the initial boundary value problem of some nonlinear evolution equations such as the Navier-Stokes equations.

3月18日（土）

第Ⅲ会場

山 崎 雅 人（東 大 ＩＰＭＵ）　可積分系とチャーン=サイモンズ理論 ·················· (13:00〜14:00)
Masahito Yamazaki (Univ. of Tokyo)　　Integrability and Chern-Simons Theory

概 要 Integrable models, which are "exactly solvable", lie at the intersections of many different topics/areas in mathematics and physics. However, many of the existing results are gradually built up through decades of research, and often involve trials and errors. This makes it newcomers (including myself) to learn the subject. One might therefore hope to find a new conceptual framework for understanding integrable models from scratch. In this lecture, I will discuss recent developments (in collaboration with Kevin Costello and Edward Witten, among others) in understanding integrable models from the perspective of the "four-dimensional Chern-Simons theory." This is a precise analog to Witten's explanation of knot invariants from the three-dimensional Chern-Simons theory, but is based mostly on perturbative methods of quantum field theory, which can be formulated mathematically. If time allows, I will also discuss more recent developments concerning affine Yangians (and quantum toroidal algebras) and five-dimensional version of the Chern-Simons theory. The developments covered in this lecture give rise to many new mathematical structures, many of which are yet to be fully studied in mathematics.

第VI会場

浅 芝 秀 人
(静岡大*・京大高等研・阪公大数学研)

Hideto Asashiba
(Shizuoka Univ.*/Kyoto Univ./Osaka Metro. Univ.)

クイバー表現のパーシステンス加群への応用: 区間加群による近似と分解 ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ (13:00〜14:00)

Applications of quiver representations to persistence modules: approximations and resolutions by interval modules

概 要　In topological data analysis, an input datum is given as a point cloud P, which is a set of points in $\mathbb{R}^d$ for some positive integer d. Then for each r with $0 \leq r \leq d$ an r-th persistent homology $H^r(P)$ of P over a field $\Bbbk$ is calculated, which is a representation of an equi-oriented type A_n quiver Q for some positive integer n over the field $\Bbbk$. By Gabriel's theorem, the "interval" representations V_I ($I := [a, b], 1 \leq a \leq b \leq n$) of Q form a complete list of indecomposable representations of Q. For each representation M of Q, let $d_M(I)$ be the multiplicity of V_I in the indecomposable decomposition of M. Then $d_M := (d_M(I))_I$ is a complete invariant up to isomorphisms of M by the Krull–Schmidt Theorem. The family $(H^r(P))_{0 \leq r \leq d}$ contains information on P valuable in applications, which is analyzed by the the persistence diagrams $d_{H^r(P)}$ of $H^r(P)$ ($0 \leq r \leq d$). When P varies with another parameter, say, time, it yields a 2D persistence module. In general, persistence modules M are understood as modules over the path algebra (or category) A of an acyclic quiver Q with full commutativity relations. (Thus A is regarded as the incidence algebra of a poset.) We deal only with the case where Q is a finite quiver. Unlike the 1-parameter case, there are an infinite number of indecomposables in the general case, which makes it difficult to use d_M in real time. The interval representation above is generalized as an interval module V_I consisting of $\Bbbk$ and the identity of $\Bbbk$ as a representation of Q whose support I forms a connected and convex subquiver of Q. Instead of using d_M, we use approximations of M by (direct sums of) interval modules in two senses.

数 学 基 礎 論 お よ び 歴 史

3月15日(水)　　第Ⅸ会場

9:30〜10:15

1　只 木 孝 太 郎（中 部 大 工）　アルゴリズム的ランダム列が満たす実効的大数の法則とその収束速度限界
$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Kohtaro Tadaki (Chubu Univ.)　An effectivization of the law of large numbers for algorithmically random sequences and its absolute speed limit of convergence

概 要　In this talk, we show that the law of large numbers can be effectivized for an arbitrary Schnorr random infinite sequence, with respect to an arbitrary computable Bernoulli measure.　Actually, we show that an absolute speed limit of convergence in this effectivization exists and it equals 2 in a certain sense.

2　鈴 木 悠 大（東 北 大 理）　On the Weihrauch degrees between $\mathsf{C}_{\omega^\omega}$ and ATR $\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15
　　横 山 啓 太（東 北 大 理）

Yudai Suzuki　　(Tohoku Univ.)　On the Weihrauch degrees between $\mathsf{C}_{\omega^\omega}$ and ATR
Keita Yokoyama (Tohoku Univ.)

概 要　A binary relation over the Cantor space 2^ω is called a Weihrauch problem.　In this talk, we introduce ω-model reflection for Weihrauch problems and show that the ω-model reflection of ATR_2 gives an upper bound for problems provable from $\mathbf{ATR}_0$ in the context of reverse mathematics.　We also consider the complexity of the existence of fixed point for monotone operators (FP) and its variations (LFP) from the viewpoint of Weihrauch degrees.　We will show that LFPs form a linear hierarchy between the ω-model reflection of ATR_2 and $\mathsf{C}_{\omega^\omega}$.

10:30〜11:30　特別講演

藤 原　　誠（東 京 理 大 理）　半直観主義算術の階層と保存拡大定理

Makoto Fujiwara (Tokyo Univ. of Sci.)　Hierarchy of semi-classical arithmetic and conservative extension theorems

概 要　It is well-known that classical arithmetic PA is Π_2-conservative over intuitionistic arithmetic HA. Using a generalized negative translation, we relativize this result with respect to theories of semi-classical arithmetic, which lie in-between PA and HA. In particular, it follows from our main result that PA is Π_{k+2}-conservative over HA $+$ Σ_k-LEM where Σ_k-LEM is the low-of-excluded-middle scheme for formulas of Σ_k form.　In addition, we show that this conservation theorem is optimal in the sense that for any semi-classical arithmetic T, if PA is Π_{k+2}-conservative over T, then T proves Σ_k-LEM. In the same manner, we also characterize conservation theorems for other well-studied classes of formulas by fragments of classical axioms or rules.　This reveals the entire structure of conservation theorems with respect to the arithmetical hierarchy of classical principles.　This is a joint work with Taishi Kurahashi.

14:15〜14:30　　歴史部門懇談会

14:30〜16:45

3　田 村　　誠　　　　　　　　『緝古算経』の方程式について ································· 15
　　　　　（大阪産大全学教育機構）
　　張 替 俊 夫
　　　　　（大阪産大全学教育機構）

Makoto Tamura (Osaka Sangyo Univ.)　On the equations of "Continuation of Ancient Mathematics"
Toshio Harikae (Osaka Sangyo Univ.)

概 要　"Continuation of Ancient Mathematics" was written by early Tang dynasty calendarist and mathematician Wang Xiaotong some time after the year 626, and is known as the oldest extant book solving cubic equations. In this talk, we list up its equations and mention the features of them.

4　張 替 俊 夫　　　　　　　　『緝古算経』の逸文の復元について ······························ 15
　　　　　（大阪産大全学教育機構）
　　田 村　　誠
　　　　　（大阪産大全学教育機構）

Toshio Harikae (Osaka Sangyo Univ.)　On restration of lost chinese text in Continuation of Ancient Mathematics
Makoto Tamura (Osaka Sangyo Univ.)

概 要　"Continuation of Ancient Mathematics" was written by early Tang dynasty calendarist and mathematician Wang Xiaotong some time after the year 626, and was listed as one of the Ten Computational Canons compiled during Tang dynasty. The aim of this talk is to provide a restration of lost chinese text in "Continuation of Ancient Mathematics."

5　脇　　克 志（山 形 大 理）　和算書内図形領域抽出の精度評価 ································ 15

Katsushi Waki (Yamagata Univ.)　Evaluation of the accuracy of extracting graphic regions in a WASAN book

概 要　In this presentation, we first present a workflow for extracting graphic regions in a WASAN book, which is necessary for creating a WASAN database, using the Hough transform, and evaluate the accuracy of the extraction. In the latter half of the presentation, we will show how the character "now," which is the starting point of the graphic problem, is extracted using artificial intelligence and used to determine the graphic region for the rectangular combined region, which is a candidate for the graphic region.

6　小 川　　束　　　　　　　　岡之只『妙矩集』における数学思想の独立性に関する問題 ·········· 15
　　　　　（四日市大関孝和数学研）

Tsukane Ogawa (Yokkaichi Univ.)　Problems related to the uniqueness of mathematical thought in Oka Yukitada's *Collection of Exquisite Formulae*

概 要　I present some arguments and summarize the current state of affairs regarding the originality of the mathematical thought of Oka Tadayuki (1791-?), that is, whether his mathematical methods and ideas were unique to him or not. In particular, I suggest that his use of the term "pole" is one clue, even though no new historical documents have been discovered at present.

7　真 島 秀 行（お茶の水女大⋆）　"Seki Takakazu, his life and bibliography" 補遺 ··················· 15

Hideyuki Majima (Ochanomizu Univ.⋆)　Supplement to the paper "Seki Takakazu, his life and bibliography"

概 要　We will talk about some episodes concerning to the discovery of Seki Takakazu's carrer in the Kofu clan.

概 要 We will give some theoretical meaning on the calculation of the number Pi by Seki Takakazu and Takebe Katahiro. Seki found the so-called Aitken's delta-sequenced process in his theory, but there were some errors in his calculation and he only claimed that his approximate number of Pi was a little bit less than 3.14159265359. Takebe Katahiro followed Seki's method and discovered another method of calculation of Pi.

概 要 The author talked about the works of SEKI Takakazu (?-1708), and TAKEBE Katahiro (1664-1739) on Pi. In this time, we propose to build a stone monument near his tomb in Jorinji Temple, because of his significant work concerning to Pi.

概 要 Regarding the random motion, including Brownian motion, Kiyoshi Ito et al. constructed a probabilistic representation, based on P. Levy's point of view. D. Mumford wrote "The Dawning of the Age of Stochasticity", the basic object of study in probability is the random variable and he argues that it should be treated as a basic construct, like spaces, groups and functions, and it is artificial and unnatural to define it in terms of measure theory. This time, based on D. Mumford's article, we discuss stochasticity based on its historical background.

17:00〜18:00　特別講演

小 林 龍 彦　　　　　　　　　新『関孝和全集』の編集を終えて
(前橋工科大*・四日市大関孝和数学研)

Tatsuhiko Kobayashi　　　　　Finishing the editing of the new Seki Takakazu's Collected Works
(Maebashi Inst. of Tech.*/Yokkaichi Univ.)

概要　Seki Takakazu's life and his mathematical achievements were published in the Takakazu Seki's Collected Works (Osaka Kyouiku Tosho, 1974), edited by Akira Hirayama and others. In the compilation of historical sources, it is natural to check the content of the descriptions in the documents, but issues relating to their history and the authenticity of the sources must also be carefully considered. The collected works by Akira Hirayama and others was carefully compiled based on detailed research. However, a detailed examination of the documents included in this collected works reveals that the compilation was not based on sufficient historical criticism. In June 2023, a new edition of the Seki Takakazu's Collected Works, edited by Kenji Ueno, Tsukane Ogawa, Tatsuhiko Kobayashi and Kenichi Sato will be published by Iwanami Shoten, publishers. The new collected works consists of three volumes with approximately 4000 pages. Volume 1 introduces Seki's life and his mathematical achievements based on new historical documents discovered. Volume 2 is a collection of transliteration from books and manuscripts which written in classical Chinese relating to Seki's mathematical achievements. In preparing these, the editors conducted a comprehensive survey of relevant sources scattered throughout Japan, and then collated the different editions. Volume 3 is a collection of historical documents related to Seki's research on calendrical calculations and his life. In addition, the book contains the writings of his disciples, various records and statements by contemporary mathematicians. Many aspects of Seki Takakazu's life and his biography remain unclear. For this reason, genealogical records relating to the Seki family and him have been included. In this lecture we will introduce the editorial policy of the new Seki Takakazu's Collected Works, how the authenticity of Seki's writings was judged etc.

3月16日(木)　　第IX会場

9:15〜12:15

11　薄 葉 季 路 (早 大 理 工)　　Monotinicity of ultrafilter numbers ······························ 15
Toshimichi Usuba (Waseda Univ.)　　Monotinicity of ultrafilter numbers

概要　We consider monotonicity of ultrafilter numbers of infinite cardinals. We show that if there are cardinals $\lambda < \kappa$ with $\mathfrak{u}(\kappa) < \mathfrak{u}(\lambda)$, then there is an inner model of a large cardinal. Hence the failure of monotinicity of ultrafilter numbers has large cardinal strength.

12　竹 内 耕 太 (筑波大数理物質)　　On the indivisibility of metric structures ······················· 15
Kota Takeuchi (Univ. of Tsukuba)　　On the indivisibility of metric structures

概要　An ifinite L-structure M is said to be indivisible if for any patition $M = X_0 \sqcup X_1$ there is $i < 2$ such that X_i contains an isomorphic copy of M. Many important structures, such as infinite sets, random garphs, countable dense linear order, in model theory has this property. Recently, many structures with metrics are studied by model theorists using continuous model theory. So it seems that investigating the indivisibility of metric structures are interseting from the point of view of continuous logic. In this talk we discuss about the indivisibility of Urysohn universal spaces, which was proven by Sauer.

13　桔 梗 宏 孝（神戸大システム情報）　Hrushovski の擬平面の構造について ···························· 15
Hirotaka Kikyo　(Kobe Univ.)　On the structure of Hrushovski's pseudoplanes

概 要　We discuss the structure of Hrushovski's pseudoplanes. In the definition of the Hrushovski's pseudo-planes associated to an irrational number α, good approximations k_n/d_n of α from the above are introduced. For each n, a tree B_n with k_n nodes, d_n edges and $d_n + 1$ vertices is introduced. B_n is a biminimal zero extension of the set of its leaves. Let B_∞ be the union of all B_n. Let M be the Hrushovski's pseudoplane associated to α. Let $D_n < M$ be a copy of B_n in M. Let a be a node of D_n and F_n the set of leaves of D_n. The closure of the orbit of a over F_n will be whole M. Let $D_\infty < M$ be a copy of B_∞ and let be the set of leaves of D_∞. Let a be a node of D_∞. We discuss the non-superstability of M by considering the type of a over some finite subset F of F_∞ and also discuss on the orbit of a over F_∞.

14　坪 井 明 人（筑 波 大★）　Ramsey's theorem and coheir sequences ························· 10
Akito Tsuboi (Univ. of Tsukuba★)　Ramsey's theorem and coheir sequences

概 要　Ramsey's theorem is very easy to prove. However, its relation to the notion of coheir sequences, which is quite important in model theory, has not been discussed much. Here we present a result that illustrates the relationship between the two.

15　L. Pacheco　（東 北 大 理）　Fixed-points in epistemic logic ································ 15
　　田 中 一 之（東 北 大 理）
Leonardo Pacheco (Tohoku Univ.)　Fixed-points in epistemic logic
Kazuyuki Tanaka (Tohoku Univ.)

概 要　The μ-calculus is an extension of modal logic by least and greatest fixed-point operators. Its alternation hierarchy characterizes formulas by the entanglement of their fixed point operators. While the alternation hierarchy is usually strict, in many settings it may collapse. We study the consequences of the strictness or the collapse in epistemic logic. We show that different axioms for knowledge imply in different numbers of possible degrees of ignorance. We also show that if we consider two or more agents simultaneously, the alternation hierarchy is strict.

16　倉 橋 太 志（神戸大システム情報）　Friedman–Goldfarb–Harrington の定理の拡張 ····················· 15
Taishi Kurahashi (Kobe Univ.)　Extensions of the Friedman–Goldfarb–Harrington theorem

概 要　We investigate the Friedman–Goldfarb–Harrington theorem. In the frameworks of classical and modal propositional logics, we study the forms of sentences whose existence is guaranteed by the FGH theorem.

17　倉 橋 太 志（神戸大システム情報）　単調性を満たす証明可能性述語の様相論理 ························ 15
　　小 暮 晏 佳（金 沢 大 理 工）
Taishi Kurahashi (Kobe Univ.)　Monotonic modal logics of provability predicates
Haruka Kogure (Kanazawa Univ.)

概 要　We investigate modal logical aspects of provability predicates $\mathrm{Pr}_T(x)$ satisfying the following condition:
M: If $T \vdash \varphi \to \psi$, then $T \vdash \mathrm{Pr}_T(\ulcorner \varphi \urcorner) \to \mathrm{Pr}_T(\ulcorner \psi \urcorner)$.
We proved the arithmetical completeness theorems for monotonic modal logics MN, MN4, MNP, MNP4, and MND with respect to provability predicates satisfying the condition **M**.

18　岩 田 荘 平（神戸大システム情報）　Sacchetti の論理のカット除去可能性について ····················· 15

Sohei Iwata　　　（Kobe Univ.）　The cut-elimination theorem for Sacchetti's logics

概 要　Sacchetti showed the modal logics $\mathbf{wGL}_n$ (Here $\mathbf{wGL}_n$ is obtained from the provability logic $\mathbf{GL}$ by replacing the axiom $\Box(\Box A \to A) \to \Box A$ by an weaker one $\Box(\Box^n A \to A) \to \Box A$.) have the fixed-point property. Moreover, these logics also have desirable properties (for instance, the Lyndon interpolation property, arithmetical completeness, effective constructibility of fixed-points, etc.). We investigate them in the point of view of proof theory. We introduce sequent calculi for $\mathbf{wGL}_n$ and give a purely syntactical proof of the cut-elimination property for these calculi.

19　大 川 裕 矢（千 葉 大 理）　様相論理 $\mathbf{IL}^-(\mathbf{P})$ について ···································· 15
　　岩 田 荘 平（神戸大システム情報）
　　倉 橋 太 志（神戸大システム情報）

Yuya Okawa　　　（Chiba Univ.）　The logic $\mathbf{IL}^-(\mathbf{P})$
Sohei Iwata　　　（Kobe Univ.）
Taishi Kurahashi（Kobe Univ.）

概 要　The logic $\mathbf{IL}^-(\mathbf{P})$ is obtained by adding the persistence principle $\mathbf{P} : A \rhd B \to \Box(A \rhd B)$ to the sublogic $\mathbf{IL}^-$ of the basic interpretability logic $\mathbf{IL}$. We investigate $\mathbf{IL}^-(\mathbf{P})$ from several perspectives. Firstly, we show that $\mathbf{IL}^-(\mathbf{P})$ has a weak version of fixed-point property. Secondly, we show that $\mathbf{IL}^-(\mathbf{P})$ is a natural basis for some relational semantics. Thirdly, we introduce a system of sequent calculus for $\mathbf{IL}^-(\mathbf{P})$, and prove the cut-elimination theorem for it. Finally, we show that $\mathbf{IL}^-(\mathbf{P})$ is sound and complete with respect to a suitable arithmetical semantics.

12:15〜12:30　数学基礎論および歴史分科会総会

代　数　学

3月15日(水)　第I会場

9:00〜12:00

1　丹 原 大 介　　　　　　　♭　長方形の条件をみたす $\mathbf{R}^2$ の直線図形について ······················ 10
Daisuke Tambara　　　　　　A linear figure in the Cartesian plane satisfying a condition of rectangle

概要　We say a subset X of the Cartesian plane $\mathbf{R}^2$ satisfies the rectangle condition if for any points (x_1, y_1), (x_1, y_2), (x_2, y_1) of X the point (x_2, y_2) also belongs to X. We are interested in what restrictions on the shape of X the condition imposes. We consider the case where X is a linear figure in the sense that X is a finite union of segments and points. Our result is about the shape of a connected component of X satisfying the rectangle condition.

2　安 部 利 之 (愛媛大教育)　原田予想 II とグラム行列式 ································· 10
Toshiyuki Abe　(Ehime Univ.)　Harada's conjecture II and Gramian determinants

概要　We consider Harada's conjeture II for finite groups G. The conjecture states that the number $h(G)$ defined as a ratio of the product of all sizes of conjugacy classes and thay of all irreducible degrees of G is an ineteger. We see that the square $h(G)^2$ is given as a quotient of Gramian determinat for suitable basis of the center of the group algebra $\mathbb{C}G$ by a product of all sizes of centalizers of representatives of conjugacy classes. We generalize $h(G)^2$ to numbers $\mu_\phi(G)$ associated to a pair of (Z, ϕ) of central subgroup Z and its irreducible character ϕ, and give a factrozation theorem of $h(G)^2$ to of these numbers $\mu_\phi(G)$ for fixed Z. We will show some examples.

3　田 邊 顕 一 朗 (東京都市大共通教育)　非退化偶格子に付随する頂点代数の不変部分代数のフュージョン則 ···· 15
Kenichiro Tanabe (Tokyo City Univ.)　Fusion rules for the fixed point subalgebra of the vertex algebra associated with a non-degenerate and non-positive definite even lattice by an automorphism of order 2

概要　Let V_L be the vertex algebra associated with a non-degenerate and non-positive definite even lattice L and V_L^+ the fixed point subalgebra of V_L under the action of the automorphism induced from the -1-isometry of L. We determine the fusion rules for weak V_L^+-modules.

4　鈴 木 武 史 (岡 山 大 理)　Cylindric skew Young 図のフック長公式について ··················· 15
　豊 澤 由 貴
Takeshi Suzuki (Okayama Univ.)　On hook formulas for cylindric skew diagrams
Yoshitaka Toyosawa

概要　We present a conjectual hook formula concerning the number of the standard tableaux on "cylindric" skew diagrams. Our formula can be seen as an extension of Naruse's hook formula for skew diagrams. Moreover, we prove our conjecture in several cases.

5　吉 井　　豊 (茨 城 大 教 育)　単純代数群の超代数のある部分代数に関するいくつかの結果 ········· 10
Yutaka Yoshii　(Ibaraki Univ.)　Some results on certain subalgebras of the hyperalgebra of a simple algebraic group

概要　Let G be a simply connected simple algebraic group defined over a field $\mathbb{F}_p$ of p elements, where p is a prime number. Then G is associated an $\mathbb{F}_p$-algebra $\mathcal{U}$ which is called a hyperalgebra. We give some results on certain $\mathbb{F}_p$-subalgebras of $\mathcal{U}$.

6　後 藤 悠 一 朗（阪　　大　　理）　　擬遺伝構造の個数に関して ·· 15

Yuichiro Goto　　(Osaka Univ.)　　A remark on the number of quasi-hereditary structures

概 要　Dlab and Ringel showed that algebras being quasi-hereditary in all total orders for indices of primitive idempotents becomes hereditary. So, we are interested in for which orders a given quasi-hereditary algebra is again quasi-hereditary. We say that two total orders are equivalent if they induce the same set of standard modules. As a matter of fact, if an equivalence class of orders make an algebra be quasi-hereditary, then we call this class a quasi-hereditary structure. Flores, Kimura and Rognerud gave the counting method of the number of quasi-hereditary structures on path algebras of Dynkin quivers. In this talk, I give a similar result for path algebras of the quivers Q. Here Q is a quiver whose underlying graph is gotten by adding a single vertex to type A_n and a single edge between the new vertex and a vertex originally in A_n.

7　宮 本 賢 伍（茨 城 大 工）　　多項式増大型の対称代数の τ-傾有限性について ····················· 15
　　王　　　　起（Tsinghua Univ.）

Kengo Miyamoto (Ibaraki Univ.)　　On τ-tilting finiteness of symmetric algebras of polynomial growth
Qi Wang　　　(Tsinghua Univ.)

概 要　In this talk, we report on the τ-tilting finiteness of finite dimensional symmetric algebras of polynomial growth over an algebraically closed field. It is known that τ-tilting finiteness is preserved under Morita equivalence, but usually not preserved under derived equivalence. However, we have not found any examples of symmetric algebras which do not preserve τ-tilting finiteness under derived equivalence. In this talk, any symmetric algebras of polynomial growth preserve τ-tilting finiteness under derived equivalence.

8　淺 井 聡 太（阪 大 情 報）　　実 Grothendieck 群の元の rigid 部分 ····························· 15
　　伊 山　　修（東 大 数 理）

Sota Asai　　　(Osaka Univ.)　　The rigid parts of the elements of the real Grothendieck groups
Osamu Iyama (Univ. of Tokyo)

概 要　Let A be a finite-dimensional algebra over a field K. For any complex X in the homotopy category $\mathsf{K}^{\mathrm{b}}(\mathsf{proj}A)$ of the complexes over the category of finitely generated projective modules, we can naturally define the rigid part of X as the maximum presilting direct summand of X. In our study, we found that the rigid part of each element θ in the real Grothendieck group $K_0(\mathsf{proj}A)_{\mathbb{R}}$, which can be identified with an Euclidean space, is also well-defined. In this talk, I will talk about some key properties to prove our result.

9　佐 藤 眞 久　　　　　　　中山 (東屋) の補題の拡張について ································· 10
　　　　（愛知大地域政策・山梨大*）

Masahisa Sato　　　　　On generalized Nakayama–Azumaya's Lemma
(Aichi Univ./Univ. of Yamanashi*)

概 要　Let R be a ring and J(R) its Jacobson radical. We prove the following lemma. Generalized Nakayama–Azumaya's Lemma "Let M be a direct summand of a direct sum of finitely generated right R-modules. If M satisfies MJ(R) = M, then M = 0."
This unifies the following known results; "Let M be a finitely generated module or a projective module. If MJ(R)=M, then M=0."
As an aplication of this lemma, we show existence of a maximal submodule for some kind of modules.

10 中 村   力 (三 重 大 教 育)   Large tilting complexes and homomorphic images of Cohen–Macaulay
    M. Hrbek   (Czech Acad. of Sci.)   rings ·· 15
    J. Šťovíček
        (Charles Univ. in Prague)

    Tsutomu Nakamura (Mie Univ.)
    Michal Hrbek (Czech Acad. of Sci.)
    Jan Šťovíček (Charles Univ. in Prague)   Large tilting complexes and homomorphic images of Cohen–Macaulay
    rings

概 要 Tilting theory plays a central role in representation theory of algebras. Making mutation operations possible, the notion of tilting objects was extended to silting objects. While they are usually assumed to be compact objects in triangulated categories, the definitions have been naturally extended to possibly non-compact objects. In this talk, we give a concrete way to construct (possibly non-compact) silting objects and cosilting objects in the unbounded derived category of a commutative noetherian ring R by using strictly increasing functions from $\operatorname{Spec} R$ to the integers. Then we discuss when they are tilting objects and cotilting objects. Finally, we relate our construction of (co)tilting objects with a question when R is a homomorphic image of a Cohen–Macaulay ring.

11 東 谷 章 弘 (阪 大 情 報)   同変 Ehrhart 理論における効果性予想とそのある種の反例 ··········· 15
    Akihiro Higashitani (Osaka Univ.)   Effectiveness conjecture on equivariant Ehrhart theory and a kind of its
    counterexample

概 要 Equivariant Ehrhart theory discusses lattice polytopes admitting a finite group action ρ. Note that the case where ρ is trivial corresponds to the usual Ehrhart theory. Since every lattice polytope admits a trivial group action, we can recover the usual Ehrhart theory. In the equivariant Ehrhart theory, the effectiveness conjecture is one of the central problems. This predicts the following: for any lattice polytope P, if the H^*-series of P, which is a formal power series appearing in the equivariant Ehrhart series, becomes just a polynomial, then the H^*-series becomes effective, i.e., the coefficients really become some representations. In this talk, we give a kind of a counterexample of this conjecture.

14:15〜14:50

12 黒 田 匡 迪 (日本文理大工)   単項 GAPN 関数の分類について ································· 15
    三 井 健 太 郎 (神 戸 大 理)

    Masamichi Kuroda
            (Nippon Bunri Univ.)
    Kentaro Mitsui   (Kobe Univ.)   On the classification of monomial GAPN functions

概 要 Perfect nonlinear (PN) functions and almost PN (APN) functions over finite fields of characteristic p have high nonlinearity. When $p = 2$, they have been widely studied due to their applications to cryptography and coding theory. Recently, generalized APN (GAPN) functions were defined as an algebraic generalization of APN functions in characteristic 2 to odd characteristic $p > 2$ and they have been studied. In this talk, we introduce some results of the study for the classification of monomial GAPN functions.

13　山 形　　颯（福 岡 大 理）　r-set の分類と超平面配置が non-very generic となるための十分条件につ
いて ‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥ 15

So Yamagata （Fukuoka Univ.）　On classification of r-sets and a sufficient condition for non-very gener-
icity of arrangements

概要　Manin and Schechtman introduced a family of arrangements of hyperplanes generalizing classical
braid arrangements, which they called the discriminantal arrangements.　Athanasiadis proved a conjecture
by Bayer and Brandt providing a full description of the combinatorics of discriminantal arrangements in the
case of very generic arrangements.　Libgober and Settepanella described a sufficient geometric condition for
given arrangements to be non very generic in terms of the notion of dependency for a certain arrangement.
Settepanella and the author generalized the notion of dependency introducing r-sets and $K_{\mathbb{T}}$-vector sets,
and provided a sufficient condition for non very genericity but still not convenient to verify by hand.　In this
talk we give a classification of the r-sets, and a more explicit and tractable condition for non very genericity.

15:00〜16:00　特別講演

藤 田 直 樹（熊 本 大 先 端）　シューベルト・カルキュラスと凸多面体

Naoki Fujita （Kumamoto Univ.）　Schubert calculus and convex polytopes

概要　A goal of Schubert calculus is to compute the structure constants of the cohomology ring of a flag
variety with respect to the basis consisting of Schubert classes.　One approach to such computation is to
realize Schubert classes as concrete combinatorial objects such as Schubert polynomials.　In type A case,
monomials in a Schubert polynomial are naturally parametrized by specific faces of a Gelfand–Tsetlin
polytope.　These faces are called reduced Kogan faces and appear as the limit of a semi-toric degeneration
of a Schubert variety.　Since the Gelfand–Tsetlin polytope is a Newton–Okounkov body of the flag variety,
Newton–Okounkov bodies and induced toric degenerations are expected to give a generalization of theories
in Schubert calculus to more general projective varieties.　Such generalization has partially developed in the
case of flag varieties in different Lie types.　In this talk, some fundamental objects in Schubert calculus will
be explained from the viewpoints of convex polytopes and of Kashiwara crystal bases.　We also discuss their
generalization to more general projective varieties.

16:15〜17:15　特別講演

松 井 紘 樹（徳島大社会産業理工）♭　三角圏のスペクトラムとスキームの復元問題

Hiroki Matsui （Tokushima Univ.）　Spectra of triangulated categories and reconstruction of schemes from
their derived categories

概要　For a given noetherian scheme X, it is natural to ask whether we can reconstruct X from its perfect
derived category $\mathrm{D}^{\mathrm{pf}}(X)$ or not.　This reconstruction problem has been well studied so far in algebraic
geometry.　It is known that we cannot reconstruct X from the triangulated category structure of $\mathrm{D}^{\mathrm{pf}}(X)$.
For example, Mukai proved that for an abelian variety A, the perfect derived categories of A and $A^{\vee}$ are
equivalent as triangulated categories.　On the other hand, Balmer proved that we can reconstruct X from
its perfect derived category using its tensor triangulated category structure.　For this, Balmer defined the
ringed space $\mathrm{Spec}_{\otimes}(\mathcal{T})$ for a given tensor triangulated category $\mathcal{T}$, which is called the *Balmer spectrum* of $\mathcal{T}$.
Using Balmer spectra, Balmer developed *tensor triangular geometry* and as an application, he proved that
the Balmer spectrum of $\mathrm{D}^{\mathrm{pf}}(X)$ is isomorphic to X as ringed spaces.　In this sense, X can be reconstructed
from the tensor triangulated category structure of $\mathrm{D}^{\mathrm{pf}}(X)$.

In this talk, I will introduce another ringed space $\mathrm{Spec}_{\triangle}(\mathcal{T})$ for a given triangulated category $\mathcal{T}$ without
using tensor structure to develop a "tensor-free" analog of tensor triangular geometry.　We call $\mathrm{Spec}_{\triangle}(\mathcal{T})$ the
spectrum of $\mathcal{T}$.　Using the spectra of derived categories, we will prove several reconstruction results.　Among
them, we will give an alternative and algebraic proof of Bondal-Orlov-Ballard reconstruction theorem.

3月16日(木)　　第I会場

9:10〜12:00

14　大 竹 優 也 (名大多元数理)　n 球加群と n 捩れ自由加群の安定圏 ····························· 10
　　Yuya Otake　　(Nagoya Univ.)　Stable categories of n-spherical modules and n-torsionfree modules

概要 Auslander and Bridger introduced the notions of n-spherical modules and n-torsionfree modules. In this talk, we study the stable category of n-spherical modules. Moreover, we introduce the notion of n-G-spherical modules as a G-analogue and give similar results for the stable category of n-G-spherical modules. As an application, we prove that if R is a Gorenstein local ring of Krull dimension $d > 0$, then there exists a stable equivalence between the category of $(d-1)$-torsionfree R-modules and the category of d-spherical modules relative to the local cohomology functor.

15　石 塚　　伶 (東 工 大 理)　混標数における perfectoid almost Cohen–Macaulay 代数の明示的構成
　　下 元 数 馬 (日 大 文 理)　·· 15
　　Ryo Ishizuka　　(Tokyo Tech)　An explicit construction of perfectoid almost Cohen–Macaulay algebra
　　Kazuma Shimomoto (Nihon Univ.)　in mixed characteristic

概要 The existence and properties of non-Noetherian algebras over a given Noetherian ring play important roles in commutative algebra. Properties of such algebras are, for example, perfectoid and almost Cohen–Macaulay. In positive characteristic, the perfect closure has these properties. In this talk, we construct an analog of the perfect closure in mixed characteristic and show that it has the same properties.

16　伊 城 慎 之 介 (日大総合基礎)　The canonical module of a local log-regular ring ··················· 15
　　Shinnosuke Ishiro (Nihon Univ.)　The canonical module of a local log-regular ring

概要 Local log-regular rings are a certain class of Cohen–Macaulay rings that are treated in logarithmic geometry. This class has similar properties to those toric rings. From this perspective, I determined the form of the canonical module of a local-log regular ring. As an application, we gave the Gorenstein criterion of this class of rings. In this talk, we introduce these results.

17　松 下 光 虹 (阪 大 情 報)　トーリック環の conic 因子的イデアルと安定集合環への応用 ·········· 15
　　Koji Matsushita (Osaka Univ.)　Conic divisorial ideals of toric rings and applications to stable set rings

概要 Conic divisorial ideals of toric rings play important roles in the theory of non-commutative algebraic geometry as well as commutative algebra. In this talk, we introduce an idea to determine a region representing conic classes in the divisor class group of a toric ring and a description of the conic divisorial ideals of stable set rings of perfect graphs.

18　石 原 侑 樹 (東 京 理 大 理)　パラメータ付きのイデアル操作の計算 ····························· 15
　　Yuki Ishihara (Tokyo Univ. of Sci.)　Computation of ideal operations with parameters

概要 Ideal is one of the fundamental concepts in Commutative Algebra and Algebraic Geometry. For one or more ideals, we consider ideal operations that generate new ideals from them, e.g., the ideal intersection $I \cap J$, the ideal quotient $I : J$, the saturation $I : J^\infty$, the radical $\sqrt{I}$, etc., where I and J are ideals in the polynomial ring $\mathbb{C}[x_1, \ldots, x_n]$. In this talk, we consider several algorithms to compute ideal operations with parameters by using Comprehensive Gröbner Systems. In addition, we present an algorithm for "feasible" parameterized primary decomposition by utilizing those operations.

19　服 部 京 平 (新 潟 大 自 然)　Rings of nilpotent elements of monomial derivations on polynomial rings
　　小 島 秀 雄 (新 潟 大 自 然)　· 15
Kyohei Hattori (Niigata Univ.)　Rings of nilpotent elements of monomial derivations on polynomial rings
Hideo Kojima　(Niigata Univ.)

概要　In this talk, we give a classification of $\operatorname{Nil} D$ of monomial derivations D on the polynomial ring $R[x, y]$ over a UFD R containing $\mathbb{Q}$. Furthermore, as its application, we show that the minimal number of generators of kernels of derivations on the polynomial ring $R[x, y, z]$ as a R-algebra is unbound.

20　木 村 海 渡 (名大多元数理)　加群の局所化の漸近深度 · 10
Kaito Kimura　(Nagoya Univ.)　Asymptotic depths of localizations of modules

概要　Let R be a commutative Noetherian ring, I an ideal of R, and M a finitely generated R-module. The asymptotic behavior of the quotient modules $M/I^n M$ of M is an actively studied subject in commutative algebra. In this talk, we consider the existence of an integer k such that for all integers $n \geq k$ and all prime ideals $\mathfrak{p}$ of R, the depth of $(M/I^n M)_\mathfrak{p}$ is equal to the depth of $(M/I^k M)_\mathfrak{p}$.

21　遠 藤 直 樹 (明大政治経済)　On the stratification of one-dimensional Cohen–Macaulay rings · · · · · · 15
Naoki Endo　　(Meiji Univ.)　On the stratification of one-dimensional Cohen–Macaulay rings

概要　The aim of this talk is to discover a good candidate for natural generalizations both of almost Gorenstein and 2-almost Gorenstein rings from the point of view of Sally modules of canonical ideals. Even though our results are at this moment restricted within the case of dimension one, we expect that a higher dimensional notion might be possible after suitable modifications.

22　奥 間 智 弘 (山 形 大 理)　The core of ideals in minimally elliptic singularities · · · · · · · · · · · · · · · · 15
　　吉 田 健 一 (日 大 文 理)
　　渡 辺 敬 一
　　　　(日大文理・明大研究・知財)
Tomohiro Okuma (Yamagata Univ.)　The core of ideals in minimally elliptic singularities
Ken-ichi Yoshida (Nihon Univ.)
Kei-ichi Watanabe
　　(Nihon Univ./Meiji Univ.)

概要　A two-dimensional normal local domain is called a minimally elliptic singularity if it is Gorenstein and its geometric genus is one. For an m-primary integrally closed ideal I in a minimally elliptic singularity (A, m), we represent its core using a cycle on a resolution of the singularity.

23　吉 田 健 一 (日 大 文 理)　Gorensteinness for normal tangent cones of the maximal ideals in Brieskorn
　　奥 間 智 弘 (山 形 大 理)　hypersurfaces · 15
　　渡 辺 敬 一
　　　　(日大文理・明大研究・知財)
Ken-ichi Yoshida (Nihon Univ.)　Gorensteinness for normal tangent cones of the maximal ideals in Brieskorn
Tomohiro Okuma (Yamagata Univ.)　hypersurfaces
Kei-ichi Watanabe
　　(Nihon Univ./Meiji Univ.)

概要　Let (A, m) be a two-dimensional excellent normal local domain containing an algebraically closed field. The graded ring defined by all integal closures of powers of an ideal I of A is called the normal tangent cone of I. We classify all Brieskorn hypersurfaces for which the normal tangent cone of the maximal ideal m is to be Gorenstein.

13:00～14:10

24 是 枝 由 統（広 島 大 理） 標数 2 の D_4^1 型曲面特異点のジェットスキーム上のファイバー ········ 13
Yoshimune Koreeda (Hiroshima Univ.) Jet scheme of a singular surface of type D_4^1 in characteristic 2

概要 Let k be an algebraically closed field, X a variety over k and m a nonnegative integer. There is a space X_m over X, called the jet scheme of X of order m, parameterizing m-th jets on X. The fiber over the singular locus of X is called the singular fiber. In this talk, we assume k is of characteristic 2 and X is a singular surface of type D_4^1. For $m \gg 0$, we give the irreducible decomposition of the singular fiber of X and determine the maximal elements among the intersections of two different irreducible components.

25 赤 池 広 都（阪　　大　　理）♭ 楕円曲面上巡回被覆ファイバー曲面の自己同型群の位数の上界について
··· 13

Hiroto Akaike　（Osaka Univ.） Bounds for the order of automorphism groups of cyclic covering fibrations of an elliptic surface

概要 In this talk, we show upper bounds for the order of automorphism groups of primitive cyclic covering fibrations of an elliptic surface. The upper bound is an explicit function in the genus of the base curve, the covering degree and the square of relative canonical divisor.

