Braids at Banff -- ABSTRACTS and titles

1. Hitoshi Murakami
"Limits of the colored Jones polynomials of a knot and the volumes of the three-manifolds obtained by Dehn surgeries"

2. Christian Kassel
"From Sturmian morphisms to the braid group B_4"

Abstract:
(joint work with Christophe Reutenauer, UQAM, Montr\'eal)
The group ${\rm Aut}(F_2)$ of automorphisms of the free group F_2 on two generators a and b contains the monoid ${\rm St}$ of positive automorphisms consisting of those automorphisms that send a and b onto words involving only positive powers of a and b. Positive automorphisms preserve an important class of infinite words in a and b, called the Sturmian sequences. (Sturmian sequences occur in various fields such as number theory, ergodic theory, dynamical systems, computer science, crystallography.) We are interested in a submonoid ${\rm St}_0$ of index two in ${\rm St}$, which we call the special Sturmian monoid. We show that this submonoid of ${\rm Aut}(F_2)$ can be realized naturally as a submonoid of the braid group B_4 of braids with four strands. We use this to relate the groups B_4 and ${\rm Aut}(F_2)$ in a precise way. We also give a new criterion for two words u and v to form a basis of F_2.

3. Patrick. Dehornoy,
"THE GROUP OF PARENTHESIZED BRAIDS"

Abstract: We describe a seemingly new and interesting group $B_\bullet$ obtained by gluing in a natural way two well-known groups, namely Artin's braid group B_∞ and Thompson's group F. The elements of $B_\bullet$ can be realized using braid diagrams in which the distances between the strands are non uniform and some rescaling operators may change these distances. We show that

$B_\bullet$ shares many properties with B_∞: as the latter, it can be realized as a subgroup of a mapping class group, here that of a sphere with a Cantor set removed, and as a group of automorphisms of a free group; also $B_\bullet$ is a group of fractions, it is orderable, and it admits an acyclic left self- distributive operation. On the other hand, like F, the group $B_\bullet$ can be interpreted as the geometry group for a family of algebraic rules, here associativity together with a twisted form of commutativity.

4. Tara Brendle:
"Commensurations of the Johnson kernel"

Abstract: We show that Comm(K) = Aut(K) = Mod(S), where K is the subgroup of the mapping class group Mod(S) generated by twists about separating simple closed curves. In particular, this verifies a conjecture of Farb. (Joint work with Dan Margalit.)

Talks for Monday, Tuesday, Wednesday and Thursday AM.
Estimate 4 hours of talks each day.
We have room for 8 1- hour + 4 3/4 hour + 6 1/2 hour:

1. Juan Gonzalez- Meneses (on work with Joan Birman)
"Conjugacy problem for pseudo- Anosov braids".

Abstract: This is a joint work with Joan S. Birman. We present a new algorithm which determines if two pseudo- Anosov braids are conjugate, and computes the conjugating element. This approach reveals some previously unknown structure of the conjugacy classes of pseudo- Anosov braids.
The algorithm seems likely to be polynomial, for reasons that we will explain, however we have not yet proved that.

2. Alissa Crans (1/2 hour, Monday or Tuesday)
"Solutions of the Yang- - Baxter and Zamolodchikov Tetrahedron Equations".

Abstract:Just as we can obtain a solution of the Yang- Baxter equation in any

braided monoidal category, we can get a solution of the Zamolodchikov
tetrahedron equation for any object in a braided monoidal 2-category. We
will show that just as any Lie algebra gives a solution of the
Yang-Baxter equation, any Lie 2-algebra gives a solution of the
Zamolodchikov tetrahedron equation.

3. Fred Cohen
"Connections of braid groups to homotopy theory, and low dimensional topology"

4. Dan Margalit
"Injections of Artin groups"

Abstract:Let G and H be any of the following Artin groups: A(A_n)
A(~A_n-1) A(C_n) A(~A_n-1) or the pure braid group PB_n, and
let Z denote the center of G (or H). It has recently come
to light that G/Z is a finite index subgroup of the mapping
class group of a sphere S with n+2 punctures. In joint work
with Bob Bell, we show that any injection from G/Z to H/Z is
induced by a homeomorphism of S. In particular, this
specifies when such an injection exists. As a corollary, we
are able to classify injections of G to H.

5. Gregor Masbaum
``Integral lattices in TQFT"

Abstract: We will describe joint work with Pat Gilmer where we
find explicit bases for naturally defined lattices in the vector
spaces associated to surfaces by the SO(3) TQFT at an odd
prime. These lattices, whose existence comes from the fact that the
associated quantum invariants of 3-manifolds are algebraic integers,
form an "Integral TQFT" in an appropriate sense.

