研究集会　Intelligence of Low-dimensional Topology

京都大学数理解析研究所 RIMS 研究集会として、また、大阪市立大学数学研究所から後援をうけて、トポロジープロジェクトの一環として、標記の研究集会を開催いたします。また、この研究集会は科学研究費補助金 基盤研究 A「結び目理論研究とその応用」（課題番号 24244005、研究代表者 河内明夫氏（大阪市立大学））と科学研究費補助金 基盤研究 B 「グラフィクスとカンドル理論の観点からの４次元トポロジーの研究」（課題番号 21340015、研究代表者 鎌田聖一氏（広島大学））と科学研究費補助金 基盤研究 B 「結び目と３次元多様体のトポロジー」（課題番号 24340012、研究代表者 大槻知忠（京都大学））の援助をうけています。

日程：２０１２年5月１６日（水）～ １８日（金）
場所：京都大学 数理解析研究所 420 大講演室
アクセス：http://www.kurims.kyoto-u.ac.jp/ja/access-01.html

５月１６日（水）

13:20～14:10　新國 亮（東京女子大学 現代教養学部）
$\triangle Y$-exchanges and Conway-Gordon type theorems

14:30～15:20　鈴木咲衣（京都大学 数理解析研究所）
On the universal sl_2 invariant of Brunnian bottom tangles

15:40～16:30　Dylan Thurston (Barnard College / Tokyo Institute of Technology (visitor))
Computing HOMFLY homology via bimodules

５月１７日（木）

10:00～10:50　広中えり子 (Florida State University / University of Tokyo (Visitor))
Small dilatation pseudo-Anosov mapping classes

11:10～12:00　安部哲哉（京都大学 数理解析研究所）
Annulus twist, diffeomorphic 4-manifolds, and slice knots

13:20～14:10　J. Scott Carter (University of South Alabama (visiting Kyungpook National University))
Local pictures for knotted foams and G-families of quandles (joint work with Masahico Saito)

14:30～15:20　藤原耕二（京都大学 理学研究科 数学専攻）
Growth of groups

15:40～　　Problem Session

５月１８日（金）

10:00〜10:50　鎌田聖一（広島大学）
Braids and branched coverings of dimension three (joint work with J. Scott Carter)

11:10〜12:00　Yongju Bae (Kyungpook National University)
On the Alexander polynomial of links with symmetry

13:20〜14:10　岩切雅英（佐賀大学 工学系研究科）
A G-family of quandles and handlebody-knots

14:30〜15:20　田中心（東京学芸大学）
Interpretation of rack coloring knot invariants in terms of quandles

組織委員：河内明夫、河野俊丈、金信泰造、鎌田聖一、大槻知忠
世話人：　大槻知忠（京大数理研）、和久井道久（関西大学）

Intelligence of Low-dimensional Topology

May 16–18, 2012
Room 420, RIMS, Kyoto University
Access: http://www.kurims.kyoto-u.ac.jp/en/access-01.html

Program

May 16 (Wed)

13:20–14:10 Ryo Nikkuni (School of Arts and Sciences, Tokyo Woman's Christian University)
$\triangle Y$-exchanges and Conway-Gordon type theorems

14:30–15:20 Sakie Suzuki (RIMS, Kyoto University)
On the universal sl_2 invariant of Brunnian bottom tangles

15:40–16:30 Dylan Thurston (Barnard College / Tokyo Institute of Technology (visitor))
Computing HOMFLY homology via bimodules

May 17 (Thu)

10:00–10:50 Eriko Hironaka (Florida State University / University of Tokyo (Visitor))
Small dilatation pseudo-Anosov mapping classes

11:10–12:00 Tetsuya Abe (RIMS, Kyoto University)
Annulus twist, diffeomorphic 4-manifolds, and slice knots

13:20–14:10 J. Scott Carter (University of South Alabama (visiting Kyungpook National University))
Local pictures for knotted foams and G-families of quandles (joint work with Masahico Saito)

14:30–15:20 Koji Fujiwara (Department of Math, Kyoto University)
Growth of groups

15:40– Problem Session

May 18 (Fri)

10:00–10:50 Seiichi Kamada (Hiroshima University)
Braids and branched coverings of dimension three (joint work with J. Scott Carter)

11:10–12:00 Yongju Bae (Kyungpook National University)
On the Alexander polynomial of links with symmetry

13:20–14:10 Masahide Iwakiri (Graduate School of Science and Engineering, Saga University)
A G-family of quandles and handlebody-knots

14:30–15:20 Kokoro Tanaka (Tokyo Gakugei University)
Interpretation of rack coloring knot invariants in terms of quandles

Intelligence of Low-dimensional Topology

May 16–18, 2012

RIMS, Kyoto University

Abstract

Tetsuya Abe (RIMS, Kyoto University)
Annulus twist, diffeomorphic 4-manifolds, and slice knots

For a knot K, let $X(K)$ be the 4-manifold obtained form the 4-ball by attaching a 2-handle along K with framing 0. In this talk, we give a method to obtain a sequence of knots $\{K_n\}$ such that $X(K_i)$ and $X(K_j)$ are diffeomorphic for each integer i and j. Our key tool is an annulus twist which is an operation on knots introduced by Osoinach to construct homeomorphic 3-manifolds by Dehn surgery. As an application, we obtain potential counterexamples of the ribbon-slice conjecture, which are slice knots in a homotopy 4-ball. This is a joint work with In Dae Jong.