26 舛 谷 亮 祐（都 立 大 理） 平面 4 次曲線の弱二重接線と有理楕円曲面について ················ 13
Ryosuke Masuya (Tokyo Metro. Univ.) On weak-bitangents for plane quartics and rational elliptic surfaces

概要 It is well-known that a smooth plane quartic has twenty-eight bitangents. We consider weak-bitangents which are generalizations on bitangents for a reduced quartic. We study weak-bitangents from the viewpoint of rational elliptic surfaces attached to reduced quartics. In particular, we consider an analogy of syzygetic triads. As a result, we can give new proofs for some classical results on certain singular plane quartics and their bitangents.

27 山 口　　樹（東 大 数 理）♭ Big Cohen–Macaulay test ideals in equal characteristic zero via ultra-products ··· 13

Tatsuki Yamaguchi (Univ. of Tokyo) Big Cohen–Macaulay test ideals in equal characteristic zero via ultra-products

概要 Schoutens constructed big Cohen–Macaulay (BCM) algebras in equal characteristic zero using ultra-products. In this talk, we show that BCM test ideals with respect to Schoutens' BCM algebras coincide with multiplier ideals, which define the non-klt loci of normal varieties. As an application, we study singularities of pure subrings.

3月17日（金）　　第I会場

9:00～12:00

28 桜 井　　真（開 智 学 園） カイラル共形場の次元と準連接層 ································ 13
Makoto Sakurai (Kaichi Gakuen) Dimensions of chiral conformal fields and quasi-coherent sheaves

概要 The so-called AGT correspondence between 4d gauge theories and 2d conformal field theories was under discussion. However, despite much effort by mathematicians (and some physicists), the scope of results is limited, although it is sophisticated. In this report, I will deliver a trial to synthesize the mathematical literature of Beilinson and Drinfeld and some of the more "natural" physics for formulae of "anomalies." Several conventional definitions of "dimensions" will be briefly reviewed. Then I will seek a correct notion of dimensions for chiral fields in the context of S-duality and the geometrical dimension. Some more efforts will be on the (non-)quasi-coherent sheaves for chiral algebra theories and $\mathcal{D}$-modules.

29　岩 見 智 宏（九 工 大 工）　Majorana double solids for three-dimensional Miyaoka–Yau type inequality with the associated third Chern classes · · · · · · · · · · · · · · · · · · · 13

Tomohiro Iwami (Kyushu Inst. of Tech.)　Majorana double solids for three-dimensional Miyaoka–Yau type inequality with the associated third Chern classes

概要　Based on S. Mori's proof for an three-dimesnional extremal neighborhood $(X, C) \subset \mathbb{C}^4$ of type A in the existence of three-dimensional flips, for an extended extremal nbd (X, C_s) with C_s not necessary irreducible nor reduced ([I2019Mar]), the author found three-dimesional Miyaoka–Yau type inequality $(MY)_{3, c_3}$ with the associated c_3 ([I2018Mar, I2019Sep]), $(MY)_{3, c_3}$ with the differential operators ([I2020Sep]) and related ones, moreover introduced an interemdiate Jacobians $\widetilde{IJ}(X, C_s)$ ([I2022Mar]) and found its strong approximation for its $\mathbb{Z}$-structure ([I2022Sep]). In this talk, as sequel to [I2022Sep], the author will report: a) to show precise form of strong approximation for $\widetilde{IJ}(X, C_s)$ via the differential operators, b) to give slightly extended diagonal decomposition ([Bloch–Srinivas 1983]) to introduce real/Majorana spinor by a), and c) to construct $\mathbb{Z}$-structure by gluing this underlying real structure via b) regarding to integral Hodge conjeture, in order to discuss alternative to [Artin–Mumford 1972].

30　髙 橋 優 太（中 大 理 工）　正標数におけるネフ接束をもつ４次元ファノ多様体の分類 · · · · · · · · · · 13
　　渡 邉 　 究（中 大 理 工）
Yuta Takahashi　（Chuo Univ.）　Fano 4-folds with nef tangent bundle in positive characteristic
Kiwamu Watanabe (Chuo Univ.)

概要　In characteristic 0, the Campana–Peternell conjecture claims that the only smooth Fano variety with nef tangent bundle should be homogeneous. In this talk, we present the positive characteristic version of the Campana–Peternell conjecture. In particular, we give a result for Fano 4-folds with nef tangent bundle and Picard number greater than one.

31　吉 野 太 郎（東 大 数 理）　On the degree of irrationality of complete intersections · · · · · · · · · · · · · · 13
Taro Yoshino（Univ. of Tokyo）　On the degree of irrationality of complete intersections

概要　This is joint work with Lucas Braune. We obtain a lower bound of the degree of irrationality of very general complete intersections over the complex field from the recent results of Braune and Chen–Stapleton. For combining these results, we make a minor adjustment of Chen–Stapleton's method using the trace map of differential modules.

32　水 野 雄 貴（早 大 理 工）　Some examples of noncommutative projective Calabi–Yau schemes · · · 13
Yuki Mizuno　（Waseda Univ.）　Some examples of noncommutative projective Calabi–Yau schemes

概要　We construct some examples of noncommutative projective Calabi–Yau schemes by using noncommutative Segre products and quantum weighted hypersurfaces. We also compare them with commutative Calabi–Yau varieties and examples by Kanazawa.

33　星 　 明 考（新 潟 大 理）　Birational classification for algebraic tori (I) · 13
　　山 崎 愛 一（京 　 大 　 理）
Akinari Hoshi　（Niigata Univ.）　Birational classification for algebraic tori (I)
Aiichi Yamasaki (Kyoto Univ.)

概要　We give a stably birational classification for algebraic k-tori of dimensions 3 and 4 over a field k.

34　星 　 明 考（新 潟 大 理）　Birational classification for algebraic tori (II) · 13
　　山 崎 愛 一（京 　 大 　 理）
Akinari Hoshi　（Niigata Univ.）　Birational classification for algebraic tori (II)
Aiichi Yamasaki (Kyoto Univ.)

概要　We give a stably birational classification for algebraic k-tori of dimensions 3 and 4 over a field k.

35　助 永 真 之（広島大先進理工）　トロピカル平面曲線の交わりの実現問題 ···························· 13
Masayuki Sukenaga (Hiroshima Univ.)　Tropical lifting problem for the intersection of plane curves

概 要 Let D be a tropical divisor in the intersection of two tropical plane curves. We study when it can be realized as the tropicalization of the intersection of two algebraic curves. When a graph theoretic condition determined by these tropical curves is satisfied, we can algorithmically find algebraic curves such that the tropicalization of their intersection is D.

36　天 野 通 大（明 星 大）　Witt vectors のある準同型写像の核について II ····················· 10
Michio Amano　(Meisei Univ.)　On kernels of certain homomorphisms of Witt vectors, II

概 要 Let $W(A)$ be a Witt group over A and let $W^n(A)$ be the product of n of $W(A)$. T. Sekiguchi and N. Suwa have constructed a certain endomorphism U_n of $W^n(A)$ related to the deformation group scheme from the additive group scheme to the multiplicative group scheme. We study the equality of kernels of certain homomorphisms related to U_n.

37　川 辺 大 貴（東 北 大 理）　Chow motives of genus one fibrations ···························· 13
Daiki Kawabe　(Tohoku Univ.)　Chow motives of genus one fibrations

概 要 Genus 1 fibrations play a central role in the classification of surfaces. Let $f : X \to C$ be a genus 1 fibration from a surface to a curve. Then there is a Jacobian genus 1 fibration $j : J \to C$ that satisfies some good properties. In this talk, we prove that the motive of X is isomorphic to the motive of J. As an application, we prove motivic finite-dimensionality for surfaces not of general type with geometric genus 0. This can be regarded as a generalization of Bloch–Kas–Lieberman's result to arbitrary characteristic.

38　安 藤 哲 哉（千 葉 大 理）　4 変数 4 次対称 extremal 不等式と K3 曲面 ························ 13
Tetsuya Ando　(Chiba Univ.)　Symmetric quartic extremal inequalities of four variables and K3 surfaces

概 要 Let $P_{4,4}$ be the convex cone of quartic homogeneous polynomials of four variables which is positive semidefinite. We present a family of symmetric elements of $P_{4,4}$. Let f be a such polynomial. Then zero locus of f in the complex 3-dimensional projective space is a K3 surface which has 10 real A_1 type rational double points.

39　寄 崎 恵 美 子（都 立 大 理）　Ramified and Split models of rational elliptic surfaces and bitangent
　　坂 内 真 三（岡 山 理 大 理）　lines for a quartic curve ··· 10
　　徳 永 浩 雄（都 立 大 理）
Emiko Yorisaki (Tokyo Metro. Univ.)　Ramified and Split models of rational elliptic surfaces and bitangent
Shinzo Bannai (Okayama Univ. of Sci.)　lines for a quartic curve
Hiro-o Tokunaga (Tokyo Metro. Univ.)

概 要 We introduce the notion of ramified and split models of elliptic surfaces. We consider how these two models are related. In particular, we apply our consideration to rational elliptic surfaces which arise as smooth models of double covers of the projective plane branched along quartics. As a result, we determine the number of concurrent bitangent lines for irreducible quartics with at most nodes.

14:15〜14:30　2023年度(第26回)日本数学会代数学賞授与式

14:40〜15:40　2023年度(第26回)日本数学会代数学賞受賞特別講演

権 業 善 範 (東 大 数 理)　高次元極小モデル理論の構築とその応用について

Yoshinori Gongyo (Univ. of Tokyo)　On higher dimensional minimal model theory and its applications

概要 I will report what I am going on projects related to the minimal model program. First, I will discuss some new invariants for studies of Fano varieties. We call it the "total index", which is natural invariant mixing Shokurov's complexities and the usual Fano index. In this study, the Birkar generalized pair naturally appears. Using this invariant, I propose some conjecture for the characterization of the product of projective spaces, which is some variant of Mukai's type conjecture. The methods are to use the local–global method from singularities rather than studies of rational curves. To study this conjecture, the non-vanishing conjecture and characterization of toric varieties are involved. Second, I will explain what I consider recently on the mainstream of the minimal model theory.

16:00〜17:00　2023年度(第26回)日本数学会代数学賞受賞特別講演

若 槻 　聡 (金 沢 大 理 工)　跡公式とその応用

Satoshi Wakatsuki (Kanazawa Univ.)　Trace formulas and their applications

概要 The trace formula is one of the main tools in the study of automorphic forms, and its theory has been greatly developed by many researchers (Selberg, Arthur, etc.). The trace formula plays an important role even today, such as the classification of automorphic representations by stable trace formulas and the study of automorphic periods by relative trace formulas. In this talk, I will give an overview of trace formulas and their applications. After that, I will introduce my recent research on asymptotic behaviors for dimensions of spaces of automorphic forms.

<div align="center">3月18日(土)　　第I会場</div>

9:15〜12:00

40 飯 高 　茂 (学 習 院 大*)　第2種スーパー完全数と完全数 80 ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 13

Shigeru Iitaka (Gakushuin Univ.*)　Super perfect numbers of the second kind

概要 Let m denote translation parameter, and let h denote an odd prime.
Defining A to be $\sigma(a)+m$ if $h\sigma(A)=2a(h+1)-h^2+mh$ then a is said to be super perfect numbers of the second kind. A is called a partner of a.

41 小 林 雅 人 (神 奈 川 大 工)　約数和関数のバランス ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 13

Masato Kobayashi (Kanagawa Univ.)　Balance for the divisor sum function

概要 Let us say finite $A \subseteq \mathbb{N}$ is balanced if

$$\sum_{n\in A}\sum_{d|n,d \text{ odd}} d = \sum_{n\in A}\sum_{d|n,d,\text{ even}} d.$$

For example, $\{1,2\}, \{1,3,4\}, \{3,6,8,9\}$ are balanced. For each natural number N, does there exist a balanced set A of the cardinality N? I solved this problem affirmatively in June 2022 with Ramanujan's theta function and Jacobi's triple product idenitity. In this talk, I wish to show details of this.

42　金 堂 優 哉 (名大多元数理)　The relation between a generalized Fibonacci sequence of Cunningham chains $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 13

Yuya Kanado　(Nagoya Univ.)　

概要 Let p be a prime number and $\alpha \geq 3$ be an integer. In this talk, a generalized Fibonacci sequence $\mathcal{F}_\alpha = (F_n)_{n\in\mathbb{Z}}$ is defined as $F_0 = 0, F_1 = 1, F_{n+2} = \alpha F_{n+1} + F_n$ $(n \in \mathbb{Z})$, and $_{\mathcal{F}_\alpha}\sigma(n) = \sum_{d|n, 0<d\in\mathcal{F}_\alpha} d$ is called the divisor function on $\mathcal{F}_\alpha$. Then we obtain that for two prime numbers p and q the fact $p = 2q + 1$ or $2q - 1$ is equivalent to $_{\mathcal{F}_\alpha}\sigma(_{\mathcal{F}_\alpha}\sigma(F_p)) = {}_{\mathcal{F}_\alpha}\sigma(F_q)$ for some α.

43　栗 野 俊 一 (日 大 経 済)　The error term in the prime number theorem under the RH $\cdots\cdots\cdots$ 10
　　中 野 正 俊 (気仙沼高等技術専)

Shun-ichi Kurino (Nihon Univ.)　
Masatoshi Nakano
　　　(Kesennuma Coll. of Tech.)

概要 We propose the conjecture that the error term in the prime number theorem under the RH is $o(\sqrt{x})$.

44　杉 山 真 吾 (日 大 理 工)　Dirichlet L 関数の族の重み付き零点密度について $\cdots\cdots\cdots\cdots\cdots\cdots$ 10
　　アデイルマスリアジャヤ
　　　　　　(九 大 数 理)

Shingo Sugiyama (Nihon Univ.)　On a weighted density of zeros of Dirichlet L-functions in a family
Ade Irma Suriajaya (Kyushu Univ.)

概要 Katz and Sarnak suggested a relation between zeros of L-functions in a family and eigenvalues of random matrices in a compact matrix group. In this talk, we consider the analogous conjecture weighted by L-values and verify this conjecture in the case of the family of Dirichlet L-functions attached to nontrivial Dirichlet characters of a prime modulus. This is a joint work with Ade Irma Suriajaya (Kyushu University).

45　橋 本 康 史 (琉 球 大 理)　セルバーグゼータ関数に関する普遍性定理 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 13
Yasufumi Hashimoto
　　　　(Univ. of Ryukyus)　Universality theorem for the Selberg zeta function

概要 In 2013, Drungilas et al. proposed the universality theorem for the Selberg zeta function associated with the modular group, which is (probably) the first universality theorem for the zeta function of the order of more than one. Recently in 2021, Mishou extended it by proving the joint universality theorem for the tuple of Selberg zeta functions associated with principal congruence subgroups. In this talk, we present the universality theorem (and joint universality theorem) for the Selberg zeta function associated with (not necessarily congruence) subgroup of the modular group. We also note that our universality theorems are available in wider regions than the regions given in the previous works.

46　篠 原　　健 (名大多元数理)　On shuffle product of desingularized multiple zeta functions $\cdots\cdots\cdots\cdots$ 13
Takeshi Shinohara (Nagoya Univ.)　On shuffle product of desingularized multiple zeta functions

概要 Furusho, Komori, Matsumoto, and Tsumura introduced the desingularized multiple zeta functions to resolve all singularities of multiple zeta functions (MZF for short). It is a natural question to ask how much desingularized MZFs retain the properties of MZFs. As one of the answers, we show that special values of desingularized MZFs at positive integer points satisfy the shuffle product that holds among special values of MZFs at positive integer points.

47 加 藤 正 輝 (富 山 高 専)   ルート系のゼータ関数の q-類似について ······················· 13
    Masaki Kato   On q-analogues of zeta functions of root systems
        (Toyama Nat. Coll. of Tech.)

概要 Komori, Matsumoto and Tsumura introduced zeta functions $\zeta_r(s, \Delta)$ associated with root systems Δ. In this talk, we introduce q-analogues of functions $\zeta_r(s, \Delta)$, denoted by $\zeta_r(s, a, \Delta; q)$. We establish q-extensions of the following properties satisfied by $\zeta_r(s, \Delta)$: (a) Integral representations of sums of zeta functions which have Weyl group symmetries. (b) Explicit expressions of Witten volume formulas. (c) Functional relations including Witten volume formulas. We also introduce elliptic analogues of $\zeta_r(s, a, \Delta; q)$, denoted by $\zeta_r(s, a, \beta, \Delta; p, q)$, and investigate their basis properties. To extend the properties (a) and (b) to $\zeta_r(s, a, \beta, \Delta; p, q)$, the factorization formulas of Poincaré polynomials, established by Macdonald, plays important roles.

48 峰   正 博 (上 智 大 理 工)   2 次無理数をパラメータに持つ Hurwitz ゼータ関数に対する弱い稠密性
                                定理 ··· 13
    Masahiro Mine (Sophia Univ.)   Weak denseness theorem for the Hurwitz zeta-function with quadratic
                                     irrational parameter

概要 In this talk, we consider the value-distribution of the Hurwitz zeta-function with algebraic irrational parameter. The main result is that any complex number can be approximated by values of the Hurwitz zeta-function for arbitrary quadratic irrational parameters but with finite exceptions.

49 中 井 啓 太 (名大多元数理)   対数をとった Selberg クラスの L 関数の反復積分の普遍性定理 ········ 10
    Keita Nakai   (Nagoya Univ.)   Universality for the iterated integrals for the logarithm of L-functions
                                     in the Selberg class

概要 In 1975, Voronin proved the Universality theorem for the Riemann zeta-function and in 2022, Endo generalized this theorem for the iterated integrals for the logarithm of the Riemann zeta-function. In this talk, we give a more generalization of this theorem for the iterated integrals for the logarithm of L-functions in the Selberg class.

50 杉 山 和 成 (千 葉 工 大)   Siegel ゼータ関数の保型性について ····························· 13
    Kazunari Sugiyama   The modularity of Siegel's zeta functions
        (Chiba Inst. of Tech.)

概要 Siegel defined zeta functions associated with indefinite quadratic forms, and proved their analytic properties such as analytic continuations and functional equations. We discuss the modularity of Siegel's zeta functions on the basis of converse theorems.

14:15〜16:45

51 武 田   渉 (東 京 理 大 理)   Quadratic relations for 9th variation Schur functions involving Plücker
    中 筋 麻 貴 (上智大理工・東北大理)   relations ··· 13
    山 﨑 義 徳 (愛 媛 大 理)
    Wataru Takeda (Tokyo Univ. of Sci.)   Quadratic relations for 9th variation Schur functions involving Plücker
    Maki Nakasuji   relations
        (Sophia Univ. / Tohoku Univ.)
    Yoshinori Yamasaki (Ehime Univ.)

概要 The 9th variation of Schur polynomial is known to satisfy determinant formulas such as Jacobi–Trudi, Gambelli, and Hamel–Goulden identities. In this talk, we apply the Plücker relations to these identities. These relations are known to give algebraic dependencies among the determinants of the various minors of an arbitrary matrix. Applying them to the $n \times n$ minors of an $n \times 2n$ matrix, we give some quadratic relations between the 9th variation of Schur polynomials.

52　渋 川 元 樹（神 戸 大 理）
　　後 藤 良 彰（小 樽 商 大）
Some monotonic properties of special values of the bivariate complete homogeneous symmetric polynomials $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 10

Genki Shibukawa (Kobe Univ.)
Yoshiaki Goto
　　　　(Otaru Univ. of Commerce)
Some monotonic properties of special values of the bivariate complete homogeneous symmetric polynomials

概 要　We prove some monotonic properties of special values of the bivariate complete homogeneous symmetric polynomials.

53　星　　　明 考（新 潟 大 理）
　　金 井 和 貴（新 潟 大 自 然）
　　山 崎 愛 一（京　大　　理）
Hasse norm principle for M_{11} extensions $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 13

Akinari Hoshi　(Niigata Univ.)
Kazuki Kanai　(Niigata Univ.)
Aiichi Yamasaki (Kyoto Univ.)
Hasse norm principle for M_{11} extensions

概 要　Let k be a field and T be an algebraic k-torus. In 1969, over a global field k, Voskresenskii proved that there exists an exact sequence $0 \to A(T) \to H^1(k, \operatorname{Pic} \overline{X})^{\vee} \to Sha(T) \to 0$ where $A(T)$ is the kernel of the weak approximation of T, $Sha(T)$ is the Shafarevich–Tate group of T, X is a smooth k-compactification of T, $\operatorname{Pic} \overline{X}$ is the Picard group of $\overline{X} = X \times_k \overline{k}$. On the other hand, in 1963, Ono proved that for the norm one torus $T = R_{K/k}^{(1)}(G_m)$ of K/k, $Sha(T) = 0$ if and only if the Hasse norm principle holds for K/k. We determine $H^1(k, \operatorname{Pic} \overline{X})$ for norm one tori $T = R_{K/k}^{(1)}(G_m)$ when the Galois group $\operatorname{Gal}(L/k)$ of the Galois closure L/k of K/k is isomorphic to the Mathieu group M_{11} of degree 11. We also give a necessary and sufficient condition for the Hasse norm principle for such extensions K/k with $\operatorname{Gal}(L/k) \simeq M_{11}$.

54　伊 吹 山 知 義（阪　　　　大*）
Tomoyoshi Ibukiyama (Osaka Univ.*)
符号付きパラモジュラー形式の次元公式 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 10

Dimensions of paramodular forms with involutions

概 要　Paramodular forms are a part of Siegel modular forms. For degree two case, they are important for Shimura–Taniyama conjecture for abelian surfaces and the new form theory of Roberts and Schmidt. Here we give explicit dimension formulas for paramodular forms of any vector valued weight $det^3 Sym(j)$ with $k \geq 3$ of prime level p with fixed sign of the Atkin–Lehner involution. It is known that such forms have a good correspondence with certain algebraic modular forms up to endoscopic part and old forms. We calculate dimensions of the corresponding algebraic modular forms and apply it to paramodular case.

55　伊 吹 山 知 義（阪　　　　大*）
Tomoyoshi Ibukiyama (Osaka Univ.*)
ジーゲル保型形式上の微分作用素とラプラス変換 $\cdots\cdots\cdots\cdots\cdots\cdots$ 13

Differential operators on Siegel modular forms and Laplace transforms

概 要　The talk has two aims. One is to give a new special basis of the polynomial ring $\mathbb{C}[T]$ in components of $n \times n$ symmetric matrix T. The basis $P(T)$ is characterized by the action of $P(\partial_Z)$ on $\det(CZ + D)^s$, where ∂_Z is the matrix of partial derivatives of the variable of the Siegel upper half space and $\det(CZ + D)$ is the automorphy factor. Everything is described explicitly. For example, the basis is obtained as coefficients of certain explicitly described generating series. The second aim is to apply this to the so-called pullback formula of the Siegel Eisenstein series of degree $2n$ and determine all appearing constants.

56　境　　優　一　　　　On modular-form solutions of a certain modular linear differential equations for cocompact groups $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 13
　　　（久留米工大基幹教育センター）

Yuichi Sakai (Kurume Inst. of Tech.)　　On modular-form solutions of a certain modular linear differential equations for cocompact groups

概要　In this talk, we give a modular linear differential equation of second order for a cocompact group of discriminant 6, and we also give its solutions. Furthermore we prove a relation between supersingular polynomials and certain polynomials derived from solutions of the modular linear differential equation.

57　杉 山 真 吾（日 大 理 工）　Hilbert 保型形式と Siegel 保型形式の Hecke 固有値の代数的整数性 $\cdots\cdot$ 10
　　佐 久 川 憲 児（信 州 大 教 育）

Shingo Sugiyama (Nihon Univ.)　　Integrality of Hecke eigenvalues of Hilbert and Siegel modular forms
Kenji Sakugawa (Shinshu Univ.)

概要　In this talk, we prove the integrality of Hecke eigenvalues of Hilbert modular forms and Siegel modular forms in a general setting. As applications, we estimate the degrees of Hecke fields of cuspidal automorphic representations of $\mathrm{GL}(2d)$ with a prime number d and $\mathrm{Sp}(2n)$.

58　加 藤 裕 基（宇 部 工 高 専）　Almost mathematics and its algebraic K-theory from non-unital algebras viewpoint $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 13

Yuki Kato (Ube Nat. Coll. of Tech.)　　Almost mathematics and its algebraic K-theory from non-unital algebras viewpoint

概要　While almost mathematics has various applications to arithmetic geometry, Quillen mentioned linear algebra over non-unital rings which is the same as almost mathematics introduced by Faltings; and Gabber and Ramero. Quillen's work is more conceptional in the sense of using categorical language: in his work, almost mathematics is characterized as bilocalization of an abelian category of modules. By using the theory of bilocalization, we define the derived category (or stable ∞-category) of almost perfect complexes, enabling us to obtain the K-theory of almost modules. Furthermore, by modifying K-theory of almost algebra, we prove that the modified K-groups decompose into the almost algebraic K-theory and the almost acyclic part of them. The main result of almost K-theory is that the almost K-theory of A is represented by the modified K-theory of the corresponding the idempotent non-unital algebra.

59　南　　範 彦（名　工　大）　任意のモチビック一般コホモロジー論に対する SBNR ((stably birationalized) unramified sheaf) と Gersten 型分解 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 13

Norihiko Minami　　　　　　SBNR (stably birationalized unramified sheaf) and Gersten type reso-
　　　　（Nagoya Inst. of Tech.）　lution for any motivic generalized cohomology theory

概要　Suppose the base field is perfect. Then, for any generalized motivic cohomology theory, I shall discuss its Zariski sheafifcation which turns out to be unramified in Morel's sense and a Nisnevich sheaf in this particular case.
Amongst of all, I shall emphasize the existence of its Gersten type resolution as Zariski sheaves and its SBNR - stably birationalized Nisnevich subsheaf of the unramified sheaf.

60　南　　範 彦（名　工　大）♭　Integral Hodge 予想反例の高次余次元非有理性 $\cdots\cdots\cdots\cdots\cdots\cdots$ 13

Norihiko Minami　　　　　　Higher codimensional irrationality of counter examples of the integral
　　　　（Nagoya Inst. of Tech.）　Hodge conjecture

概要　Some necessary condition for a non-singular complex projective manifold X to be a counter-example for the codimension k integral Hodge conjecture $Z^{2k}(X) \neq 0$ is given.
Our necessary condition is stated as codimension c_k irrationality for some c_k, which grows as k increases. This may suggest that counter-examples to the integral Hodge conjecture become ubiquitous as k increases.

幾　何　学

3月15日(水)　　第Ⅱ会場

9:30〜11:40

1　キヨヴスキアントニ　　　　Asymptotically mean value harmonic functions ···················· 15
　　　　　　　　(沖縄科学技術大)

Antoni Kijowski　　　　　　Asymptotically mean value harmonic functions
(Okinawa Inst. of Sci. and Tech. Grad. Univ.)

概要　The Blaschke–Privaloff–Zaremba theorem gives rise to a recently investigated concept of the asymptotic mean value harmonic function on a metric measure space X. For a function $u \in L^1_{loc}(X)$ define the r-laplacian of u as:

$$\Delta_r u(x) := \frac{u_{B_r(x)} - u(x)}{r^2},$$

where $u_{B_r(x)}$ stands for the mean-value of u over a ball $B_r(x)$. We say that u is amv-harmonic if its r-laplacian converges to 0 in an appropriate sense as $r \to 0$. In my talk I will present known results focusing on regularity, blow ups and characterization of these functions in the following settings: weighted Euclidean domains, Carnot groups and RCD spaces.

2　横 田 滋 亮 (東 北 大 理)　Geometric data set の幾何学 ································· 15

Shigeaki Yokota (Tohoku Univ.)　Geometry of geometric data set

概要　Gromov originated a geometric theory of metric measure spaces based on the phenomenon of concentration of measure and the theory of the collapsing of Riemannian manifolds; Pestov pointed out the connection of Gromov's theory with the curse of dimensionality in statistics. To improve time complexity, Hanika, Schneider, Stumme proposed to generalize metric measure space to 'geometric data set'. The total set of the metric measure spaces has two natural distance functions, the observable and box distance functions, and their topological properties are well known, but the properties of the total set of the geometric data set are almost unknown. In this talk, we extend these results of metric measure space to the total set of geometric data sets.

3　数 川 大 輔 (九 大 数 理)　測度距離空間全体の位相的性質について ·························· 15
　　中 島 啓 貴 (東北大 IEHE)
　　塩 谷　　隆 (東 北 大 理)

Daisuke Kazukawa (Kyushu Univ.)　Topological aspects of the space of metric measure spaces
Hiroki Nakajima (Tohoku Univ.)
Takashi Shioya (Tohoku Univ.)

概要　Gromov introduced two distance functions, the box distance and the observable distance, on the space of isomorphism classes of metric measure spaces and developed the convergence theory of metric measure spaces. We investigate several topological properties on the space equipped with these distance functions toward a deep understanding of convergence theory.

4　数 川 大 輔 (九 大 数 理)　測度距離空間全体のスケーリング作用に関する主束構造について ······ 10
　　中 島 啓 貴 (東北大 IEHE)
　　塩 谷　　隆 (東 北 大 理)

Daisuke Kazukawa (Kyushu Univ.)　Principal bundle structure of the space of metric measure spaces
Hiroki Nakajima (Tohoku Univ.)
Takashi Shioya (Tohoku Univ.)

概 要　We study the topological structure of the space $\mathcal{X}$ of isomorphism classes of metric measure spaces equipped with the box or concentration topologies. We consider the scale-change action of the multiplicative group $\mathbb{R}_+$ of positive real numbers on $\mathcal{X}$, which has a one-point metric measure space, say $*$, as only one fixed point. We prove that the $\mathbb{R}_+$-action on $\mathcal{X} \setminus \{*\}$ admits the structure of nontrivial and locally trivial principal $\mathbb{R}_+$-bundle over the quotient space. A similar statement is obtained for the pyramidal compactification of $\mathcal{X}$, where we completely determine the structure of the fixed-point set of the $\mathbb{R}_+$-action on the compactification.

5　松 家 拓 稔 (都 立 大 理)　距離空間の自由積と粗バウム・コンヌ予想 ························ 15
Takumi Matsuka (Tokyo Metro. Univ.)　Free products of metric spaces and the coarse Baum–Connes conjecture

概 要　We introduce the notion of free products of metric spaces. When X and Y are coarsely convex, the free product $X * Y$ is coarsely convex. In particular, the free product $X * Y$ satisfies the coarse Baum–Connes conjecture. This talk is based on a ongoing joint work with Tomohiro Fukaya (Tokyo Metropolitan University).

6　伊 敷 喜 斗 (理化学研 RAP)　グロモフ・ハウスドルフ空間の中の連結空間 ····················· 15
Yoshito Ishiki　　　(RIKEN)　Continua in the Gromov–Hausdorff space

概 要　We first prove that for all compact metrizable spaces, there exists a topological embedding of the compact metrizable space into each of the sets of compact metric spaces which are connected, path-connected, geodesic, or CAT(0), in the Gromov–Hausdorff space with finite prescribed values. As its application, we show that the sets prescribed above are path-connected and their non-empty open subsets have infinite topological dimension. By the same method, we also prove that the set of all proper CAT(0) spaces is path-connected and its non-empty open subsets have infinite topological dimension with respect to the pointed Gromov–Hausdorff distance.

7　伊 敷 喜 斗 (理化学研 RAP)　グロモフ・ハウスドルフ空間の中の木 ···························· 15
Yoshito Ishiki　　　(RIKEN)　Metric trees in the Gromov–Hausdorff space

概 要　Using the wedge sum of metric spaces, for all compact metrizable spaces, we construct a topological embedding of the compact metrizable space into the set of all metric trees in the Gromov–Hausdorff space with finite prescribed values. As its application, we show that the set of all metric trees is path-connected and its all non-empty open subsets have infinite topological dimension.

14:15〜16:00

8　米 村 拳 太 郎 (九 大 数 理)　多様体構造を持つカンドルの Lie 群への埋め込み ··················· 10
Kentaro Yonemura (Kyushu Univ.)　Embedding smooth quandles in Lie groups

概 要　We deal with embedding smooth quandles in Lie groups in this talk.

9 佐 々 木 優 (東京工高専)   結合的グラスマン多様体の部分多様体 ···························· 15
Yuuki Sasaki (Tokyo Nat. Coll. of Tech.)   Some submanifolds of the associative Grassmann manifold

概要 We construct a totally complex immersion from almost complex submanifolds of the 6-dimensional sphere into the associative Grassmann manifold. Also, as an analogy of almost complex immersions we construct a CR immersion from 3-dimensional CR submanifolds of the 6-dimensional sphere into the associative Grassmann manifold. Moreover, in the associative Grassmann manifold we show that many orbits of the action of the isotropy subgroup of the isometry group are the image of some CR immersions.

10 木 村 太 郎 (鶴岡工高専)   Biharmonic Cartan embeddings ································· 10
    間 下 克 哉 (法政大理工)
Taro Kimura   Biharmonic Cartan embeddings
(Nat. Inst. of Tech., Tsuruoka Coll.)
Katsuya Mashimo (Hosei Univ.)

概要 In this talk, we determine all the proper biharmonic submanifolds in compact Lie groups which are the image of Cartan embeddings defined by automorphism of order 4. Moreover we show that if the Cartan embedding defined by automorphism of order 3 is biharmonic, then it is harmonic.

11 井 川   治 (京都工繊大工芸) $Spin(8)$ の triality automorphism から誘導される σ 作用の軌道の幾何学
    間 下 克 哉 (法政大理工) ·· 15
Osamu Ikawa (Kyoto Inst. Tech.)   The geometry of orbits of σ-action induced by triality automorphism of
Katsuya Mashimo (Hosei Univ.) $Spin(8)$

概要 The universal covering group $Spin(8)$ of the special orthogonal group $SO(8)$ has an outer automorphism σ of order 3 called the triality automorphism. From this σ, the action of $Spin(8)$ on $Spin(8)$ itself, called the σ-action, is determined. This action is a hyperpolar action of cohomogeneity (= codimension of maximum-dimensional orbit) 2. We report on the orbit space and properties of orbits of this action.

12 塚 田 和 美 (お茶の水女大*)   Lie 球面幾何学の複素化と実グラスマン多様体の全複素部分多様体 ···· 15
Kazumi Tsukada (Ochanomizu Univ.*)   The complexification of Lie sphere geometry and totally complex sub-
                                    manifolds of the real Grassmann manifold

概要 The real Grassmann manifold $Gr_4(R^n)$ of all 4-dimensional subspaces in R^n is known to have the quaternionic Kähler structure. We consider the set $H_2(C^n)$ of all 2-dimensional complex subspaces in C^n that are isotropic with respect to the standard complex inner product. $H_2(C^n)$ is a complex manifold of dimension $2n - 7$ and has the holomorphic contact structure. The natural projection of $H_2(C^n)$ onto $Gr_4(R^n)$ is a twistor fibration. Through $H_2(C^n)$, we show the relation between the geometry regarded as the complexification of Lie sphere geometry and that of totally complex submanifolds of $Gr_4(R^n)$.

13 坂 根 由 昌 (阪   大*)   コンパクト等質空間上のアインシュタイン計量の存在・非存在について
                            ·· 15
Yusuke Sakane (Osaka Univ.*)   Existence and non-existence of Einstein metrics on compact homoge-
                                neous manifolds

概要 The study of existence and non-existence of Einstein metrics on G/H is started by Wang and Ziller in 1986. More general results for non-existence are obtained by Böhm in 2005. One of his results is that $G/H = SU(n + k_1 + \cdots + k_p)/S(SO(n)U(1) \times U(k_1) \times \cdots \times U(k_p))$ (where $SO(n)U(1) \subset U(n)$) does not admit G-invariant Einstein metrics, if $n > (k_1 + \cdots + k_p)^2 + 2$. He has obtained the results by considering "traceless" part of Ricci tensor. For $G/H = SO(2n + k_1 + \cdots + k_p)/SO(n)U(1) \times SO(k_1) \times \cdots \times SO(k_p)$ (where $SO(n)U(1) \subset U(n) \subset SO(2n)$), we can not apply his method directly. In this talk, we will show that, if $n \geq 5(k_1 + \cdots + k_p)$ $(k_i \geq 3)$, G/H does not admit G-invariant Einstein metrics. We also discuss existence of Einstein metrics for compact homogeneous manifolds G/H above.

16:15〜17:15　特別講演

多 羅 間 大 輔 (立命館大理工)　半単純 Lie 群上の可積分測地流について

Daisuke Tarama (Ritsumeikan Univ.)　On integrable geodesic flows over a semi-simple Lie group

概要　This talk deals with the geodesic flow of a semi-simple Lie group equipped with a left-invariant metric. After a short review over the geometric settings for general left-invariant Hamiltonian systems on the cotangent bundle to a Lie group, a class of left-invariant metrics is considered on a semi-simple Lie group, following Mishchenko and Fomenko. These metrics have been known to give rise to completely integrable geodesic flows since late 1970's. It is however rather recent that their equilibrium points are studied mostly on the basis of techniques in symplectic/Poisson geometry. In the talk, these developments are briefly reviewed. Then, as a main result, the classification of Williamson types of relative equilibrium points for a large subclass of above integrable geodesic flows is explained in terms of root systems. Related studies and remaining problems are also mentioned.

3月16日(木)　第Ⅱ会場

9:30〜12:00

14　川 村 昌 也 (香 川 高 専)　コンパクト概 Hermitian 多様体上の k-th Gauduchon 計量について ···· 15

Masaya Kawamura
　　(Kagawa Nat. Coll. of Tech.)　On a k-th Gauduchon metric on compact almost Hermitian manifolds

概要　In this talk, we introduce some results about k-th Gauduchon metrics on compact almost Hermitian manifolds. We have shown that if both the conformally k-th Gauduchon condition and the conformally semi-Kähler condition are satisfied, then it becomes conformally quasi-Kähler. Also, we characterize the k-th Gauduchon condition and by applying its characterization, we have shown some geometric conditions for negative Kodaira dimension on compact almost Hermitian manifolds.

15　宮 武 夏 雄 (九 大 Ｉ Ｍ Ｉ)　Uniformization of compact Sasakian manifolds using basic Higgs bun-
　　糟 谷 久 矢 (阪 大 理)　dles ··· 15

Natsuo Miyatake (Kyushu Univ.)　Uniformization of compact Sasakian manifolds using basic Higgs bun-
Hisashi Kasuya　(Osaka Univ.)　dles

概要　Simpson introduced the notion of uniformizing variation of Hodge structure (VHS) and showed that the universal covering of a compact Kähler manifold is isomorphic to a bounded symmetric domain if and only if there exists a uniformizing VHS on the Kähler manifold. In this talk, on compact Sasakian manifolds, we consider an analogy of this. We can formulate an analogy of the uniformizing VHS also on compact Sasakian manifolds. However, even if there exists a uniformizing VHS on a compact Sasakian manifold, the constructed map collapses all the points on each leaf of the foliation of the universal covering into one point and can never be an isomorphism. I will explain how to properly take the lift of this map and construct an isomorphism from the universal covering to a homogeneous space.

16　宮 武 夏 雄（九 大 Ｉ Ｍ Ｉ）　正則ではない Higgs 場を持つ Higgs 束の Donaldson 汎関数の対角形の計
量全体への制限 ·· 15

Natsuo Miyatake（Kyushu Univ.）　Restriction of Donaldson's functional to diagonal metrics on Higgs bundles with not-holomorphic Higgs filelds

概要　A Higgs bundle over a compact Kähler manifold X is the pair (E, θ) consisting of a holomorphic vector bundle $E \to X$ and a holomorphic section θ of $\mathrm{End}E \otimes \bigwedge^{1,0}$ satisfying $\theta \wedge \theta = 0$. The holomorphic section θ is called a Higgs field. Usually, Higgs fields are assumed to be holomorphic. However, in this talk, I will consider Higgs bundles with not holomorphic Higgs fields. I will suppose that the holomorphic vector bundle E decomposes into a direct sum of holomorphic line bundles, and I will give some necessary and sufficient conditions for Donaldson's functional to attain a minimum over diagonal metrics concerning the decomposition. I will also slightly extend the theorem for not-holomorphic splittings of the vector bundle.

