LOGIC SEMINAR
***Fall* 2009**

Friday, December 4, 2009
5:00–6:00 p.m.
Speaker: Hunter Monroe, International Monetary Fund
Place: Monroe Hall (2115 G Street), Room 267
Title: *Speedup for Natural Problems*

Abstract: Informally, a language *L* has speedup if, for any Turing machine for *L*, there exists one that is better. Blum showed that there are computable languages that have almost-everywhere speedup. These languages were unnatural in that they were constructed for the sole purpose of having such speedup. We identify an intuitive condition which, like several others in the literature, implies that accepting any *coNP*-complete language has an infinitely-often (i.o.) superpolynomial speedup. We also exhibit a natural problem which unconditionally has a weaker type of i.o. speedup based upon whether the full input is read. Neither speedup pertains to the worst case.

Friday, November 13, 2009
3:30–5:00 p.m.
(jointly with the Philosophy Department; Contact: Michele Friend michele@gwu.edu)
Speaker: Andrea Pedeferri, Università degli Studi di Milano, Italy
Place: Phillips Hall (801 22nd Street), Room 510
Title: *Why Do We Call Second Order Logic* "*Logic*"

Abstract: Second order logic has been always considered as problematic by modern logicians: the lack of completeness and the subsequent lack of a sound deductive system seem to rule out second order from the realm of "pure" logic. However, second order logic provides, with its expressive power, the possibility to give categorical characterizations of infinite structures. Accordingly, on the one hand we do not call second order a proper logic due to its being "uncontrollable". On the other hand, we consider the Löwenheim-Skolem Theorem as a corner stone of the "controllable" first order, although it states the incapability of a theory to "control" its models.

I think limitative theorems of first order are only *desiderata*. It has been shown in many ways how to deal with second order. I think it is time to move on to a more general level. In the light of these results on second order logic it is possible to start a discussion on which notions and rules are needed to make formalized languages "really" logic. Of course we need a sound deductive system; is it possible to find a way to control deduction in a second order framework to make it sound "enough"?

Friday, November 6, 2009
5:00–6:00 p.m.
Speaker: Russell Miller, CYNY, New York

http://qcpages.qc.cuny.edu/~rmiller/
Place: Monroe Hall (2115 G Street), Room 267
Title: *BSS Machines: Computability Without Search Procedures*

Abstract: Blum-Shub-Smale machines act on tuples of real numbers, treating each x in R as an atomic object, rather than as a Dedekind cut, a Cauchy sequence, or a subset of omega. Such machines run according to finite programs, using finitely many real parameters; they can perform comparisons (< and =) and compute any standard binary operation in a single step. Since their computations are required to halt within finitely many steps, they cannot search through the entire domain R^n, unlike standard Turing machines, which can search through N^n. We exploit this difference to show that for polynomials in *R[X]*, although factorizability is (easily) BSS-decidable, there are no BSS algorithms for finding the factors, nor for determining roots in R or C. If time permits, we will also examine a (significantly more involved) proof that the set of algebraic real numbers of degree d+1 over the rationals is not BSS-decidable from an oracle for the set of algebraic reals of degree less than or equal to d. This is a recent theorem of Calvert and Miller, which answers a question of Meer and Ziegler.

Friday, October 9, 2009
5:00–6:00 p.m.
Speaker: Valentina Harizanov, GWU
http://home.gwu.edu/~harizanv
Place: Monroe Hall (2115 G Street), Room 267
Title: *Computable Categoricity of Equivalence Structures*

Abstract: We investigate algorithmic properties of computable equivalence structures, their equivalence classes, and their characters. A computable structure A is computably categorical if for every computable isomorphic copy B of A, there is a computable isomorphism from A onto B. We establish that a computable equivalence structure A is computably categorical if and only if A has only finitely many finite equivalence classes, or A has only finitely many infinite classes, bounded character, and at most one finite k such that there are infinitely many classes of size k. We show that all computably categorical equivalence structures are relatively computably categorical. This is joint work with W. Calvert, D. Cenzer, and A. Morozov.