Yongju Bae (Kyungpook National University)
On the Alexander polynomial of links with symmetry

By a link with symmetry, we mean a link with a diagram on which a finite group can act. In this talk, we will introduce a method to construct such symmetric links and try to find out their Seifert matrix. In fact, we will give formulae for the Alexander polynomial and the determinant of a symmetric link whose acting group is the cyclic group or the Klein 4-group.

J. Scott Carter (University of South Alabama (visiting Kyungpook National University))
Local pictures for knotted foams and G-families of quandles (joint work with Masahico Saito)

This is based upon on-going work with Masahico Saito. Knotted surface foams are analogues of knotted trivalent graphs. The local pictures of knotted foams are constructed by considering the moves to trivalent graphs as movies and considering interpolating surfaces between them. More generally, we define an n-dimensional foam and consider the local pictures of its possible crossings. The boundaries of these crossings are knot moves for the lower dimensional foams.

Indeed the knot moves and the local crossings have interpretations in terms of a homology theory that is associated to G-families of quandles — an idea that was introduced by Ishii, Iwakiri, Jang, and Oshiro. This homology theory effectively encompasses both group and quandle homologies.

Koji Fujiwara (Department of Math, Kyoto University)
Growth of groups

Let G be a group with a finite generating set S. Let a_n be the number of elements whose word length in terms of S is n. The growth function $f_S(t)$ is defined by $f_S(t) = \sum_n a_n t^n$.

There have been many studies on $\{a_n\}$ and $f_S(t)$ from the view point of geometry, for example, on the growth rate of a_n by Milnor and Gromov, and on the rationality of $f_S(t)$ for word-hyperbolic groups. More recently, there are interesting results for Coxeter groups and knot groups.

This will be a survey talk on this subject. I plan to explain some standard methods from geometric group theory, which do not exactly apply to knot groups.

Eriko Hironaka (Florida State University / University of Tokyo (Visitor))
Small dilatation pseudo-Anosov mapping classes

It is an open problem to describe pseudo-Anosov mapping classes with small dilatation. In this talk we present the minimum dilatation problem, and give some conjectures about necessary characteristics of mapping classes with small dilatation.

Masahide Iwakiri (Graduate School of Science and Engineering, Saga University)
A G-family of quandles and handlebody-knots

In this talk, we introduce the notion of a G-family of quandles and use it to construct invariants for handlebody-knots. We also show that our invariant can detect the chiralities of some handlebody-knots including unknown ones.

This is a joint work with Atsushi Ishii, Yeonhee Jang and Kanako Oshiro.

Seiichi Kamada (Hiroshima University)
Braids and branched coverings of dimension three (joint work with J. Scott Carter)

Braids and 2-dimensional braids (surface braids) are related to links and surface links, and have been studied well. Here we introduce the notion of an (embedded or immersed) 3-dimensional braid, and study about a relationship between branched coverings of the 3-sphere. The chart description method for 2-dimensional braids is generalized to those for branched coverings of the 2 and 3-sphere, and 3-dimensional braids. In the talk, 2-dimensional case will be explained much so that the audience would be able to see the idea of charts. This is a joint work with J. Scott Carter.

Ryo Nikkuni (School of Arts and Sciences, Tokyo Woman's Christian University)
$\triangle Y$-exchanges and Conway-Gordon type theorems

Knots and links in a spatial graph are mutually dependent in general. Actually, what is called the Conway-Gordon theorem gives a kind of dependent relation on the invariants of knots and links in a spatial graph. In this talk, we introduce several such Conway-Gordon type dependent relations and give a method to carry the dependent relation for a graph to the one for another graph by $\triangle Y$-exchanges. This is partially joint work with Hiroka Hashimoto and Kouki Taniyama.

Sakie Suzuki (RIMS, Kyoto University)
On the universal sl_2 invariant of Brunnian bottom tangles

The universal sl_2 invariant is an invariant of bottom tangles from which one can recover the colored Jones polynomial of links. We are interested in the relationship between topological properties of bottom tangles and algebraic properties of the universal sl_2 invariant. A bottom tangle T is called Brunnian if every proper subtangle of T is trivial. In this talk, we study the universal sl_2 invariant of Brunnian bottom tangles. This result is applied to the colored Jones polynomial of Brunnian links.

Kokoro Tanaka (Tokyo Gakugei University)
Interpretation of rack coloring knot invariants in terms of quandles

It is known that quandles give us invariants of knots and racks give us that of framed knots. Considering a knot with an integer as a framed knot, Nelson constructed an invariant of (unframed) knots by using rack coloring invariants. It is natural to consider whether there is some relationship between his invariant and an invariant of knots derived from quandle theory. In this talk, we give an interpretation of his invariant in terms of quandles. This is a joint work with Yuma Taniguchi.

Dylan Thurston (Barnard College / Tokyo Institute of Technology (visitor))
Computing HOMFLY homology via bimodules

Khovanov explained how HOMFLY homology can be presented in terms of Soergel bimodules. This description is reasonably computationally effective as it stands, although more can be hoped for. This talk will introduce the description and show how to use it in practice.