17　宮 武 夏 雄（九 大 Ｉ Ｍ Ｉ）　巡回 Higgs 束の Hermitian–Einstein 方程式の拡張とその放物型方程式と
Dirichlet 問題 ··· 15

Natsuo Miyatake（Kyushu Univ.）　Some generalizations of the Hermitian–Einstein equation of cyclic Higgs bundles and their parabolic equations and the Dirichlet problem

概要　In this talk, I will introduce some generalizations of the Hermitian–Einstein equation of cyclic Higgs bundles on Riemann surfaces. For such generalized equations, I will show the existence and the uniqueness of the time-global solution of the parabolic equations and I will also show the existence and the uniqueness of the solution to the Dirichlet problem.

18　松 坂 公 暉（北大教育推進機構）　Recursion relation on moduli space of quasimaps in the case of Calabi–
秦 泉 寺 雅 夫（岡 山 大 自 然）　Yau hypersurface in CP^{N-1} ································· 15

Koki Matsuzaka（Hokkaido Univ.）　Recursion relation on moduli space of quasimaps in the case of Calabi–
Masao Jinzenji（Okayama Univ.）　Yau hypersurface in CP^{N-1}

概要　In computing of B-model in classical mirror symmetry, Picard–Fuchs equation is very important. In the case of Calabi–Yau hypersurface in CP^{N-1}, its solutions are used in a mirror map, and it is known that a generating function of intersection numbers $w(\mathcal{O}_{h^{N-3}}\mathcal{O}_{h^0})_{0,d}$ of moduli space $\widetilde{Mp}_{0,2}(N, d)$ of quasimaps from CP^1 with 2 marked points to CP^{N-1} coincides with the mirror map. In our previous work, we proved that the solutions are written by using a term $d \cdot w(\sigma_j(\mathcal{O}_{h^{N-2-j}})\mathcal{O}_{h^{-1}})_{0,d} + w(\sigma_{j-1}(\mathcal{O}_{h^{N-1-j}})\mathcal{O}_{h^{-1}})_{0,d}$, where σ_j corresponds to the Mumford–Morita–Miller class. In this talk, we see that the above term can be obtained from a recursion relation on moduli space $\widetilde{Mp}_{0,2|1}(N, d)$ of quasimaps from CP^1 with $2+1$ marked points to CP^{N-1}.

19　小 林 和 志（阪 大 理）　ある gerbe による複素トーラスの変形とホモロジー的ミラー対称性 ···· 15
Kazushi Kobayashi（Osaka Univ.）　A gerby deformation of complex tori and the homological mirror symmetry

概要　Let $(X, \check{X})$ be a mirror pair of a complex torus X and its mirror partner $\check{X}$. This mirror pair is described as the trivial special Lagrangian torus fibrations $X \to B$ and $\check{X} \to B$ on the same base space B by SYZ construction. Then, we can associate a holomorphic line bundle $E(s, \mathcal{L}) \to X$ to a pair $(s, \mathcal{L})$ of a Lagrangian section s of $\check{X} \to B$ and a unitary local system $\mathcal{L}$ along it. In this talk, we first construct the deformation $X_{\mathcal{G}}$ of X by a certain flat gerbe $\mathcal{G}$ and its mirror partner $\check{X}_{\mathcal{G}}$ from the mirror pair $(X, \check{X})$, and discuss deformations of objects $E(s, \mathcal{L})$ and $(s, \mathcal{L})$ over the deformed mirror pair $(X_{\mathcal{G}}, \check{X}_{\mathcal{G}})$.

20　中 西 隼 斗（千葉大融合理工）　モースホモトピーを用いたトーリックファノ曲面のホモロジー的ミラー
　　　　　　　　　　　　　　　　対称性 ·· 15

　　　Hayato Nakanishi（Chiba Univ.）　Homological mirror symmetry of toric Fano surfaces via Morse homotopy

概 要　Strominger–Yau–Zaslow (SYZ) proposed a way of constructing mirror pairs as pairs of torus fibrations. We apply this SYZ construction to toric Fano surfaces as complex manifolds, and discuss the homological mirror symmetry, where we consider Morse homotopy of the moment polytope instead of the Fukaya category.

21　山 本 悠 登（ IBS-CGP ）　超曲面の周期積分とトロピカル幾何学 ···························· 15
　　　Yuto Yamamoto　（IBS-CGP）　Period integrals of hypersurfaces via tropical geometry

概 要　Let $\{Z_t\}_t$ be a one-parameter family of complex toric hypersurfaces of dimension $d \geq 1$. We compute asymptotics of period integrals for $\{Z_t\}_t$ by applying the method of Abouzaid–Ganatra–Iritani–Sheridan, which uses tropical geometry. As integrands, we consider Poincaré residues of meromorphic $(d+1)$-forms on the ambient toric variety, which have poles along the hypersurface Z_t. The cycles over which we integrate them are spheres and tori which correspond to tropical $(0, d)$-cycles and $(d, 0)$-cycles on the tropicalization of $\{Z_t\}_t$ respectively.

13:00〜14:00　特別講演

橋 本 義 規（阪 公 大 理）♭　因子に沿って錐的特異点をもつ 定スカラー曲率 Kähler 計量についての
　　　　　　　　　　　　　　　　最近の進展
Yoshinori Hashimoto　　　　Recent developments on constant scalar curvature Kähler metrics with
　　（Osaka Metro. Univ.）　　cone singularities along a divisor

概 要　We present some recent results concerning constant scalar curvature Kähler metrics with cone singularities along a divisor, henceforth abbreviated as cscK cone metrics. One of the main results is that the existence of cscK cone metrics implies various stability conditions of the underlying pair of the manifold and the divisor, including G-uniform K-stability and K-polystability. We also prove that any Kähler manifold admits a cscK cone metric if the divisor is a generic member of the linear system defined by a sufficiently large multiple of the polarisation, and point out an analogy to the twisted constant scalar curvature Kähler metrics. This talk is based on a joint work with Takahiro Aoi and Kai Zheng.

3月17日（金）　　第Ⅱ会場

9:30〜11:40

22　泉　　宏 明（広 　 島 　 大）　ゲーム理論の意義と概日リズムの定式化 ························· 15
　　　Hiroaki Izumi（Hiroshima Univ.）　Significance of game theory and formulization of in-phase and anti-phase circadian rhythms

概 要　In this paper, we explain the significance of game theory, which frees a system of differential equations from the spell of integrability conditions. Also using it, we present the system of equations of in-phase and anti-phase circadian rhythms from the viewpoint of variational principle. In addition, the general formulization of the mathematical structure of phase transition and synchronization is carried out.

23　軸 丸 芳 揮（九 大 Ｉ Ｍ Ｉ）　可積分幾何に基づく Michell トラス型構造と離散対数型美的曲線 ‥‥‥ 15
　　早 川 健太郎（京　大　　工）
　　林　　和 希（京　大　　工）
　　梶 原 健 司（九 大 Ｉ Ｍ Ｉ）
　　横 須 賀 洋 平（鹿児島大理工）

Yoshiki Jikumaru (Kyushu Univ.)
Kentaro Hayakawa (Kyoto Univ.)
Kazuki Hayashi (Kyoto Univ.)
Kenji Kajiwara (Kyushu Univ.)
Yohei Yokosuka (Kagoshima Univ.)
On the Michell truss-like structure and discrete log-aesthetic curves based on integrable geometry

概要　The truss structure minimizing the product of axial forces and lengths for a given load and a support condition is called Michell truss, which is classically known in the field of structural mechanics. In this presentation, we have an analytical construction of Michell truss-like structure described by a discrete holomorphic function (discrete conformal map) in the context of discrete integrable systems. The validity of the structure is demonstrated by the result of structural analysis. Moreover, we show the truss structure is composed of so-called discrete log-aesthetic curves. This structure connects three objects (discrete holomorphic functions, discrete log-aesthetic curves, and classical truss structures) having completely different origins which were achieved through the collaboration of mathematics and architecture.

24　陶 山 芳 彦（福 岡 大 理）　Generic で共形平坦な超曲面内の曲率曲面の拡張と近似 ‥‥‥‥‥‥ 15
　　松 浦　　望（久留米工大工）

Yoshihiko Suyama (Fukuoka Univ.)
Nozomu Matsuura
　　　　　(Kurume Inst. of Tech.)
Extension and approximation of curvature surfaces in generic conformally flat hypersurfaces

概要　We talk about curvature surfaces of generic conformally flat analytic-hypersurfaces in the Euclidean 4-space.

25　石 渡　　聡（山 形 大 理）　リーマン多様体上の非対称拡散過程の離散近似 ‥‥‥‥‥‥‥‥‥ 10
　　河 備 浩 司（慶 大 経 済）

Satoshi Ishiwata (Yamagata Univ.)
Hiroshi Kawabi　(Keio Univ.)
A discretization of a non-symmetric diffusion on a Riemannian manifold

概要　In this talk, we give a graph discretized approximation of the diffusion for a Schrödinger operator with drift on a complete Riemannian manifold.

26　張　　　　頁（沖縄科学技術大）　Gradient estimates for the heat semigroup on step-two Carnot groups ‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥ 15

Ye Zhang
(Okinawa Inst. of Sci. and Tech. Grad. Univ.)
Gradient estimates for the heat semigroup on step-two Carnot groups

概要　It is well-known that we can characterize the lower bound of the Ricci curvature by the bound for the gradient of the heat semigroup. However, on a nonabelian nilpotent Lie group endowed with a left-invariant Riemannian metric, there exists a direction of strictly negative Ricci curvature. This implies the gradient bound has exponential growth. In this talk, I will present how to improve the gradient bound to the constant in the setting of step-two Carnot groups on which the H.-Q. Li inequality holds.

27 武 富 雄 一 郎（阪 公 大 理）　リーマン計量の moduli 空間の極大元について · 15
　　Yuichiro Taketomi　　　　　　　A maximal element of a moduli space of Riemannian metrics
　　　　　　　（Osaka Metro. Univ.）

概要 For a given smooth manifold X, we consider the moduli space of Riemannian metrics on X up to isometry and scaling. One can define a preorder on the moduli space by the size of isometry groups. We call a Riemannian metric that attains a maximal element with respect to the preorder a maximal metric. Maximal metrics give nice examples of self-similar solutions for various metric evolution equations such as the Ricci flow. In this talk, we construct many examples of maximal metrics on Euclidean spaces.

28 松 本 佳 彦（阪　大　理）　写像の繰り込みエネルギーと共形測地線 · 15
　　Yoshihiko Matsumoto (Osaka Univ.)　　Renormalized energy of maps and conformal geodesics

概要 We introduce a certain renormalized energy of maps between asymptotically hyperbolic Einstein manifolds. Then, it is used to give a holographic description of conformal geodesics on the boundary at infinity, in a way deeply inspired by a work of Fine and Herfray on renormalized area minimization and conformal geodesics.

14:15〜14:55

29 雪 田 友 成（早 大 教 育）　On nerves and growth rates of 2-dimensional Coxeter systems · · · · · · · 15
　　Tomoshige Yukita (Waseda Univ.)　　On nerves and growth rates of 2-dimensional Coxeter systems

概要 For a Coxeter system (Γ, S), the nerve $L(\Gamma, S)$ is a simplicial complex defined via the structure of finite parabolic subgroups of Γ. The dimension of (Γ, S) is defined by $\dim L(\Gamma, S) + 1$. In this talk, we consider the relationship between the combinatorial structure of $L(\Gamma, S)$ and the arithmetic properties of the growth rate of (Γ, S). We show that the growth rate of a 2-dimensional Coxeter system (Γ, S) with vanishing (resp. positive) Euler characteristic $\chi(L(\Gamma, S))$ is a Salem (resp. Pisot) number. This is a joint work with Naomi Bredon.

30 牛 島　　　顕（兵庫県立大国際商経）　ケーリー・クライン幾何学としての双曲平面でのチェバの定理とメネラ
　　　　　　　　　　　　　　　　　　ウスの定理 · 10
　　Akira Ushijima (Univ. of Hyogo)　　Ceva's and Menelaus' theorems in the hyperbolic plane as Cayley–Klein
　　　　　　　　　　　　　　　　　　geometry

概要 Using the construction of the hyperbolic plane as Cayley–Klein geometry, we will demonstrate how to obtain Ceva's and Menelaus' theorems in the hyperbolic plane from their corresponding theorems in the real projective plane.

15:10〜16:10　特別講演

　　H. Seshadri　　　　　　　　　　　正の双正則断面曲率を持つケーラー多様体の直径について
　　（Indian Inst. of Sci., Bangalore）

　　Harish Seshadri　　　　　　　　　On the diameter of Kähler manifolds with positive bisectional curvature
　　（Indian Inst. of Sci., Bangalore）

概要 I will discuss the Kähler analogues of the classical Bishop volume inequality and Myers–Bonnet diameter bound for Riemannian manifolds. In particular, I will outline the proof of diameter rigidity (an analogue of Cheng's theorem in the Riemannian case) for compact Kähler n-manifolds (M, ω) with bisectional curvature $BK \geq 1$. It is known from the work of Li–Wang that $\mathrm{diam}\,(M) \leq \mathrm{diam}\,(\mathbb{C}P^n)$ for such manifolds, where $\mathbb{C}P^n$ is endowed the Fubini–Study metric. In joint work with V. Datar, we proved that if $\mathrm{diam}\,(M) = \mathrm{diam}\,(\mathbb{C}P^n)$, then M is isometric to $\mathbb{C}P^n$.

函　数　論

3月15日(水)　　第Ⅴ会場

9:30～11:45

1　齋 藤 三 郎 (群馬大*•再生核研)　Complex analysis and theory of reproducing kernels ················ 10

Saburou Saitoh　　　　　　　Complex analysis and theory of reproducing kernels
(Gunma Univ.*/Inst. of Reproducing Kernels)

概要 The theory of reproducing kernels is very fundamental, beautiful and will have many applications in analysis, numerical analysis and data sciences. Based on a draft paper, I would like to give a global viewpoint for the relation of complex analysis and the theory of reproducing kernels. I listed the basic references on the topics.

2　齋 藤 三 郎 (群馬大*•再生核研)　Complex analysis and division by zero calculus ···················· 15

Saburou Saitoh　　　　　　　Complex analysis and division by zero calculus
(Gunma Univ.*/Inst. of Reproducing Kernels)

概要 Based on a draft book manuscript, I would like to introduce the basic and essential relations of complex analysis and division by zero calculus. Basic references are cited in the references.

3　綾 野 孝 則 (阪公大数学研)　種数 3 の超楕円関数と楕円関数の間の関係式 ······················· 15
V. M. Buchstaber
　　　(Steklov Inst. of Math.)

Takanori Ayano (Osaka Metro. Univ.)　A relationship between hyperelliptic functions of genus 3 and elliptic
Victor M. Buchstaber　　　　　functions
　　　(Steklov Inst. of Math.)

概要 In the nineteenth century, the reductions of hyperelliptic integrals to elliptic integrals were studied actively and many examples of the reductions were obtained. They are closely related to coverings of curves, split Jacobians, and automorphism groups of curves. This knowledge is applied to the isogeny-based cryptography. In our previous work, by using this knowledge, we derived the relationships between the hyperelliptic functions of genus 2 and the elliptic functions when the curve of genus 2 admits a morphism of degree 2 to an elliptic curve. In this talk, we will derive a relationship between the hyperelliptic functions of genus 3 and the elliptic functions when the hyperelliptic curve of genus 3 admits a morphism of degree 2 to an elliptic curve.

4　杉 山 真 吾 (日 大 理 工)　同変関数の存在と Schwarz 微分 ································· 10

Shingo Sugiyama (Nihon Univ.)　The existence of equivariant functions and the Schwarzian derivative

概要 Equivariant functions associated to a 2-dimensional representation of a Fuchsian group was introduced by Saber and Sebbar. They are regarded as a generalization of automorphic functions. We prove the existence of equivariant functions associated to any generic 2-dimensional representation of any Fuchsian group. We prove such existence by using the Schwarzian derivative.

5　山 岸 義 和（龍谷大先端理工）　回転対称性を加えた対数螺旋格子上の円充填とボロノイ分割 · · · · · · · · · 10
　　上 薗 拓 郎
　　　　　　（マースネットワークス）
　　須 志 田 隆 道（サレジオ工高専）

Yoshikazu Yamagishi (Ryukoku Univ.)
Takuro Uezono (Mars Networks Corp.)
Takamichi Sushida (Salesian Polytech.)
Voronoi tiling and circle packing on spiral lattices with rotational symmetry

概要　It is shown that the bifurcation diagram of circle packings on logarithmic spiral lattices with rotational symmetry is graph-theoretically dual to the bifurcation diagram of Voronoi tessellations, by using the relative metric. If the rotation parameter (called divergence angle) is badly approximable, then the aspect ratio of the quadrilateral Voronoi cells is bounded. If the divergence angle is linearly equivalent to the golden section, then the shape of the quadrilateral cells tend to square as the plastochron ratio tends to 1.

6　熊 谷　　　駿（東 北 大 情 報）　折り紙のボロノイ分解について · 15
　Shun Kumagai (Tohoku Univ.)　Voronoi decomposition of origamis

概要　The Edwards–Sanderson–Schmidt method uses the Voronoi decomposition to present an excellent criterion for the equivalence class and the Veech group of a finite translation surface. The key argument of their method includes a complicated combinatorial structure. An origami is a typical example of a translation surface defined combinatorially. This talk discusses the Voronoi decomposition of a half-translation version of origami.

7　馬 場 伸 平（阪　　大　　理）　Bending maps of Teichmüller spaces and character varieties · · · · · · · · · 15
　Shinpei Baba　　(Osaka Univ.)　Bending maps of Teichmüller spaces and character varieties

概要　The space holomorphic quadratic differentials on a compact Riemann surface is a complex vector space. By the holonomy map of complex projective structures, this vector space properly embeds into the PSL(2, C)-character variety of the base surface. We construct certain analogues of such an embedding from the viewpoint of Thurston's parametrization of complex projective structures.

8　小 森 洋 平（早　大　教　育）　Applications of canonical polygons of Zieschang–Vogt–Coldewey · · · · · 15
　Yohei Komori　(Waseda Univ.)　Applications of canonical polygons of Zieschang–Vogt–Coldewey

概要　As applications of canonical polygons of Zieschang–Vogt–Coldewey, we will show that (1) 6g-6 angles between geodesics on Riemann surfaces of genus g globally parametrize Teichmuller space of genus g surfaces. (2) Mapping classes of genus 2 surface can be represented by the cut and paste argument of canonical polygons.

9　木 坂 正 史（京大人間環境）　Polynomial-like mappings and transcendental entire functions with irrationally indifferent fixed points · 15
　Masashi Kisaka　(Kyoto Univ.)　Polynomial-like mappings and transcendental entire functions with irrationally indifferent fixed points

概要　In this talk, by using the theory of polynomial-like mappings, we construct various kinds of transcendental entire functions with irrationally indifferent fixed points. This talk is based on the joint work with Hiroto Naba.

14:15〜15:15　特別講演

中 西 敏 浩（島根大総合理工）　おもに種数 2 のタイヒミュラー空間とクライン群について

Toshihiro Nakanishi (Shimane Univ.)　Teichmüller space of the genus two surface and Kleinian groups

概要　In this talk the Teichmüller space is a deformation space of marked Fuchsian groups of finite type, in most cases, genus two Fuchsian groups. We deal with (1) trace functions as parameters for a Teichmüller space, (2) matrix representation of the genus two surface group, (3) mapping classes represented by rational transformations. These materials are used to produce some examples of Kleinian groups related to surface groups.

15:30〜16:30　2022 年度 (第 21 回) 日本数学会解析学賞受賞特別講演

松 崎 克 彦（早 大 教 育）　絶対連続タイヒミュラー空間の曲線と関数空間

Katsuhiko Matsuzaki (Waseda Univ.)　Curves and function spaces of absolutely continuous Teichmüller spaces

概要　The universal Teichmüller space is the total space containing all quasiconformal Teichmüller spaces and it can be regarded as the space of normalized quasisymmetric functions f on the real line. According to the regularity of these functions f, there are two different directions of subspaces included in the universal Teichmüller space: Teichmüller spaces of Riemann surfaces are typically in the direction of totally singular f, and Teichmüller spaces of function spaces are absolutely continuous f.

Teichmüller spaces can be represented by quasisymmetric homeomorphisms mentioned above, and in other ways, they can be represented by the complex dilatations of quasiconformal mappings, the Schwarzian or pre-Schwarzian derivatives of conformal mappings, and the quasicircles given as the images of the circle. Fundamental studies of particular Teichmüller spaces are composed by the investigation of the relationship between these different representations and structures. In addition, if we deal with absolutely continuous Teichmüller spaces, the derivative f' or $\log f'$ defines the corresponding function spaces, and by using them, we can introduce simpler structures to these Teichmüller spaces.

In this talk, we exhibit several important examples of absolutely continuous Teichmüller spaces and explain how the identification of different representations works. The examples include Weil–Petersson Teichmüller spaces, BMO Teichmüller spaces and the space of chord-arc curves between them. One technical tool is the simultaneous uniformization imported from the theory of quasifuchsian spaces. We represent the space of particular quasicircles by the product of the corresponding Teichmüller spaces and consider biholomorphic correspondence between this parameter space and the complex function space. Furthermore, we apply this method to see (dis)continuous dependence of the Riemann mapping parametrizations of the family of Weil–Petersson curves and chord-arc curves to their arc-length parametrizations.

3 月 16 日（木）　第 V 会場

9:30〜11:45

10　上 野 康 平（大 同 大）　Dynamics of superattracting skew products ⋯⋯⋯⋯⋯⋯⋯⋯⋯ 15

Kohei Ueno　　(Daido Univ.)　Dynamics of superattracting skew products

概要　We consider the dynamics of a holomorphic skew product with a superattracting fixed point. We proved that it is generally conjugate to a monomial map on an invariant wedge whose closure contains the fixed point. In this talk we provide several kinds of plurisubharmonic functions on the complement of specific fibers in the attracting basin, which describe the vertical dynamics well.

11　Shaolin Chen
　　　　　(Hengyang Normal Univ.)
　濱 田 英 隆 (九州産大理工)
　Jian-Feng Zhu (Huaqiao Univ.)

Lipschitz constant of harmonic Bloch functions and composition operators on Bloch and Hardy type spaces ·························· 15

Shaolin Chen (Hengyang Normal Univ.)
Hidetaka Hamada
　　　　(Kyushu Sangyo Univ.)
Jian-Feng Zhu (Huaqiao Univ.)

Lipschitz constant of harmonic Bloch functions and composition operators on Bloch and Hardy type spaces

概要　The main purpose of this talk is to discuss Hardy type spaces, Bloch type spaces and the composition operators of complex-valued harmonic functions. We first establish a sharp estimate of the Lipschitz continuity of complex-valued harmonic functions in Bloch type spaces with respect to the pseudo-hyperbolic metric, which gives an answer to an open problem. Then some classes of composition operators on Bloch and Hardy type spaces will be investigated. The obtained results improve and extend some corresponding known results.

12　濱 田 英 隆 (九州産大理工)
　G. Kohr　　　(Babeş-Bolyai Univ.)
　M. Kohr　　　(Babeş-Bolyai Univ)

Fekete–Szegö problem for univalent mappings in one and higher dimensions ·· 15

Hidetaka Hamada
　　　　(Kyushu Sangyo Univ.)
Gabriela Kohr (Babeş-Bolyai Univ.)
Mirela Kohr (Babeş-Bolyai Univ)

Fekete–Szegö problem for univalent mappings in one and higher dimensions

概要　In this talk, we will give the Fekete–Szegö inequality for the mappings f in various subclasses of normalized univalent mappings which are the first elements of g-Loewner chains on the unit disc $\mathbb{U}$ in $\mathbb{C}$ and also on the unit ball $\mathbb{B}$ of a complex Banach space. As an application, we give the estimation of the third coefficient for f under the condition that the second coefficient of f is zero. This result gives a generalization of the estimation of the third coefficient for odd univalent functions on the unit disc $\mathbb{U}$. We also give the Fekete–Szegö inequality for the images of the first elements of g-Loewner chains on $\mathbb{U}$ under the Roper–Suffridge type extension operators.

13　濱 田 英 隆 (九州産大理工)
　G. Kohr　　　(Babeş-Bolyai Univ.)

Loewner PDE in infinite dimensions ··························· 15

Hidetaka Hamada
　　　　(Kyushu Sangyo Univ.)
Gabriela Kohr (Babeş-Bolyai Univ.)

Loewner PDE in infinite dimensions

概要　In this talk, we generalize the existence and uniqueness result for the solutions of the Loewner partial differential equation (Loewner PDE) from $\mathbb{C}^n$ to the case of separable reflexive complex Banach spaces.

Shaolin Chen (Hengyang Normal Univ.)
Hidetaka Hamada
　　　　(Kyushu Sangyo Univ.)

Some sharp Schwarz–Pick type estimates and their applications of harmonic and pluriharmonic functions

概要　The purpose of this talk is to study the Schwarz–Pick type inequalities for harmonic or pluriharmonic functions. By analogy with the generalized Khavinson conjecture, we first give some sharp estimates of the norm of harmonic functions from the Euclidean unit ball in $\mathbb{R}^n$ into the unit ball of the real ℓ_p space. Next, we give several sharp Schwarz–Pick type inequalities for pluriharmonic functions from the Euclidean unit ball in $\mathbb{C}^n$ or from the unit polydisc in $\mathbb{C}^n$ into the unit ball of the ℓ_p space. Furthermore, we establish some sharp coefficient type Schwarz–Pick inequalities for pluriharmonic functions defined in the ℓ_p space. Finally, we use the obtained Schwarz–Pick type inequalities to discuss the Schwarz–Pick type lemmas of arbitrary order and the Bohr phenomenon of harmonic or pluriharmonic functions.

Shaolin Chen (Hengyang Normal Univ.)
Hidetaka Hamada
　　　　(Kyushu Sangyo Univ.)
Saminathan Ponnusamy
　　(Indian Inst. of Tech. Madras)
Ramakrishnan Vijayakumar
　　(Indian Inst. of Tech. Madras)

Schwarz type lemmas and their applications in Banach spaces

概要　The main purpose of this talk is to develop some methods to investigate the Schwarz type lemmas of holomorphic mappings and pluriharmonic mappings in Banach spaces. Initially, we extend the classical Schwarz lemmas of holomorphic mappings to Banach spaces, and then we apply to establish a sharp Bloch type theorem for pluriharmonic mappings on homogeneous unit balls of $\mathbb{C}^n$ and to obtain some sharp boundary Schwarz type lemmas for holomorphic mappings in Banach spaces. Next, we improve and generalize the classical Schwarz lemmas of planar harmonic mappings into the sharp forms of Banach spaces and give some applications to sharp boundary Schwarz type lemmas for pluriharmonic mappings in Banach spaces. Finally, we give some sharp Schwarz-Pick type estimates of pluriharmonic mappings in JB*-triples.

Yuta Watanabe (Univ. of Tokyo)

L^2-type Dolbeault isomorphisms and vanishing theorems for logarithmic sheaves twisted by multiplier ideal sheaves

概要　In this speech, we first establish an L^2-type Dolbeault isomorphism for the sheaf of logarithmic differential forms twisted by the multiplier ideal sheaf. By using this isomorphism and L^2-estimates equipped with a singular Hermitian metric, we obtain logarithmic vanishing theorems involving multiplier ideal sheaves on compact Kähler manifolds with simple normal crossing divisors.

17 大 沢 健 夫 (名大多元数理)♭ On the Levi problem on Kähler manifolds under the negativity of canonical bundles on the boundary · 15

Takeo Ohsawa（Nagoya Univ.） On the Levi problem on Kähler manifolds under the negativity of canonical bundles on the boundary

概要 It is proved that a bounded smooth pseudoconvex domain D in a Kähler manifold M can be mapped onto a locally closed analytic set in a complex number space holomorphically and properly with connected fibers if the caninical bundle of M is negative on a neighborhood of the boundary of D. A similar result holds for Zariski open domains of compact manifolds.

13:00〜14:00　特別講演

阿 部　　誠 (広島大先進理工)　Stein 多様体上の岡・Grauert の原理をみたす領域について

Makoto Abe (Hiroshima Univ.)　Domains over a Stein manifold satisfying the Oka–Grauert principle

概要 We discuss the pseudoconvexity and the Steinness of a complex manifold or a complex space under some conditions. Among others, we announce the recent joint research with Sugiyama on the Steinness of a domain over a Stein manifold that satisfies the Oka–Grauert principle for a complex Lie group of positive dimension and some additional cohomological conditions.

函 数 方 程 式 論

3月15日(水)　　第Ⅳ会場

9:30〜12:00

1 竹 井 優 美 子（茨 城 工 高 専）　(1, 1, 1, 2)-超幾何微分方程式の Voros 係数の位相的漸化式による表示と
　　　　　　　　　　　　　　　　　　その応用 ··· 12

Yumiko Takei
　　　　(Ibaraki Nat. Coll. of Tech.)　On the expression of Voros coefficients for the hypergeometric differential equation of type (1,1,1,2) in terms of the topological recursion, and its applications

概 要　Voros coefficients are important objects in the exact WKB analysis for the global study of solutions of differential equations. In this talk I will report that the Voros coefficients for the hypergeometric differential equation of type (1,1,1,2) are given by the generating functions of free energies defined in terms of Eynard and Orantin's topological recursion.

2 松 原 宰 栄（熊 本 大 先 端）　The signature of the invariant hermitian form for a regular holonomic
　後 藤 良 彰（小 樽 商 大）　GKZ system ··· 12
Saiei-Jaeyeong Matsubara-Heo
　　　　　　　(Kumamoto Univ.)　The signature of the invariant hermitian form for a regular holonomic GKZ system
Yoshiaki Goto
　　　(Otaru Univ. of Commerce)

概 要　Frits Beukers and Carlos Verschoor conjectured that the signature of the monodromy invariant hermitian form for a regular holonomic GKZ system has an explicit formula. We prove that this conjecture is true, by computing the intersection matrix of the twisted homology group associated to Euler type integral representation of a solution to GKZ system.

3 伊 藤 秀 一（神 奈 川 大 工）　シンプレクティック写像族のバーコフ標準化とハミルトン系の超可積分性
　　　　　　　　　　　　　　　　　　··· 12

Hidekazu Ito (Kanagawa Univ.)　Birkhoff normalization of a family of symplectic maps and superintegrability of Hamiltonian systems

概 要　Integrability of a Hamiltonian system is defined by the existence of sufficiently many (Poisson-commuting) integrals. The Liouville–Arnold theorem gives description of the orbit structure near a compact regular level set of those integrals, however, is not valid near singularities of those integrals. The aim of this talk is to clarify the orbit structure of a super (noncommutatively) integrable system near singularities of its integrals. For this purpose, Birkhoff normalization for a family of symplectic maps plays a key role. We show that there exists a convergent Birkhoff normalization if a family of $2n$-dimensional analytic symplectic maps has $n + q$ integrals near a fixed point of resonance degree q.

4 上 村 　 豊（東 京 海 洋 大★）♭ エネルギー依存逆散乱の 2 成分ソリトン ··························· 12
Yutaka Kamimura
(Tokyo Univ. of Marine Sci. and Tech.★)　Two-component solitons via an energy dependent inverse scattering

概 要　An extended KdV hierarchy is discussed. Based upon an inverse scattering method on an energy dependent Schroedinger operator, soliton solutions in the hierarchy are constructed in a unified manner.

5　畑　　裕　貴（阪 府 大 理）　２つの時間遅れをもつ線形微分方程式の漸近安定性 ·················· 12
　　松 永 秀 章（阪 公 大 理）
Yuki Hata （Osaka Pref. Univ.）　Asymptotic stability in a linear differential equation with two delays
Hideaki Matsunaga
　　　　　（Osaka Metro. Univ.）

概要　This study is devoted to the investigation of the effect of delays on the asymptotic stability of a linear differential equation with two delays $x'(t) = -ax(t) - bx(t - \tau) - cx(t - 2\tau)$, $t \geq 0$, where a, b, and c are real numbers and $\tau > 0$. We establish some explicit conditions for the zero solution of the equation to be asymptotically stable.

6　鬼 塚 政 一（岡 山 理 大 理）　On Ulam stability of two-dimensional linear differential systems ······ 10
Masakazu Onitsuka　　　　　On Ulam stability of two-dimensional linear differential systems
　　　　（Okayama Univ. of Sci.）

概要　The main purpose of this talk is to classify the Ulam stability of the linear differential equation $\mathbf{u}' = A\mathbf{u}$, where A is a real-valued constant 2×2 matrix. The best Ulam constant is obtained for some special cases of A.

7　宇 佐 美 広 介（岐 阜 大 工）　非線形項に単調性等を仮定しない常微分方程式の正値解の非存在定理に
　　　　　　　　　　　　　　　　ついて ··· 10
Hiroyuki Usami　（Gifu Univ.）　Study on nonexistence results of positive solutions of ODEs without
　　　　　　　　　　　　　　　assuming monotonicities on nonlinear terms

概要　Sufficient conditions for the existence of positive solutions of quasilinear ODEs are given. Usually, such results are proved under the monotonicity conditions of nonlinear terms. However, in this talk we will give such results without assuming monotonicities on nonlinear terms.

8　柴 田 徹 太 郎（広島大先進理工）　Global and asymptotic behaviors of bifurcation curves of one-dimensional
　　　　　　　　　　　　　　　　　nonlocal elliptic equations ······································· 12
Tetsutaro Shibata (Hiroshima Univ.)　Global and asymptotic behaviors of bifurcation curves of one-dimensional
　　　　　　　　　　　　　　　　　nonlocal elliptic equations

概要　We consider the global behavior of the bifurcation curves and solution curves of one-dimensional nonlocal elliptic eigenvalue problems. We know that the bifurcation curve λ is a continuous function of the maximum norm $\alpha = \|u_\lambda\|_\infty$ such as $\lambda(\alpha)$. Here, u_λ is the positive solution associated with λ. Our purpose here is to establish the asymptotic formulas for $\lambda(\alpha)$ and u_λ as $\lambda \to \infty$.

9　濱 本 直 樹（阪 公 大 理）　The Poincaré constant for curl-free vector fields on a ball ··········· 12
Naoki Hamamoto (Osaka Metro. Univ.)　The Poincaré constant for curl-free vector fields on a ball

概要　We investigate the best value of the constant in classical Poincaré inequality

$$\int_{B^N} |\nabla \boldsymbol{u}|^2 dx \geq C \int_{B^N} |\boldsymbol{u}|^2 dx$$

for a class of vector fields $\boldsymbol{u}$ with $\boldsymbol{u}|_{\partial B^N} = \mathbf{0}$ on the unit ball $B^N \subset \mathbb{R}^N$ which are subject to the curl-free constraint. We find that the best value of C turns out to be the square of the first zero of Bessel function of the $(N/2)$-th order.

10　齋 藤 三 郎（群馬大*・再生核研）　Functional equations and theory of reproducing kernels ············· 10

Saburou Saitoh
(Gunma Univ.*/Inst. of Reproducing Kernels)

Functional equations and theory of reproducing kernels

概 要　By a survey paper, we shall introduce the basic relations of functional equations and the theory of reproducing kernels, globally, as a summary of the topics. In particular, I would like to introduce typical results with their principles in some concrete way based on the draft paper.

The general theory of reproducing kernels will give the basic tool of these widespread problems.

11　齋 藤 三 郎（群馬大*・再生核研）　Representations of quotients g/f =h in terms of g=fh ··············· 12

Saburou Saitoh
(Gunma Univ.*/Inst. of Reproducing Kernels)

Representations of quotients g/f =h in terms of g=fh

概 要　We are considering the simple functional equation hf=g. By the paper (REPRESENTATIONS OF QUOTIENTS g/f = h IN TERMS OF g = fh, International Journal of Reproducing Kernels Vol. 2 No. 1 (2023)), we shall introduce quotients g/f of general functions f and g in some deep and natural meanings, in a natural setting.

14:15〜16:15

12　堀 内 利 郎（茨 城 大 理）　On general Caffarelli–Kohn–Nirenberg type inequalities involving non-doubling weights ··· 12

Toshio Horiuchi (Ibaraki Univ.)

On general Caffarelli–Kohn–Nirenberg type inequalities involving non-doubling weights

概 要　By introducing $W(R_+) = P(R_+) \cup Q(R_+) = \cup_{a \in [0,\infty]} W_a(R_+)$ as a class of weight functions, we will establish the Caffarelli–Kohn–Nirenberg type inequalities for $p \geq 1$ involving non-doubling weights in $W(R_+)$. The classical Caffarelli–Kohn–Nirenberg type inequalities are categorized into non-critical and critical cases, and it is known that there is some kind of mysterious relationship between them. Interestingly the new framework in this treatise allows them to be integrated and reveals the meaning of mysterious relationships. A function $w(t)$ on $(0,\infty)$ is said to be a doubling weight if there exists a positive number C such that we have $C^{-1}w(t) \leq w(2t) \leq Cw(t)$　$(0 < t < \infty)$, where C is independent of each $t \in (0,\infty)$. When $w(t)$ does not possess this property, $w(t)$ is said to be a non-doubling weight in the talk.

13　梶 木 屋 龍 治　Boundedness of critical points in the symmetric mountain pass lemma

　　　（大阪電通大共通教育機構）　·· 12

Ryuji Kajikiya
　　（Osaka Electro-Comm. Univ.）

Boundedness of critical points in the symmetric mountain pass lemma

概 要　We study the boundedness of critical points defined by the symmetric mountain pass lemma. We construct three types of functionals, which have an unbounded sequence of critical values. For the first one, the set of all critical points is bounded and the set of critical values is unbounded. The second one has both an unbounded sequence and a bounded sequence of critical points. For the last one, the set of critical points is countably infinite and unbounded.

14　赤 木 剛 朗（東 北 大 理）　Maximal regularity of distributional solutions to degenerate elliptic sys-

　　宮 川 寛 基（東 北 大 理）　tems for locally integrable data ································· 12

Goro Akagi　　（Tohoku Univ.）
Hiroki Miyakawa (Tohoku Univ.)

Maximal regularity of distributional solutions to degenerate elliptic systems for locally integrable data

概 要　This talk is concerned with degenerate elliptic equations involving the p-Laplacian and absorption in unbounded domains. Main results consist of the existence of distributional solutions and their maximal regularity (estimates) for locally integrable forcing terms beyond the duality.

15　赤 木 剛 朗（東 北 大 理）　On some quasistatic evolution equation arising from fracture mechanics
　　佐 藤 光汰朗（東 北 大 理）　· 12

Goro Akagi　　（Tohoku Univ.）　On some quasistatic evolution equation arising from fracture mechanics
Kotaro Sato　（Tohoku Univ.）

概 要　This talk deals with some quasistatic evolution equation, which relates fracture mechanics and is also written as an evolutionary variational inequality. The main result of this talk is concerned with the existence of strong solutions complying with three qualitative properties, that is, irreversibility, unilateral equilibrium and energy conservation, which were originally proposed in a phase-field model for brittle fracture.

16　岡　　大 将（東　大　工）　Corrector results for space-time homogenization of fast diffusion equa-
　　　　　　　　　　　　　　　tions without assumptions for smoothness of coefficients　· · · · · · · · · · · 12

Tomoyuki Oka （Univ. of Tokyo）　Corrector results for space-time homogenization of fast diffusion equa-
　　　　　　　　　　　　　　　　tions without assumptions for smoothness of coefficients

概 要　In this talk, we shall discuss a space-time homogenization problem for fast diffusion equations with periodically oscillating (in space and time) coefficients. The main purpose of this talk is to present a corrector result, i.e., strong convergence of gradient of the solution with a corrector term. The proof is based on the unfolding method and the strong two-scale convergence theory.

