Abstracts of talks presented at KNOTS in WASHINGTON
the First Miniconference on Knot Theory and its Ramifications held on Saturday, October 28, 1995 at the George Washington University.

10:30 - 11:00 Jozef H. Przytycki (GWU), Knots and Braids in Gauss' notebooks.

ABSTRACT. "One of the oldest notes by Gauss to be found among his papers is a sheet of paper with the date 1794. It bears the heading "A collection of knots" and contains thirteen neatly sketched views of knots with English names written beside them... With it are two additional pieces of paper with sketches of knots. One is dated 1819; the other is much later, ...".

Motivated by this description taken from P.G.Stäckel's article "Gauss als Geometer", in the X'th Volume of Gauss' Collected Works, I spend a few days at the old University Library in Göttingen looking through Gauss' old notebooks. I will present here some of the findindgs including the drawing of the four string braid with a comment "From this you can get the essence of knotting." It is not easy to date the drawing but I believe it was done around 1814 and for sure before 1830.

11:15 - 12:15 Yongwu Rong (GWU), Distinguishing knots using Jones-Witten invariants.

ABSTRACT

One of the major unsolved problems in knot theory is to find a practical way of deciding whether two knots are the same. The discovery of Jones-Witten invariants has shed some light on this problem. This talk intends to discuss some aspects of this approach.

On the negative side, we show examples of different knots or 3-manifolds that the Jones-Witten invariants fail to detect. We introduce a notion of "generalized mutation" that unifies many of such previous constructions. This allows us to produce new examples of 3-manifolds with the same Witten invariants.

On the positive side, we describe a class of new invariants of links that we call "higher order link polynomials". They are naturally related to the previous link polynomials and the Vassiliev invariants. We explain how they may distinguish more or even all knots.

2:00 - 3:00 Józef H. Przytycki (GWU), Search for different links with the same Jones' type polynomials.

Abstract.
We describe in this talk three methods of constructing different links with the same Jones type invariant. All three can be thought as generalizations of mutation. The first combines the satellite construction with mutation. The second uses the notion of rotant, taken from the graph theory, the third, invented by Jones, transplants into knot theory the idea of the Yang-Baxter equation with the spectral parameter (idea employed by Baxter in the theory of solvable models in statistical mechanics). We extend the Jones result and relate it to Traczyk's work on rotors of links. We also show further applications of the Jones idea, e.g. to 3-string links in the solid torus. We stress the fact that ideas coming from various areas of mathematics (and theoretical physics) has been fruitfully used in knot theory, and vice versa.

3.30 - 3:50 Adam Sikora (GWU), Conway algebras and the Homflypt polynomial.

Abstract:
We are going to discuss Conway algebras and state the basic theorems concerning these algebras. Conway algebras are abstract algebras with two binary operations and axioms motivated by Conway's skein theory. They were introduced by J. Przytycki and P. Traczyk in 1984, who proved that every Conway algebra yields an invariant of links which take values in this algebra. The Homfly polynomial was the main example of an invariant obtained in this way. I have recently shown that it is also the strongest invariant given by Conway algebras.

4:00 - 4:20 Eugene Xia (Univ. Maryland, College Park), The Moduli of Flat $PGL(2,\mathbb{R})$ Structures Over Riemann Surfaces.

Abstract.
Given a compact Riemann surface M with genus $g > 1$, the deformation space $Hom(\pi_1(M), PGL(2,\mathbb{R}))/PGL(2,\mathbb{R})$ has $2^{2g+1}+2g-3$ connected components with $2g-1$ of them belonging to $Hom(\pi_1(M), PSL(2,\mathbb{R}))/PGL(2,\mathbb{R})$. We study the topology of these components and prove that each of the other $2^{2g+1}-2$ components contains an open dense subset $\mathcal{W}'$ of complex dimension $3g-3$. Moreover, there exists a complex vector bundle $\mathcal{E}$ of rank $2g-2$ over $T^{g-1}\setminus\{1\}$ where T^{g-1} is the compact complex torus of complex dimension $g-1$ such that $\mathcal{W}' \cong \mathcal{E} \setminus \mathcal{Z}$ where Z is the zero section of $\mathcal{E}$.

4:30 - 4:50 Michael McDaniel (GWU), On the dimension of the space of Vassiliev invariants.

ABSTRACT: Vassiliev Invariants are a collection of knot invariants introduced in 1990 in the study of singularities. They form vector spaces V_n graded by integers. An interesting problem is to compute the dimensions of these spaces. This talk surveys some partial results about dimensions of subspaces. Following Guowu Meng's 1994 paper, "Bracket Models for Weight Systems and the Universal Vassiliev Invariants", I will explore certain subspaces that come from various link polynomials, and explain Meng's computation of the dimension of these subspaces. A few questions that naturally arise from Meng's work will be discussed.