LOGIC SEMINAR

Logic Seminar for General Audience
Friday, September 16, 2005
2:30–3:30 p.m.
1957 E Street, Room 212
Speaker: John Chisholm, Western Illinois University
Title: *Dividing the goods*
Abstract: Not until the twentieth century did mathematicians successfully devise "fair division" methods for more than two people, and active research in this field continues to make new discoveries. This talk will present an overview of the mathematics of fair division, including discussion of such questions as: What should we mean to say a division is "fair"? Are there different possible meanings? How can three people divide a cake among themselves so that their shares are "proportional"? Or "envy-free"? Can we prove that these methods are guaranteed always to work? Can these methods be used for more than three people? What happens if we want to divide an inheritance consisting of several pieces of furniture? (We don't want to be cutting any furniture into pieces!) We will conclude with an "envy-free" method for this situation, recently discovered by the speaker.

No background beyond basic algebra is required. Everybody welcome, from all departments, including undergraduates.

Friday, September 23, 2005
2:30–3:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: John Chisholm, Western Illinois University
Title: *Constructing computable models*
Abstract: The lecture will develop and give applications of a cleaned-up, mess-free standard framework for finite-injury priority constructions of computable isomorphic copies of structures, which allows us to push to the background many of the details that all too often can obscure key features of proofs in computable model theory.

Friday, September 30, 2005
4:30–5:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: John Chisholm, Western Illinois University
Title: *Algorithmic categoricity of structures*
Abstract: A computable structure A is *computably categorical* provided that, for any computable structure B isomorphic to A, there is some computable isomorphism between A and B. When we can't necessarily get a computable isomorphism, but we can get one that is Δ_2^0, we say that A is Δ_2^0-*categorical*. If the isomorphism can be drawn from some fixed list of uniformly Δ_2^0 bijections (where the same list works for all computable copies of A), then A is said to be *strongly Δ_2^0-categorical*. We will discuss how these properties

are connected with whether *A* contains some fixed finite tuple of parameters ***a*** such that the type of every tuple in (*A*, ***a***) is determined by an existential formula. [When this occurs, *A* is said to have a *Scott family* (of existential formulas) over ***a***.]

Friday, October 7, 2005
2:30–3:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: Jennifer Chubb, GWU graduate student
Title: *New results on algorithmic degree spectra of relations on structures*
Abstract: I will present some of the very recent results on degrees of unsolvability of relations on computable structures. This is joint work with Chisholm, Harizanov, McNicholl, and Sarah Pingrey (grad student).

Friday, October 14, 2005
2:30–3:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: Eric Ufferman, GWU graduate student
Title: *Automorphism groups of structures*
Abstract: We will discuss some general results on the automorphism and computable automorphism groups of countable and computable structures. In some cases, we can reconstruct the structures from their automorphism groups.

Friday, October 28, 2005
2:30–3:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: Eric Ufferman, GWU graduate student
Title: *New results on finite automorphism semigroups*
Abstract: For a structure, the set of all finite partial automorphisms forms a semigroup under function composition. I will present some of the recent results on recovering information about countable structures form these semigroups. This is joint work with Jennifer Chubb (grad student), V. Harizanov, A. Morozov, and Sarah Pingrey (grad student).

Friday, November 4, 2005
2:30–3:30 p.m.
Old Main (1922 F Street), Room 104
`Speaker:` Eric Ufferman, GWU graduate student
`Title:` *New results on partial computable automorphism semigroups*
`Abstract:` For a computable structure, we consider the semigroup of all partial computable automorphisms, under function composition. We establish that for certain computable structures, the isomorphism of these semigroups implies that the structures are also isomorphic, even by a computable isomorphism. This is joint work with Jennifer Chubb (grad student), Harizanov, Morozov, and Sarah Pingrey (grad student).

Logic Seminar for General Audience
Friday, November 11, 2005
2:30–3:30 p.m.
1957 E Street, Room 314
`Speaker:` Michael Moses, GWU
`Title:` *Mathematical abstraction: Plato's ideal forms or Leibniz's felicitous fictions?*
`Abstract:` Do abstract mathematical structures represent our feeble attempt to capture other, more perfect entities that exist 'out there' or are they little things that we fabricate in order to keep our confusion under control? Where's 'out there' and which fabrications are the more 'felicitous'? And why do we bother with them anyway?

I will offer in this talk an explanation of just why abstraction plays such a central role in mathematical (and other scientific) reasoning, which explanation will suggest answers for at least one or two of the above questions. In the last part of the talk I will give an example of the interaction of these 'soft' ideas with more concrete mathematics.

Friday, November 18, 2005
2:30–3:30 p.m.
Old Main (1922 F Street), Room 104
`Speaker:` John Chisholm, Western Illinois University
`Title:` *Definability of intrinsically computably enumerable sets*
`Abstract:` Let S be a computably enumerable (c.e.) subset of a computable structure A. We say that S is *intrinsically c.e.* iff any isomorphism from A to any computable structure maps S to a c.e. set. We will discuss definability of intrinsically c.e. sets, showing in particular that an intrinsically c.e. set need not be definable by any (infinitary) Σ_2 formula.

Friday, December 2, 2005
12:30–1:30 p.m.
Old Main (1922 F Street), Room 305
`Speaker:` Bakhadyr Khoussainov, University of Auckland, New Zealand
http://www.cs.auckland.ac.nz/~bmk/
`Title:` *Automatic Structures*
`Abstract:` We introduce the concept of a structure that can be defined in terms of automata: finite automata, tree automata, Buchi automata, Rabin automata. Nerode and

the speaker initiated the systematic study of automatic structures in 1994. An important property of automatic structures is that they are closed under first order interpretations and have effective semantics. In particular, the first order theory of any automatic structure is decidable. In addition to giving many examples of automatic structures, we will survey recent results and outline some of the interesting proofs. Results are jointly with Nerode, Rubin, Stephan, and Nies. This talk will be accessible to all math and computer science graduate students.

Friday, December 9, 2005
12:30–1:30 p.m.
Old Main (1922 F Street), Room 305
`Speaker:` John Chisholm, Western Illinois University
`Title:` *Computable copies of* 1-*decidable structures*
`Abstract:` A structure is 1-*decidable* when we can computably determine whether a finite sequence satisfies an existential formula. Kudinov has characterized when such a structure is computably categorical; we will give a comprehensible proof of this result. Also, using a very similar proof technique, we will show that any intrinsically c.e. relation on a 1-decidable structure must be definable by a computable Π_2 formula.

Math Logic PhD Specialty Exam Lecture
`Speaker:` Jennifer Chubb, GWU
Wednesday, December 14
11:00a.m.–1:00p.m.
1957 E Street, Room B16
`Title:` *Computability and Ramsey's Theorem on Trees*
`Abstract:` In 1930 Ramsey showed for any a finite coloring f of the collection of n-element subsets of natural numbers, there is an infinite subset A of the naturals so that all the n-element subsets of A are colored the same color by f. In 1968, Jockusch showed that for computable colorings; this fact is witnessed by a Π_2^0 set. In this talk, I will present similar results for finite colorings of n-tuples of comparable nodes of the full binary tree, 2^ω. In particular, for any 2 coloring of pairs of comparable nodes of 2^ω, there is a Π_2^0 monochromatic embedded subtree isomorphic to the full binary tree.