17　鈴 木　　　貴（阪 大 Ｍ Ｍ Ｄ Ｓ）　ブラウン粒子気体モデルの数学解析 · 5

Takashi Suzuki　（Osaka Univ.）　Mathematical analysis for Brownian particle gas

概 要　We study Streater's model on Brownian particle gas in statistical mechanics on bounded domain in $\mathbf{R}^n$. If $n \le 2$, there is a solution global in time, provided that the entropy production is bounded.

18　谷 口 晃 一（東北大 AIMR）　Hardy–Hénon 型半線型熱方程式の解の無条件一意性と非一意性 · · · · · 10
　　千 頭　　昇（名　工　大）
　　池 田 正 弘
　　　　　（理化学研 AIP・慶大理工）
　　S. Tayachi
　　　　　（Univ. de Tunis El Manar）

Koichi Taniguchi （Tohoku Univ.）　Unconditional uniqueness and non-uniqueness of solutions for Hardy–
Noboru Chikami （Nagoya Inst. of Tech.）　Hénon parabolic equations
Masahiro Ikeda （RIKEN/Keio Univ.）
Slim Tayachi （Univ. de Tunis El Manar）

概 要　In this talk we study the problems of uniqueness for Hardy–Hénon parabolic equations, which are semilinear heat equations with the singular potential (Hardy type) or the increasing potential (Hénon type) in the nonlinear term. To deal with the Hardy–Hénon type nonlinearities, we employ the weighted Lorentz spaces as the solution space. The purpose of this talk is to prove unconditional uniqueness and non-uniqueness for Hardy–Hénon parabolic equations in the weighted Lorentz spaces.

19　下 條 昌 彦（都 立 大 理）　Spreading behavior of an SIR model with non-local dispersal · · · · · · · · 10
　　Jong Shenq Guo （Tamkang Univ.）
　　Amy Ai-Ling Poh（東　大　工）

Masahiko Shimojo　　Spreading behavior of an SIR model with non-local dispersal
　　　　（Tokyo Metro. Univ.）
Jong Shenq Guo （Tamkang Univ.）
Amy Ai-Ling Poh （Univ. of Tokyo）

概 要　We explain a Liouville type of theorem on the positive bounded entire solution of a class of reaction-diffusion systems with nonlocal dispersal. Some application from epidemiology is also given.

20 下 條 昌 彦（都 立 大 理）   Spreading behavior of a predator-prey system with fractional Laplacian
    Jong Shenq Guo（Tamkang Univ.） · 12
    <u>Masahiko Shimojo</u>   Spreading behavior of a predator-prey system with fractional Laplacian
            （Tokyo Metro. Univ.）
    Jong Shenq Guo（Tamkang Univ.）

概 要 We establish a Liouville theorem on the positive bounded entire solution of a class of reaction-diffusion systems with fractional diffusion. As an application, we investigate the spreading phenomena of a predator-prey system with fractional diffusion. More precisely, by a suitable limiting argument along with the Liouville-type theorem, we prove that the solution converges to the unique positive co-existence state behind the spreading front.

16:30〜17:30   2022年度 (第21回) 日本数学会解析学賞受賞特別講演

池 畠   優（広 島 大 工）   時間領域における囲い込み法の展開

Masaru Ikehata（Hiroshima Univ.）   Development of the time domain enclosure method

概 要 This talk is concerned with a reconstruction method in inverse problems formulated by using the solutions of various partial differential equations. Such equations are called the governing equations and the observation data are described by the solutions. The object to be reconstructed or extracted from the data is the discontinuity such as obstacles, inclusions, cracks etc.

The probe and enclosure methods are general ideas to extract information about unknown discontinuity embedded in a known background medium from the observation data. The data are given by the far field pattern of the scattered field, the Dirichlet-to-Neumann map or its partial knowledge at the boundary of the medium. The methods were introduced by the speaker and it has already been passed more than twenty years. The methods have been applied to several inverse problems, e.g., an inverse boundary value problem related to EIT(electrical impedance tomography), elasticity and inverse obstacle scattering problems of acoustic wave at a fixed wave number, whose governing equations are time-independent.

The next challenge and interest of the speaker were to extend the enclosure method to cover inverse problems governed by time-dependent PDEs. However, as a result of research over the last ten years, it has been found that the enclosure method is also effective for various time-dependent PDEs, such as the heat equation, the wave equation, a system of equations in thermoelasticity, the Maxwell system and quite recently the fractional diffusion equation.

This talk will give a brief history of probe and enclosure method and then describe some of recent developments of enclosure methods in the time domain.

3月16日（木）   第IV会場

9:15〜12:00

21 水 上 雅 昭（京 都 教 育 大）   Non-simultaneous blow-up in a two-species chemotaxis-competition model
    田 中 悠 也（東 京 理 大 理）   with single production · 12
    Masaaki Mizukami   Non-simultaneous blow-up in a two-species chemotaxis-competition model
            （Kyoto Univ. of Edu.）   with single production
    <u>Yuya Tanaka</u>（Tokyo Univ. of Sci.）

概 要 In a two-species chemotaxis-competition model, blow-up of solutions was shown in a previous paper. In this model, the production term seems to promote blow-up phenomena; this implies that the lack of the production term makes the solution likely to be bounded. Thus, it is expected that the model without one of the production terms has a solution such that the species which does not produce the chemical substance remains bounded, whereas the other species blows up. The purpose of this paper is to prove that this conjecture is true.

22　田 中 悠 也 (東 京 理 大 理)　Finite-time blow-up in a degenerate parabolic–elliptic Keller–Segel system with logistic source ·· 12

Yuya Tanaka (Tokyo Univ. of Sci.)　Finite-time blow-up in a degenerate parabolic–elliptic Keller–Segel system with logistic source

概要　This talk deals with a degenerate parabolic–elliptic Keller–Segel system with logistic source. In the case of nondegenerate diffusion, Black, Fuest and Lankeit (Z. Angew. Math. Phys.; 2021; 72; no. 96, 23 pp.) obtained a condition such that finite-time blow-up occurs. The purpose of this talk is to show that finite-time blow-up occurs also in the case of degenerate diffusion.

23　千 代 祐 太 朗 (東 京 理 大 理)　Boundedness of solutions to a chemotaxis system for tumor angiogenesis
　　水 上 雅 昭 (京都教育大教育)　·· 12

Yutaro Chiyo (Tokyo Univ. of Sci.)　Boundedness of solutions to a chemotaxis system for tumor angiogenesis
Masaaki Mizukami
　　　　　(Kyoto Univ. of Edu.)

概要　This talk deals with a chemotaxis system for tumor angiogenesis. When the third equation is simplified by the elliptic one and the sensitivity functions are constants, global existence and boundedness were proved by Tao and Winkler (Nonlinear Analysis; 2021; 112324; 16 pp). However, the case that the sensitivity functions are not constants and the third equation is parabolic seems not to have been studied yet. The purpose of this talk is to establish global existence and boundedness in a fully parabolic chemotaxis system for tumor angiogenesis with sensitivity functions.

24　勝 呂 剛 志 (京 大 数 理 研)♭　放物-楕円型 Keller–Segel 系の初期値問題の一様局所可積分空間における
　　　　　　　　　　　　　　適切性について ··· 12

Takeshi Suguro　(Kyoto Univ.)　Well-posedness of the Cauchy problem of a parabolic-elliptic Keller–Segel system in uniformly local spaces

概要　We consider the Cauchy problem of the parabolic-elliptic Keller–Segel system on Euclidean space. This system is one of the diffusion equation involving a nonlocal term. It is interesting whether this problem is well-posed in function spaces containing the non-decaying function. We show that the Cauchy problem of a Keller–Segel system is well-posed in uniformly local Lebesgue spaces.

25　細 野 竜 也 (東 北 大 理)♭　Global existence of solutions to the 4D attraction-repulsion chemotaxis
　　小 川 卓 克 (東 北 大 理)　system and applications of Brezis–Merle inequality ················ 12

Tatsuya Hosono (Tohoku Univ.)　Global existence of solutions to the 4D attraction-repulsion chemotaxis
Takayoshi Ogawa (Tohoku Univ.)　system and applications of Brezis–Merle inequality

概要　We consider the Cauchy problem for an attraction-repulsion chemotaxis system in the four space dimension. One of main topics in the study of such a system is the presence of L^1 threshold. In fact, the critical mass phenomenon called 8π-problem is well-known in the 2-dimensional setting. In this talk, using the Brezis–Merle type inequality and rearrangement arguments, we will show that the solution exists globally in time when the initial mass is less than 4-dimensional L^1 threshold value $(8\pi)^2$.

26　田 代 紀 一 (東 工 大 理)　Elliptic regularization による適切な一般化平均曲率流の構成について · 10

Kiichi Tashiro　　(Tokyo Tech)　On the construction of canonical generalized mean curvature flow by elliptic regularization

概要　In this talk, we consider a generalized mean curvature flow constructed by elliptic regularization. Elliptic regularization is a method invented by Tom Ilmanen to construct an approximation of the generalized mean curvature flow using real analytic functional. We will show that the area change of the region moved by this flow is given by equality using the generalized mean curvature. The key to the proof is to establish approximate velocity and estimate it in L^2.

27 三 浦 達 哉 (東 工 大 理)　Complete classification of planar p-elasticae $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 12
　　吉 澤 研 介 (九 大 I M I)

Tatsuya Miura　(Tokyo Tech)　Complete classification of planar p-elasticae
Kensuke Yoshizawa (Kyushu Univ.)

概 要 Euler's elastica is defined by a critical point of the total squared curvature under the fixed length constraint, and its L^p-counterpart is called p-elastica. In our talk, we completely classify all p-elasticae in the plane and obtain their explicit formulae as well as optimal regularity. To this end we introduce new types of p-elliptic functions which streamline the whole argument and result. As an application we also classify all closed planar p-elasticae.

28 長 澤 壯 之 (埼 玉 大 理 工)　非局所曲率流の存在時間の下界評価と爆発レート $\cdots\cdots\cdots\cdots\cdots\cdots$ 10

Takeyuki Nagasawa (Saitama Univ.)　A lower estimate of the life-span and a blow-up rate for non-local curvature flows for plane curves

概 要 Several non-local curvature flows for plane curves with general rotation number are considered here. The flows include the area-preserving flow and the length-preserving flow. Previously, we showed sufficient conditions for finite-time blow-up, and gave an upper bound of the blow-up time. Here, we give estimates for solutions including at least two important applications. As the first one, it gives a lower bound of the life span, which is a lower bound of the blow-up time for blow-up solutions. Secondly, our estimate also improves the blow-up rate of blow-up solutions.

29 三 浦 達 彦 (弘 前 大 理 工)　Error estimate for classical solutions to the heat equation in a moving thin domain and its limit equation $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 12

Tatsu-Hiko Miura (Hirosaki Univ.)　Error estimate for classical solutions to the heat equation in a moving thin domain and its limit equation

概 要 We consider the Neumann type problem of the heat equation in a moving thin domain around a given closed moving hypersurface. Our main result is an estimate in the sup-norm for the difference of a classical solution to the heat equation in the moving thin domain and a classical solution to a limit equation on the moving hypersurface which appears in the thin-film limit of the heat equation. To prove that error estimate, we construct a suitable approximate solution to the heat equation from a classical solution to the limit equation and then estimate the difference of a classical solution and the approximate one to the heat equation based on the maximum principle.

30 二 宮 広 和 (明 大 総 合 数 理)　等拡散によるパターン形成の例 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 12

Hirokazu Ninomiya (Meiji Univ.)　Example of pattern formation by equal diffusion

概 要 In 1952, Turing proposed the mechanism of pattern formation in which a stable equilibrium of some kinetic system is destabilized by diffusion. In the case of two-component reaction-diffusion systems, however, the diffusion coefficients should be different. Conversely, there exist several chemical models that produce the stable patterns even though the diffusion coefficients are equal. To study the pattern formation by equal diffusion, this talk presents an example of a kinetic system with a asymptotically stable equilibrium, while the corresponding reaction-diffusion system has a family of unstable stationary solutions that is arbitrarily close to the homogeneous stationary solution.

31　二 宮 広 和 (明大総合数理)　非一様場における面積保存曲率流のダイナミクス ·················· 12

Hirokazu Ninomiya (Meiji Univ.)　Dynamics of area-preserving curvature flow of a convex plane curve in an inhomogeneous medium

概要 In 1986, Gage studied the area-preserving curvature flows in a two-dimensional homogeneous medium. He showed that an initially convex closed curve remains convex and converges to a circle as time goes to infinity. However, in many applications, the medium is not homogeneous. In this talk, we consider the area preserving flow in an inhomogeneous medium when the area enclosed by the interface is small. The reduced equation of its center will be explained.

13:00〜14:00　特別講演

長 澤 壯 之 (埼 玉 大 理 工)　Möbius エネルギーの分解と波動写像

Takeyuki Nagasawa (Saitama Univ.)　The decomposition of the Möbius energies and wave maps

概要 The Möbius energy for knots is known as a functional invariant under Möbius transformations. There is an energy for links having the same properties. For the energies for knots and two-component links, there exists a Möbius invariant decomposition, that is, each decomposed part is still invariant under Möbius transformations.

Recently, the author found two new expressions of decomposition using Gauss maps of knots and links. One is an "indirect expression", the other is a "direct expression."

Using the indirect expression, we can regard the decomposition as the *parallelogram law* of the Möbius energy. Furthermore, the cosine formula of the Möbois energy for knots is generalized to decomposed energies.

It has been known that the first decomposed energy relates to an energy of fractional harmonic maps. We can see from the direct expression that the second one does to an energy of wave maps. As an application, we show the existence or non-existence of knots and links which Gauss maps are wave maps.

3月17日(金)　　第IV会場

9:30〜12:00

32　佐 藤 洋 平 (埼 玉 大 理 工)　斥力的連立シュレディンガー方程式の偶対称基底状態 ··············· 12

Yohei Sato　　(Saitama Univ.)　Even ground state for nonlinear Schrödinger systems with repulsive interaction

概要 It is known that the nonlinear Schrödinger systems with repulsive interaction has no ground states. Here ground state means a positive solution that attains a minimizing problem on the Nehari set with two constrains. On the other hand, when the minimizing problem is restricted to even functions, one calls a positive minimizer as an even ground state. We show the existence of even ground states of nonlinear Schrödinger systems with repulsive interaction. The keys of the proof are estimates of minimizing level and a classificaton of Palais-Smale sequences of even functions. In particular, the case $N = 1$ requires more detailed estimates than $N = 2, 3$.

33　平 山 浩 之（宮 崎 大 教 育）　微分型の非線形項を持つ非線形シュレディンガー方程式系の基底状態の
　　池 田 正 弘　　　　　　　　存在と安定性について ··· 12
　　　　　（理化学研 AIP・慶大理工）

Hiroyuki Hirayama (Univ. of Miyazaki)
Masahiro Ikeda (RIKEN/Keio Univ.)
Existence and stability of ground states for the system of nonlinear
Schrödinger equations with derivative nonlinearity

概 要　We consider the Cauchy problem of the system of nonlinear Schrödinger equations with derivative nonlinearlity. The well-posedness of this system in the Sobolev space H^1 is obtained by the previous works. But the long time behavior of the solution of this system is not well known. In this talk, we prove the existence of ground state solutions of this system. Furthermore, for 1 dimensional case, we also prove the stability of ground states by using the variational method.

34　深 谷 法 良（東 京 理 大 理）　1次元における二重べき型非線形シュレディンガー方程式の定常解の不安
　　林　　　雅 行（ピサ大・早大理工）　定性 ··· 12

Noriyoshi Fukaya (Tokyo Univ. of Sci.)
Masayuki Hayashi
　（Univ. di Pisa/Waseda Univ.）
Instability of stationary solutions for double power nonlinear Schrödinger
equations in one dimension

概 要　We consider a double power nonlinear Schrödinger equation in one dimension and L^2-subcritical setting. The equation has the algebraically decaying stationary solution ϕ_0 as well as exponentially decaying standing waves $e^{i\omega t}\phi_\omega(x)$ with positive frequency. It is known from the general theory that the standing wave with positive frequency is stable if $M'(\omega) > 0$ and unstable if $M'(\omega) < 0$, where $M(\omega) := \frac{1}{2}\|\phi_\omega\|_{L^2}^2$. In this talk we prove the instability of the stationary solution under the condition $M'(0) := \lim_{\omega\downarrow 0} M'(\omega) \in [-\infty, 0)$. The key in the proof is the costruction of the one-sided derivative of $\omega \mapsto \phi_\omega$ at $\omega = 0$, which is effectively used to construct the unstable direction.

35　佐 川 侑 司（千 葉 工 大 工）　調和ポテンシャル付き非線形シュレディンガー方程式に対する小さな初
　　佐 藤 拓 也（東 北 大 理）　期値の有限時間爆発解 ······································· 12
　　川 上 翔 汰（埼 玉 大 理 工）

Yuji Sagawa (Chiba Inst. of Tech.)
Takuya Sato　　（Tohoku Univ.）
Shota Kawakami (Saitama Univ.)
Finite time blow up solutions to the nonlinear Schrödinger equation
with harmonic potential for arbitrary small initial data

概 要　We construct finite time blow up solutions to the power type nonlinear Schrödinger equation with harmonic potential for arbitrary small initial data in the positive time direction. We simultaneously observe that those solutions exist globally in time and its mass decays in the negative time direction. This part is an improvement of the previous work by Antonelli, Carles and Sparber.

36　平 山 浩 之（宮 崎 大 教 育）　2次の非線形項をもつ2次元非線形 Schrödinger 方程式の角度正則性を課
　　木 下 真 也（埼 玉 大 理 工）　した Sobolev 空間での適切性 ······························ 12
　　岡 本　　葵（阪 大 理）

Hiroyuki Hirayama (Univ. of Miyazaki)
Shinya Kinoshita (Saitama Univ.)
Mamoru Okamoto (Osaka Univ.)
Well-posedness of the Cauchy problem for the two dimensional quadratic
nonlinear Schrödinger equation with angular regularity

概 要　We consider the Cauchy problem for the two dimensional nonlinear Schrödinger equation with the quadratic nonlinearity $|u|^2$. In the Sobolev space $H^s(\mathbb{R}^2)$, it is known that $s = -\frac{1}{4}$ is the threshold for the Cauchy problem to be well-posed. We prove the well-posedness in $H^s(\mathbb{R}^2)$ for $-\frac{1}{2} < s < -\frac{1}{4}$ by assuming some angular regularity on initial data.

37　津 原　　 駿（東 北 大 理）♭　4次元 Sobolev 臨界の連立非線型 Schrödinger 方程式系の時間大域適切性
　　 小 川 卓 克（東 北 大 理）　について $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 12
　　 Shun Tsuhara （Tohoku Univ.）　Global well-posedness for the Sobolev critical nonlinear Schrödinger sys-
　　 Takayoshi Ogawa （Tohoku Univ.）　tem in four space dimensions

概 要　We consider the Cauchy problem of the system of nonlinear Schrödinger equations with cubic non-
linearity in four space dimensions. We prove the existence of the ground state solution and the global
well-posedness for the system below the ground state solution under the mass resonance condition. We
also show that the ground state solution is written by Aubin–Talenti function. The proof of the gloval
well-posedness result is following the well-known results due to Kenig–Merle (2006).

38　佐 藤 拓 也（東 北 大 理）♭　The initial boundary value problem of nonlinear Schrödinger equations
　　 林　　 仲 夫（東 北 大 理）　with a nonlinear Neumann boundary condition $\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 12
　　 小 川 卓 克（東 北 大 理）
　　 Takuya Sato 　　（Tohoku Univ.）　The initial boundary value problem of nonlinear Schrödinger equations
　　 Nakao Hayashi （Tohoku Univ.）　with a nonlinear Neumann boundary condition
　　 Takayoshi Ogawa （Tohoku Univ.）

概 要　We consider the initial-boundary value problem of the nonlinear Schrödinger equation on the half line
with a nonlinear Neumann boundary condition. After establishing the boundary Srtichartz estimate in L^2,
we consider the time local well-posedness of the problem in the lower regularity spaces as L^2.

39　長 田 祐 輝（都 立 大 理）　非対称ポテンシャルの下での3波相互作用をもつ非線形シュレディンガー
　　　　　　　　　　　　　　　方程式系の minimizer の存在 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 12
　　 Yuki Osada （Tokyo Metro. Univ.）　Existence of a minimizer for a nonlinear Schrödinger system with three
　　　　　　　　　　　　　　　wave interaction under non-symmetric potentials

概 要　In this talk, we show the existence of a minimizer for the L^2-constrained minimization problem
associated with a nonlinear Schrödinger system with three wave interaction without assuming symmetry for
potentials by using interaction estimates.

40　池 田 正 弘　　　　　　　　Global dynamics below a threshold for the nonlinear Schrödinger equa-
　　　　　　（理化学研 AIP・慶大理工）　tions with the Kirchhoff boundary and the repulsive Dirac delta bound-
　　 戌 亥 隆 恭　　　　　　　　ary on a star graph $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 12
　　（阪大理・ブリティッシュコロンビア大）
　　 浜 野　　 大（早 大 理 工）
　　 清 水 一 慶（阪 大 基 礎 工）
　　 Masahiro Ikeda （RIKEN／Keio Univ.）　Global dynamics below a threshold for the nonlinear Schrödinger equa-
　　 Takahisa Inui 　　　　　　　tions with the Kirchhoff boundary and the repulsive Dirac delta bound-
　　（Osaka Univ./Univ. of British Columbia）　ary on a star graph
　　 Masaru Hamano （Waseda Univ.）
　　 Ikkei Shimizu 　　（Osaka Univ.）

概 要　We consider the nonlinear Schrödinger equations on the star graph with the Kirchhoff boundary and
the repulsive Dirac delta boundary at the origin. In this talk, we show scattering-blowup dichotomy result
below the mass-energy of the ground state on the real line. The proof of the scattering part is based
on a concentration compactness and rigidity argument. Our main contribution is to give a linear profile
decomposition on the star graph by using a new idea of decomposition of functions on the star graph.

41　川 上 隼 平 (京 　 大 　 理)　Averaging of strong magnetic nonlinear Schrödinger equations in energy
space ··· 12

Jumpei Kawakami (Kyoto Univ.)　Averaging of strong magnetic nonlinear Schrödinger equations in energy
space

概 要　We consider nonlinear Schrödinger equation with strong magnetic field in 3-dimension. To analyze
this, R. L. Frank, F. Méhats, C. Sparber derived two nonlinear Schrödinger type models. One model is
derived by spatial scaling and the other model is obtained by averaging the aforesaid spatial scaled model
in time. We study these two models in energy space and obtain global solutions for some cases. We also
prove that the time averaged model is energy-critical when this model has the nonic nonlinear power.
Furthermore, we improve the previous result that the solution to the spatial scaled model converges to the
solution to the time averaged model.

14:15～16:15

42　石 塚 健 二 郎 (京 大 数 理 研)　ポテンシャルのついた非線形消散クライン・ゴルドン 方程式の漸近挙動
について ·· 12

Kenjiro Ishizuka (Kyoto Univ.)　Long-time asymptotics of the one-dimensional damped nonlinear Klein–
Gordon equation with a potential

概 要　In this talk, we consider the one-dimensional nonlinear focusing damped Klein–Gordon equation with
a potential. When a potential is good conditon, it follows from standard arguments that the Cauchy
problem for this equation is locally well-posed in the energy space. When a potential is zero, Cote–Martel–
Yuan (2021) proved the full soliton resolution. Anywaw we consider soliton resolution for this equation.
Especially we will mainly talk the case that a potential is a repulsive delta potential.

43　眞 﨑 　 聡 (阪 大 基 礎 工)　3 次非線形方程式系の分類について ······························ 12
瀬 片 純 市 (九 大 数 理)
瓜 屋 航 太 (岡 山 理 大 理)

Satoshi Masaki　(Osaka Univ.)　On classification of cubic nonlinear systems
Jun-ichi Segata (Kyushu Univ.)
Kota Uriya (Okayama Univ. of Sci.)

概 要　In this talk, we introduce the classification of cubic nonlinear systems. The critical ingredient is to
introduce a matrix representation of a system. It turns out that the rank of the matrix is an invariant
quantity that describes the number of linearly independent conserved quantities. We give a classification of
systems that have two distinct conserved quantities.

44　眞 﨑 　 聡 (阪 大 基 礎 工)♭　複素数値 3 次非線形方程式系の分類について ····················· 12
Satoshi Masaki　(Osaka Univ.)　On classification of complex-valued cubic nonlinear systems

概 要　In this talk, we introduce the classification of complex-valued gauge-invariant cubic systems. The
critical ingredient is the matrix-vector representation of a system. This clarifies the effect of the change
of variables and describes the systems' Hamiltonian structure. In particular, the rank of the matrix part
denotes the number of the conserved quantities, and hence reflects the system's complexity. We show the
classification of systems that have only one conserved quantity.

45　津 田 谷 公 利 (弘 前 大 理 工)♭
　　若 杉 勇 太 (広島大先進理工)
　　Kimitoshi Tsutaya (Hirosaki Univ.)
　　Yuta Wakasugi (Hiroshima Univ.)

Blow up of solutions of semilinear wave equations with time-dependent damping $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 12

概 要　We consider the Cauchy problem for nonlinear wave equations with time-dependent damping. We show that blow-up in a finite time occurs for the equation with arbitrary power nonlinearity as well as upper bounds of the lifespan of blow-up solutions. We also show the same results for the space derivative nonlinear term.

46　福 田 一 貴 (信 州 大 工)
　　平 山 浩 之 (宮 崎 大 教 育)
　　Ikki Fukuda　　(Shinshu Univ.)
　　Hiroyuki Hirayama (Univ. of Miyazaki)

一般化 KP–Burgers 方程式の初期値問題の解の長時間挙動と最良な減衰評価について $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 10

概 要　In this talk, we consider the Cauchy problem for the generalized KP–Burgers equation in 2D. This is one of the nonlinear dispersive-dissipative type equations, which has a spatial anisotropic dissipative term. Under some suitable regularity assumptions on the initial data u_0, especially the condition $\partial_x^{-1} u_0 \in L^1(\mathbb{R}^2)$, it is known that the solution to this problem decays at the rate of $t^{-\frac{7}{4}}$ in the L^∞-sense. In this study, we investigate the more detailed large time behavior of the solution and construct the approximate formula for the solution at $t \to \infty$. Moreover, we obtain a lower bound of the L^∞-norm of the solution and prove that the decay rate $t^{-\frac{7}{4}}$ of the solution given in the previous work to be optimal.

47　S. Ibrahim　　(Univ. of Victoria)
　　清 水 一 慶 (阪 大 基 礎 工)
　　Slim Ibrahim (Univ. of Victoria)
　　Ikkei Shimizu　(Osaka Univ.)

Phase transition threshold and stability of magnetic skyrmions $\cdots\cdots$ 12

概 要　We examine the stability of vortex-like configuration of magnetization in magnetic materials, so-called the magnetic skyrmion. These correspond to critical points of the Landau–Lifshitz energy with the Dzyaloshinskii–Moriya interactions. In this talk, we prove that there is an explicit critical value of the parameter in the energy above which the skyrmion is unstable, while stable below this threshold. This mathematically explains the occurrence of phase transition observed in some experiments. We also show that in the unstable regime, the infimum of energy is not bounded below.

48　大 縄 将 史 (東京海洋大海洋環境)
　　鈴 木 政 尋 (名 工 大 工)
　　Masashi Ohnawa
　　(Tokyo Univ. of Marine Sci. and Tech.)
　　Masahiro Suzuki (Nagoya Inst. of Tech.)

周期境界条件下の浅水波系について $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 12

概 要　We consider stationary flows over periodic topography modeled by one-dimensional shallow water equation. We first show the nonexistence of stationary solutions with discontinuities as well as the conditions on the existence of continuous subsonic/supersonic stationary solutions. We also claim that the subsonic stationary solutions are not asymptotically stable.

49　古 屋 貴 士　　　　　　　　Inverse medium scattering problems with Kalman filter techniques $\cdots$ 10
（島根大数理・データサイエンス教育研究センター）

Takashi Furuya (Shimane Univ.)　　Inverse medium scattering problems with Kalman filter techniques

概 要　We study the inverse medium scattering problem to reconstruct the unknown inhomogeneous medium from the far-field patterns of scattered waves. The inverse scattering problem is generally ill-posed and nonlinear, and the iterative optimization method is often adapted. A natural iterative approach to this problem is to place all available measurements and mappings into one long vector and mapping, respectively, and to iteratively solve the linearized large system equation. However, this is computationally expensive because we must construct the larger system equations when the number of available measurements increases. In this talk, we propose the reconstruction algorithm based on the Kalman filter, which avoids the construction of a large system equation and retains the information of past updates.

16:30～17:30　特別講演

北　　　直　泰（熊 本 大 工）♭ 複素係数をもつ非線形シュレーディンガー方程式の解の挙動

Naoyasu Kita (Kumamoto Univ.)　　On behaviors of solutions to nonlinear Schrödinger equations with complex coefficient in its nonlinearity

概 要　We consider the Cauchy problem of nonlinear Schrodinger equations. Unlike the conservative system, the equation contains a complex coefficient in its nonlinearity. The physical background of such a non-conservative system is coming from the optical fiber engineering, where nonlinear Ohm's law and nonlinear amplification are applied. My talk consists of two parts. The first part treats a problem of global existence and asymptotic behavior of solutions without size restriction on the initial data, where Hayashi–Naumkin's theory basically contributes to the result. The second part treats a construction of blowing-up solutions. Combining the former result on asymptotic behavior of solutions, we can obtain blowing-up solutions even for small initial data. Recently, the result on the blowing-up solutions has been generalized by Cazenave–Martel–Zhao, Cazenave–Han–Martel and Kawakami–Machihara. If time permits, these recent progresses will be also presented.

3月18日（土）　　第Ⅳ会場

9:30～12:00

50　岩 田 直 之（名 工 大 工）　多成分プラズマの Vlasov–Poisson 方程式の定常解 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 12
　　鈴 木 政 尋（名 工 大 工）

Naoyuki Iwata (Nagoya Inst. of Tech.)　　Stationary solutions of the Vlasov–Poisson system for a multicomponent
Masahiro Suzuki (Nagoya Inst. of Tech.)　　plasma

概 要　In this talk, we mathematically investigate the formation of a plasma sheath, and analyze the Bohm criterion which is required for the formation. In 1995, Riemann derived the Bohm criterion from the stationary Vlasov–Poisson system which describes the motion of a multicomponent plasma. We study the solvability of boundary value problems of the system, and show that the Bohm criterion is a necessary condition but not a sufficient condition for the solvability.

Masahiro Suzuki (Nagoya Inst. of Tech.)
Masahiro Takayama (Keio Univ.)
Katherine Zhiyuan Zhang
　　　　　　　(New York Univ.)

Stability and instability of stationary solutions of the Vlasov–Poisson system

概要　We investigate the formation of a plasma boundary layer (sheath) by considering the Vlasov–Poisson system on a half-line with the completely absorbing boundary condition. The solvability of the stationary problem has been established. In this talk, we study the nonlinear stability and instability of these stationary solutions of the Vlasov–Poisson system.

Taichi Eguchi　(Waseda Univ.)
Energy equality of MHD system under a weaker condition on magnetic field

概要　We prove the energy equality of MHD system in the space founded by Cheskidov–Constantin Friedlander–Shvydkoy (2008) and Berselli–Chiodaroli (2020). It is clarified that the energy equality is established for a lager class of the magnetic filed than that of velocity field. Our result covers most of previous theorems on validity of the energy equality on the Navier–Stokes equations.

Ryosuke Nakasato (Waseda Univ.)
Asymptotic stability for quasi-linear plasma models with Hall effects via energy methods on Fourier–Herz spaces

概要　We consider the initial-value problem for the compressible Hall-magnetohydrodynamic system with quantum effects in the 3-dimensional Euclidean space $\mathbb{R}^3$. The aim of this talk is to obtain time-decay estimates for solutions as a perturbation from a constant equilibrium state $(1, 0, \bar{B})$ in a critical L^p framework. Here $\bar{B} \in \mathbb{R}^3$ is denoted by constant magnetic fields. To obtain such a result, we establish energy methods on Fourier–Herz spaces $\widehat{L}^p$ introduced by Grünrock (2004). By combining $\widehat{L}^p$ energy methods and a transformation of the momentum equation given by the effective velocity, we will derive the $\widehat{L}^p$-$\widehat{L}^{p/2}$ type time-decay estimate without the smallness requirement of low frequencies for initial data.

Sonae Hadama　(Kyoto Univ.)
Stability of Fermi gas at zero temperature for the Hartree equation

概要　We consider the Hartree equation describing the time evolution of wave functions of infinitely many fermions interacting with each other. The Hartree equation can be formulated in terms of the operators on $L^2(\mathbb{R}^d)$. It has infinitely many stationary solutions, and several authors have studied their stability, for example, Lewin–Sabin(2014), Chen–Hong–Pavlović(2018), and Collot–de Suzzoni(2020, 2022). However, the stability of Fermi gas at zero temperature, one of the most important stationary solutions from the physics point of view, was left open. In this talk, we report that it is stable; that is, any small perturbation from Fermi gas at zero temperature scatters.

55　古 場　　一（阪 大 基 礎 工）　界面流を含む非粘性混相流の数理モデリング ･･････････････････････ 10

Hajime Koba　　（Osaka Univ.）　Mathematical modeling of inviscid multiphase flow system with surface flow

概 要 We consider the governing equations for the motion of the inviscid fluids in moving domains and surface from an energetic point of view. We employ an energetic variational approach to derive multiphase flow system with surface flow and tension. We make use of the feature of the barotropic fluid to derive the surface pressure and tension of the compressible fluid in the surface.

56　古 場　　一（阪 大 基 礎 工）　相転移を含む非粘性混相流の数理モデリング ･･････････････････････ 10

Hajime Koba　　（Osaka Univ.）　Mathematical modeling of inviscid multiphase flow system with phase transition

概 要 We consider the governing equations for the motion of the fluid particles near air-water interface from an energetic point of view. We employ an energetic variational approach to derive inviscid multiphase flow system with phase transition, where a phase transition means a jump condition. We apply our energetic variational approach and jump condition to study the dominant equations for the densities of the fluids in moving domains.

57　古 川　　賢（理 化 学 研）　最大正則性のクラスでのプリミティブ方程式のデータ同化 ･･･････････ 10

Ken Furukawa　　（RIKEN）　Data assimilation of the primitive equations in maximal L^p-L^q settings

概 要 We discuss about data assimilation to the primitive equations in maximal L^p-L^q settings in a mathematically rigorous way. The primitive equations describe the flow in a thin domain. The equations combined with some data assimilation methods are used in meteorology and ocean physics for predictions for phenomena. Our results are that the solution to data assimilation equations of the primitive equations converges to the solution to the primitive equations in maximal L^p-L^q spaces at $t \to \infty$.

58　野 田　　慶（京大人間環境）　最大正則性に基づく多重線形作用素をもつ方程式の解の時空解析性について ･･ 10

Kei Noda　　（Kyoto Univ.）　Analyticity in space-time of solutions to evolution equations with multilinear operator based on maximal regularity

概 要 In this presentation, we introduce a method to prove space-time analyticity for evolution equations with nonlinear terms represented by multilinear operators via the parameter trick. By extending the case of bilinear operators in the previous work, this method is expected to be applicable not only to the Navier–Stokes equations but also to the equations of Fujita type.

59　飯 田 祥 樹（早 大 理 工）　Energy equality for the 3D inhomogeneous Navier–Stokes equations in Lorentz–Besov spaces ･･･ 12

Yoshiki Iida　　（Waseda Univ.）　Energy equality for the 3D inhomogeneous Navier–Stokes equations in Lorentz–Besov spaces

概 要 We establish the energy equality for Leray–Hopf weak solutions of the 3D incompressible *inhomogeneous* Navier–Stokes equations in Lorentz–Besov spaces. This result may be regarded as an extension of that by Cheskidov and Luo (2020).

14:15〜16:15

60　青木基記（東北大理）　On the ill-posedness for the full system of the compressible Navier–
　　岩渕　司（東北大理）　Stokes equations ·· 12
　　Motofumi Aoki (Tohoku Univ.)　On the ill-posedness for the full system of the compressible Navier–
　　Tsukasa Iwabuchi (Tohoku Univ.)　Stokes equations

概要　We consider the Cauchy problem for the equations of the ideal gas in the three space dimensions. In the critical Besov spaces, it is known that the Cauchy problem is uniquely solvable for all $1 < p < 3$ and ill-posed for all $p > 3$. We study the threshold case $p = 3$. We prove that the Cauchy problem is ill-posed by constructing a sequence of the initial data such that the solution map is discontinuous.

61　オーヘーダヒ（東北大理）　Optimality of the decay estimate of solutions to the linearised curl-free
　　岩渕　司（東北大理）　compressible Navier–Stokes equations ···························· 12
　　Dáithí Ó hAodha (Tohoku Univ.)　Optimality of the decay estimate of solutions to the linearised curl-free
　　Tsukasa Iwabuchi (Tohoku Univ.)　compressible Navier–Stokes equations

概要　We discuss optimal estimates of solutions to the compressible Navier–Stokes equations in Besov norms. In particular, we consider the estimate of the curl-free part of the solution to the linearised equations, in the homogeneous case. We prove that our estimate is optimal in the L^∞-norm by showing that the norm is bounded from below by the same decay rate. This is the first time such a bound from below has been obtained for the compressible Navier–Stokes equation.

62　岡部考宏（阪大基礎工）　Forced rapidly dissipative Navier–Stokes flows ··················· 12
　　L. Brandolese（Univ. Lyon 1）
　　Takahiro Okabe (Osaka Univ.)　Forced rapidly dissipative Navier–Stokes flows
　　Lorenzo Brandolese (Univ. Lyon 1)

概要　We consider the asymptotic behavior of the solution to the incompressible Navier–Stokes equation on the whole space. By an action of a forcing term we control the nonlinear term of the flow and derive a rapid time decay. This talk is based on the joint work with Lorenzo Brandolese (Univ. Lyon 1).

63　中塚智之（松山大経済）　On solvability of the time-periodic problem for the Navier–Stokes equa-
　　　　　　　　　　　　　　tion ·· 12
　　Tomoyuki Nakatsuka　On solvability of the time-periodic problem for the Navier–Stokes equa-
　　　　　　　（Matsuyama Univ.）　tion

概要　In this talk, we consider the existence of time-periodic solutions to the Navier–Stokes equation in the whole space. We decompose periodic solutions into steady and purely periodic parts, and we analyze the equations they should satisfy. Based on the analysis of the purely periodic solutions represented by the Fourier transform to the Stokes equation, their additional property can be obtained and we use it to construct a time-periodic solution of the Navier–Stokes equation.

64　小泉祐太（早大理工）　Convergence of approximating solutions of the Navier–Stokes equations
　　谷口透也（早大理工）　·· 12
　　Yuta Koizumi (Waseda Univ.)　Convergence of approximating solutions of the Navier–Stokes equations
　　Toya Taniguchi (Waseda Univ.)

概要　We show that the approximating solutions $\{u_j\}_{j=0}^\infty$ of the Navier–Stokes equations constructed by Kato (1984) with the initial data $u(0) \in L_\sigma^n(\mathbb{R}^n)$ converge to the local strong solution u in the topology of $W^{2,n}(\mathbb{R}^n)$ provided the convergence in the scaling invariant norm in $L^p(\mathbb{R}^n)$ with the time weight holds.

65　大 山 広 樹（九 大 数 理）　Fast rotation limit for the magnetohydrodynamics equations in a 3D
　　米 田 慧 司（九 大 数 理）　layer ··· 10

Hiroki Ohyama (Kyushu Univ.)　Fast rotation limit for the magnetohydrodynamics equations in a 3D
Keiji Yoneda　(Kyushu Univ.)　layer

概 要　We consider the initial value problem for the incompressible magnetohydrodynamics system with the Coriolis force in a three-dimensional infinite layer. We prove the unique existence of global solutions for initial data in the scaling invariant space when the speed of rotation is sufficiently high. Moreover, we show that the global solution converges to that of the coupled system of the 2D incompressible magnetohydrodynamics equations and the 3D incompressible Maxwell equations as the rotation speed tends to infinity.

