FALL 2004
LOGIC SEMINAR

Friday, October 15, 2004
2:30-3:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: Valentina Harizanov, GWU
Title: *Effectively categorical models*

Friday, October 29, 2004
2:30-3:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: Russell Miller, Queens College, CUNY
Title: *Order-computable sets*

Abstract: Let S be a subset of ω, and consider the structure $(\omega, <, S)$, in the language of linear orders with an additional unary predicate. We say that S is *order-computable* if this structure is computably presentable, i.e. if there is a computable set C and a computable order 0 on ω such that $(\omega, 0, C)$ is isomorphic to $(\omega, <, S)$.

This simple concept resists any straightforward characterization by purely computability-theoretic properties. We present a survey of results about order-computable sets, with proofs described or sketched as time permits, including the following. All low c.e. sets are order-computable, but there exist c.e. sets and low d.c.e. sets which are not. Every n-c.e. set is Turing-equivalent to an n-c.e. order-computable set, and similarly for ω–c.e. sets. However, there exist Turing degrees below $\mathbf{0'}$ containing no order-computable set. There also exist (noncomputable) Turing degrees containing only order-computable sets. No 1-random set is order-computable. Finally, we combine some of these results to prove that there exist an order-computable c.e. set and an order-noncomputable c.e. set which are computably isomorphic to each other. This last result suggests the extent to which the property of order-computability differs from most computability-theoretic properties.

This work is joint with Denis Hirschfeldt and Sergey Podzorov.

Friday, November 5, 2004
2:30-3:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: Tim McNicholl, University of Dallas and GWU
Title: *Intrinsic reducibilities*, Part I

Abstract: We discuss the relation between the computability and definability. In particular, we prove a body of results which establish that if a computational relationship between a relation and a Turing jump of a countable model is preserved under isomorphism, then the relation must be definable by a computable infinitary formula.

Friday, November 12, 2004
2:30-3:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: Tim McNicholl, University of Dallas and GWU
Title: *Intrinsic reducibilities*, Part II

Friday, November 19, 2004
2:30-3:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: Jeff Hirst, Appalachian State University
Title: *A real tour of reverse mathematics*
Abstract: This talk will survey the subsystems of second order arithmetic used in reverse mathematics, categorizing results from real analysis by proof theoretic strength and degree of noncomputability. We will look at results that illustrate common proof techniques in reverse mathematics and results that reveal peculiar aspects of real analysis.

Friday, December 10, 2004
2:30-3:30 p.m.
Old Main (1922 F Street), Room 104
Speaker: Valentina Harizanov, GWU
Title: *Degree spectra of relations on structures*
Abstract: We study relations on countable structures. For a complexity class P, we say that a relation R on a computable structure A is intrinsically P if its image on any computable isomorphic copy of the structure belongs to P. The Turing degree spectrum of R on A is the set of all Turing degrees of images of R under isomorphisms of A with computable structures. Turing degree spectra can be uncountable, countable and finite.

OTHER LOGIC TALKS

Mathematics Colloquium
Friday, October 29, 2004
1:00-2:00 p.m.
1957 E Street, Room B12
Speaker: Russell Miller, Queens College, CUNY
Title: *Coding information into structures*
Abstract: We consider the extent to which different types of structures allow information to be coded into them. For example, by a result of Hirschfeldt, Khoussainov, Shore, and Slinko, it is a straightforward matter to build a (symmetric irreflexive) graph from which one can compute a given set. It is also possible to code a set into a linear order, but in a weaker way: the set is computable in that particular copy of the linear order, but (by a result of Richter) not necessarily from another linear order isomorphic to the first one. In contrast, our coding into graphs allows the set to be computed from any isomorphic copy of the graph we built. We investigate the extent to which other types of structures allow stronger or weaker coding; as time permits, we may look at groups, rings, Boolean algebras, and/or trees.

The split between structures such as graphs, which allow structural coding, and those such as linear orders, which only allow coding into a presentation, appears to mirror the split between structures which admit all possible computable dimensions and those which only admit 1 and ω. However, the evidence for this conjecture remains empirical, and it is surprising, on the surface, that these two concepts might be related. We will introduce the notion of computable dimension and mention recent work which has supported the conjecture.

Mathematics Colloquium
Friday, November 19, 2004
1:00-2:00 p.m.
1957 E Street, Room B12
`Speaker:` Jeff Hirst, Appalachian State University
`Title:` *Reverse analysis*
`Abstract:` Reverse mathematics is a program in the foundations of mathematics which assesses the proof theoretic strength and degree of noncomputability of theorems from traditional branches of mathematics. In this talk, we will apply the techniques of reverse mathematics to some statements from real analysis. This process sometimes reveals surprising connections between theorems, with interesting consequences in computable analysis and constructive analysis.

Mathematics Colloquium
Friday, December 3, 2004
1:00-2:00 p.m.
1957 E Street, Room B12
`Speaker:` Tim McNicholl, University of Dallas and GWU
`Title:` *Ramsey theory on trees and reverse math*
`Abstract:` Let T be the complete infinite binary tree. Let n be a positive integer, and suppose the unordered n-tuples of T are finitely colored. We show there is a self embedding of T whose image is monochromatic. We then show that for fixed values of n no smaller than 3, this assertion is equivalent to a certain set-existence axiom which in turn is equivalent to the classical Ramsey Theorem for the same fixed value of n. This is the assertion that every finite coloring of the unordered n-tuples of natural numbers has an infinite monochromatic subset.