6. Luis Paris
"Artin groups up to isomorphism"

7. Bill Menasco
"Monotonic Simplification and Recognizing Exchange Reducibility"

\begin{abstract}
The Markov Theorem Without Stabilization (MTWS) established the existence

of a calculus of braid isotopies that can be used to move between closed braid
representatives of a given oriented link type without having to increase the
braid index by stabilization. Although the calculus is extensive there
are three key isotopies that were identified and analyzed---destabilization,
exchange moves and braid preserving flypes. One of the critical open problems
left in the wake of the MTWS is the {\em recognition problem}---determining when
a given closed n-braid admits a specified move of the calculus.
This talk is about an algorithmic solution to the recognition problem for
three isotopies of the MTWS calculus---destabilization, exchange moves
and braid preserving flypes. The algorithm is ``directed'' by a complexity measure
that can be {\em monotonic simplified} by the application of {\em
elementary moves} on a modified braid presentation.
\end{abstract}

8.Xiao-Song Lin:
"Representations of braid group and colored HOMFLY polynomials".

9. Hao Zheng:
"A reflexive representation of braid groups and its applications"

10. Liam Watson (1/2 hour on thesis, ubc)
"Braid Group Actions and the Jones Polynomial"

11. Hans Wenzl
"Braid representations and tensor categories"

Description: how representations of braid groups can be used to construct and classify
certain braided tensor categories which are useful in low dimensional
topology, physics, operator algebras etc.
I could also put more emphasis about classifying all representations
of B_3 up to dimension 5.

12. Toshitake Kohno
"Braids and hypergeometric integrals"

13. Christine Lescop

Title: The Walker invariant as a configuration space integral.

The Casson invariant λ is a topological invariant of integral homology 3-spheres
(that are 3-manifolds with the same integral homology as S^3).
Casson defined it by introducing a clever way of counting the
SU(2)-representations of the fundamental groups of these manifolds, in 1984.
In 1999, Greg Kuperberg and Dylan Thurston showed how to
express the Casson invariant as a configuration space integral.

This Kuperberg-Thurston result implies that $6 \lambda(M)$ is the
algebraic intersection of three codimension 2 manifolds
in the 6-dimensional space of two-point configurations of M,
for an integral homology sphere M.

We shall explain this result and show how it extends to the
Walker generalisation of the Casson invariant to rational homology spheres.
On our way, we shall present a topological characterisation of the Walker
invariant.

14. Jean Michel (1/2 hour, at his request)
'Hurwitz action on euclidean reflections'

Abstract: Dubrovin and Mazocco (Inventiones 141(2000)55--147) have given a proof
that, if the Hurwitz action of the braid group on a triple of Euclidean
reflections in R^3 has a finite orbit, then the group generated by these
reflections is finite. The proof is rather long, and they ask if the
analogous question has a positive answer in R^n.
Humphries (J. Algebra 269(2003) 556-588) has asserted such a result,
but his proof is irremediably flawed. I have found a very short
proof that if the Hurwitz orbit of an n-tuple of Euclidean
reflections is finite, then the group generated
is finite. At well as correcting Humphries' result, the proof is
considerably simpler that Dubrovin's and Mazocco's argument.

15. Gus Lehrer
``The action of reflection groups on the cohomology of generalised
pure braid groups.''

16. Ivan Marin

"On the representation theory of (generalized ?) braid groups"

Abstract: My talk will be about the representations of braids obtained in a systematic way from the representations of infinitesimal braids, The decompositions of tensor products and the unitarisability properties can be shown to hold from this approach -- also the actions of Gal(Qbar/Q) that are involved in this setting.

17. Holly Hauschild (1/2 hour)
"The Tangle Picture for the Affine Birman-Murakami-Wenzl Algebra"

Abstract: It has been shown by Morton and Wassermann that the Birman-Murakami-Wenzl algebra is isomorphic to a Kauffman tangle algebra.
We show an extension of this isomorphism gives an isomorphism between the affine Birman-Murakami-Wenzl algebra and a corresponding tangle algebra in the solid torus.

Elena Kudryavtseva (Moscow State University)
"Invariants of Knots, Braids and Magnetic Fields"

Abstract: Let G be the group of all area-preserving self mappings of the 2-disk D^2, whose restriction to the boundary of the disk is the identity. A real valued function f on G is called invariant if $f(g)=f(hgh^{-1})$ for any elements g,h of G. Known examples are:
1) the Calabi invariant, which equals the averaged linking number for pairs of orbits of the corresponding (magnetic) flow in the solid torus $D^2\times S^1$,
2) the norm corresponding to the L_∞ metric on the tangent space of G, called the Hofer norm,
3) certain spectral invariants.

We introduce the notion of a C^1-smooth function on G and prove that any C^1-smooth invariant on G is a function of the Calabi invariant. As a consequence, higher order knot (or braid) invariants cannot be generalized to invariants of magnetic fields in the solid torus.