66　江 頭 貴 成（九 大 数 理）　Large time behavior of solutions to the 3D rotating Navier–Stokes equa-
　　髙 田　　了（東 大 数 理）　tions ··· 10

Takanari Egashira (Kyushu Univ.)　Large time behavior of solutions to the 3D rotating Navier–Stokes equa-
Ryo Takada　(Univ. of Tokyo)　tions

概 要　We consider the large time behavior of the solutions for the initial value problem of the Navier–Stokes equations with the Coriolis force in the three-dimensional whole space. We show the temporal decay estimates with the dispersion effect of the Coriolis force for the global solutions. Moreover, we prove the large time asymptotic expansion of the solutions behaving like the first-order spatial derivatives of the integral kernel of the corresponding linear solution.

67　藤 井 幹 大（九 大 数 理）　Global strong solutions to the compressible Navier–Stokes equation with
　　　　　　　　　　　　　　　　the Coriolis force ··· 12

Mikihiro Fujii　(Kyushu Univ.)　Global strong solutions to the compressible Navier–Stokes equation with
　　　　　　　　　　　　　　　　the Coriolis force

概 要　In this talk, we consider the global solvability for the compressible Navier–Stokes equation with the Coriolis force in the scaling critical Besov space. Despite many studies on the weak solutions, the existence of global strong solutions has been an open problem. Unlike the incompressible case, the Coriolis force causes the linear solutions to behave like a semigroup $\{e^{-t\Delta^2}\}_{t>0}$, which creates difficulties in nonlinear estimates in the low frequency part. In this research, we propose a new idea of the low frequency analysis and overcome these difficulties.

68　齋 藤 平 和（電通大情報理工）　On decay properties of solutions to the two-phase Stokes equations with
　　　　　　　　　　　　　　　　surface tension and gravity ··································· 10

Hirokazu Saito　　　　　　　　　On decay properties of solutions to the two-phase Stokes equations with
　　　(Univ. of Electro-Comm.)　surface tension and gravity

概 要　In this talk, we consider the two-phase Stokes equations with surface tension in $\dot{\mathbf{R}}^N = \mathbf{R}_+^N \cup \mathbf{R}_-^N$ and in the presence of a uniform gravitational field acting vertically downward. Let $\rho_\pm$ be positive constants describing the densities of fluids occupying $\mathbf{R}_\pm^N$. It is well-known that the Rayleigh-Taylor instability occurs when the upper fluid is heavier than the lower one, i.e., when $\rho_+ > \rho_-$. On the other hand, this talk aims to introduce time decay estimates of solutions to the two-phase Stokes equations under the condition that the lower fluid is heavier than the upper one, i.e., $\rho_- > \rho_+$.

16:30〜17:30　特別講演

筒 井 容 平 (京　大　理)♭ Convergence to the initial data and weighted estimates for the incompressible Navier–Stokes equations

Youhei Tsutsui （Kyoto Univ.） Convergence to the initial data and weighted estimates for the incompressible Navier–Stokes equations

概 要　We discuss conditions on data for which ensure the solution to the incompressible Navier–Stokes equations strongly converges to the initial data from weak L^n space on the whole space. We also consider weighted estimates for the solutions.

実 函 数 論

3月17日(金) 　第Ⅴ会場

9:00〜11:45

1 　豊 田 昌 史（東 邦 大 理） 　ボール空間における不動点定理と Caristi の不動点定理 ･･････････････ 15
Masashi Toyoda （Toho Univ.） 　Fixed point theorem in a ball space and Caristi fixed point theorem

概 要 　The purpose of this talk is to introduce a fixed point theorem in a ball space, which is proved without the Axiom of Choice. Moreover, using the fixed point theorem in a ball space, we prove Caristi's fixed point theorem. Therefore the proof of Caristi's fixed point theorem in this paper does not depend on the Axiom of Choice.

2 　厚 芝 幸 子（東京女大現代教養） 　Convergence theorems for families of monotone nonexpansive mappings in orderd Banach spaces ･･････････････････････････････････････ 15
Sachiko Atsushiba 　Convergence theorems for families of monotone nonexpansive mappings
(Tokyo Woman's Christian Univ.) 　in orderd Banach spaces

概 要 　In this talk, we prove weak and strong convergence theorems for monotone nonexpansive mappings and convergence theorems for monotone nonexpansive semigroups in Banach spaces endowed with a partial order.

3 　木 村 泰 紀（東 邦 大 理） 　収縮射影法の類似手法による写像族の共通不動点近似 ･･････････････ 15
Yasunori Kimura （Toho Univ.） 　Approximation of common fixed points by modified shrinking projection methods

概 要 　This study deals with the approximation of fixed points for nonexpansive and other types of mappings. Using a modified shrinking projection method, we obtain the delta-convergence of generated approximation sequence to a fixed point of the mapping. We also consider a family of mappings and show a convergence theorem to their common fixed point.

4 　青 山 耕 治（千 葉 大 社 会） 　吸引点に関する平均収束定理 ･････････････････････････････････ 15
Koji Aoyama 　（Chiba Univ.） 　Mean convergence theorems with respect to attractive points in a Hilbert space

概 要 　We show a mean convergence theorem for a mapping with an attractive point in a Hilbert space by using a quasinonexpansive extension of the mapping and a mean convergence theorem for a quasinonexpansive mapping. Then using the theorem, we establish a mean convergence theorem for a λ-hybrid mapping in the sense of Aoyama, Iemoto, Kohosaka, and Takahashi (2010).

5 　波 多 野 修 也（中 大 理 工） 　モレー・ローレンツ空間に対する真の埋め込み ････････････････････ 15
Naoya Hatano 　（Chuo Univ.） 　Proper embedding for Morrey–Lorentz spaces

概 要 　The embeddings for Morrey–Lorentz spaces have been previously introduced by Ragusa. This paper describes the major differences between these embedding types.

6　D. I. Hakim　　　　　　　　　Bourgain–Morrey spaces and its applications ···················· 15
　　　　　(Bandung Inst. of Tech.)
波 多 野 修 也 (中　大　理　工)
野 ヶ 山 徹 (中　大　理　工)
澤 野 嘉 宏 (中　大　理　工)
Denny Ivanal Hakim　　　　　　Bourgain–Morrey spaces and its applications
　　　　　(Bandung Inst. of Tech.)
Naoya Hatano　　(Chuo Univ.)
Toru Nogayama　(Chuo Univ.)
Yoshihiro Sawano (Chuo Univ.)

概要　In this talk, we introduce the Bourgain–Morrey space which is a one generalization of Morrey spaces. By using this space, it is showed that we can refine the Strichartz estimate for Schrödinger equations. We consider some properties of this space from the viewpoints of harmonic analysis and functional analysis.

7　野 ヶ 山 徹 (中　大　理　工)　Complex interpolation for mixed Morrey spaces ···················· 15
Toru Nogayama　(Chuo Univ.)　Complex interpolation for mixed Morrey spaces

概要　In this talk, we consider the complex interpolation for mixed Morrey spaces via the Calderón product. The mixed Morrey space $\mathcal{M}^p_q(\mathbb{R}^n)$ is a function space which is a generalization of Morrey spaces. The results in this talk are extensions for classical Morrey spaces.

8　谷 口 晃 一 (東北大 AIMR)　Besov 空間上の合成作用素の有界性 ···························· 15
池 田 正 弘
　　　　(理化学研 AIP・慶大理工)
石 川　　勲
(愛媛大データサイエンスセンター)
Koichi Taniguchi (Tohoku Univ.)　Boundedness of composition operators on Besov spaces
Masahiro Ikeda (RIKEN／Keio Univ.)
Isao Ishikawa　　(Ehime Univ.)

概要　In this talk we consider boundedness of composition operators on Besov spaces $B^s_{p,q}$ on one dimensional Euclidean space. The boundedness has been well studied in the lower derivative case $0 < s < 1$. In contrast, there is almost no research on the higher order case $s \geq 1$, and many problems remain unsolved. The purpose of this talk is to give necessary and sufficient conditions for the boundedness when $s > 1 + 1/p$. Similar results for composition operators on Triebel–Lizorkin spaces are provided.

9　原　　宇 信 (北　大　情　報)　Strong barriers for weighted quasilinear equations ················· 15
Takanobu Hara (Hokkaido Univ.)　Strong barriers for weighted quasilinear equations

概要　We construct strong barriers for weighted quasilinear elliptic equations. There are two applications: (i) solvability of Poisson-type equations with boundary singular data, and (ii) a geometric version of Hardy inequality.

14:15〜15:25
10　川 﨑 敏 治　　　　　　　　拡張積分可能関数族と拡張原始関数族の差について ················ 15
(玉川大工・千葉大法経・千葉大理)
Toshiharu Kawasaki　　　　　　On the difference between the families of extended integrable functions
(Tamagawa Univ./Chiba Univ./Chiba Univ.)　and extended primitive functions

概要　In this talk, we discuss the difference between the families of extended integrable functions and extended primitive functions.

11　国 定 亮 一　　　　　　　On topologically invariant means and almost convergence · · · · · · · · · · · 15

　　Ryoichi Kunisada　　　　On topologically invariant means and almost convergence

概 要　In this talk, we discuss applications of topologically invariant means and almost convergence for the theory of analytic functions on the half plane.

12　寺 江 拓 海 (東工大情報理工)　非加法的測度論における歪測度の上限増分の一致条件 · · · · · · · · · · · · · · 15
　　室 伏 俊 明 (東工大情報理工)

　　Takumi Terae　　　(Tokyo Tech)　An equality condition for supremum increments of distorted measures
　　Toshiaki Murofushi (Tokyo Tech)　in non-additive measure theory

概 要　In non-additive measure theory, there exist two definitions of null sets, which are weak null sets and strong null sets. Several theorems in measure theory such as the Egoroff theorem and the Lebesgue theorem are described by using the concept of null sets, therefore there exist weak forms and strong forms of these theorems as definitions in non-additive measure theory. The concept of supremum increment is important for studying about the strong forms of them. This paper has an argument that gives a necessary and sufficient condition for two different distorted measures having an equal supremum increment for a simple case. In addition, we define the concept of strong supremum increments in preparation for generalizing this argument.

13　岡 崎 悦 明 (ファジィシステム研)　非加法的測度の定める集合環上の Fréchet–Nikodym 一様位相 · · · · · · · · 15
　　福 田 亮 治 (大 分 大 理 工)
　　本 田 あ お い (九工大情報工)

　　Yoshiaki Okazaki　　　　　　Fréchet–Nikodym uniformity on a ring determined by a non-additive
　　　　(Fuzzy Logic Systems Inst.)　measure
　　Ryoji Fukuda　　　(Oita Univ.)
　　Aoi Honda (Kyushu Inst. of Tech.)

概 要　Fréchet–Nikodym difference on a measure ring $\mathcal{R}$ determined by a non-additive measure μ is defined by $\mu(A \ominus B)$. We prove that if μ is quasi-monotone and satisfies (p.g.p)-condition, then the entourages $\{(A, B) \mid \mu(A \ominus B) \leq \epsilon\}$, $\epsilon > 0$ is a basis of entourages of a uniform structure on the measure ring $\mathcal{R}$.

15:40〜16:40　2022 年度 (第 21 回) 日本数学会解析学賞受賞特別講演
　　中 井 英 一 (茨 城 大 理)　平均振動量が一様でないカンパナト空間とそれに関連する話題
　　Eiichi Nakai　　(Ibaraki Univ.)　Generalized Campanato spaces with variable growth condition and re-
　　　　　　　　　　　　　　　　lated topics

概 要　Generalized Campanato spaces with variable growth condition were introduced by Nakai and Yabuta in 1985 to characterize the space of pointwise multipliers on $\mathrm{BMO}(\mathbb{R}^n)$. This characterization was extended from $\mathbb{R}^n$ to spaces of homogeneous type in 1997, to probability spaces with filtration in 2014, and, to $\mathbb{R}^n$ with non-doubling measures in 2018. On the other hand, this characterization was used by Lerner in 2005 to study the class $\mathcal{P}(\mathbb{R}^n)$ of functions $p(\cdot)$ for which the Hardy-Littlewood maximal operator is bounded on the Lebesgue spaces $L^{p(\cdot)}(\mathbb{R}^n)$ with variable exponent, and positively solve a conjecture of Deining in 2005 saying that there are discontinuous functions belonging to $\mathcal{P}(\mathbb{R}^n)$. Moreover, in 2012 it was discovered by Nakai and Sawano that the dual of generalized Hardy space $H^{p(\cdot)}(\mathbb{R}^n)$ with variable exponent is a generalized Campanato space with variable growth condition. In this talk we discuss generalized Campanato spaces with variable growth condition and related topics.

17:00〜18:00　特別講演

田 中　　仁（筑 波 技 術 大）　2進立方体解析・2進直方体解析

Hitoshi Tanaka　　　　　　　Dyadic cubes analysis, dyadic rectangles analysis
　　　（Tsukuba Univ. of Tech.）

概 要　After reviewing a history of the dyadic cubes analysis, with rectangular doubling weight, a generalized Hardy–Littlewood–Sobolev inequality for rectangular fractional integral operators is verified. The result is a nice application of M-linear embedding theorem for dyadic ractangles.

3月18日(土)　　第Ⅴ会場

9:00〜12:00

14　赤 木 剛 朗（東 北 大 理）　非整数階時間微分を含む発展方程式の可解性とその応用 ············· 15
　　中 島 慶 人（東 北 大 理）

Goro Akagi　　（Tohoku Univ.）　Solvability of evolution equations involving time-fractional derivatives
Yoshihito Nakajima（Tohoku Univ.）　and applications

概 要　This talk is concerned with local and global in time solvability of abstract evolution equations involving time-fractional derivatives as well as subdifferential operators. An application to the initial-boundary value problem for degenerate parabolic equations involving time-fractional derivatives as well as blow-up nonlinearity will also be discussed.

15　喜 多 航 佑（早 大 理 工）　Mosco convergence of functionals associated with Laplacian under non-
　　大 谷 光 春（早 大 理 工）　linear boundary conditions ···································· 15

Kosuke Kita　　（Waseda Univ.）　Mosco convergence of functionals associated with Laplacian under non-
Ôtani Mitsuharu（Waseda Univ.）　linear boundary conditions

概 要　This talk is devoted to studying the convergence of functionals associated with Laplacian under nonlinear boundary conditions and the asymptotic behavior of solutions to nonlinear evolution equations governed by subdifferential operators of the functionals. To be more precise, we show the continuous dependence of the solution on the power of the nonlinear term of boundary conditions. The proof is based on some modifications of the argument of Mosco convergence by Attouch.

16 黒 田 隆 徳 (早 大 理 工)   Asymptotic behaviors of complex solutions for the semilinear heat equa-
    大 谷 光 春 (早 大 理 工)   tion with arbitrarily large initial energy · 15

Takanori Kuroda (Waseda Univ.)   Asymptotic behaviors of complex solutions for the semilinear heat equa-
Mitsuharu Ôtani (Waseda Univ.)   tion with arbitrarily large initial energy

概 要 In this talk, we consider the semilinear heat equation (P):

$$u_t - \Delta u - |u|^{q-2}u = 0, \quad u(0) = u_0$$

and the semilinear elliptic equation (E), which corresponds to the stationary problem of (P):

$$-\Delta u - |u|^{q-2}u = 0,$$

with the hohogeneous Dirichlet boundary condition in bounded domains $\Omega \subset \mathbb{R}^N$, $(N \geq 3)$ which are radially symmetric with respect to the first two variables. We seek solutions which takes complex values of the following form:

$$u_k(x_1, x_2, \tilde{x}) = e^{ik\theta}v_k(r, \tilde{x}), \quad (x_1, x_2, \tilde{x}) = (r\cos\theta, r\sin\theta, \tilde{x}) \in \Omega, \quad k \in \mathbb{N}.$$

We show the energy of solutions u_k of (E) tends to infinity as $k \to \infty$. Making use of this fact, for initial data of arbitrarily large energy, we construct two kinds of sets, i.e., stable set W and blow-up set V such that if $u_0 \in W$ (resp. $u_0 \in V$), then u can be continued globally up to $(0, \infty)$ (resp. u blows up in finite time).

17 小 波 津 晶 平 (東 京 理 大 理)   Behavior of weak solutions to a Keller–Segel system with gradient de-
    横 田 智 巳 (東 京 理 大 理)   pendent chemotactic coefficient · 15

Shohei Kohatsu (Tokyo Univ. of Sci.)   Behavior of weak solutions to a Keller–Segel system with gradient de-
Tomomi Yokota (Tokyo Univ. of Sci.)   pendent chemotactic coefficient

概 要 We consider behavior of weak solutions to a Keller–Segel system with gradient dependent chemotactic coefficient:

$$\begin{cases} u_t = \Delta u - \chi\nabla \cdot (u|\nabla v|^{p-2}\nabla v), \\ v_t = \Delta v - v + u, \end{cases}$$

where $\chi > 0$, $p \in (1, \infty)$.

18 千 代 祐 太 朗 (東 京 理 大 理)   Boundedness and stabilization in a quasilinear attraction-repulsion chemo-
    taxis system · 15

Yutaro Chiyo (Tokyo Univ. of Sci.)   Boundedness and stabilization in a quasilinear attraction-repulsion chemo-
taxis system

概 要 This talk deals with a quasilinear parabolic–parabolic–elliptic attraction-repulsion chemotaxis system. In the case that the second equation is simplified by the elliptic one, boundedness and stabilization have already been obtained. The purpose of this talk is to derive boundedness and stabilization in the case that the second equation is parabolic.

19　T. Black　　　　(Paderborn Univ.)
　　M. Fuest
　　　　　(Leibniz Univ. Hannover)
　　J. Lankeit
　　　　　(Leibniz Univ. Hannover)
　　水 上 雅 昭 (京 都 教 育 大)

Tobias Black (Paderborn Univ.)
Mario Fuest (Leibniz Univ. Hannover)
Johannes Lankeit
　　　　　(Leibniz Univ. Hannover)
Masaaki Mizukami
　　　　　(Kyoto Univ. of Edu.)

Possible points of blow-up in a chemotaxis system with environmental dependent logistic source $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Possible points of blow-up in a chemotaxis system with environmental dependent logistic source

概 要　We discuss the influence of possible spatial inhomogeneities in the coeffcients of logistic source terms in parabolic–elliptic chemotaxis-growth systems in two-dimensional smoothly bounded domains. Assuming that the coeffcient functions is nonnegative, we prove that finite-time blow-up of the classical solution can only occur in points where the coefficient function is zero.

20　赤 川 佳 穂 (岐 阜 工 高 専)
　　加 納 理 成 (高 知 大 教 育)
　　深 尾 武 史 (京 都 教 育 大)
Yoshiho Akagawa
　　　　(Gifu Nat. Coll. of Tech.)
Risei Kano　　　　(Kochi Univ.)
Takeshi Fukao (Kyoto Univ. of Edu.)

仮似変分不等式で記述される塑弾性モデルについて $\cdots\cdots\cdots\cdots\cdots\cdots$ 15

A quasi-variational inequality in plasticity model

概 要　This paper discusses the a quasi-variational inequality in plasticity model. In phys- ical terms, it is natural that the threshold function depends on some unknown variable. This model is expected to describe plastic deformation due to the time-nonlocal depen- dence of the constraint on the unknown function. This is a difference from the perfect plasticity model. To prove the existence of a solution of the plastity model, Banach fixed point theorem is applied, taking care to choose the test function.

21　森 村 晃 子 (日 本 女 大 理)
　　愛 木 豊 彦 (日 本 女 大 理)
Akiko Morimura
　　　　(Japan Women's Univ.)
Toyohiko Aiki (Japan Women's Univ.)

多孔質媒体における水分移動モデルの解の存在と一意性について $\cdots\cdots$ 15

On existence and uniqueness of solutions to the moisture transport model in porous materials

概 要　We consider the initial-boundary value problems for nonlinear parabolic equations describing mois- ture transport in a porous material occupying a one-dimensional interval. Our problem is obtained by simplification of the model proposed by Green, Dabiri and Weinaug. Precisely, their system consists of two equations corresponding to conservation law for water in air and liquid regions, and in our problem the water distribution in air is given. The unknown function of the problem indicates the chemical potential of water. Also, we approximate the equation which is type of elliptic-parabolic, originally, as a first step in this research. The aim of this talk is to establish existence and uniqueness of solutions to the approximate problem by applying the standard fixed-point argument.

22　小 杉 千 春（日 本 女 大 理）　圧縮性弾性体の伸縮運動を表す初期値境界値問題の強解に対する ω 極限
　　愛 木 豊 彦（日 本 女 大 理）　集合について $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Chiharu Kosugi (Japan Women's Univ.)　Omega-limit sets for the strong solutions to initial and boundary value
Toyohiko Aiki (Japan Women's Univ.)　problems for compressible elastic curves

概 要　We talk about omega-limit sets for strong solutions to the initial and boundary value problem for the beam equation with the viscosity term and the nonlinear stress function having a singularity. Thanks to the singularity, we obtained the uniform estimate of lower bounds for the strain, and already proved existence and uniqueness of weak and strong solutions. By effect of the viscosity, it seems to be natural that the solution converges to the stationary solution. On this conjecture we show existence of a subsequence of the orbit $\{u(t)|t \geq 0\}$ such that it converges to a strong solution to the steady problem. We note that similar result on the weak solutions was reported at the previous meeting.

23　熊 崎 耕 太（長 崎 大 教 育）　多孔質媒体の湿潤・乾燥現象を表すマルチスケールモデルについて $\cdots\cdot$ 15
　　A. Muntean　　（Karlstads Univ.）

Kota Kumazaki (Nagasaki Univ.)　A multiscale model describing the wetting-drying phenomenon in porous
Adrian Muntean (Karlstads Univ.)　materials

概 要　In this talk, we propose a multiscale model describing the wetting-drying phenomenon in porous materials. This model consists of a diffusion equation for the relative humidity distributed in materials and a free boundary problem describing the wetting-drying process in microscopic pores. We consider each microscopic pore as a one-dimensional interval and correspond the interval to each point of materials. In our previous results, for a given relative humidity we showed the well-posedness of the free boundary problem. In this talk, we impose a governing equation for the relative humidity and discuss the existence and uniqueness of a locally-in-time solution of this model.

14:15〜16:30

24　水 野 大 樹（千 葉 大 教 育）　擬放物型全変動流の適切性と解の正則性 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15
　　白 川　　健（千 葉 大 教 育）

Daiki Mizuno　　（Chiba Univ.）　Well-posedness and regularity results for a class of total variation flows
Ken Shirakawa　（Chiba Univ.）　of pseudo-parabolic types

概 要　In this talk, a class of initial-boundary value problems of total variation flows of pseudo-parabolic types is considered. Total variation flow has been adopted as governing equation of various nonlinear phenomena, such as grain boundary motion, image denoising, and so on. The principal characteristic of our problem is in the velocity term of diffusion flux, and the velocity would bring stronger regularity that that as in standard parabolic PDE. Meanwhile, our total variation flow contains singular diffusion, and the singularity would degenerate the regularity of solution. The objective of this paper will be to clarify the power balance between these conflicted effects. Consequently, the mathematical results concerned with well-posedness and regularity of solution will be discussed in the Main Theorems of this talk.

25　久 保 田 翔 大（神 奈 川 大 工）　結晶粒界運動を記述する Warren–Kobayashi–Lobkovsky–Carter 型シス
　　　　　　　　　　　　　　　　　テムにおける時間周期解 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Shodai Kubota (Kanagawa Univ.)　Periodic solutions for Warren– Kobayashi–Lobkovsky–Carter type systems of grain boundary motions

概 要　In this talk, we consider teh periodic solutions for the parabolic PDE systems denoted by (S). Each system (S) is associated with the phase field model of grain boundary motion, proposed by [Warren, et al.; *Acta Materialia*, 51(20): 6035–6058, 2003]. Under suitable assumptions, the existence of the periodic solution to the system (S) will be reported as the main theorem of this talk.

26　渡 邉　　　紘 (大 分 大 理 工)
　　白 川　　　健 (千 葉 大 教 育)
　　S. Moll　　　　(Univ. València)
３次元結晶粒界運動のフェーズフィールドモデルに対する解の存在 ···· 15

Hiroshi Watanabe (Oita Univ.)
Ken Shirakawa (Chiba Univ.)
Salvador Moll (Univ. València)
Existence of solutions to a phase-field model of 3D-grain boundary motion

概要　We consider a phase-field model of 3D-grain boundary motion. The model is based on the three dimensional Kobayashi–Warren model for the dynamics of polycrystals. To formulate our 3D-model, we use a quaternion formulation for the orientation variable. In this talk, we obtain existence of solutions to the L^2-gradient descent flow of the constrained energy functional via several approximating problems. Moreover, we also obtain an invariance principle for the orientation variable.

27　深 尾 武 史 (京 都 教 育 大)
　　P. Colli　　　 (Univ. of Pavia)
　　L. Scarpa
　　　　　　 (Politecnico di Milano)
前方後方動的境界条件を持つ Cahn–Hilliard 方程式に対する LW モデルからの接近 ··· 15

Takeshi Fukao (Kyoto Univ. of Edu.)
Pierluigi Colli (Univ. of Pavia)
Luca Scarpa (Politecnico di Milano)
The Cahn–Hilliard system of LW model with forward-backward dynamic boundary condition

概要　For Cahn–Hilliard equations with forward-backward dynamical boundary conditions, we consider the vanishing viscosity approach from LW model. In the previous study, the approach from GMS model was discussed. The same idea is used for the LW model. Since the regularity of the solution is lowered in the limit equations, we define a weak solution using the subdifferential with suitable function spaces. In the LW model unlike the GMS model, it is subject to the mass conservations at the bulk and the boundary, respectively, which makes some difficulty. In this talk, we will especially introduce the idea of the uniform estimate.

28　山 崎 教 昭 (神 奈 川 大 工)
　　剣 持 信 幸 (千　　葉　　大⋆)
　　白 川　　　健 (千 葉 大 教 育)
Approximation of singular optimal control problems for doubly quasi-variational evolution inclusions ································· 15

Noriaki Yamazaki (Kanagawa Univ.)
Nobuyuki Kenmochi (Chiba Univ.⋆)
Ken Shirakawa (Chiba Univ.)
Approximation of singular optimal control problems for doubly quasi-variational evolution inclusions

概要　In this talk, we establish an approximate procedure for singular optimal control problems for abstract doubly quasi-variational evolution inclusions governed by time-dependent subdifferentials with the unknown-dependent constraints. Indeed, we consider the parameter-dependent state inclusion and its control problems. Then, we show the relationship between the original control problem and its approximate one.

29　伊 藤 昭 夫　　　　　Tumor invasion model with quasi-variational structural porous medium diffusion ·· 15

　　Akio Ito　　　　　Tumor invasion model with quasi-variational structural porous medium diffusion

概 要　We consider an initial-boundary value problem of a tumor invasion of Chaplain–Anderson type, in which the coefficient of random motility of tumor cells depends on the extracellular matrix and the diffusion flux of tumor cells is porous medium type whose power depends upon the extracellular matrix. Form these points of view, the Cauchy problem considered in this talk has a quasi-variational structure and this fact makes it more difficult and complicate to analyze this model mathematically. The aim of this talk, we give the global existence of strong solutions by using the general theory, which was established in the paper, Evolution inclusion on a real Hilbert space with quasi-variational structure for inner products, Journal of Convex Analysis, 26 (2019), No. 4, 1185–1252.

30　松 本 敏 隆（静 岡 大 理）　一般化安定性条件の下での線形発展作用素の生成 ··················· 15
　　田 中 直 樹（静 岡 大 理）

　　Toshitaka Matsumoto (Shizuoka Univ.)　　Generation of evolution operators under a generalized stability condition
　　Naoki Tanaka (Shizuoka Univ.)

概 要　A generation theorem of a linear evolution operator on a Banach spaces is given under a generalized stability condition for a difference scheme. The denseness and the time-independence of the domains of generators are not assumed. A differentiablity theorem of an evolution operator is also given.

17:00〜18:00　特別講演

　　来 間 俊 介（東 京 理 大 理）　フェーズフィールドシステムに対する時間離散化法
　　Shunsuke Kurima (Tokyo Univ. of Sci.)　　Time discretization methods for phase field systems

概 要　The speaker has studied approaches by time discretization to a phase field system of Caginalp type and a singular phase field system of conserved type with Pierluigi Colli. The time discretization method is a method of capturing the derivative with respect to time with the limit of the difference quotient, and it has the advantage that evolution equations can be reduced to stationary problems of elliptic equations. In this talk, for phase field systems with inertial term which has already been proved to have solutions, we will confirm if we can apply time discretization methods to show existence of solutions and derive error estimates for the time step. Also, in this talk, for singular nonlocal phase field systems with inertial term which has not yet been proved to have solutions, we will show existence of solutions by time discretization methods.

函 数 解 析 学

3月15日(水)　　第Ⅵ会場

9:30〜12:00

1　岩 田 順 敬（関西大化学生命工）　非有界作用素の対数表現による フォン・ノイマン方程式の一般化 ····· 15
　Yoritaka Iwata（Kansai Univ.）　Generalization of von Neumann equation based on the logarithmic representation of unbounded operators

概要　In this paper, by replacing the commutator product by the logarithmic representation of unbounded operators [1-9], the generalized/unbounded version of von Neumann equation is presented. The proposed equation is general enough to be valid to bounded situations (i.e., classical mechanics). By taking some concrete examples in the quantum mechanics, the derivation of generalized von Neumann equation is explained.

2　渡 辺 秀 司（群 馬 大 理 工）　超伝導の BCS ギャップ方程式の新たな作用素論的扱いと 2 次相転移への
　　　　応用 ··· 15
　Shuji Watanabe (Gunma Univ.)　A new operator-theoretical treatment of the BCS gap equation of superconductivity and its application to the second-order phase transition

概要　We give a new operator-theoretical proof of the existence, uniqueness and smoothness of the solution to the BCS-Bogoliubov gap equation of superconductivity and apply the results to the second-order phase transition.

3　青 木 貴 史（近　　畿　　大★）　整関数の空間における連続準同型の微分作用素表示 ················· 15
　石 村 隆 一（千　　葉　　大★）
　岡 田 靖 則（千 葉 大 理）
　Takashi Aoki　（Kindai Univ.★）　Differential operator representations of continuous homomorphisms on
　Ryuichi Ishimura（Chiba Univ.★）　some spaces of entire functions
　Yasunori Okada（Chiba Univ.）

概要　The space of entire functions at most of a given order and of normal type (resp. minimal type) is endowed with a locally convex topology as an inductive limit (resp. projective limit) of Banach spaces. Continuous endomorphisms of such spaces include differential operators, translations, dilations, etc., and they can be represented as formal differential operators of infinite order satisfying suitable conditions. We consider continuous homomorphisms between spaces of entire functions with growth given by proximate orders instead of orders, and give their differential operator representations. We also reveal the merits of treating proximate orders and homomorphisms from the view point of inductive and projective descriptions.

4　廣 島 文 生（九 大 数 理）　並行移動不変なネルソン模型の正値改良性 ························ 15
　Fumio Hiroshima (Kyushu Univ.)　Positivity improving for the translation invariant Nelson model

概要　Let H(P) be the renormalized Nelson Hamiltonian with total momentum P. We show that exp(-TH(P)) is positivity improving for any P.

5　佐々木　格（信　州　大　理）　Analyticity of the ground state for the pair interaction model ········ 15
　　松　澤　泰　道（信州大教育）
　　泉　真　之　介（信　州　大　理）
　　井　村　航　太（長野県富士見高）

Itaru Sasaki　　（Shinshu Univ.）　Analyticity of the ground state for the pair interaction model
Yasumichi Matsuzawa (Shinshu Univ.)
Shinnosuke Izumi (Shinshu Univ.)
Kota Imura
(Nagano Pref. Fujimi High School)

概要　We consider the pair interaction model which is a models in the quantum field theory. In our previous work, we diagonalize its Hamiltonian by a Bogoliubov transformation. As a consequence, the existence and uniqueness of the ground states are proven. In addition, the explicit formula for the ground state energy has been given. In this talk, we show that the ground state and the ground state energy are analytic in the coupling constant. Their radii of convergence are always finite.

6　吉　田　尚　矢（立命館大理工）　Bohr–Sommerfeld quantization condition for self-adjoint Dirac operators ·· 15

Naoya Yoshida (Ritsumeikan Univ.)　Bohr–Sommerfeld quantization condition for self-adjoint Dirac operators

概要　We consider the eigenvalue problem for self-adjoint Dirac operators. It is known that, near an energy level where the square of the potential makes a simple well, the eigenvalues are approximated by a Bohr–Sommerfeld type quantization rule. A remarkable difference from the Schroedinger case appears in the Maslov correction term. This fact was recently found by Hirota (2017) under the analyticity condition of the potential using a complex WKB method. In this talk, we approach this problem with a microlocal technique focusing on the asymptotic behavior of the eigenfunction along the characteristic set to generalize the result to smooth potentials.

7　板　倉　恭　平（東　大　数　理）　On resonances for inverted harmonic oscillators ··················· 15
Kyohei Itakura (Univ. of Tokyo)　On resonances for inverted harmonic oscillators

概要　We characterize resonance free domain for semiclassical inverted harmonic oscillators by employing method of Briet–Combes–Duclos. For fixed non-zero energy E, we assume a certain non-trapping condition; the whole domain can be split into the classically forbidden region and region where virial is bounded by negative constant from above. Then we obtain the absence of resonances in a complex neighborhood of E.

8　宇治野広大（九　大　数　理）　Exact Hausdorff dimension of the spectral measure for the graph Laplacian on a sparse tree ·· 15

Kota Ujino　　（Kyushu Univ.）　Exact Hausdorff dimension of the spectral measure for the graph Laplacian on a sparse tree

概要　It is known that Schroedinger operators with sparse potentials have singular continuous spectrum. The graph Laplacian on a sparse tree is identified with one-dimensional discrete Schroedinger operators, and has singular continuous spectrum. The intermittency function describes the behavior of the time averaged momentum and gives the upper bound of the Hausdorff dimension of the spectral measure. We show the intermittency function explicitly and give the Hausdorff dimension of the spectral measure for the graph Laplacian on a sparse tree.

9　宇治野広大（九　大　数　理）　No eigenvectors embedded in the singular continuous spectrum of Schrödinger operators ·· 15

Kota Ujino　　（Kyushu Univ.）　No eigenvectors embedded in the singular continuous spectrum of Schrödinger operators

概要　It is known that the spectrum of Schrödinger operators with sparse potentials consists of singular continuous spectrum.　We give a sufficient condition so that the edge of the singular continuous spectrum is not an eigenvalue and construct examples with singular continuous spectrum which have no eigenvalues and which have a single negative eigenvalue.

14:15〜16:15

10　柳　下　浩　紀（京　都　産　大　理）♭　無限次元空間 $\mathbb{R}^\infty$ 上の Laplace 作用素の変分法的定式化と自己共役性·· 10

Hiroki Yagisita (Kyoto Sangyo Univ.)　Variational formulation and self-adjointness of Laplace operator in infinite dimensional space $\mathbb{R}^\infty$

概要　In a variational method like Lax–Milgram theorem, we define Laplacian on the infinite direct product space $\mathbb{R}^\infty := \prod_{n\in\mathbb{N}} \mathbb{R}$ and show that it is a self-adjoint operator.　Here, the most important thing is to define Hilbert space that corresponds to Sobolev space $H^1(\mathbb{R}^\infty)$.　To do it, we use square root of density introduced by Hormander in context of Fourier integral operator theory.　However, here, we use a measure-theoretic method rather than a geometric method to give a very elementary introduction at least for analyst (inspired by statistical interpretation of quantum mechanical wave function by Born and Heisenberg) of square root of density.　All in all, only basic knowledge of analysis (as it is quite possible to study undergraduate) is required.

11　柳　下　浩　紀（京　都　産　大　理）♭　$\mathbb{R}^\infty$ 上の無限次元干渉 Brown 運動に関する解析的半群··············　5

Hiroki Yagisita (Kyoto Sangyo Univ.)　Analytic semigroup of infinite dimensional interacting Brownian motion on $\mathbb{R}^\infty$

概要　We define the generator of a holomorphic semigroup for a countably infinite interacting Brownian particle system on a countable direct product space $\mathbb{R}^\infty := \prod_{n\in\mathbb{N}} \mathbb{R}$ as a maximal monotone self-adjoint operator $\sum_{k=1}^\infty((-\frac{\partial}{\partial x_k} + H_k)(\frac{\partial}{\partial x_k} + H_k))$.　At first glance, this may seem like a pretty difficult problem, but it is not too difficult because $\frac{\partial}{\partial x_k}$ on $\mathbb{R}^\infty$ can be defined as just a (generalized) partial derivative.　The most important thing is to define a H-partial derivative $\partial_{H,k} := \frac{\partial}{\partial x_k} + H_k$ as a closed operator for a sequence $\{H_k\}_{k=1}^\infty$ of measurable functions whose domain are measurable "subsets" of $\mathbb{R}^\infty$.　As with the previous talk, only basic knowledge of analysis (and part of the previous talk) is required.

12　望　月　　　清（中大理工・都立大*）　摩擦項をもつ磁場中の波動方程式に対する極限振幅の原理 ··········· 15
　　中　澤　秀　夫（日　本　医　大）

Kiyoshi Mochizuki
(Chuo Univ. / Tokyo Metro. Univ.*)　The principle of limiting amplitude for dissipative wave equations in magnetic fields
Hideo Nakazawa
　　　（Nippon Medical School）

概要　The dissipative wave propagation problem with magnetic Laplacian in an exterior domain is considered.The uniform estimates and Hölder conditions of the resolvent are studied for the reduced wave operator without dissipation.　Based on these results, the validity of the principle of limiting amplitude is proved for wave propagation problem with dissipation.　As byproduct, the result by Mizohata–Mochizuki in 1966 are improved.

13   大 屋 博 一 (サレジオ工高専)   指数関数を重みにもつ ソボレフ空間の埋め込みに関する一考察 ······· 15

Hirokazu Ohya (Salesian Polytech.)   Embedding properties for some Weighted Sobolev spaces with growing weight

概 要 In this talk we are concerned with the embedding properties for several kind of functional spaces in R^N. We will consider the functional spaces called as Weighted Sobolev space with some weight function. If we choose some suitable growing functions in the weight functions, we can derive the continuity and compact embedding for these functional spaces. We also obtain the sufficient conditions for the weight functions to show the above properties. Our method is mainly owed to usual Sobolev's inequality.

14   樋 口 健 太 (愛 媛 大 理 工)   複数の接触交差が生成する小さな擬交差間の 2 準位断熱遷移確率 ····· 15
     渡 部 拓 也 (立命館大理工)

Kenta Higuchi   (Ehime Univ.)   Two-level adiabatic transition probability for small avoided crossings
Takuya Watanabe (Ritsumeikan Univ.)   generated by tangential intersections

概 要 We consider a first order ordinary differential system with two small parameters, which are an adiabatic parameter and an interaction one. This system is a model of a time-dependent Schrödinger equation which describes that two energy-levels with tangential intersections avoid crossings. In this talk, we give asymptotic expansion of the transition probability between avoided crossings as two parameters tend to zero as well as their ratio determined by the tangential order does.

15   宮 西 吉 久 (信 州 大 理)   薄型領域におけるノイマン・ポアンカレ作用素のスペクトル ·········· 10

Yoshihisa Miyanishi (Shinshu Univ.)   Spectrum of the Neumann–Poincaré operator on thin domains

概 要 The Neumann–Poincaré operator (abbreviated by NP) is a boundary integral linear operator known as one of the important tools associated with boundary value problems in the field of partial differential equations. Our purpose here is to introduce the spectral structure of the NP operator. In an asymptotic sense, the NP spectrum distributed in the interval [-1/2, 1/2] as the domains become longer in 2D. In an asymptotic sense, we also find that the NP spectrum densely distributed in the interval [-1/2, 1/2] (resp. [0, 1/2)), as the domains which are defined by spheroids become flatter (resp. longer) in 3D.

