**Abstracts of talks**

**KNOTS in WASHINGTON VIII;**
The Conference on Knot Theory and its Ramifications

April 30, May 1 , 1999, at the George Washington University..
Organizers:
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All talks will take place in Funger Hall (2201 G Street, NW), Room 310 (G street / 23 street on GWU campus)
FRIDAY April 30.

1:00 - 2:00 Jeffrey Lagarias (Lucent Technologies Bell Laboratories)
Much Ado about Knotting: The Complexity of Unknotting
Abstract:
We consider the problem of deciding whether a polygonal knot in 3-dimensional Euclidean space is unknotted (that is, whether it is capable of being continuously deformed without self-intersection so that it lies in a plane). As background we will first review the history of results on the computational complexity of problems in low dimensional topology. We show that this problem, UNKNOTTING PROBLEM, can be solved in time O(exp(cn)) where the input is a knot diagram with n crossings, and that it is in the complexity class NP. More generally, we show that the problem of determining the genus of a polygonal knot is in PSPACE, and is solvable in time $O(exp(cn^2))$. The approach is based on Haken's work using normal surfaces in 3-manifolds. (This is joint work with Joel Hass (U. Calif-Davis, and Nick Pippenger-U. British Columbia).

Hiroshi Goda (University of California at Davis)
Almost alternating diagrams and fibered links in the 3-sphere
Abstract:
This is joint work with Mikami Hirasawa and Ryosuke Yamamoto. Let L be an oriented link with an alternating diagram D. It is known that L is a fibered link if and only if the surface R obtained by applying Seifert's algorithm to D is a Hopf plumbing. Here, we call R a Hopf

plumbing if R is obtained by successively plumbing finite number of Hopf bands to a disk. In this talk, we discuss its generalization so that we show the following theorem. Let R be a Seifert surface obtained by applying Seifert's algorithm to an almost alternating diagrams. Then R is a fiber surface if and only if R is a Hopf plumbing. We also show that the above theorem can not be generalized to 2-almost alternating diagrams, that is, we give examples of 2-almost alternating diagrams for knots whose Seifert surface obtained by Seifert's algorithm are fiber surfaces that are not Hopf plumbing. This is shown by using a criterion of Melvin-Morton.

3:40 Reception; Funger Hall, Room 310

SATURDAY May 1

10:00 - 10:30am Coffee and refreshments

10:30 - 11:10 Ted Stanford (US Naval Academy)
A move on diagrams that generates S-equivalence of knots
Abstract:
Given a knot K, choose a Seifert surface S and a basis B for the first homology of S. Then there is a matrix M that gives the pairwise linking numbers of these basis elements. This matrix is not an invariant for K because it changes when either S or B is chosen differently. Much information is still available from M (both the Alexander polynomial and signature may be computed from M, for example), because allowable changes in S or B translate into allowable modifications, or moves, on M, and these moves generate an equivalence relation on matrices which is called S-equivalence and which is quite nontrivial. Two knots with S-equivalent matrices are themselves called S-equivalent.

Trotter (1973) characterized S-equivalence from a purely a lgebraic point of view, and showed, among other things, that some knots are not S-equivalent to their reverses. Thus S-equivalence is stronger in some ways than quantum invariants, while on the other hand it is easy to give examples of S-equivalent knots which are distinguished by the Jones polynomial.

In joint work with Swatee Naik, I will show that S-equivalence is generated by a single move on knot diagrams, the doubled-delta move.

11:10 - 11:30 coffee and refreshments

11:30 - 11:50 Yongwu Rong (GWU)
A Leibniz type formula for links
Abstract:
- with application to higher order link polynomials

12:30 - 12:50 Doug Bullock (UMCP) The Yang-Mills measure in the Kauffman bracket skein algebra Abstract:
The Kauffman bracket skein algebra of a handlebody is now known to be a quantization of the function algebra on the SL(2,C)-character variety of the handlebody. The "measure" of the title is a method of integrating functions in this algebra, even though their domain is not a recognizable measure space. We give both a combinatorial and an analytic integration procedure. The latter is expressed as an integral over a compact Lie group, while the former is used to show that a particular function obtained from a Heegaard splitting integrates to the Turaev-Viro invariant.

12:50-2:30 Lunch

2:30 - 3:00 Maxim Sokolov (GWU)
Dijkgraaf-Witten invariants and periodic 3-manifolds
Abstract:

3:10 - 3:30 Dubravko Ivansic (GWU)
Hyperbolic manifolds as "knot" complements
Abstract:
A finite volume hyperbolic 3-manifold M is always the complement of some link (i.e. a codim-2 submanifold) inside a compact manifold N which is often the 3-sphere. We look at what the situation is for the generalization of this question to higher dimensions and come up with a surprise: there are only finitely many hyperbolic 4-manifolds that are "knot" complements inside the 4-sphere. Generalizing "being complement to a codim-2 submanifold" to "being complement to a codim-1 submanifold" gives an analogue of Dehn surgery where only finitely many manifolds are obtained as a result of surgery.

3:40 - 4:00 Jozef H. Przytycki (GWU)
Homotopy skein modules of 3-manifolds: an example in Algebra Situs
Abstract:
*Algebra Situs* is a branch of mathematics which has its roots in Jones construction of his polynomial invariant of links, Jones polynomial and Drinfeld work on quantum groups. It encompasses theory of quantum invariants of knots and 3-manifolds, algebraic topology based on knots, q-deformations, quantum groups, and overlaps with algebraic geometry, non-commutative geometry and statistical mechanics.

*Algebraic topology based on knots* may be characterized as a study of properties of manifolds by considering links (submanifolds) in a manifold and their algebraic structure. The main objects of the discipline are *skein modules*, that is quotients of free modules over ambient isotopy classes of links in a manifold by properly chosen local (skein) relations.

We concentrate, at this lecture, on one relatively simple example of skein modules of 3-manifolds – the q-homotopy skein module. This skein module has already many ingradients of the theory: algebra structure (reflecting topology), associated Lie algebra, quantization, state models...

4:10 - 4:30 Paul Kainen (GeorgeTown University)
Topological graph theory and quantum computing
Abstract:

4:40 - 5:00 Tatsuya Tsukamoto (GWU)
A criterion for almost alternating links to be non-splittable
Abstract:

5:10-5:30 Qi Chen (GWU)
The 3-move conjecture for 5-braids
Abstract: