*UNIVERSITY SEMINAR: LOGIC ACROSS DISCIPLINES*

**Spring 2020**

**Monday, March 9, 2020**
3:45–5:00pm
Speaker: Alexandra Shlapentokh, East Carolina University
http://myweb.ecu.edu/shlapentokha/
Place: Phillips Hall (801 22nd Street), Room 736
Title: *What is the difference between the sets of primes*?
Abstract: We will discuss the history and recent developments concerning definability and decidability problems over subrings of the field of rational numbers.

**Thursday, February 20, 2020**
12:40–1:40pm
Speaker: Andrei Morozov, Sobolev Institute of Mathematics, Siberian Branch of the Russian Academy of Sciences, Novosibirsk
http://www.math.nsc.ru/%7Easm256/
Place: 1776 G Street, Room C117
Title: *On Sigma preorderings in* HF(R)
Abstract: We prove that omega_1 cannot be embedded into any preordering Sigma-definable with parameters in the hereditarily finite superstructure over the ordered field of real numbers, HF(R). As a corollary, we obtain characterizations of Sigma-presentable ordinals and Goedel constructive sets L_alpha. It also follows that there are no Sigma-presentations over HF(R) for structures of Turing degrees and certain strong degrees.

**Wednesday, February 19, 2020**
3:45–5:00pm
Speaker: Rumen Dimitrov, Western Illinois University
http://www.wiu.edu/users/rdd104/home.htm
Place: Phillips Hall (801 22nd Street), Room 736
Title: *Standard and nonstandard models*
Abstract: We will discuss the spectrum of standard and nonstandard models of arithmetic and of other systems of axioms. We will emphasize the importance of nonstandard models.

**Friday, February 14, 2020**
12:30–1:30pm
Speaker: Victor Selivanov, Institute of Informatics Systems, Siberian Branch of the Russian Academy of Sciences, Novosibirsk
https://persons.iis.nsk.su/en/vseliv
Place: Phillips Hall (801 22nd Street), Room 736
Title: *On computable fields of reals and some applications*

Abstract: In this joint work with Svetlana Selivanova we will discuss relationships of computably presentable ordered fields of reals with the field of computable reals. This have some applications to computable analysis, notably to linear algebra and to computing solutions of some linear systems of PDEs.

**Fall 2019**

**Friday, November 22, 2019**
11:00am–12:00noon
Speaker: Vince Guingona, Towson University
https://tigerweb.towson.edu/vguingona/
Place: Phillips Hall (801 22nd Street), Room 736
Title: *Computing* VC*-density*
Abstract: We consider the problem of computing Vapnik-Chervonenkis Density (VC-density) of uniformly definable families of sets in models of certain theories. VC-density is a measurement of the complexity of set systems that is closely related to multiple notions of learning in theoretical machine learning theory. In this talk, we survey some earlier results, including computing VC-density in weakly o-minimal theories and strongly minimal theories from a paper by Aschenbrenner, Dolich, Haskell, MacPherson, and Starchenko and computing VC-density in algebraically closed valued fields from a paper by Basu and Patel. Finally, we examine some results of mine on computing VC-density in VC-minimal theories.

**Friday, November 15, 2019**
11:00am–12:00noon
Speaker: Steffen Lempp, University of Wisconsin-Madison
https://www.math.wisc.edu/~lempp/
Place: Phillips Hall (801 22nd Street), Room 736
Title: *Building models of strongly minimal theories*
Abstract: What information does one need to know in order to build the models of a strongly minimal theory? To answer this question, we first formalize it in two ways. Note that if a theory T has a computable model, then $T \cap \exists_n$ is uniformly $\Sigma^0_n$. We call such theories Solovay theories. A degree is strongly minimal computing if it computes a copy of every model of every strongly minimal Solovay theory. A second notion, introduced by Lempp in the mid-1990's, is that of a strongly minimal relatively computing degree. A degree **d** is strongly minimal relatively computing if whenever T is a strongly minimal theory with one computable model, **d** computes a copy of every model of T. We characterize both classes of degrees as exactly the degrees which are high over **0**", i.e., $\mathbf{d} \geq \mathbf{0}''$ and $\mathbf{d}' \geq \mathbf{0}^{(4)}$.