16   穴 原 義 弘 (横浜国大先進実践)   流出入を伴う 1 次元格子上量子ウォークの極限定理 ················ 15
     今 野 紀 雄 (横 浜 国 大 工)
     森 岡   悠 (愛 媛 大 理 工)
     瀬 川 悦 生 (横浜国大環境情報)

Yoshihiro Anahara   Limit theorem for quantum walk on one dimensional lattice with inflows
        (Yokohama Nat. Univ.)   and outflows
Norio Konno (Yokohama Nat. Univ.)
Morioka Hisashi (Ehime Univ.)
Etsuo Segawa (Yokohama Nat. Univ.)

概 要 To obtain a stationary state of quantum walks on the finite path, we set the sink and source to the boundaries of the path so that the internal path receives the inflow and raditas the outflow at every time step. In this talk we consider one dimensional lattice as finite graph and we show the weak convergence theorem for the scaled limit distribution of the comfortability in the limit of the length of the path.

17　樋 口 健 太（愛 媛 大 理 工）
　　森 岡　　悠（愛 媛 大 理 工）
　　瀬 川 悦 生（横浜国大環境情報）

Kenta Higuchi　(Ehime Univ.)
Hisashi Morioka (Ehime Univ.)
Etsuo Segawa (Yokohama Nat. Univ.)

Resonance expansion for finitely perturbed free quantum walks on the line ·· 15

Resonance expansion for finitely perturbed free quantum walks on the line

概要　We introduce resonances to a class of quantum walks on the line as poles inside the unit circle of the outgoing resolvent. With each resonance, a resonant state which behaves like an eigenvector is associated. We show that the time evolution with an initial state with compact incoming support exactly coincides with the evolution of a sum of resonant states in each compact set after a finite length of time has passed. Consequently, the exponential decay rate of the time evolution is given by the modulus of resonances. We note that in the special case where a resonance is algebraically multiple, the decay becomes polynomially slower.

16:30〜17:30　特別講演

髙 江 洲 俊 光（群 馬 大 理 工）　　相互作用する場の量子論の系のスペクトル解析について

Toshimitsu Takaesu (Gunma Univ.)　　On the spectral analysis of interacting quantum field systems

概要　In this talk, interacting systems of quantum field models are investigated. We mainly consider the system of quantum electrodynamics, which is the interaction system of a Dirac field and the radiation field in the Coulomb gauge, but the Yukawa model and ϕ^4 model are also considered. By introducing momentum and spatial cutoffs, the Hamiltonians are self-adjoint operators on a Hilbert space. Focusing on ground states, the spectral analysis of these systems will be explained.

3月16日（木）　　第VI会場

9:30〜12:00

18　里 見 貴 志（東 大 数 理）　　ユニモジュラー局所コンパクト群上の畳み込みと再配分に関する不等式
　　　　　　　　　　　　　　　　　と関連する不等式の最適定数 ······························· 15

Takashi Satomi (Univ. of Tokyo)　　Inequality for the convolutions on unimodular locally compact groups
　　　　　　　　　　　　　　　　　　　and the optimal constant of related inequalities

概要　Let μ be the Haar measure of a unimodular locally compact group G and $m(G)$ be the infimum of the volumes of all open subgroups of G. The main result is that $\int_G f \circ (\phi_1 * \phi_2)(g)\, dg \le \int_{\mathbb{R}} f \circ (\phi_1^* * \phi_2^*)(x)\, dx$ holds for any measurable functions $\phi_1, \phi_2 : G \to \mathbb{R}_{\ge 0}$ with $\mu(\mathrm{supp}\,\phi_1) + \mu(\mathrm{supp}\,\phi_2) \le m(G)$ and any convex function $f : \mathbb{R}_{\ge 0} \to \mathbb{R}$ with $f(0) = 0$. Here ϕ^* is the rearrangement of ϕ.

Let $Y_O(P, G)$ and $Y_R(P, G)$ denote the optimal constants of Young's and the reverse Young's inequality, respectively, on G for the pair of the exponents $P = (p_1, p_2)$ under the assumption $\mu(\mathrm{supp}\,\phi_1) + \mu(\mathrm{supp}\,\phi_2) \le m(G)$. Then we have $Y_O(P, G) \le Y_O(P, \mathbb{R})$ and $Y_R(P, G) \ge Y_R(P, \mathbb{R})$ as a corollary of the main result. Thus, we obtain that $m(G) = \infty$ holds if and only if $H(p, G) \le H(p, \mathbb{R})$ in the case of $p' := p/(p-1) \in 2\mathbb{Z}$, where $H(p, G)$ is the optimal constant of the Hausdorff–Young inequality on G for the exponent p.

19　久 保 利 久（龍 谷 大 経 済）　On the standardness of homomorphisms between generalized Verma modules for $\mathfrak{sl}(3, \mathbb{C})$ ··· 15

Toshihisa Kubo (Ryukoku Univ.)　On the standardness of homomorphisms between generalized Verma modules for $\mathfrak{sl}(3, \mathbb{C})$

概要　Let $\mathfrak{g}$ be a finite dimensional complex simple Lie algebra and $\mathfrak{b}$ a Borel subalgebra. Let $\mathfrak{p} \supset \mathfrak{b}$ be a standard parabolic subalgebra. In 1977, Lepowsky showed that a homomorphism $\varphi \colon M_\mathfrak{b}(\nu) \to M_\mathfrak{b}(\zeta)$ between Verma modules induces a map $\varphi_{\text{std}} \colon M_\mathfrak{p}(\nu) \to M_\mathfrak{p}(\zeta)$ between the corresponding generalized Verma modules, provided that ν and ζ satisfy a certain integral condition. He called such a map φ_{std} *standard*. It was also observed that the standard map φ_{std} could be zero and even in the case there could be a non-zero homomorphism $\varphi_{\text{nonstd}} \colon M_\mathfrak{p}(\nu) \to M_\mathfrak{p}(\zeta)$. Any map that is not standard is called *non-standard*. The classification of standard/non-standard maps is still an open problem.

In this talk, for $\mathfrak{g} = \mathfrak{sl}(3, \mathbb{C})$ with a maximal parabolic subalgebra $\mathfrak{p}$, we shall show that all non-zero homomorphisms $\psi \colon M_\mathfrak{p}(\nu) \to M_\mathfrak{p}(\zeta)$, where $M_\mathfrak{p}(\zeta)$ is of scalar type, are standard.

20　織 田　　寛（拓 殖 大 工）　BC 型 Opdam–Cherednik 変換の逆変換公式 ······················· 15

Hiroshi Oda (Takushoku Univ.)　Inversion formula for Opdam–Cherednik transform associated with a root system of type BC

概要　We give the inversion formula and the Plancherel formula for Opdam–Cherednik transform associated with a root system of type BC, when the multiplicity parameters are not necessarily nonnegative.

21　貝 塚 公 一（日 本 医 大）　Some remarks on the Dirac operator on symmetric spaces ··········· 15

Koichi Kaizuka　　　　　　　Some remarks on the Dirac operator on symmetric spaces
　　　　（Nippon Medical School）

概要　We develop the spectral analysis for the Dirac operator on symmetric spaces of noncompact type based on harmonic analysis on Lie groups. In this talk, we compute the continuous spectrum of the Dirac operator on irreducible symmetric spaces of noncompact type. We show that the continuous spectrum has a spectral gap if and only if the symmetric space is isomorphic to a coset space of the special pseudo-unitary group of odd matrix size. Furthermore, we give a uniform weighted resolvent estimate for the Dirac operator under a certain assumption on the symmetric space.

22　中 濱 良 祐　　　　　　　Computation of weighted Bergman inner products on block off-diagonal
　　　（NTT基礎数学研究センタ）　matrices in bounded symmetric domains for $Sp(2r, \mathbb{R})$ ·············· 15

Ryosuke Nakahama　　　　　Computation of weighted Bergman inner products on block off-diagonal
　（NTT Inst. for Funda. Math.）　matrices in bounded symmetric domains for $Sp(2r, \mathbb{R})$

概要　Let $(G, G_1) = (G, (G^\sigma)_0)$ be a symmetric pair of holomorphic type, and we consider a pair of Hermitian symmetric spaces $D_1 = G_1/K_1 \subset D = G/K$, realized as bounded symmetric domains in complex vector spaces $\mathfrak{p}_1^+ := (\mathfrak{p}^+)^\sigma \subset \mathfrak{p}^+$ respectively. Then the universal covering group $\widetilde{G}$ of G acts unitarily on the weighted Bergman space $\mathcal{H}_\lambda(D) \subset \mathcal{O}(D) = \mathcal{O}_\lambda(D)$ on D for sufficiently large λ. Its restriction to the subgroup $\widetilde{G}_1$ decomposes discretely and multiplicity-freely, and its branching law is given in terms of the $\widetilde{K}_1$-decomposition of the space $\mathcal{P}(\mathfrak{p}_2^+)$ of polynomials on $\mathfrak{p}_2^+ := (\mathfrak{p}^+)^{-\sigma} \subset \mathfrak{p}^+$. Our goal is to understand the decomposition of the restriction $\mathcal{H}_\lambda(D)|_{\widetilde{G}_1}$ by studying the weighted Bergman inner product on each $\widetilde{K}_1$-type in $\mathcal{P}(\mathfrak{p}_2^+) \subset \mathcal{H}_\lambda(D)$. Today we deal with the symmetric pair $(G, G_1) = (Sp(2r, \mathbb{R}), Sp(r, \mathbb{R}) \times Sp(r, \mathbb{R}))$.

23 田 中 雄 一 郎 (東 大 数 理) 無重複性のユニタリトリックについて ·························· 15

Yuichiro Tanaka (Univ. of Tokyo) A unitary trick for the multiplicity-freeness property

概要 With the aim of uniform treatment of multiplicity-free representations of Lie groups including infinite-dimensional representations, T. Kobayashi introduced the notion of visible actions on complex manifolds. In this talk I would like to show a trick for obtaining the multiplicity-freeness property of infinite-dimensional representations of real semisimple Lie groups from that of finite-dimensional ones of compact Lie groups through visible actions on flag varieties.

24 V. Pérez-Valdés (東 大 数 理) 3次元球面上のベクトル束から2次元球面上の直線束への共形同変な微分
対称性破れ作用素の構成と分類 ································ 15

Víctor Pérez-Valdés (Univ. of Tokyo) Construction and classification of conformally equivariant differential symmetry breaking operators from a vector bundle over S^3 to a line bundle over S^2

概要 In this talk, we explain about the construction and classification problems of all differential symmetry breaking operators $D : C^\infty(S^3, \mathcal{V}_\lambda^{2N+1}) \to C^\infty(S^2, \mathcal{L}_{m,\nu})$ between the section spaces of $\mathcal{V}_\lambda^{2N+1} \to S^3$, a rank $2N+1$ vector bundle over S^3, and $\mathcal{L}_{m,\nu} \to S^2$, a line bundle over S^2.

25 中 島 秀 斗 (統 計 数 理 研) 等質開凸錐に付随するゼータ関数のガンマ行列の分解定理 ·········· 15

Hideto Nakashima (Inst. of Stat. Math.) Decomposition formulas for gamma matrices of zeta functions associated with homogeneous cones

概要 Associated with homogeneous cones, we are able to construct solvable prehomogeneous vector spaces. In the previous paper, we calculate gamma matrices of the associated zeta functions explicitly. In this talk, we show that the gamma matrices can be decomposed into variable-wise matrices. Moreover, under suitable condition, we show that the associated zeta functions admit a kind of completion forms.

13:10〜14:10 特別講演

橋 本 隆 司
(鳥取大教育支援・国際交流推進機構)

シンプレクティック・ベクトル空間上の運動量写像の量子化と極小表現

Takashi Hashimoto (Tottori Univ.) Qunatization of the moment map on symplectic vector spaces and minimal representation

概要 Let G be $\mathrm{Sp}(n, \mathbb{R}), \mathrm{U}(p,q)$, or $\mathrm{O}^*(2n)$, which acts on a symplectic vector space W in a Hamiltonian way with moment map μ. The purpose of this talk is twofold: the first one is to show that the canonical quantization of μ with a choice of a Lagrangian subspace of W provides the oscillator representations of G, which have been extensively studied in relation to the Howe duality and to minimal representations. The second one is to construct the minimal representation of $\mathrm{O}(p,q)$ by applying this method to $\mathrm{O}(p,q)$ and using the fact that $(\mathrm{O}(p,q), \mathrm{SL}_2(\mathbb{R}))$ is a Howe's dual pair.

3月17日(金) 第VI会場

9:30〜12:00

26 大 井 志 穂 (新 潟 大 理) 行列値リプシッツ環上の全射線形等距離写像の代数的反射性 ········ 15

Shiho Oi (Niigata Univ.) Algebraic reflexivity of isometry groups of Lipschitz algebras

概要 We consider Banach algebras of Lipschitz maps taking the values in a Banach algebra of complex matrices of degree n. The unital subjective linear isometries on the Banach algebras have been obtained. In this talk, we study the algebraic reflexivity of the set of subjective linear isometries. The subset S of the set of all bounded linear operators from A_1 into A_2 is called algebraically reflexive if a bounded linear operator $T : A_1 \to A_2$ which satisfies $Ta \in Sa$ for every $a \in A_1$ implies $T \in S$. We show the set of unital subjective linear isometries is algebraic reflexivity.

27　榎 並 優 太（新 潟 大 自 然）　Surjective isometries on the Banach algebra of analytic functions with
　　三 浦　　毅（新 潟 大 理）　C^n-boundary values ·· 12

Yuta Enami　　(Niigata Univ.)　Surjective isometries on the Banach algebra of analytic functions with
Takeshi Miura　(Niigata Univ.)　C^n-boundary values

概 要　Let $\mathbb{D}, \overline{\mathbb{D}}$ and $\mathbb{T}$ be the open unit disk, closed unit disk and unit circle in the complex plane $\mathbb{C}$. The disk algebra $A(\overline{\mathbb{D}})$ is the algebra of all continuous functions on $\overline{\mathbb{D}}$ that is holomorphic in $\mathbb{D}$. We consider the subalgebra $A^n(\overline{\mathbb{D}})$ consisting of all $f \in A(\overline{\mathbb{D}})$ whose restrictions $f|_{\mathbb{T}}$ are of class C^n. For each $f \in A^n(\overline{\mathbb{D}})$, we denote by $D^k(f)$ the k-th derivative of $f|_{\mathbb{T}}$. The algebra $A^n(\overline{\mathbb{D}})$ is a Banach algebra, with the norm $\|f\|_{\Sigma} = \sum_{k=0}^{n} \|D^k(f)\|_{\infty}/k!$, where $\|g\|_{\infty} = \sup_{z \in \mathbb{T}} |g(z)|$. We characterized surjective, not necessarily linear, isometries on $A^n(\overline{\mathbb{D}})$ with respect to the norm $\|\cdot\|_{\Sigma}$.

28　三 浦　　毅（新 潟 大 理）　Tingley's problem for uniformly closed function algebras ············ 15
　　廣 田 大 輔（新 潟 大 自 然）

Takeshi Miura　(Niigata Univ.)　Tingley's problem for uniformly closed function algebras
Daisuke Hirota　(Niigata Univ.)

概 要　Let A and B be uniformly closed function algebras on locally compact Hausdorff spaces X and Y, respectively. We shall present a positive answer to Tingley's problem for A and B. More explicitly, we prove that every surjective isometry between the unit spheres, $S(A)$ and $S(B)$, of A and B admits an extension to a surjective real linear isometry between whole spaces A and B.

29　佐 野 隆 志（山 形 大 理）♭　クラウス行列の固有値分布について ····························· 10
　　武 内 和 希（山 形 大 理 工）

Takashi Sano　(Yamagata Univ.)　Inertia of Kraus matrices
Kazuki Takeuchi　(Yamagata Univ.)

概 要　Let $r, p_0, p_1 < \cdots < p_n$ be positive numbers. We consider the $n \times n$ matrix whose (i, j) entry is given as $\dfrac{1}{p_i - p_j}\left(\dfrac{p_i^r - p_0^r}{p_i - p_0} - \dfrac{p_j^r - p_0^r}{p_j - p_0}\right)$. We call this a Kraus matrix associated with t^r. We show the inertia of this Kraus matrix.

30　渚　　　　勝　　　　行列の p-ノルム ··· 10
　　　　（立命館大理工・千葉大理）

Masaru Nagisa　　　　The p-norm of some matrices
(Ritsumeikan Univ./Chiba Univ.)

概 要　We compute the operator p-norm of some $n \times n$ complex matrices, which can be seen as bounded linear operators on the n-dimensional Banach space $\ell^p(n)$. In particular, a p-norm of a matrix $A = \begin{pmatrix} 8 & 1 & 6 \\ 3 & 5 & 7 \\ 4 & 9 & 2 \end{pmatrix}$ which corresponds to a magic square is 15 for any $p \in [1, \infty]$.

31　遠 山 宏 明（前 橋 工 科 大）　Operator inequalities related to Young's inequality ················ 15
　　亀 井 栄 三 郎
　　渡 邉 雅 之（前 橋 工 科 大）

Hiroaki Tohyama　　　　Operator inequalities related to Young's inequality
　　　　　(Maebashi Inst. of Tech.)
Eizaburo Kamei
Masayuki Watanabe
　　　　　(Maebashi Inst. of Tech.)

概 要　In this talk, we show several operator inequalities concerning Young's inequality by using relative operator entropies and operator valued α-divergence. One of them is partially a refinement of Young's inequality.

32　山 崎 丈 明（東 洋 大 理 工）　Limit of iterated induced Aluthge transformations of centered operators
　　大 坂 博 幸（立命館大理工）　· 15

Takeaki Yamazaki (Toyo Univ.)　Limit of iterated induced Aluthge transformations of centered operators
Hiroyuki Osaka (Ritsumeikan Univ.)

概 要　In this talk, we shall discuss on bounded linear operators on a complex Hilbert space. We will introduce convergence property of an operator sequence which is generated by iteration of the induced Aluthge transformation. In this talk, we consider the case of centered operators.

33　大 坂 博 幸（立命館大理工）　On a class of K-entanglement witnesses · 15
　　T. Młynik　　（Univ. of Gdansk）
　　M. Marciniak　（Univ. of Gdansk）

Hiroyuki Osaka (Ritsumeikan Univ.)　On a class of K-entanglement witnesses
Tomasz Młynik (Univ. of Gdansk)
Marcin Marciniak (Univ. of Gdansk)

概 要　Recently, Yang et al.showed that each 2-positive map acting from $\mathcal{M}_3(\mathbb{C})$ into itself is decomposable. It is equivalent to the statement that each PPT state on $\mathbb{C}^3 \otimes \mathbb{C}^3$ has Schmidt number at most 2. It is a generalization of Perez–Horodecki criterion which states that each PPT state on $\mathbb{C}^2 \otimes \mathbb{C}^2$ or $\mathbb{C}^2 \otimes \mathbb{C}^3$ has Schmidt rank 1 i.e. is separable. Natural question arises whether the result of Yang at al. stays true for PPT states on $\mathbb{C}^3 \otimes \mathbb{C}^4$. This question can be considered also in higher dimensions. We construct a positive maps which is suspected for being a counterexample. More generally, we provide a class of positive maps between matrix algebras whose k-positivity properties can be easily controlled.

34　瀬 尾 祐 貴（大阪教育大教育）　量子 $\natural_\alpha$-Rényi ダイヴァージェンスのデータ処理不等式について · · · · · · · 15

Yuki Seo (Osaka Kyoiku Univ.)　On data processing inequality for quantum $\natural_\alpha$-Rényi divergences of positive order

概 要　In this talk, we show some fundamental properties of quantum $\natural_\alpha$-Rényi divergences of real order. In particular, we show that the data processing inequality holds for all $\alpha > 0$.

14:15〜15:30

35　井 上　　寛（九州産大経済）　An unbounded generalization of Tomita's observable algebras II · · · · · · 15

Hiroshi Inoue (Kyushu Sangyo Univ.)　An unbounded generalization of Tomita's observable algebras II

概 要　In a previous talk we tried to build the basic theory of unbounded Tomita's observable algebras called $T^\dagger$-algebras which are related to unbounded operator algebras, especially unbounded Tomita–Takesaki theory, operator algebras on Krein spaces, studies of positive linear functionals on $*$-algebras and so on. And we defined the notions of regularity, semisimplicity and singularity of $T^\dagger$-algebras and characterized them. In this talk we shall proceed further studies of $T^\dagger$-algebras and investigate whether a $T^\dagger$-algebra is decomposable into a regular part and a singular part.

36　伊 藤　　慧（東 大 数 理）　複素力学系に付随する C*-環のカルタン部分環 · 10

Kei Ito　　（Univ. of Tokyo）　Cartan subalgebras of C*-algebras associated with complex dynamical systems

概 要　Deaconu and Muhly was defined C^*-algebras associated with branched coverings. But their algebras lack information of branch points. Kajiwara and Watatani tried to modify Deaconu–Muhly algebras and defined C^*-algebras associated with complex dynamical systems. Let R be a rational function and J be its Julia set. It is known that the C^*-algebra $C(J)$ of complex-valued continuous functions on J is a Cartan subalgebra of the Deaconu–Muhly algebra for the dynamical system (J, R), but it was not known whether $C(J)$ is a Cartan subalgebra of the Kajiwara–Watatani algebra for (J, R) or not. In this talk, I explain that $C(J)$ may not be a Cartan subalgebra of the Kajiwara–Watatani algebra for (J, R).

37　有 本 諒 也（京 大 数 理 研）　On the type of the von Neumann algebra of an open subgroup of the Neretin group ·· 15

Ryoya Arimoto　（Kyoto Univ.）　On the type of the von Neumann algebra of an open subgroup of the Neretin group

概要　The Neretin group is the totally disconnected locally compact group consisting of almost automorphisms of the tree. In 2021, P.-E. Caprace, A. Le Boudec, and N. Matte Bon proved that the Neretin group is not of type I. We prove that a distinguished open subgroup of the Neretin group is not of type I either.

38　後 藤 聡 史（上 智 大 理 工）　On flat part commuting squares ······························· 10

Satoshi Goto　（Sophia Univ.）　On flat part commuting squares

概要　When a non-degenerate commuting square is given, we can construct a hyperfinite II_1 subfactor $N \subset M$ generated by the tower of the given non-degenerate commuting squares. From the original commuting square, we can also construct the flat part commuting squares. If the subfactor $N \subset M$ is of finite depth, we will show that the composite connection of the original and the flat part ones (in the sense of N. Sato) produces a subfactor which is isomorphic to $N \subset M$. We also show an application of this result.

15:45〜16:45　特別講演

渚　　　勝　　　　　　　コンパクト環上の非線型トレースとマジョリゼーション
　（立命館大理工・千葉大理）

Masaru Nagisa　　　　　Non-linear traces on the algebra of compact operators and majorization
(Ritsumeikan Univ./Chiba Univ.)

概要　We study non-linear traces of Choquet type and Sugeno type on the algebra of compact operators. They have certain partial additivities. We show that these partial additivities charactererize non-linear traces of both Choquet type and Sugeno type respectively. There exists a close relation between non-linear traces of Choquet type and majorization theory. We study trace class operators for non-linear traces of Choquet type. More generally we discuss Schatten–von Neumann p-class operators for non-linear traces of Choquet type. We determine when they form Banach spaces. This is an attempt of non-commutative integration theory for non-linear traces of Choquet type on the algebra of compact operators. We also consider the triangle inequality for non-linear traces of Sugeno type.

統 計 数 学

3月15日(水)　　第Ⅷ会場

10:00〜11:30

1　久保田直樹（日 大 理 工）　フロッグモデルの時間定数におけるリプシッツ型評価 ⋯⋯⋯⋯⋯⋯⋯ 15
　Naoki Kubota　（Nihon Univ.）　Lipschitz-tiype estimates for the time constant of the frog model

概要　We consider the frog model on the multidimensional lattice, whose initial configuration is according to a Bernoulli distribution. The main object of interest is the so-called time constant, which describes the speed of the spread of frogs. The time constant depends on the parameter of the Bernoulli distribution. Hence, in this talk, we discuss how the change in the parameter of the Bernoulli distribution affects the time constant. More precisely, we provide some Lipschitz-type estimates for the time constant.

2　大 井 拓 夢（京 大 数 理 研）　Convergence of time-changed α-stable processes by GMC ⋯⋯⋯⋯⋯ 15
　Takumu Ooi　（Kyoto Univ.）　Convergence of time-changed α-stable processes by GMC

概要　We consider Gaussian fields whose covariance kernels are 1-order green functions of d-dimensional symmetric α-stable processes, Gaussian multiplicative chaos (GMC) and time-changed α-stable processes by GMC. In the case of both d and α are 2, these are the Gaussian free field, the Liouville measure and the Liouville Brownian motion, respectively. In this talk, we explain weak convergence of the time-changed α-stable processes by GMC with Skorokhod's topology.

3　広 兼 巳 紀 雄（阪 大 基 礎 工）　A limit theorem for generalized tempered stable processes and their
　深 澤 正 彰（阪 大 基 礎 工）　quadratic variations with stable index tending to two ⋯⋯⋯⋯⋯⋯⋯ 15
　Mikio Hirokane　（Osaka Univ.）　A limit theorem for generalized tempered stable processes and their
　Masaaki Fukasawa（Osaka Univ.）　quadratic variations with stable index tending to two

概要　Motivated by Yoshida's martingale expansion theory, we study the limit of the joint distribution of a multidimensional Generalized Tempered Stable (GTS) process and its quadratic covariation process when the stable index tends to two. Under a proper scaling, the GTS processes converges to a Brownian motion that is a stable process with stable index two. We renormalize their quadratic covariation processes so that they have a nondegenerate limit distribution. We show that the limit is a stable process with stable index one and is independent of the limit Brownian motion of the GTS processes.

4　鈴 木 由 紀（慶　大　医）　A diffusion process with a symmetric stable potential on the negative
　高 橋 　 弘（慶　大　商）　side in $\mathbb{R}$ ⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯ 15
　田 村 要 造
　Yuki Suzuki　（Keio Univ.）　A diffusion process with a symmetric stable potential on the negative
　Hiroshi Takahashi（Keio Univ.）　side in $\mathbb{R}$
　Yozo Tamura

概要　We investigate a diffusion process with a symmetric stable potential on the negative side in $\mathbb{R}$. In the case of a Brownian potential on the negative side, this process was examined by Kawazu, Suzuki and Tanaka (2001, 2006). We study a long-time behavior of our process by a different method from theirs. We use a method based on a theory of bi-generalized diffusion processes studied by Ogura (1989).

5　鈴 木 由 紀（慶　　大　　医）　Limit theorems for a diffusion process with a non-selfsimilar random potential $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Yuki Suzuki　　　（Keio Univ.）　Limit theorems for a diffusion process with a non-selfsimilar random potential

概 要　We study a one-dimensional diffusion process with a non-selfsimilar random potential. The type of the potential is different on the left and the right hand sides of the origin. We show that the long-time behavior of the process is different from the behaviors of any other previous models.

6　小 川 重 義（立命館大理工）　Another representation of the mean value theorem for noncausal stochastic integrals $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 10

Shigeyoshi Ogawa (Ritsumeikan Univ.)　Another representation of the mean value theorem for noncausal stochastic integrals

概 要　This is the follow up to the preceding lecture "Mean value theorems for the noncausal stochastic integral" that was presented at the 2022 annual meeting of Math Society of Japan held in Sappro, in Octobre 2022. There we showed a basic fact about the validity of a mean value theorem for the noncausal stochastic integral, also called ogawa integral, with respect to Brownian motion W_t of the form $\int_s^t f(X_r)d_*W_r$ where X_t is an Itô process, We derived formulae of mean value theorem for Itô integral $\int_s^t f(X_r)d_0W_r$ and for the noncausal integral $\int_s^t f(\tilde{X}_r)d_*W_r$ where $\tilde{X}_t(\emptyset)$ is a noncausal variation of X_t.
The aim of the present talk is to give an elementary but important comment on the basic result and show another formula of mean value theorem for each of three cases mentioned above.

14:15〜15:15　特別講演

中 島 秀 太（明　大　理　工）　ファーストパッセージパーコレーションと関連する話題

Shuta Nakajima　（Meiji Univ.）　First-passage percolation and its related topics

概 要　In this talk, we discuss recent progress on First-passage percolation (FPP). FPP was originally introduced by Hammersley and Welsh as a model of the spread of fluid in a random medium. The model also can be regarded as a dynamic version of percolation. In FPP, a graph with random weights is given, and we consider the optimization problem of the passage time between two fixed vertices. The minimum value is called the first passage time and it represents the time when the fluid reaches from one point to the other. From the viewpoint of an optimization problem, properties of the optimal path that attains minimum value are also of interest. Over 50 years, many mathematical techniques have been developed to study these objects. This talk mainly focuses on the fluctuations and the large deviations of the first passage times, and the geometric properties of geodesics. We also discuss related models such as the chemical distance.

15:30〜16:30　特別講演

梁　　　　松（早　大　教　育）　ブラウン運動と古典力学系

Song Liang　　（Waseda Univ.）　A mechanical model of Brownian motion

概 要　We provide a connection between Brownian motion and a classical Newton mechanical system.
Brownian motion is a well-known physical phenomenon concerning the erratic motion of a small particle immersed into a fluid in equilibrium. The physical explanation of Brownian motion is often presented in the following way: since the massive particle is interacted by a large number of very light environmental particles, if we could assume that the interactions from each light particle at each time are independent, then by the central limit theorem for the sums of *i.i.d.* random variables, this will give in a suitable limit the Brownian motion. We notice that this assumption of independence can hardly be justified, even in a collision model, because of the possibility of re-collisions. This becomes a more evident and significant drawback when considering the model of interactions caused by potentials.
In this talk, we consider a mechanical model consisting of a massive particle in an ideal gas, evolved according to non-random Newton mechanical principles, via interaction potentials. We prove that under certain conditions, the (position, velocity)-process of the massive particle converges to a diffusion process, when the mass of the environmental particles converges to 0, while the density and the velocities of them go to infinity promptly. The precise expression of the limiting process is also given.

3月16日(木)　　第VIII会場

10:20〜11:10

7　田 中 晴 喜（和歌山県立医大）　On dimension estimates in nonconformal graph iterated function systems via asymptotic perturbation ································ 15

Haruyoshi Tanaka　　On dimension estimates in nonconformal graph iterated function sys-
　　（Wakayama Med. Univ.）　tems via asymptotic perturbation

概 要　We consider infinite graph-directed iterated function systems (GIFSs) whose contraction mappings are nonconformal. As our main result, we formulate asymptotic perturbations from conformal GIFSs to nonconformal GIFSs, and give the asymptotic behaviour of the Hausdorff dimension of the limit set of the perturbed system. We also investigate perturbed self-affine sets as special cases.

8　髙 野 凌 史（阪 大 基 礎 工）　Large deviation principle for the Lyons–Victoir extension ··········· 15

Ryoji Takano　　（Osaka Univ.）　Large deviation principle for the Lyons–Victoir extension

概 要　We study the large deviation principle for the Lyons–Victoir extension. The Lyons–Victoir extension is known as a method to lift a general continuous path of finite p-variation to a geometric q-variation rough path, where q is grater than p. We use the Lyons–Victoir extension as a method for lifting continuous stochastic processes to geometric rough paths. The main idea of this study is that by using the Lyons–Victoir extension, lifting the large deviation principle for continuous stochastic processes to that for geometirc rough paths. To do so, we will prove the boundedness of the Lyons–Victoir extension map. As consequence of this, the large deviation principle for rough differential equation driven by the Lyons–Victoir extenstion can be obtained.

9　柳 下 浩 紀 (京 都 産 大 理)♭　無限次元空間 $\mathbb{R}^\infty$ 上の Gibbs 測度は, コンパクト空間 $(\mathbb{R} \cup \{\infty\})^\infty$ 上の
局所性をもつ正則 Dirichlet 形式を定める ·························· 10

Hiroki Yagisita (Kyoto Sangyo Univ.)　Any Gibbs measure on infinite-dimensional space $\mathbb{R}^\infty$ defines a regular
Dirichlet form with local property on compact space $(\mathbb{R} \cup \{\infty\})^\infty$

概 要　For Gibbs measure μ on $\mathbb{R}^\infty$, we consider a classical symmetric form formally denoted $E_{CD}^\mu(f_1, f_2) := \sum_{k \in \mathbb{N}} \int_{\mathbb{R}^\infty} \frac{\partial f_1}{\partial x_k} \frac{\partial f_2}{\partial x_k} d\mu$. Following, for example, Albeverio, Kondratiev, Rockner, etc., we adopt definition of Gibbs measure by establishment of integration by parts formula. In our main result, "μ determines a regular Dirichlet form with local property", there are no constraints other than that μ is (what we say) Gibbs measure. It seems that Gibbs measure (as we call it) also includes fairly marginal probability measure in that it is "spatially spread out". Note that we see $\mathbb{R}^\infty$ as a direct product of Riemannian manifolds.

10　中 川 雄 太 (京大人間環境)　ギブス点過程と非正のポテンシャルに関するシュレディンガー作用素の
状態密度 ·· 10

Yuta Nakagawa （Kyoto Univ.）　Density of states for Schrödinger operators associated with Gibbs point
processes and nonpositive potentials

概 要　In this talk, we consider the random Schrödinger operator for the potential generated by the nonpositive single site potential and the points randomly located according to the Gibbs point process for the pairwise interaction. We determine the leading term of the asymptotic behavior of the integrated density of states (IDS) for the Schrödinger operator. This IDS vanishes much faster near $-\infty$ than the IDS for the Poisson point process, of which asymptotic behavior is known.

11:20〜11:50　統計数学分科会総会

<div align="center">

3月17日(金)　　第 VIII 会場

</div>

9:50〜11:35

11　田 中 輝 雄 (広島市大情報)　最適停止問題の預言者の不等式 —差の評価— ····················· 10

Teruo Tanaka (Hiroshima City Univ.)　Prophet inequalities for finite stage multiparameter optimal stopping
problems

概 要　We consider the optimal stopping problem for discrete time multiparameter stochastic processes. In the classical optimal stopping problems, the comparisons between the expected reward of a player with complete foresight and the expected reward of a player using nonanticipating stop rules, known as prophet inequalities, have been studied by many authors. We shall study the prophet inequalities for optimal stopping problems for finite stage multiparameter stochastic processes.

12　藤 田 敏 治 (九 工 大 工)　合流型推移をもつマルコフ決定過程 —乗法型評価— ··············· 10

Toshiharu Fujita
　　（Kyushu Inst. of Tech.）　Markov decision process with converging branch system —Multiplicative
reward system—

概 要　We consider multiplicative reward system on a certain finite-stage stochastic converging decision process model. Converging decision process has converging transition, which is one of the nonserial branch systems proposed by Nemhauser. We apply bidecision approach to our model and give a recursive method by dynamic programming technique.

13　高　橋　勇　人 (Random Data Lab.)　Posterior distributions weakly converge to Martin-Löf random parameters · 15

Hayato Takahashi (Random Data Lab.)　Posterior distributions weakly converge to Martin-Löf random parameters

概要　In parametric models estimators that are consistent at all parameters are concerned, while in Bayes models those that are consistent at almost all parameters are concerned. The identification of the points at which the posterior distributions weakly converge constitutes the problem (Diaconis and Freedman 1986). We show that for joint probabilities on complete separable metric spaces, the posterior distributions are consistent at almost all parameters if and only if the posterior distributions are consistent at ML-random parameters. Reference: Hayato Takahashi, Bayesian definition of random sequences with respect to conditional probabilities, preprint

14　高　橋　勇　人 (Random Data Lab.)　Some explicit formulae for the distributions of words · · · · · · · · · · · · · · 15

Hayato Takahashi (Random Data Lab.)　Some explicit formulae for the distributions of words

概要　Bassino et al. 2010 and Regnier et al. 1998 showed generating functions of the distributions of words for all sample sizes. Robin et al. 1999 presented generating functions of the distributions for the return time of words and demonstrated a recurrence formula for these distributions. These generating functions are rational functions; except for simple cases, it is difficult to expand them into power series. In this paper, we study finite-dimensional generating functions of the distributions of nonoverlapping words and some overlapping words for each fixed sample size, respectively and demonstrate the explicit formulae for the distributions of words for the Bernoulli models.

15　地　嵩　頌　子 (大阪工大情報)
　　栗　木　進　二 (阪　　府　　大*)
　　藤　原　　　良 (筑　　波　　大*)
　　宮　本　暢　子 (東京理大理工)　Optimality of spanning bipartite block designs II · 15

Shoko Chisaki (Osaka Inst. of Tech.)　Optimality of spanning bipartite block designs II
Shinji Kuriki (Osaka Pref. Univ.*)
Ryoh Fuji-Hara (Univ. of Tsukuba*)
Nobuko Miyamoto (Tokyo Univ. of Sci.)

概要　It is usually to design an experiment using treatments and its blocks in the design of experiments. Consider a set of edges of a complete bipartite graph as a treatments set and suppose the treatments have a structure. Then, we proposed a spanning bipartite block design (SBBD) to achieve better estimation accuracy. In this talk, using an SBBD as a statistical model, we prove that the design matrix of an SBBD is A-optimal under some conditions.

16　種　市　信　裕 (北 教 大 札 幌)
　　関　谷　祐　里 (北 教 大 釧 路)　多項分布の適合度検定統計量選択の指針とその応用 · · · · · · · · · · · · · · · · 15

Nobuhiro Taneichi
　　　　(Hokkaido Univ. of Edu.)　An index for selecting the multinomial goodness-of-fit test statistics and its applications
Yuri Sekiya (Hokkaido Univ. of Edu.)

概要　For the goodness-of-fit test for a multinomial distribution, we consider phi-divergence family of goodness-of-fit test statistics. Members of phi-divergence family of statistics all have an equivalent limiting chi-square distribution under the null hypothesis. We consider a second-order correction term as an index whether the distribution of statistic is close to the limiting chi-square distribution. We derive important properties of the index for selecting a phi-divergence goodness-of-fit statistic. We also discuss an application of the index to the other kinds of tests.

17 栗 田 絵 梨（東 京 理 大 理）   多変量歪度を用いた多変量正規性検定統計量の帰無分布について ····· 15
　　瀬 尾　　隆（東 京 理 大 理）
Eri Kurita (Tokyo Univ. of Sci.)   On the null distribution of multivariate normality test statistics using
Takashi Seo (Tokyo Univ. of Sci.)   multivariate skewness

概 要 In this talk, we consider on the null distribution of multivariate normality test statistic using multivariate skewness. Although there are several definitions of multivariate skewness and kurtosis, this talk focuses on Mardia's multivariate skewness and proposes a new chi-square approximation with adjusted degrees of freedom for the null distribution of the normality test statistic using it. Finally, some simulation results are presented to investigate the accuracy of the chi-square approximation of the test statistic proposed in this talk.

14:25〜15:25 特別講演

松 田 孟 留   行列の縮小推定
　　　　（東大情報理工・理化学研）
Takeru Matsuda   Shrinkage estimation: from vector to matrix
　　　　(Univ. of Tokyo/RIKEN)

概 要 In the estimation of a normal mean vector under the quadratic loss, the maximum likelihood estimator (MLE) is inadmissible and dominated by shrinkage estimators (e.g. James–Stein estimator) when the dimension is greater than or equal to three (Stein's paradox). In particular, generalized Bayes estimators with respect to superharmonic priors (e.g. Stein's prior) are minimax and dominate MLE. Note that a function is said to be superharmonic if its average value on a hypersphere is always not greater than its value at the center.

In this talk, I will introduce recent studies on generalizations of the above results to matrices. First, we develop a superharmonic prior for matrices that shrinks singular values, which can be viewed as a natural generalization of Stein's prior. This prior is motivated from the Efron–Morris estimator, which is an extension of the James–Stein estimator to matrices. The generalized Bayes estimator with respect to this prior is minimax and dominates MLE under the Frobenius loss. In particular, since it shrinks to the space of low-rank matrices, it attains large risk reduction when the unknown matrix is close to low-rank (e.g. reduced-rank regression). Next, we construct a theory of shrinkage estimation under the "matrix quadratic loss", which is a matrix-valued loss function suitable for matrix estimation. A notion of "matrix superharmonicity" for matrix-variate functions is introduced and the generalized Bayes estimator with respect to a matrix superharmonic prior is shown to be minimax under the matrix quadratic loss. The matrix-variate improper t-priors are matrix superharmonic and this class includes the above generalization of Stein's prior. Applications include matrix completion and nonparametric estimation.

15:40〜16:40 特別講演

上 原 悠 槙（関西大システム理工）   Information criteria for jump diffusion models
Yuma Uehara   (Kansai Univ.)   Information criteria for jump diffusion models

概 要 In this talk, we consider ergodic jump diffusion models with high-frequency observations. We mainly focus on the model selection problem for the models. More specifically, our interest is to select all drift and diffusion coefficients, and jump distribution among candidates. For such a problem, the threshold based transition density approximation which corresponds to the case where at most one jump occur within one observation interval is useful. We evaluate such an approximation, and propose explicit AIC-type information criterion constructed by the threshold based quasi-likelihood function.

3月18日(土)　　第Ⅷ会場

10:00～11:10

18　八 木 文 香 (東 京 理 大 理)
　　尾 﨑 冬 弥 (東 京 理 大 理)
　　瀬 尾 　 隆 (東 京 理 大 理)

On the test for adequacy in growth curve model with two-step monotone missing data ·· 15

Ayaka Yagi (Tokyo Univ. of Sci.)
Toya Ozaki (Tokyo Univ. of Sci.)
Takashi Seo (Tokyo Univ. of Sci.)

On the test for adequacy in growth curve model with two-step monotone missing data

概 要　We consider the test for adequacy in growth curve model when the data set has a two-step monotone missing pattern. For the complete data case, to test the adequacy hypothesis, Hotelling's T^2 statistic is presented in Fujikoshi, Ulyanov and Shimizu (2010). In this talk, we propose a test statistic for the adequacy hypothesis with two-step monotone missing data based on the above result. Further, we give the approximation to the upper percentile of this statistic. Finally, we investigate the accuracy of the approximation by Monte Carlo simulation.

19　小 池 祐 太 (東 大 数 理)　対数凹な独立同分布確率ベクトルの和に対する高次元中心極限定理 ···· 15
　　Xiao Fang
　　　(Chinese Univ. of Hong Kong)

Yuta Koike　　(Univ. of Tokyo)
Xiao Fang
　　(Chinese Univ. of Hong Kong)

A high-dimensional central limit theorem for sums of i. i. d log-concave random vectors

概 要　We consider the problem of bounding the normal approximation error over rectangles for a sum of n independent d-dimensional random vectors. Here, our aim is to establish such a bound with poly-logarithmic dependence on the dimension d. It is known that such a bound is available with a nearly $n^{-1/2}$ convergence rate when the covariance matrix of the sum is non-degenerate. In this talk, we show that, if the random vectors are i.i.d. and log-concave, we can derive an error bound with a nearly $n^{-1/2}$ convergence rate and poly-log dependence on d without any restriction on the covariance matrix.

20　山 形 浩 一 (国立情報学研)　局所漸近正規性を有する量子統計モデルに対する推定量の有効性 ······ 15
　　藤 原 彰 夫 (阪 　 大 　 理)

Koichi Yamagata
　　　(Nat. Inst. of Informatics)
Akio Fujiwara　(Osaka Univ.)

Efficiency of estimators for locally asymptotically normal quantum statistical models

概 要　We herein establish an asymptotic representation theorem for locally asymptotically normal quantum statistical models. This theorem enables us to study the asymptotic efficiency of quantum estimators such as quantum regular estimators and quantum minimax estimators, leading to a universal tight lower bound beyond the i.i.d. assumption. This formulation complements the theory of quantum contiguity developed in the previous paper [Fujiwara and Yamagata, *Bernoulli* **26** (2020) 2105–2141], providing a solid foundation of the theory of weak quantum local asymptotic normality.

中 川 智 之 (東京理大理工)
田 畑 耕 治 (東京理大理工)
Keita Nakamura (Tokyo Univ. of Sci.)
Tomoyuki Nakagawa
　　　　　(Tokyo Univ. of Sci.)
Kouji Tahata (Tokyo Univ. of Sci.)

Symmetry in square contingency tables using aitchison geometry

概 要　The probability table obtained from a contingency table can be viewed as an element in the simplex. Symmetric probability tables are identified as a linear subspace using the Aitchison geometry of the simplex. Given a probability table, we can obtain the closest symmetric table by orthogonal projection onto the symmetric subspace. The original probability table is decomposed into the symmetric and the skew-symmetric tables that are orthogonal to each other. A procedure to test symmetry of a contingency table, based on a multinomial simulation, is developed and examples of tests carried out are given.

応 用 数 学

3月15日(水)　　第VII会場

9:50〜11:50

1　田 中 優 帆 (早 大 理 工)　　Jacobi 多項式とデザイン理論について ･････････････････････････ 15
　　三 枝 崎 剛 (早 大 理 工)
　　大 浦 　 学 (金 沢 大 理 工)
　　H. S. Chakraborty
　　　(Shahjalal Univ. of Sci. Tech.)

Yuho Tanaka　(Waseda Univ.)　　Jacobi polynomials and design theory
Tsuyoshi Miezaki (Waseda Univ.)
Manabu Oura (Kanazawa Univ.)
Himadri Shekhar Chakraborty
　　(Shahjalal Univ. of Sci. Tech.)

概要　There are Jacobi polynomials as an analogue to Jacobi forms as a powerful generalization of theta series of Lattices. It is a generalization of weight enumerators that M. Ozeki introduced for codes. A. Bonnecaze et al. constructed various types of designs and did some studies to establish a relationship between Jacobi polynomials and designs by focusing on weight enumerators, Jacobi polynomials, and the Molien series. In this talk, we introduce the concept of multiple Jacobi polynomials and give the MacWilliams type duality for them. We also give generalizations and analogies of some results in their paper. In addition, we introduce a criterion for the existence of (generalized) designs using Jacobi polynomials.

2　須 田 　 庄 (防 　 衛 　 大)　　4-$(11, 5, 1)$ デザインに関連するアソシエーション・スキームの一意性 ･･ 10
　　A. L. Gavrilyuk (島根大総合理工)

Sho Suda (Nat. Defense Acad. of Japan)　　Uniqueness of an association scheme related to the 4-$(11, 5, 1)$-design
Alexander L. Gavrilyuk
　　　　　　(Shimane Univ.)

概要　It follows from the Delsarte theory that the Witt 4-$(11, 5, 1)$ design gives rise to a (Q-polynomial) association scheme $\mathcal{W}$ defined on the set of its blocks. In this talk, we observe that $\mathcal{W}$ is unique, i.e., defined up to isomorphism by its parameters.

3　尾 白 典 文 (豊 田 工 大 工)　　準巡回符号における LCD 性と反転不変性 ･･･････････････････････ 15
　　松 井 　 一 (豊 田 工 大 工)

Norifumi Ojiro (Toyota Tech. Inst.)　　LCD property and reversiblity in quasi-cyclic codes
Hajime Matsui (Toyota Tech. Inst.)

概要　We show a necessary and sufficient condition for which quasi-cyclic codes represented by polynomial matrices are to be LCD (Linear Complimentary Dual), and using this result, a connection between LCD quasi-cyclic codes and reversible quasi-cyclic codes is investigated.

4　佐 竹 翔 平 (明大総合数理)　　高い内周をもつ弧推移的エクスパンダーグラフ ････････････････････ 15
　　Hyungrok Jo　(横 浜 国 大 IAS)

Shohei Satake　(Meiji Univ.)　　On high-girth arc-transitive expander graphs
Hyungrok Jo (Yokohama Nat. Univ.)

概要　Expander graphs are highly-connected sparse graphs which have fruitful connections to mathematics, computer science and cryptography. One of the fundamental problems about expander graphs is to construct explicit high-girth expander graphs, which can be applied for designing cryptographic hash functions, for example. In this talk we introduce new explicit constructions of high-girth expander graphs that are arc-transitive.

最終版: 2023/2/17

5　藤 田 慎 也　　　　　Connectivity keeping paths in highly connected graphs ············· 15
　　　　（横浜市大データサイエンス）

Shinya Fujita (Yokohama City Univ.)　Connectivity keeping paths in highly connected graphs

概 要　Some recent results concerning connectivity keeping paths in highly connected graphs will be reviewed.

6　藤 村　　丞　　　　　On the generation of all Euler trails for an Eulerian graph with 2^n edges
　　　　（福岡大情報基盤センター）　·· 10
　　白 石 修 二（福 岡 大 理）

Sho Fujimura　(Fukuoka Univ.)　On the generation of all Euler trails for an Eulerian graph with 2^n edges
Shuji SHIRAISHI (Fukuoka Univ.)

概 要　For an Eulerian graph G with 2^n edges, we give a new method of generating all Euler trails in G in parallel efficiently by using 2-chain cover of G.

7　町 出 智 也（国立情報学研）　Boolean 多項式の連立方程式の彩色問題への応用 ··················· 15

Tomoya Machide　　　　　　　An application of systems of Boolean polynomial equations to list color
　　　（Nat. Inst. of Informatics）　problems

概 要　I will talk an application of systems of Boolean polynomial equations to list color problems, in which not only vertex-coloring conditions but also edge-coloring conditions are imposed under Grünbaum method.

8　高 橋　　正（甲南大知能情報）　グレブナー基底を用いた学習モデルにおける補題証明 ··············· 10
　　鷲 野 朋 広（甲南大知能情報）

Tadashi Takahashi (Konan Univ.)　On the proof of lemma in the learning model using Groebner basis
Tomohiro Washino (Konan Univ.)

概 要　We consider the statistical model of three-layer neural network with H hidden units. By using taylor expansion of activation function , the set of parameters that true density function is realizable by a statistical model is a common zero points defined by finite polynomials. First, in this case H = 2, we calculate equations define the algebraic set. The algebraic set is the set of parameters that true density function is realizable by a statistical model with one or zero hidden unit. Next, we determine equations define the algebraic set. The algebraic set is the set of parameters that true density function is realizable by a statistical model with H0 < H hidden unit. We prove the lemma in the learning model applying Hilbert's basis theorem using Groebner basis.

14:15～15:25

9　辻 栄 周 平（北 教 大 旭 川）　グラフ埋め込みと辺に付随する互換の積 ·························· 15
　　内 海　　凌（北　大　理）

Shuhei Tsujie (Hokkaido Univ. of Edu.)　Graph embedding and the product of transpositions associated with
Ryo Uchiumi (Hokkaido Univ.)　　edges

概 要　Given a graph, we associate each edge with the transposition which exchanges the endvertices. Fixing a linear order on the edge set, we obtain a permutation of the vertices. Dénes proved that the permutation is a full cyclic permutation for any linear order if and only if the graph is a tree.
In this article, we characterize graphs having a linear order such that the associated permutation is a full cyclic permutation in terms of graph embeddings.

10　山　田　祐　見 (筑波大システム情報)　格子凸多面体の free sum の Ehrhart 多項式の根の分布 ············· 15
　　八　森　正　泰 (筑波大システム情報)
　　東　谷　章　弘 (阪　大　情　報)

Yumi Yamada (Univ. of Tsukuba)
Masahiro Hachimori
　　　　　　　　(Univ. of Tsukuba)
Akihiro Higashitani (Osaka Univ.)

The root distributions of Ehrhart polynomials of free sums of lattice polytopes

概要　In this talk, we study the root distributions of Ehrhart polynomials of free sums of certain lattice polytopes. We investigate cases where the roots of the Ehrhart polynomials of the free sums of A_d^*'s or A_d's lie on the canonical line $Re(z) = -1/2$ on the complex plane $\mathbb{C}$, where A_d denotes the root polytope of type A of dimension d and A_d^* denotes its polar dual. For example, it is proved that $A_m^* \oplus A_n^*$ with $\min\{m, n\} \leq 1$ or $m + n \leq 7$, $A_2^* \oplus (A_1^*)^{\oplus n}$ and $A_3^* \oplus (A_1^*)^{\oplus n}$ for any n satisfy this property.

11　東　谷　章　弘 (阪　大　情　報)　行列のスイッチングと付随する単体的複体による歪多項式環の分類 ···· 15
　　上　山　健　太 (弘　前　大　教　育)

Akihiro Higashitani (Osaka Univ.)
Kenta Ueyama (Hirosaki Univ.)

Classification of skew polynomial algebras by switching of matrices and its associated simplicial complexes

概要　Classifying skew polynomial rings is important in noncommutative algebraic geometry because a skew polynomial ring can be regarded as a noncommutative version of the homogeneous coordinate ring of the projective space. In this talk, we focus on a particular class of skew polynomial rings and discuss whether the classification of such skew polynomial rings up to equivalence of their graded module categories can be done by using the switching of matrices and the simplicial complexes associated to switching equivalence classes. We prove that we can do it if the sizes of the matrices are relatively small.

12　栗　原　大　武 (山　口　大　創　成)　根付き木を用いた等質ラグランジュ部分代数の構成 ················ 15
　　橋　永　貴　弘 (佐　賀　大　教　育)

Hirotake Kurihara (Yamaguchi Univ.)
Takahiro Hashinaga (Saga Univ.)

Construction of homogeneous Lagrangian subalgebras using rooted trees

概要　In this talk, we consider the construction and classification problems of homogeneous Lagrangian submanifolds of the noncompact Hermitian symmetric space $M = \mathrm{Sp}(n, \mathbb{R})/\mathrm{U}(n)$ of rank n. We give that rooted trees contribute to the classification of homogeneous Lagrangian submanifolds in $M = \mathrm{Sp}(n, \mathbb{R})/\mathrm{U}(n)$.

15:45〜16:45　特別講演

　　野　口　健　太 (東京理大理工)　閉曲面上のグラフ, とくに三角形分割と四角形分割

Kenta Noguchi (Tokyo Univ. of Sci.)

Graphs on closed surfaces, expressly triangulations and quadrangulations

概要　Graphs on closed surfaces are widely studied in the literature. We have been interested in and studied the triangulations and quadrangulations, which are important classes of such graphs. Specifically, we have been investigated the relationship between them to reveal their several properties, such as the chromatic number and the related topics. In this talk, we will present the basic background and some problems, and give recent results on the extension from a quadrangulation to a triangulation and spanning quadrangulation subgraphs of triangulations.

最終版: 2023/2/17

3月16日(木)　第VII会場

10:00〜11:45

13　佐　藤　　巖 (小 山 工 高 専)　Metzler/Zeta 対応 · 15
　　井 手 勇 介 (日 大 文 理)
　　小 松 　 尭
　　(産業数理研究所Calc・広島大先進理工)
　　今 野 紀 雄 (横 浜 国 大 工)

Iwao Sato (Oyama Nat. Coll. of Tech.)　Metzler/Zeta correspondence
Yusuke Ide　　　 (Nihon Univ.)
Takashi Komatsu
(Math. Res. Inst. Calc for Industry/Hiroshima Univ.)
Norio Konno (Yokohama Nat. Univ.)

概 要　We present an explicit formula for the determinant on the Metzler matrix of a digraph D. Furthermore, we introduce a walk-type zeta function with respect to this Metzler matrix of the symmetric digraph of a finite torus, and express its limit formula by using the integral expression.

14　佐　藤　　巖 (小 山 工 高 専)　Alternating walk/Zeta 対応 · 15
　　小 松 　 尭
　　(産業数理研究所Calc・広島大先進理工)
　　今 野 紀 雄 (横 浜 国 大 工)

Iwao Sato (Oyama Nat. Coll. of Tech.)　Alternating walk/Zeta correspondence
Takashi Kmatsu
(Math. Res. Inst. Calc for Industry/Hiroshima Univ.)
Norio Konno (Yokohama Nat. Univ.)

概 要　We express the alternating zeta function of a graph G by using the Ihara zeta function of G. Next, we define a generalized alternating zeta function of a graph, and express it of a vertex-transitive regular graph by spectra of the transition probability matrix of the symmetric simple random walk on it and its Laplacian. Furthermore, we present an integral expression for the limit of the generalized alternating zeta functions of a series of vertex-transitive regular graphs. As an example, we treat the generalized alternating zeta functions of a finite torus. Finally, we treat the relation between the Mahler measure and the alternating zeta function of a graph.

15　穴 原 義 弘 (横浜国大先進実践)　流出入を伴う1次元格子上量子ウォークの収束速度 · · · · · · · · · · · · · · · · 15
　　瀬 川 悦 生 (横浜国大環境情報)
　　森 岡 　 悠 (愛 媛 大 理 工)

Yoshihiro Anahara　　　　Convergence speed for quantum walks on one dimensional lattice with
　　　　 (Yokohama Nat. Univ.)　inflows and outflows
Etsuo Segawa (Yokohama Nat. Univ.)
Morioka Hisashi (Ehime Univ.)

概 要　For quantum walks on finite graphs whose time evolution is unitary operator, it is difficult to find a stationary state which is not equal to the initial state. We can consider a quantum walk model with a stationary state on a connected finite graph by introducing infinite length tails and inserting a quantum walker into the internal graph at every time step from the tail. In this talk focusing on the finite path as the internal graph, and also on the spectrum of the truncated submatrix of the unitary time evolution operator with respect to the internal graph, we estimate a convergence speed to the stationary state.

16　成 松 明 廣　完全状態遷移, グラフの衡平分割と連続時間量子ウォークによる探索アル
　　（福知山公大数理・データサイエンスセンター）　ゴリズム ··· 15
　　井 手 勇 介（日 大 文 理）

Akihiro Narimatsu
　　　　　　　（Univ. of Fukuchiyama)
Yusuke Ide　　　（Nihon Univ.)

Perfect state transfer, equitable partition and continuous-time quantum
walk based search

概 要　We consider a continuous-time quantum walk based search algorithm. We introduce equitable partition
of the graph and perfect state transfer on it. By these two methods, we can calculate the success probability
and the finding time of the search algorithm. In addition, we gave some examples of graphs that we can
calculate the success probability and the finding time.

17　藪 奥 哲 史（北九州工高専）　Enumeration of connected bipartite graphs with given Betti number ·· 15
　　蓮 井 太 朗（九 大 数 理）
　　白 井 朋 之（九 大 Ｉ Ｍ Ｉ）

Satoshi Yabuoku
(Kitakyushu Nat. Coll. of Tech.)
Taro Hasui　　　（Kyushu Univ.)
Tomoyuki Shirai (Kyushu Univ.)

Enumeration of connected bipartite graphs with given Betti number

概 要　Let $G = (V, E)$ be a simple connected bipartite graph with bipartition $V = V_1 \sqcup V_2$, and $f(r, s, q)$
denote the number of Gs such that $|V_1| = r, |V_2| = s$ and $|E| = q$. In this talk, we focus on the values
$f(r, s, r + s + k - 1)$ for given Betti number k. For $k = 0$, this is the number of spanning trees on $K_{r,s}$,
and Scoins proved $f(r, s, r + s - 1) = r^{s-1}s^{r-1}$. By recurrence equation, we obtain the explicit form of
exponential generating functions of $f(r, s, r + s + k - 1)$ for general k, and we derive the asymptotic behavior
of their coefficients. We also give another expression of the generating functions as the summation of
rational functions of those for the number of bipartite rooted spanning trees.

18　山 岸 弘 幸（都立産業技術高専）　完全グラフに対応する ℓ^p 離散ソボレフ不等式の最良定数 ············· 15
　　渡 辺 宏 太 郎（防　衛　大）

Hiroyuki Yamagishi
(Tokyo Metro. Coll. of Ind. Tech.)
Kohtaro Watanabe
　（Nat. Defense Acad. of Japan)

The best constant of the discrete ℓ^p Sobolev inequality on the complete
graph

概 要　We assume a classical mechanical model of the complete graph K_N with N vertices. We put the N
atoms on vertices of K_N. Its neighboring two atoms are connected to a linear spring. The spring constant
is 1. Let p and q be real numbers satisfying $1/p + 1/q = 1$ $(p, q > 1)$. If u(i) takes a real value, then u(i)
represents a deviation from the steady state. The discrete ℓ^p Sobolev inequality shows that the maximum
of deviation $|u(i)|^p$ is estimated in a constant multiple of the potential energy on K_N. Hence, the best
contants represent the rigidity of the mechanical model on K_N.

13:00〜14:10

19　盧　　暁 南（岐 阜 大 工）　Covering arrays guaranteeing a passing test ····················· 15

Xiao-Nan Lu　　（Gifu Univ.)　Covering arrays guaranteeing a passing test

概 要　Covering arrays (CAs) are a kind of combinatorial designs proposed for applications in combinatorial
testing (CT). For adaptive decoding algorithms in CT using CAs, it is required that a passing test should
be contained in the CA. In this talk, a few results on such binary CAs that guarantee at least one passing
test are introduced. In particular, it is shown that for no more than two faulty interactions, the known
optimal construction for binary CAs is good enough. Then, a general sufficient condition for such CAs in
terms of domination numbers of graphs associated to the CAs is proposed.

20 <u>斎 藤　　明</u>（日　大　文　理）　安全支配数に関する2つの上界······································ 15
　　出 川 慎 悟（日　大　文　理）
　　増 田 合 氣（日　大　文　理）
　　西 田 大 輝（日　大　文　理）

<u>Akira Saito</u>　　（Nihon Univ.）　　Two upper bounds on secure domination number
Shingo Degawa　（Nihon Univ.）
Aiki Masuda　　（Nihon Univ.）
Hiroki Nishida　（Nihon Univ.）

概 要 A set of vertices S in a graph G is a dominating set if every $v \in V(G) - S$ satisfies $N_G(v) \cap S \neq \emptyset$. A dominating set S is secure if for every $v \in V(G) - S$, there exists $x \in S$ such that $(S - \{x\}) \cup \{v\}$ is a dominating set. The order of a smallest secure dominating set of G is called the secure domination number of G and denoted by $\gamma_s(G)$. In this talk, we report an upper bound $\gamma_s(G) \leq \frac{3}{5}|G|$ for a graph G of minimum degree at least 2. Then we generalize the notion of a secure dominating set. A dominating set $S = \{x_1, \ldots, x_k\}$ in G is weakly secure if for every $v \in V(G) - S$, there exists $y_i \in N_G(x_i) \cup \{x_i\}$ for each i with $1 \leq i \leq k$ such that $\{y_1, \ldots, y_k\}$ is a dominating set and $v \in \{y_1, \ldots, y_k\}$. The order of a smallest weakly secure dominating set of G is called the weakly secure domination number and denoted by $\gamma_{ws}(G)$. We report $\gamma_{ws}(G) \leq \lceil |G|/2 \rceil$ for every onnected graph G of minimum degree at least 1.

21 <u>吉 田 裕 一</u>（北 見 工 大 工）　連結単純グラフのマッチングに付随する3種の不変量 ··············· 15
　　松 田 一 徳（北 見 工 大 工）

<u>Yuichi Yoshida</u>（Kitami Inst. of Tech.）　On the three graph invariants related to matching of finite simple graphs
Kazunori Matsuda
　　　　　（Kitami Inst. of Tech.）

概 要 We determine the relationship between the matching number, the minimum matching number, the induced matching number and the number of vertices.

22 R. E. L. Aldred（Univ. of Otago）　閉曲面上の三角形分割でない5-連結グラフにおけるマッチング拡張問題
　　<u>藤 沢　　潤</u>（慶　大　商）　··· 15

Robert E. L. Aldred（Univ. of Otago）　Distance restricted matching extension in 5-connected graphs on sur-
<u>Jun Fujisawa</u>　　（Keio Univ.）　faces which are not triangulation

概 要 In this talk, we show the following result. Let G be a 5-connected graph of even order which is 2-cell embedded in a surface F^2 with sufficiently large face-width, and let M be a matching of G such that any two edges in M are at distance at least $2\left(20 - \frac{12\chi(F^2)+25}{|M|}\right)$ in the face subdivision G. Then G has a perfect matching containing M.

3月17日（金）　　第VII会場

9:50〜11:50

23 三 好 啓 也（埼 玉 大 理 工）　Derivation of Brownian motion from the Goldstein–Taylor model····· 15

Hironari Miyoshi（Saitama Univ.）　Derivation of Brownian motion from the Goldstein–Taylor model

概 要 In this lecture, we consider a random walk associated with the initial value problem of the Goldstein–Taylor model. First, we show the existence of the solution for a scaled Goldstein–Taylor model by using the corresponding telegraph equation. Next, we find the probability density function $p_\varepsilon(x, t)$ associated with a random process of particles for the Goldstein–Taylor model. Finally, we prove that the scaling limit of the cumulative distribution function for $p_\varepsilon(x, t)$ converges to the Brownian motion in the sense of distributions.

24　渡 辺　　樹（早 大 理 工）　High-density limit of controlled density-dependent Markov processes ·· 15
　　Itsuki Watanabe (Waseda Univ.)　High-density limit of controlled density-dependent Markov processes

概要　We consider the high-density type scaling limit of the controlled stochastic model. The stochastic model can be constructed as a particle system with birth and death events whose transition rate depends on its density and control. In this talk, we reveal that the scaling limit of this model is governed by the controlled stochastic differential equation by showing the relative compactness and using the continuous mapping theorem.

25　A. Diez　　　　（京 大 Ａ Ｓ Ｈ Ｂ ｉ）　Scaling limits and emergent phenomena in a system of body-oriented
　　　　　　　　　　　　　　　　　　　　　　particles ·· 15
　　Antoine Diez　　（Kyoto Univ.）　Scaling limits and emergent phenomena in a system of body-oriented
　　　　　　　　　　　　　　　　　　　　particles

概要　Biological phenomena such as the flock of birds or the swarm of bacteria and other active cells reveal that complex self-organized patterns can emerge from active particle systems when the number of particles becomes very large. In this talk, I will describe a modelling framework based on classical tools developed in the mathematical kinetic theory of gas. The core idea is the derivation of PDE models from stochastic many-particle systems. I will illustrate these ideas with a system of so-called body-oriented particles and explain how the behavior of many-particle systems can be inferred by looking at appropriate scaling limits. In particular, this work demonstrates the influence of stochasticity and geometry on self-organization.

26　長 瀬 准 平　　　　　　　　　　階層的な集合を表現する部分置換不変な深層ニューラルネットモデル ·· 15
　　（芝浦工大理工・ZOZO Research）
　　斎 藤 侑 輝（ZOZO Research）
　　石 渡 哲 哉
　　　　　　（芝浦工大システム理工）
　　Jumpei Nagase　　　　　　　　Permutation invariant deep neural network model for representing hier-
　　(Shibaura Inst. of Tech./ZOZO Research)　archical sets
　　Yuki Saito　　（ZOZO Research）
　　Tetsuya Ishiwata
　　　　　（Shibaura Inst. of Tech.）

概要　Deep neural network models, which have been rapidly developing and expanding their range of application in recent years, need to be applied to structured data. Specifically, there is a wide range of applications such as face recognition, set matching, and point cloud segmentation. A set data is interpreted as structured data, and representations of a set data based on permutations equivalence / invariance properties are known. In particular, Renhao et al. have made a mathematical discussion of a machine learning model that satisfies equivalence / invariance for hierarchical group actions by introducing the idea of Wreath product. In this paper, we focus on the results of Renhao et al. especially for hierarchical set data, and discuss the representation of hierarchical sets by specifically discussing hierarchical permutation equivalence / invariance.

27　米 田　　剛（一 橋 大 経 済）　深層ニューラルネットワークのミニバッチ勾配降下に対する各点収束定理
　　　　　　　　　　　　　　　　　　　　· 15

Tsuyoshi Yoneda (Hitotsubashi Univ.) 　Pointwise convergence theorem of mini-batch gradient descent in terms of deep neural network

概 要　The theoretical understanding of deep neural network (DNN) has not yet been fully understood. Nevertheless, even in this recent circumstance, Imaizumi-Fukumizu (2019) and Suzuki (2019) clarified that the learning ability of DNN is superior to the previous theories when the target function is non-smooth functions. In this talk we give a convergence problem in more practical setting. More precisely, we prove that a certain prescribed function pointwisely converges to a step function provided by mini-batch gradient descent process with ReLU DNN.

28　奥 村 真 善 美（北 大 電 子 研）　毛包形成の数理モデルの数値計算とその考察 · 15
　　小 林 康 明（北 大 電 子 研）
　　長 山 雅 晴（北 大 電 子 研）
　　藤 原 裕 展（理 化 学 研）
　　安 ヶ 平 祐 介（日 立 製 作 所）
　　大 野 航 太（中 大 理 工）

Makoto Okumura (Hokkaido Univ.)　　Numerical simulations of a mathematical model of hair follicle formation
Yasuaki Kobayashi (Hokkaido Univ.)
Masaharu Nagayama (Hokkaido Univ.)
Hironobu Fujiwara　(RIKEN)
Yasugahira Yusuke (Hitachi, Ltd.)
Kota Ohno　　　(Chuo Univ.)

概 要　As an appendage of the skin, a hair follicle is the source of the hair. Moreover, the hair follicle has a cylinder-like structure. In this study, we attempt to examine the mechanism of hair follicle formation from a mathematical viewpoint by applying a mathematical model of the basement membrane, which enables us to describe plastic deformation. In this presentation, we will introduce numerical examples of our mathematical model and discuss what assumptions play an essential role in shaping the cylinder shape of the hair follicle. If possible, we will also present the numerical results that consider the epithelium, while previous mathematical models have considered only the basal layer, basement membrane, and dermal structure.

29　シュワドレンカカレル　　　　　構造材料の弾塑性有限変形の変分解析 · 15
　　　　　　　　（京　　大　　理）

Karel Svadlenka (Kyoto Univ.)　　Variational analysis of finite strain elastoplasticity for structured materials

概 要　Structured materials, such as metallic alloys with atomic-scale layers, show peculiar deformation patterns, which may have significant implications on material properties. In this talk, we discuss one possible approach to modeling and understanding of this kind of pattern formation through the so-called rate-independent evolution in the variational setting of finite-strain elastoplasticity. Besides mentioning connections to homogenization via Gamma-convergence, we present the underlying mathematical theory and show numerical simulations in comparison to experimental measurements.

14:15〜14:40　2022 年度日本数学会応用数学賞授賞式

14:45〜16:30

30　土 屋 拓 也 (八 戸 工 大)　de Sitter 時空中における半線形 Klein–Gordon 方程式の精度と数値安定
　　中 村 　 誠 (阪 大 情 報)　性について ·· 15
　　Takuya Tsuchiya　　　　　Numerical accuracy and stability of semilinear Klein–Gordon equation
　　　　(Hachinohe Inst. of Tech.)　in de Sitter spacetime
　　Makoto Nakamura (Osaka Univ.)

概 要　The Klein–Gordon equation is known as the fundamental wave equation in relativistic phenomena such as near light speed phenomena. We perform numerical simulations of this equation using the structure-preserving scheme in the de Sitter spacetime. The discretization equation proposed in our previous work (J. Comput. Appl. Math. 361 pp.364–412) has good accuracy but poor numerical stability. In this talk, we propose a new discretization equation with the structure-preserving scheme and show numerical results with high-accuracy and high-stability.

31　土 屋 拓 也 (八 戸 工 大)　収縮する de Sitter 時空における半線形 Klein–Gordon 方程式の解の挙動
　　中 村 　 誠 (阪 大 情 報)　について ·· 15
　　Takuya Tsuchiya　　　　　On behaviors of solutions of semilinear Klein–Gordon equation in con-
　　　　(Hachinohe Inst. of Tech.)　tracting de Sitter spacetime
　　Makoto Nakamura (Osaka Univ.)

概 要　de Sitter spacetime is a well-known model of expanding or contracting universes. In this spacetime, we investigate numerical solutions of the semilinear Klein–Gordon equation. In particular, in the case of contracting spacetime, it is difficult to investigate the behaviors of the solutions even by numerical calculations because of the blow-up solutions. Therefore, we apply the structure-preserving scheme to the Klein–Gordon equation to obtain accurate and stable numerical solutions and show the behaviors of the solutions.

32　竹 田 航 太 (京 　 大 　 理)　HMC による球面上 N 点渦系不変測度の計算 ···················· 15
　　坂 上 貴 之 (京 　 大 　 理)
　　Kota Takeda　　　(Kyoto Univ.)　Computing an invariant measure of the N-vortex problem on the sphere
　　Takashi Sakajo　(Kyoto Univ.)　by Hamiltonian Monte Carlo

概 要　Hamiltonian Monte Carlo (HMC) is a stochastic method to approximate high-dimensional integrals by the samples from the target distribution, efficiently by utilizing the Hamiltonian dynamics. In general, the efficiency of HMC is characterized by a geometric convergence rate of the associated Markov chain, known as a property 'geometric ergodicity'. For a class of target distributions on the Euclidean space, geometric ergodicity for HMC has been established, however, that has not yet been established on manifolds. Hence, we prove geometric ergodicity for HMC on compact manifolds. As an application, we consider the sampling problem from the invariant measure of the N-vortex problem on the sphere, which is relevant to two-dimensional turbulence on geophysical fluid.

33　藤 原 宏 志（京 大 情 報）
K. Sadiq
（Johann Radon Inst. for Comput. Appl. Math.）
A. Tamasan
　　　　（Univ. Central Florida）
On a Cauchy-type singular integral equation for x-ray computerized tomography with partial measurement $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Hiroshi Fujiwara（Kyoto Univ.）
Kamran Sadiq
（Johann Radon Inst. for Comput. Appl. Math.）
Alexandru Tamasan
　　　　（Univ. Central Florida）
On a Cauchy-type singular integral equation for x-ray computerized tomography with partial measurement

概 要　In this talk we propose a direct numerical reconstruction procedure for x-ray tomography with partial measurement. The proposed method is based on Bukhgeim–Cauchy boundary integral formula developed for an inverse source problem of the transport equation, and is characterized by a singular integral equation with Cauchy kernel for the considering partial measurement case. We also show its quantitative stability in terms of the condition number with a particular discretization for reliable numerical reconstruction.

34　石 毛 利 昌（千葉大融合理工）
　　高 安 亮 紀（筑波大システム情報）
ある K3 曲面族についての Picard–Fuchs 微分方程式のモノドロミーに対する精度保証付き数値計算 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Toshimasa Ishige（Chiba Univ.）
Akitoshi Takayasu（Univ. of Tsukuba）
Rigorous numerics for finding the monodromy of Picard–Fuchs differential equations for a family of K3 toric hypersurfaces

概 要　In this talk, we introduce a method for finding monodromy matrices of linear differential equations with finite-dimensional solution spaces using rigorous numerics. We also provide a result of computer-assisted proof that yields monodromy matrices of Picard–Fuchs differential equations for a certain family of K3 toric hypersurfaces.

35　木 下 武 彦（佐 賀 大 理 工）
　　渡 部 善 隆
　　（九大情報基盤研究開発センター）
　　中 尾 充 宏（早 大 理 工）
2 階楕円型線形作用素に対する近似逆作用素ノルムの収束オーダー評価 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Takehiko Kinoshita（Saga Univ.）
Yoshitaka Watanabe（Kyushu Univ.）
Mitsuhiro T. Nakao（Waseda Univ.）
Convergence order estimations of approximate inverse operator norm for second-order elliptic linear operators

概 要　In this talk, we consider the convergence order of the approximate inverse operator norm for second-order elliptic linear operators. We show that the general order of convergence is $O(\sqrt{h})$, and give concrete computable error bounds for achieving the same order.

16:45～17:45　特別講演

榊 原 航 也（岡山理大理・理化学研）　界面現象の構造保存型数値解析

Koya Sakakibara
（Okayama Univ. of Sci./RIKEN）
Structure-preserving numerical analysis of interfacial phenomena

概 要　Soap bubbles, falling water droplets, and other phenomena that deform from moment to moment are all around us. The problem of mathematically investigating these phenomena is known as the moving boundary problem, which has been studied in mathematics, physics, and various other fields. Numerical analysis of interfacial phenomena is more complicated than the usual numerical analysis of differential equations on a fixed domain because the problem domain changes from moment to moment. In this talk, we will review what has been known about attempts to design structure-preserving numerical methods for mathematical models describing interfacial phenomena. Further directions of research development will also be discussed.

3月18日（土）　第VII会場

9:50〜11:50

36　國 谷 紀 良 (神戸大システム情報)　隔離と時間遅れを考慮した感染症モデルにおけるホップ分岐 ‥‥‥‥‥ 15

Toshikazu Kuniya (Kobe Univ.)　Hopf bifurcation in a delayed epidemic model with quarantine

概 要　In this study, we construct a time-delayed epidemic model with quarantine and obtain sufficient conditions for a Hopf bifurcation, which represents the recurrent epidemic waves. We show that if the basic reproduction number $\mathcal{R}_0$ is less than 1, then the disease-free equilibrium is globally asymptotically stable, whereas if $\mathcal{R}_0 > 1$, then the unique endemic equilibrium exists and it can be destabilized and a nontrivial periodic solution can arise in a Hopf bifurcation. Our numerical simulation suggests that the quarantine and time delay play important roles in the occurrence of recurrent epidemic waves.

37　竹 口 佳 輝 (京 大 情 報)　力学系理論の手法による感染症数理モデル SEIR 系の最適制御 ‥‥‥‥ 15
　　矢 ヶ 崎 一 幸 (京 大 情 報)

Yoshiki Takeguchi (Kyoto Univ.)　Optimal control of the SEIR epidemic model using a dynamical systems
Kazuyuki Yagasaki (Kyoto Univ.)　approach

概 要　We consider the susceptible-exposed-infected-removed (SEIR) epidemic model and apply optimal control to it. Our approach is to reduce the computation of the optimal control input to that of the stable manifold of an invariant manifold in a Hamiltonian system. Some numerical examples in which the computer software AUTO is used to numerically compute the stable manifold are given to demonstrate the usefulness of our approach for the optimal control in the SEIR model. Our study suggests how we can decrease the number of infected individuals quickly before a critical situation occurs while keeping social and economic burdens small.

38　田 﨑 創 平 (北 大 理)　腸管上皮細胞社会における脱分化現象の数理解析 ‥‥‥‥‥‥‥‥ 15
　　長 井 広 樹
　　(東大薬・東北大学際フロンティア研)
　　ルイスアウグストエイジナガイ
　　　　　　　　　(東 大 薬)
　　中 戸 隆 一 郎 (東大定量生命研)
　　三 浦 正 幸 (東 大 薬)
　　中 嶋 悠 一 朗
　　(東大薬・東北大学際フロンティア研)

Sohei Tasaki　(Hokkaido Univ.)　Mathematical analysis of dedifferentiation in the intestinal epithelial cell
Hiroki Nagai　community
　(Univ. of Tokyo / Tohoku Univ.)
Luis Augusto Eijy Nagai
　　　　　　(Univ. of Tokyo)
Ryuichiro Nakato (Univ. of Tokyo)
Masayuki Miura (Univ. of Tokyo)
Yu-ichiro Nakajima
　(Univ. of Tokyo / Tohoku Univ.)

概 要　The intestinal epithelium is a highly flexible and adaptive cell community that is formed and regulated by the proliferation and differentiation of intestinal stem cells (ISCs). We have quantitatively analyzed the nutrient-dependent tissue expansion of the adult Drosophila intestinal epithelium just after eclosion. We have shown that stem cell division alone cannot explain the increase in stem cell number, and have proposed a novel dedifferentiation phenomenon as a possible compensatory mechanism. We have developed a mathematical model of intestinal epithelial cell society and established a simulation system that enables quantitative prediction of cell population dynamics. The analysis is revealing that enteroendocrine cell dedifferentiation is a good way to efficiently achieve intestinal enlargement while maintaining cell diversity.

39 松 江 　要 　常微分方程式の爆発解の漸近展開と無限遠ダイナミクス ············· 15
　　　　（九大IMI・九大I2CNER）
落 合 啓 之 (九 大 Ｉ Ｍ Ｉ)
小 谷 久 寿 (九 大 Ｉ Ｍ Ｉ)
高 安 亮 紀 (筑波大システム情報)

Kaname Matsue 　Correspondence between asymptotic expansions of blow-up solutions for
　(Kyushu Univ. / Kyushu Univ.) 　ODEs and dynamics at infinity
Hiroyuki Ochiai (Kyushu Univ.)
Hisatoshi Kodani (Kyushu Univ.)
Akitoshi Takayasu (Univ. of Tsukuba)

概 要 　We provide a natural correspondence of eigenstructures of Jacobian matrices associated with equilibria for appropriately transformed two systems (describing asymptotic expansions and dynamics at infinity) describing finite-time blow-ups for ODEs with quasi-homogeneity in an asymptotic sense. As a corollary, we see that asymptotic expansions of blow-ups themselves provide a criterion of the existence of blow-ups with an intrinsic gap structure of stability information among two systems.

40 劉 　逸 侃 (北 大 電 子 研) 　非整数階拡散方程式系の初期値境界値問題について ················ 15
Yikan Liu 　　(Hokkaido Univ.) 　Initial-boundary value problems for coupled systems of time-fractional
　　　　　　　　　　　　　　　diffusion equations

概 要 　This talk is concerned with the initial-boundary value problem for a moderately coupled system of time-fractional diffusion equations with Caputo derivatives of orders in $(0, 1)$. Regarding the coupled part of components as a source term, we define the mild solution by an integral equation. Then we establish fundamental unique existence, limited smoothing property and long-time asymptotic behavior of the solution, which mostly inherit those of a single equation.

41 宮 路 智 行 (京 　大 　理) 　A conjecture on the asymptotic reflection rule of a self-propelled particle
R. Sinclair 　　　　　　　　　　　·· 15
Tomoyuki Miyaji (Kyoto Univ.) 　A conjecture on the asymptotic reflection rule of a self-propelled particle
Robert Sinclair

概 要 　We consider a four-dimensional ODE model of a self-propelled particle that interacts repulsively with the domain boundary. It is derived from certain planar reaction-diffusion systems. A previous study proves that the particle governed by this model moves almost in a straight line and reflects from the boundary without collision. In addition, numerical simulations suggest that the angle of reflection is greater than that of incidence, which is proved under certain conditions. Recently, we have proposed a conjecture on the functional relationship between the angles. We will discuss how we arrived at the conjecture and became convinced.

42 石 井 宙 志 (京 大 ＡＳＨＢｉ) 　十分弱い非局所効果を持つ反応拡散方程式における積分核形状に依存し
　　　　　　　　　　　　　　　たパターンダイナミクス ··· 15
Hiroshi Ishii 　　(Kyoto Univ.) 　Pattern dynamics depending on integral kernel shape in reaction-diffusion
　　　　　　　　　　　　　　　equations with sufficiently weak nonlocal effect

概 要 　In this talk, we consider reaction-diffusion equations with nonlocal effects described by the convolution with an appropriate integral kernel. Such a nonlocal effect is used to describe the diffusion process of substances and cell-cell interactions, for example. This work is particularly concerned with the behavior of the widths of phase-separated patterns. The equation of motion of the width is derived and applied to several integral kernels as examples to explain how the pattern dynamics of the solution depend on the shape of the integral kernel.

14:15〜15:05

43 大 野 航 太（中 大 理 工）　Stability of traveling wave in nonlocally coupled oscillator system ···· 15
　　小 川 知 之（明大先端数理）

Kota Ohno　　　　（Chuo Univ.）　Stability of traveling wave in nonlocally coupled oscillator system
Toshiyuki Ogawa（Meiji Univ.）

概要　Coupled oscillator systems have been studied in various fields of physical and biological phenomena. Among them, systems of nonlocally coupled oscillators can exhibit chimera states, which consist of spatially coherent and incoherent states. However, the stability and bifurcation origin of chimera states have not been understood. Stuart–Landau type nonlinearity enables us to formulate the stability problem of traveling waves precisely through Floquet theory. We analyzed Floquet multiplier and confirmed the transition of stability of traveling wave by changing the parameters of nonlocal coupling. In this study, we will state the relationship between the stability of traveling waves and chimera states.

44 関 坂 歩 幹（明大研究・知財）　振動場反応拡散系に現れるセグメントパターンの安定性について ······ 15
　　小 川 知 之（明大先端数理）

Ayuki Sekisaka　　（Meiji Univ.）　Stability problem of segmented pattern for oscillatory reaction-diffusion
Toshiyuki Ogawa（Meiji Univ.）　　systems

概要　In reaction-diffusion systems of oscillatory fields, especially those in which wave bifurcations occur, it is known that traveling waves with periodic profiles appear. Even if the traveling waves are asymptotically stable, starting from a random initial value, several segments are formed, each consisting of different periodic traveling waves. Pattern dynamics is then observed in which the segments change from one to another. The transition between different segments is considered to be the so-called defect solution. In this lecture, we will discuss whether the defect solution can be regarded as a steady-state observation of the segment pattern.

45 小 川 知 之（明大先端数理）　Compact metric graph 上の Turing 不安定性 ······················ 15
　　小 林 俊 介（宮 崎 大 工）

Toshiyuki Ogawa（Meiji Univ.）　Turing instability on compact metric graph
Shunsuke Kobayashi
　　　　　　　（Univ. of Miyazaki）

概要　Studies on the behavior of reaction-diffusion systems on a one-dimensional domain with junctions (metric graph) have been increasing recently. It is expected that joint research with cell physiology and ecology will progress more and more in the future. So, we would like to clarify from the basics what kind of pattern formation occurs in compact metric graphs. First, by preparing 2 or 3 bounded intervals, let us classify the metric graph that is created by connecting them, and consider the eigenvalue problem there. Then, we describe the conditions under which Turing instability occurs for each modes, and discuss the differences in pattern formation by metric graphs.

15:20〜16:20　特別講演

西　　　慧 (京 都 産 大 理)　　3種反応拡散方程式のパルスダイナミクスについて

Kei Nishi (Kyoto Sangyo Univ.)　　Pulse dynamics in a three-component reaction-diffusion system

概要　The pulse dynamics in a three-component FitzHugh–Nagumo system is considered both numerically and analytically. The system admits a pulse solution of bistable type, which exhibits a variety of interface dynamics, not observed for the two-component FitzHugh–Nagumo systems. In this talk, we focus on the parameter regime $\alpha > 0$, $\beta < 0$, where there appear not only two types of pulse solutions, whose profiles are mutually inverted, but also multiple-pulse solutions which show collective motions such as clustered traveling pulses and an array of oscillating pulses. In order to analytically investigate these pulse behaviors, we apply the multiple scales method to the original reaction-diffusion system, and derive finite-dimensional ordinary differential equations which describe the motions of the pulse interfaces. The reduced ODEs enable us to reveal the global bifurcation structures of the pulse solutions, as well as the clustered multiple-pulse solutions, and to elucidate the mechanism for the rich variety of pulse dynamics in a clear, unified manner.

ト ポ ロ ジ ー

3月15日(水)   第Ⅲ会場

9:30～12:00

1　黒 木 慎太郎 (岡 山 理 大 理)　Orlik–Raymond type classification of simply connected 6-dimensional
　　　　　　　　　　　　　　　torus manifolds with vanishing odd degree cohomology ············· 15
Shintaro Kuroki
　　　　(Okayama Univ. of Sci.)　Orlik–Raymond type classification of simply connected 6-dimensional
　　　　　　　　　　　　　　　torus manifolds with vanishing odd degree cohomology

概要 A torus manifold is defined as an even-dimensional compact manifold with a half-dimensional torus
action which has fixed points. This notion was introduced by Hattori–Masuda in 2003 as the generalization
of the toric and the quasitoric manifolds. The aim of this talk is to classify simply connected 6-dimensional
torus manifolds with vanishing odd-degree cohomology. It is shown that there is a one-to-one correspondence
between equivariant diffeomorphism types of such manifolds and 3-valent torus graphs introduced by Maeda–
Masuda–Panov. Using this correspondence and combinatorial arguments, we prove that such a manifold
is equivariantly diffeomorphic to the 6-dimensional sphere or an equivariant connected sum of copies of
6-dimensional quasitoric manifolds or 4-dimensional sphere bundles over the 2-dimensional sphere.

2　那 須 正 和　　　　　　　The limits of resolving directions of automorphisms of sofic systems ·· 15
Masakazu Nasu　　　　　　　　The limits of resolving directions of automorphisms of sofic systems

概要 We present the results that an automorphism of a sofic system has the same limits of resolving
directions as those of its canonical support by way of the Krieger cover and that a similar result to this
holds for an automorphism of a transitive sofic system and its canonical support by way of the Fischer cover.
One of the corollaries to these proves that no automorphism of a transitive sofic system has an irrational
unique non-expansive direction.

3　白 根 竹 人 (徳 島 大 理 工)　Splitting invariants and a π_1-equivalent Zariski pair of conic-line ar-
　　M. Amram　　　　　　　rangements ··· 15
　　　　　(Shamoon Coll. of Eng.)
　　坂 内 真 三 (岡 山 理 大 理)
　　U. Sinichkin　 (Tel Aviv Univ.)
　　徳 永 浩 雄 (都 立 大 理)
Taketo Shirane (Tokushima Univ.)　Splitting invariants and a π_1-equivalent Zariski pair of conic-line ar-
Meirav Amram (Shamoon Coll. of Eng.)　rangements
Shinzo Bannai (Okayama Univ. of Sci.)
Uriel Sinichkin (Tel Aviv Univ.)
Hiro-o Tokunaga (Tokyo Metro. Univ.)

概要 In this talk, we consider the embedded topology of plane curves on the complex projective plane $\mathbb{P}^2$.
It is known that there are π_1-equivalent Zariski pairs $(\mathcal{C}_1, \mathcal{C}_2)$ of plane curves $\mathcal{C}_1, \mathcal{C}_2 \subset \mathbb{P}^2$, i.e., $\mathcal{C}_1$ and $\mathcal{C}_2$
have the same embedded topology in their tubular neighborhoods but different embedded topology in $\mathbb{P}^2$,
and $\pi_1(\mathbb{P}^2 \setminus \mathcal{C}_1) \cong \pi_1(\mathbb{P}^2 \setminus \mathcal{C}_2)$. Known examples of π_1-equivalent Zariski pairs consist of curves containing
a component with either singularities or genus $g \geq 1$. The aim of this talk is to give a π_1-equivalent Zariski
pair of conic-line arrangements, i.e., a pair of curves consisting of smooth rational curves.

4　山 﨑 薫 里（高崎経大経済）　Extensions of continuous increasing functions ······················ 10

Kaori Yamazaki
　（Takasaki City Univ. of Econ.）

概 要　In this talk, we study extensions of continuous increasing functions, and provide an increasing version of Gillman–Jerison theorem.

5　深 沢 尚 希（都 立 大 理）　Persistent cohomology と cup length function の計算 ··············· 15

Naoki Fukasawa (Tokyo Metro. Univ.)　Persistent cohomology and computation of cup length function

概 要　We introduce the structure theorem of the persistent cohomology to describe the representative cocycles in detail. Then, taking cup products of representative cocycles, we can compute the cup length function of a finite metric space.

6　田 嶋　　優（北　大　理）　グラフのマグニチュードホモトピー型と Mayer–Vietoris 型定理 ······· 15
　吉 永 正 彦（阪　大　理）

Yu Tajima　　　（Hokkaido Univ.）　Magnitude homotopy type of graphs and Mayer–Vietoris type theorem
Masahiko Yoshinaga (Osaka Univ.)

概 要　Magnitude homology is defined by Hepworth and Willerton as a categorification of the magnitude (an invariant for metric spaces). They proved the Kunneth formula and Mayer–Vietoris type theorem for magnitude homology of graphs. Recently, Asao–Izumihara introduced the pair of simplicial complexes (K, K') whose homology groups are isomorphic to direct summands of graph magnitude homology groups. We call the CW complex K/K' magnitude homotopy type. In this talk, we give a new proof of Mayer–Vietoris type theorem using Discrete Morse theory on magnitude homotopy types. If time permits, we also talk about generalizatios to metric spaces.

7　原 子 秀 一（東 大 数 理）　The modular class of an orientable ρ-Q-manifold ·················· 15

Shuichi Harako (Univ. of Tokyo)　The modular class of an orientable ρ-Q-manifold

概 要　As one generalization of Lie algebras and commutative algebras, we have ρ-Lie algebras and ρ-commutative algebras, respectively. We will introduce a concept of a ρ-manifold, whose functional algebra is locally isomorphic to a ρ-commutative algebra, and discuss its modular class where the ρ-manifold is orientable and equipped with a Q-structure.

8　若 月　　駿（名大多元数理）♭　Independence complexes of grid graphs ························· 10
　松 下 尚 弘（琉 球 大 理）

Shun Wakatsuki (Nagoya Univ.)　Independence complexes of grid graphs
Takahiro Matsushita
　　　　　（Univ. of Ryukyus）

概 要　We determine the homotopy types of the independence complexes of $(n \times 4)$, $(n \times 5)$ and $(n \times 6)$-square grid graphs. In fact, they are homotopy equivalent to wedges of spheres.

14:20〜15:20　特別講演

小 川 　　竜 (東 海 大 理)　凸シンプレクティック多様体の Liouville 構造と Weinstein 構造

Noboru Ogawa　(Tokai Univ.)　Liouville and Weinstein structures on convex symplectic manifolds

概要 In symplectic geometry, there are two important classes on convexity: Liouville structures and Weinstein structures. The former is a symplectic manifold equipped with a conformally expanding symplectic vector field which is pointing outward. The latter is imposed so that the vector field is gradient-like. Such structures have played a significant role in the study of symplectic and contact topology. For example, the convexity provides a constraint on the behavior of pseudo-holomorphic curves by the maximum principle. By definition, a Weinstein structure is a Liouville structure, but the converse is not true in general; McDuff gave the first example which is a Liouville manifold without any Weinstein structures. The purpose of this talk is to present recent advances on the difference between the two structures, up to homotopy. In particular, I will show that the stabilization of McDuff's example admits a flexible Weinstein structure. The main part is based on a joint work with Yakov Eliashberg (Stanford University) and Toru Yoshiyasu (Kyoto University of Education). If time permits, I would like to discuss some open questions, progress and perspective.

15:40〜17:30

Naotsugu Chinen　　　　　　Isometry groups of symmetric products of $(\mathbb{R}^k)_p^q$
(Nat. Defense Acad. of Japan)

概要 By $F_n(X)$, $n \geq 1$, we denote the n-th symmetric product of a metric space (X, d) as the space of the nonempty finite subsets of X with at most n elements endowed with the Hausdorff metric d_H. By $\mathrm{Iso}(X)$ we denote the topological group of all isometries from X onto itself with the topology of pointwise convergence. We are interested in what topological group $\mathrm{Iso}(F_n(X))$ is. The aim is to decide a topological group structure of $\mathrm{Iso}(F_n((\mathbb{R}^k)_p^q))$ for any $(n, k, p, q) \in \mathbb{N} \times \mathbb{N} \times (\mathbb{N} \cup \{\infty\}) \times (\mathbb{N} \cup \{\infty\})$.

Atsuhide Mori (Osaka Dent. Univ.)　Mutual Bayesian learning for manifolds

概要 In previous work, the author described the geometry of Bayesian learning on a manifold. In this talk, we take the square of any manifold and a positive function which takes the maximum 1 on the diagonal set. Then we define the mutual Bayesian learning between the factors of the square. Particularly, we consider mutual learning between two copies of the parameter space of a statiscal model, and associate the above function with the relative entropy. Although the mutual learning forgets all about the model except the relative entropy, it still substitutes for the usual Bayesian estimation of the parameter in a certain case.

Shunsuke Kano (Tohoku Univ.)　Unbounded $\mathfrak{sl}_3$-laminations and their shear coordinates
Tsukasa Ishibashi (Tohoku Univ.)

概要 Generalizing the work of Fock–Goncharov on rational unbounded laminations, we give a geometric model of the tropical points of the moduli space $\mathcal{X}_{PGL_3,\Sigma}$ of framed PGL_3-local systems on a marked surface Σ based on the Kuperberg's $\mathfrak{sl}_3$-webs. We introduce their tropical cluster coordinates as an $\mathfrak{sl}_3$-analogue of the Thurston's shear coordinates associated with any ideal triangulation. We also describe tropical points of Goncharov–Shen's moduli space $\mathcal{P}_{PGL_3,\Sigma}$. Then we give a tropical anologue of gluing morphisms among the moduli spaces as a geometric gluing procedure of $\mathfrak{sl}_3$-laminations with "shearings". We also investigate a relation to the graphical basis of the $\mathfrak{sl}_3$-skein algebra by Ishibashi–Yuasa, which conjecturally leads to a quantum duality map.

12　越 野 克 久（神 奈 川 大 工）　A characterization of compact sets in L^p-spaces and its application $\cdots$ 15

Katsuhisa Koshino (Kanagawa Univ.)　A characterization of compact sets in L^p-spaces and its application

概 要 In this talk, we give a characterization of compact sets in L^p-spaces on metric measure spaces. As its application, we investigate the topological types of the subspace consisting of lipschitz functions with bounded supports.

13　足 立 真 訓（静 岡 大 理）　Harmonic measures and rigidity for surface group actions on the circle
　　松 田 能 文（青 学 大 理 工）　$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15
　　野 沢　　啓（立命館大理工）

Masanori Adachi (Shizuoka Univ.)　Harmonic measures and rigidity for surface group actions on the circle
Yoshifumi Matsuda
　　　　　(Aoyama Gakuin Univ.)
Hiraku Nozawa (Ritsumeikan Univ.)

概 要 We study rigidity properties of surface group actions on the circle via foliated harmonic measures on the suspension bundles. We show a curvature estimate and a Gauss–Bonnet formula for an S^1-connection obtained by taking the average of the flat connection on the suspension bundle with respect to a harmonic measure. As consequences, we give a precise description of the harmonic measure on suspension foliations with maximal Euler number and an alternative proof of rigidity theorems of Matsumoto and Burger–Iozzi–Wienhard.

3月16日（木）　　第Ⅲ会場

9:30～12:00

14　山 本 卓 宏（東京学大教育）　連続写像のファイバー特異点 $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Takahiro Yamamoto　　　　　Fiber singularities of continuous maps
　　　　(Tokyo Gakugei Univ.)

概 要 The notion of fiber-singularities of continuous maps between topological manifolds are introduced. Then, we investigate some examples of fiber-singularities and, study fiber-singularities of simplicial maps of PL maps of surfaces.

15　濱 田 直 希（　KLab(株)　）　多目的最適化問題における制約関数芽および実行可能領域芽の分類と認識
　　早 野 健 太（慶 大 理 工）　$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15
　　寺 本　　央（関西大システム理工）

Naoki Hamada　　　(KLab Inc.)　Classification and recognition of constraint function-germs and feasible
Kenta Hayano　　　(Keio Univ.)　set-germs in multiobjective optimization
Hiroshi Teramoto (Kansai Univ.)

概 要 For functions $g_1, \ldots, g_q$ and $h_1, \ldots, h_r$ on the Euclidian space, we consider the minimizing problems of some given functions on the set $M(g, h) = \{x \mid \forall i, g_i(x) \leq 0, \forall j, h_j(x) = 0\}$. The functions g_i's, h_j's and the set $M(g, h)$ are respectively called the constraint functions and the feasible set for the problem. In this talk, we will explain the results on classification and recognition of constraint function-germs under suitable equivalence for them (called $\mathcal{K}[G]$-equivalence). If time permits, we will also discuss how the results are related with classification of feasible set-germs.

概要　Let N be a connected nonorientable surface with or without boundary components and punctures. We prove that the graph consists of the isotopy classes of nonseparating curves of N is connected and Gromov hyperbolic with a constant which does not depend on the topological type of the surface by using the bicorn curves introduced by Przytycki and Sisto. The proof is based on the argument by Rasmussen on the uniform hyperbolicity for the graphs consists of the isotopy classes of nonseparating curves for orientable surfaces.

概要　A fine curve graph defined by Bowden, Hensel, and Webb (J. Amer. Math. Soc. (2021)) is a new curve graph consists of all essential simple closed curves on a surface. They proved that the fine curve graph of any closed orientable surface of genus $g \geq 1$ is uniformly hyperbolic in the sense of Gromov. We proved that the fine curve graph of any closed nonorientable surface of genus $g \geq 2$ is also uniformly hyperbolic.

概要　The level 2 mapping class group $\mathcal{M}_2(N)$ of a non-orientable closed surface N is the subgroup of the mapping class group of N consisting of elements acting trivially on $H_1(N; \mathbb{Z}/2\mathbb{Z})$. In our work, we proved that for any non-separating simple closed curves α and β of N, there is $\varphi \in \mathcal{M}_2(N)$ such that $\varphi(\alpha) = \beta$ if and only if α and β are equal as elements in $H_1(N; \mathbb{Z}/2\mathbb{Z})$.

概要　The level 2 mapping class group of an orientable closed surface is equal to the group generated by squares of Dehn twists about non-separating simple closed curves. In our work, we proved that the twist subgroup of the level 2 mapping class group of a non-orientable closed surface is not equal to the group generated by squares of Dehn twists about non-separating simple closed curves and Dehn twists about separating simple closed curves. As an application, we gave a finite generating set for this group.

概要　The balanced superelliptic handlebody group is the normalizer of the transformation group of the balanced superelliptic covering space in the handlebody group of the total space. We give a finite presentation for the balanced superelliptic handlebody group. To give this presentation, we construct a finite presentation for the liftable Hilden group.

21　大 森 源 城（東京理大理工）　A small generating set for the balanced superelliptic handlebogy group
$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 10

Genki Omori (Tokyo Univ. of Sci.)　A small generating set for the balanced superelliptic handlebogy group

概 要 The balanced superelliptic handlebody group is the normalizer of the transformation group of the balanced superelliptic covering space in the handlebody group of the total space. We prove that the balanced superelliptic mapping class group is generated by four elements. To prove this, we also proved that the liftable Hilden group is generated by three elements. This generating set for the liftable Hilden group is minimal except for some hyperelliptic cases and the generating set for the balanced superelliptic mapping class group above is also minimal for several cases.

13:00〜14:00

22　北 野 晃 朗（創 価 大 理 工）　Morse–Smale flow を用いた Reidemeister torsion のトーラス和公式につ
　　清 水 達 郎　　　　　　　　　いて $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 10
　　（東京電機大システムデザイン工）

Teruaki Kitano　　(Soka Univ.)　On the torus sum formula of Reidemeister torsion defined by Morse–
Tatsuro Shimizu (Tokyo Denki Univ.)　Smale flows

概 要 We consider Reidemeister torsion for a 3-manifold. It can defined by several ways. For a 3-manifold with a torus decomposition, the torus sum formula of Reidemeister torsion is well known. In this talk we give a proof of the torus sum formula by using Morse–Smale flows.

23　寺 垣 内 政 一（広 島 大 教 育）　双曲的 L 空間結び目の Upsilon 不変量について $\cdots\cdots\cdots\cdots\cdots$ 10

Masakazu Teragaito (Hiroshima Univ.)　Hyperbolic L-space knots and their Upsilon invariants

概 要 For a knot in the 3-sphere, the Upsilon invariant is a piecewise linear function defined on the interval $[0,2]$. It is known that for an L-space knot, the Upsilon invariant is determined only by the Alexander polynomial. We exhibit infinitely many pairs of hyperbolic L-space knots such that two knots of each pair have distinct Alexander polynomials, so they are not concordant, but share the same non-zero Upsilon invariant. Conversely, we examine the restorability of the Alexander polynomial of an L-space knot from the Upsilon invariant through the Legendre–Fenchel transformation.

24　門 上 晃 久（金 沢 大 理 工）　The Ma–Qiu index and the Nakanishi index for a fibered knot are equal,
and ω-solvability $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Teruhisa Kadokami (Kanazawa Univ.)　The Ma–Qiu index and the Nakanishi index for a fibered knot are equal,
and ω-solvability

概 要 For a knot K, let $G(K)$ be the knot group of K, $a(K)$ the Ma–Qiu index, which is the minimal number of normal generators of the commutator subgroup of $G(K)$, and $m(K)$ the Nakanishi index of K, which is the minimal number of generators of the Alexander module of K. We generalize the notions for a pair of a group G and its normal sugroup N, and we denote them by $a(G, N)$ and $m(G, N)$ respectively. Then it is easy to see $m(G, N) \leq a(G, N)$ in general. We also introduce a notion "ω-solvability" for a group. Our main theorem is that if N is ω-solvable, then we have $m(G, N) = a(G, N)$. As corollaries, for a fibered knot K, we have $m(K) = a(K)$, and we could determine the MQ indices of prime knots up to 9 crossings completely.

3月17日(金) 第Ⅲ会場

9:30〜12:00

25 松 土 恵 理（日大文理自然研） Minimum numbers of Dehn colors and $\mathcal{R}$-palette graphs ············ 10
　 大 城 佳 奈 子（上 智 大 理 工）
　 山 岸 凱 司（上 智 大 理 工）
Eri Matsudo 　　（Nihon Univ.） Minimum numbers of Dehn colors and $\mathcal{R}$-palette graphs
Kanako Oshiro （Sophia Univ.）
Gaishi Yamagishi （Sophia Univ.）

概 要 We consider the number of colors for Dehn-colorings, and we define a $\mathcal{R}$-palette graphs. In this talk, for any Dehn p-colorable knot, we give a lower bound of the minimum number of colors on diagrams.

26 市 原 一 裕（日 大 文 理） 絡み目群の全射二面体群表現と二相彩色について ·················· 10
　 石 川 勝 巳（京 大 数 理 研）
　 鈴 木 正 明（明大総合数理）
　 松 土 恵 理（日大文理自然研）
Kazuhiro Ichihara （Nihon Univ.） Two-tone colorings and surjective dihedral representations for links
Katsumi Ishikawa （Kyoto Univ.）
Masaaki Suzuki 　（Meiji Univ.）
Eri Matsudo 　　（Nihon Univ.）

概 要 It is well-known that a knot group admits a surjective homomorphism to the dihedral group of degree n if and only if the knot is Fox n-colorable. However, it is not true for links with two or more components. In this talk, I will introduce a two-tone coloring on a link diagram, and give a condition for links that the link groups admit surjective representations to dihedral groups.

27 野 坂 武 史（東 工 大 理） 閉 3 次元多様体の対称ラックコサイクル不変量 ····················· 10
Takefumi Nosaka （Tokyo Tech） Symmetric rack cocycle invariants of closed 3-manifolds

概 要 We establish a new approach to obtain 3-manifold invariants via Dehn surgery. For this, we introduce racks with good involution and Property FR, and define cocycle invariants as 3-manifold invariants.

28 松 崎 尚 作 空間曲面と多重群ラックコサイクル不変量 ······················· 10
　　　（足利大共通教育センター）
　 村 尾　　智（早 大 Ｇ Ｅ Ｃ）
Shosaku Matsuzaki Spatial surfaces and multiple group rack cocycle invariants
　（Int. Affairs Ashikaga Univ.）
Tomo Murao （Waseda Univ.）

概 要 A spatial surface is a compact surface embedded in the 3-sphere. A multiple group rack is an algebraic structure motivated from Reidemeister moves of oriented spatial surfaces. In this talk, we introduce a multiple group rack cocycle invariant for oriented spatial surfaces and give some calculation examples.

29 谷 口 雄 大（阪 大 理） 結び目の n-カンドルの中心拡大 ································ 15
　 田 中　　心（東京学大教育）
Yuta Taniguchi （Osaka Univ.） A central extension of the n-quandle of a knot
Kokoro Tanaka （Tokyo Gakugei Univ.）

概 要 The fundamental quandle is a powerful invariant for knots. However, it is difficult to compare them. Then, we often use a certain quotient of the fundamental quandle of a knot, which is called an n-quandle of a knot. In this talk, we show that the fundamental quandle of the n-twist spun knot, which is a 2-knot introduced by Zeeman, is a central extension of the n-quandle. As a corollary, we determine the second quandle homology group of n-quandles.

30　田 中　　心（東京学大教育）　二次元結び目の結び目カンドルと結び目群について ················· 10
　　谷 口 雄 大（阪　　大　　理）

Kokoro Tanaka (Tokyo Gakugei Univ.)　Knot quandles and knot groups for 2-knots
Yuta Taniguchi　(Osaka Univ.)

概 要　We give examples of 2-knots with the same knot group but different knot quandles by analyzing the knot quandles of twist-spun knots. As a byproduct of our method, we give a classification of all twist-spun knots with finite knot quandles.

31　和 田 康 載（神　戸　大　理）　ブルンの性質をもつリボン 2 次元ストリング絡み目の有限型不変量 ···· 10

Kodai Wada　　　(Kobe Univ.)　Finite type invariants of ribbon 2-dimensional string links with generalized Brunnian properties

概 要　Gusarov and Habiro independently gave a topological interpretation of finite type invariants for 1-dimensional knots in terms of C_k-equivalence. As a 4-dimensional analogue, Watanabe introduced the notion of RC_k-equivalence on ribbon knotted surfaces and proved that two ribbon 2-dimensional knots are RC_k-equivalent if and only if they cannot be distinguished by any finite type invariant of degree less than k. In this talk, we provide an extension of the above result of Watanabe to ribbon 2-dimensional string links with generalized Brunnian properties.

14:20～15:20　特別講演

石 井　　敦（筑波大数理物質）　Alexander type invariants of groups, quandles and MCQs

Atsushi Ishii (Univ. of Tsukuba)　Alexander type invariants of groups, quandles and MCQs

概 要　Groups, quandles and MCQs are algebraic objects appeared in low-dimensional topology. In particular, the notions of quandles and multiple conjugation quandles (MCQs) were introduced via the axioms corresponding to the Reidemeister moves for oriented knots and handlebody-knots, respectively. In this talk, we discuss Alexander type invariants of groups, quandles and MCQs, which include the Alexander ideal and the (twisted) Alexander polynomial.

15:40～17:00

32　若 槇 洋 平（阪　大　情　報）　いくつかの有理曲面のコルク ···································· 15

Yohei Wakamaki (Osaka Univ.)　Corks of some rational surfaces

概 要　Corks of 4-manifolds are one of the most important objects in the study of exotic 4-manifolds. Nevertheless, we only have a few explicit examples of corks of standard simply-connected closed 4-manifolds with small second Betti numbers b_2. In this talk, we give the first example of a cork of $\mathbb{CP}^2 \# 8\overline{\mathbb{CP}^2}$. This achieves the smallest b_2 where a cork of standard simply-connected closed 4-manifold has been found. We also talk about new examples of corks of $\mathbb{CP}^2 \# 9\overline{\mathbb{CP}^2}$.

33　浅 野 喜 敬 (津 山 工 高 専)
　　直 江 央 寛 (中 大 理 工)
　　小 川 将 輝 (埼 玉 大 理 工)

Nobutaka Asano
　(Tsuyama Nat. Coll. of Tech.)
Hironobu Naoe　(Chuo Univ.)
Masaki Ogawa (Saitama Univ.)

Some lower bounds for the Kirby–Thompson invariant of 4-manifolds

概要　A trisection is a decomposition of a 4-manifold into three 1-handlebodies. This decomposition is characterized by a diagram called a trisection diagram. A trisection diagram is a 4-tuple consisting of a closed surface and three cut systems. Kirby and Thompson introduced an invariant of a 4-manifold that is a kind of complexity defined by its trisection diagrams. This invariant is called the Kirby–Thompson invariant. In this talk, we give some lower bounds for the Kirby–Thompson invariant of certain 4-manifolds. As an application, we find the first example of a 4-manifold with non-trivial Kirby–Thompson invariant.

34　磯 島 　　司 (東 工 大 理)
　　小 川 将 輝 (埼 玉 大 理 工)

Tsukasa Isoshima (Tokyo Tech)
Masaki Ogawa (Saitama Univ.)

Trisections of the 4-sphere obtained by Gluck twisting

概要　A trisection of a 4-manifold, introduced by Gay and Kirby in 2012, is a decomposition of the 4-manifold into three 4-dimensional 1-handlebodies. A trisection can be described by a trisection diagram that is similar to a Heegaard diagram. In this talk, we construct infinitely many trisection diagrams of the 4-sphere obtained by Gluck twisting along some spun torus knots. We also study the standardness of the trisection diagrams.

35　大 場 貴 裕 (阪 　大 　理)

Takahiro Oba　(Osaka Univ.)

Symplectic submanifolds in dimension 6 from Lefschetz fibrations

概要　Thanks to the affirmative answer to the symplectic Thom conjecture, all connected symplectic surfaces representing the same homology class in a closed symplectic 4-manifold are diffeomorphic. In higher dimension, for example, take $\mathbb{CP}^3$ with the Fubini–Study form. Then, it is known that its connected symplectic submanifolds representing the class $d[\mathbb{CP}^2]$ are mutually diffeomorphic as long as $1 \leq d \leq 3$. In this talk, I will present arbitrarily (finitely) many codimension 2 connected symplectic submanifolds in a closed symplectic 6-manifold which are mutually homotopy inequivalent but homologous. A key ingredient of the construction is hyperelliptic Lefschetz fibrations.

無 限 可 積 分 系

3月17日(金)　　第IX会場

9:45〜10:45

1　上 野 祐 一　　　　　　　　Polynomial Hamiltonians for quantum Garnier system in two variables
　　　　(皇學館大教育・神戸大理)　· 10

Yuichi Ueno　　　　　　　　　Polynomial Hamiltonians for quantum Garnier system in two variables
　(Kogakkan Univ./Kobe Univ.)

概 要　Garnier system is the extension of Painlevé equations and is given as Frobenius integrable multi-time Hamiltonian systems. In this talk, we construct and characterize the quantum Gariner system by certain holomorphic properties. The characterization of the classical Garnier system by holomorphic properties has been given by Sasano, and our result is a quantization of that work. In other words, we introduce quantum canonical transformations such that the Hamiltonian system of the Garnier system is again transformed into a polynomial Hamiltonian system, and show that the Hamiltonian can be uniquely characterized by this holomorphic properties.

2　中 園 信 孝 (東京農工大工)　　離散 KdV 方程式の立方体周りの整合性 · 15

Nobutaka Nakazono　　　　　　Consistency around a cube property of Hirota's discrete KdV equation
(Tokyo Univ. of Agri. and Tech.)

概 要　It has been unknown whether Hirota's discrete analogue of the Korteweg-de Vries (KdV) equation have the consistency around a cube (CAC) property, which is known as an integrability of 2-dimensional difference equation. In this talk, we show that Hirota's discrete KdV equation has the CAC property.

3　鈴 木 貴 雄 (近 畿 大 理 工)　　q-ガルニエ系に由来する q-超幾何級数へのアフィン・ワイル群作用 · · · · 15

Takao Suzuki　　(Kindai Univ.)　An affine Weyl group action on the basic hypergeometric series arising
　　　　　　　　　　　　　　　　from the q-Garnier system

概 要　Recently, we formulated the q-Garnier system and its variations as translations of an extended affine Weyl group of type $A_{2n+1}^{(1)} \times A_1^{(1)} \times A_1^{(1)}$. On the other hand, those systems admit particular solutions in terms of the basic hypergeometric series $_{n+1}\phi_n$. In this talk, we investigate an action of the extended affine Weyl group on $_{n+1}\phi_n$. This talk is based on a joint work with Taiki Idomoto of Kindai University.

4　大 山 陽 介 (徳 島 大 理 工)　　Boundary behavior of q-Painlevé equation of type $A_4^{(1)}$ · · · · · · · · · · · · · 15

Yousuke Ohyama (Tokushima Univ.)　Boundary behavior of q-Painlevé equation of type $A_4^{(1)}$

概 要　We study asymptotic analysis on the q-Painleve V equation around the origin. We solve the q-Riemann–Hilbert problem for any asymptotic series of q-Painleve V functions. We show the Mano-type decomposition for q-Painleve V.

11:00～12:00　特別講演

井 上　　玲 (千 葉 大 理)　ワイル群のクラスター実現と表現論への応用

Rei Inoue　　　(Chiba Univ.)　Cluster realization of Weyl groups and its applications to representation theory

概要　The cluster algebra is a commutative algebra introduced by Fomin and Zelevinsky around 2000. The characteristic operation in the algebra called 'mutation' is related to various notions in mathematics and mathematical physics.

In this talk we introduce a realization of Weyl groups in terms of cluster mutations, for finite dimensional semisimple Lie algebras. We discuss its applications to (1) the geometric R-matrix of symmetric power representations for the affine quantum algebra of A-type, and to (2) the q-characters of quantum non-twisted affine algebras introduced by Frenkel and Reshetikhin, when q is a root of unity. If time permits we also mention the application to higher Teichmüller theory.

This talk is based on joint works with Thomas Lam, Pavlo Pylyavskyy, Tsukasa Ishibashi, Hironori Oya, and Takao Yamazaki.

3月18日(土)　　第IX会場

10:00～10:45

5　小 見 山 尚 (名大多元数理)　Associators and the Grothendieck–Teichmüller group in mould theory
$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 10

Nao Komiyama (Nagoya Univ.)　Associators and the Grothendieck–Teichmüller group in mould theory

概要　In this talk, we explain the mould theory introduced by Jean Ecalle, and we introduce mould theoretic formulations of Drinfeld's notion of the associator set and that of the Grothendieck–Teichmüller group. This talk is based on the joint work with Hidekazu Furusho and Minoru Hirose.

6　国 場 敦 夫 (東大総合文化)　New solutions to the tetrahedron equation associated with quantized
松 生 周 一 郎 (東大総合文化)　six-vertex models $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15
米 山 瑛 仁 (東大総合文化)

Atsuo Kuniba (Univ. of Tokyo)　New solutions to the tetrahedron equation associated with quantized
Shuichiro Matsuike (Univ. of Tokyo)　six-vertex models
Akihito Yoneyama (Univ. of Tokyo)

概要　In this talk, we present a family of new solutions to the tetrahedron equation of the form $RLLL = LLLR$, where L operator may be regarded as a quantized six-vertex model whose Boltzmann weights are specific representations of the q-oscillator or q-Weyl algebras. When the three L's are associated with the q-oscillator algebra, R coincides with the known intertwiner of the quantized coordinate ring $A_q(sl_3)$. On the other hand, L's based on the q-Weyl algebra lead to new R's whose elements are either factorized or expressed as a terminating q-hypergeometric type series.

7　中 島 俊 樹 (上 智 大 理 工)　Geometric crystal on unipotent variety and crystal of modified quantum
algebra $\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$ 15

Toshiki Nakashima (Sophia Univ.)　Geometric crystal on unipotent variety and crystal of modified quantum algebra

概要　We shall define a geometric crystal structure on the unipotent variety of a simple, simply connected complex algebraic group. In SL(2)-case, certain relation to crystal base of a modified quantum algebra will be presented.

11:00〜12:00　特別講演

T. Scrimshaw（北大教育推進機構)♭　Krystal theory

Travis Scrimshaw (Hokkaido Univ.)　　Krystal theory

概 要　Kashiwara's theory of crystal bases has been applied to many different problems in representation theory, physics, and geometry. In this talk, we will focus on their appearance in the K-theoretic Schubert calculus of the Grassmannian. Specifically, we look at the symmetric function representatives of K-theory classes that arise from Schubert varieties called (symmetric) Grothendieck polynomials $\{G_\lambda\}_\lambda$ and three other related bases: the dual basis and their "weak" analogs. We construct a $\mathfrak{gl}_n$-crystal using the combinatorial descriptions of Buch and Lam–Pylyavskyy to describe the decomposition of these bases into Schur functions and describe their multiplicties. We will then discuss extensions to the (refined) canonical Grothendieck polynomials introduced by Hwang *et al.* and Yeliussizov. This suggest an extension of Kashiwara's theory which we call K-crystals, or Krystals for short. We conclude with some open problems. This is based on joint works with Graham Hawkes, Cara Monical, Oliver Pechenik.