**Friday, November 1, 2019**
11:00am–12:00noon
Speaker: Valentina Harizanov, GWU
https://home.gwu.edu/~harizanv/

Place: Phillips Hall (801 22nd Street), Room 736
Title: *Isomorphism problems*
Abstract: We consider the computable isomorphism problem, given by the set of pairs of codes for computable isomorphic structures. The complexity is measured using the notion of completeness within a suitable computability-theoretic complexity class.

**Friday, October 11, 2019**
11:00am–12:00noon
Speaker: Iva Bilanovic, GWU
Place: Phillips Hall (801 22nd Street), Room 736
Title: *Markov properties*
Abstract: We begin with a historical treatment of *Markov properties* in the original context of *recursively presented groups* and their relation to early questions in computability theory. We will then abstract the notion to other classes of structures and, time allowing, consider the examples of *partial injection structures* and *nested equivalence classes*.

**Friday, October 4, 2019**
11:00am–12:00noon
Speaker: Philip White, GWU
Place: Phillips Hall (801 22nd Street), Room 736
Title: *Motivating and characterizing large cardinals*
Abstract: There are certain properties which characterize the largeness of **N**. Whether or not these same features of largeness can be applied to an uncountable cardinal *aleph* is independent of the traditional axioms of set theory. If we suppose there exists a large cardinal exhibiting such features, we arrive at a theory provably stronger than traditional set theory. The aim of the talk is to motivate large cardinals as well as to introduce a preliminary result involving a new large cardinal notion (obtained under the guidance of Brent Cody of VCU).

**Friday, September 27, 2019**
11:00am–12:00noon
Speaker: Philip White, GWU
Place: Phillips Hall (801 22nd Street), Room 736
Title: *Forcing, an introduction*
Abstract: Forcing is a mathematical technique developed by Paul Cohen in the 1960s, which he used to prove the independence of the continuum hypothesis. Although forcing in many ways has become the standard technique used in set theory, to non-set-theorists it often seems like a mystery. We hope to give a quick introduction to the forcing technique, all the while making the technique seem less enigmatic to the non-set-theorist.

Logic-Topology Seminar
**Friday, September 20, 2019**
11:00am–12:00noon
Speaker: Jozef Przytycki, GWU
http://home.gwu.edu/~przytyck/

Place: Phillips Hall (801 22nd Street), Room 736
Title: *Gram determinants and Temperley-Lieb algebras*
Abstract: I will outline research completed with my students Rhea, Dionne, and Sujoy as part of our Mathathon IV project (December 2018-May 2019). We worked on Gram type determinants motivated and applied to Knot Theory. In particular, we found the closed formula involving Chebyshev polynomials for a Gram determinant involving the trace of Temperley-Lieb algebra.

**Friday, September 13, 2019**
11:00am–12:00noon
Speaker: Keshav Srinivasan, GWU
Place: Phillips Hall (801 22nd Street), Room 736
Title: *Can you always raise a natural number to a power*? (Part 2)

Abstract: We will continue our discussion of predicativity, the notion that we can only define new mathematical objects in terms of existing mathematical objects. We will walk through the proofs of results by John Burgess and Allen Hazen, concerning how much of natural number arithmetic can be recovered in predicative second-order logic. In the final part of the talk, we will discuss potential avenues for future research extending Burgess' and Hazen's work.

**Friday, September 6, 2019**
11:00am–12:00noon
Speaker: Keshav Srinivasan, GWU
Place: Phillips Hall (801 22nd Street), Room 736
Title: *Can you always raise a natural number to a power*?
Abstract: We will discuss predicativity, the notion that we can only define new mathematical objects in terms of existing mathematical objects. We will give an introduction to second-order logic, and explain how we can use it to do mathematics predicatively. In the final portion of the talk, we will discuss work by John Burgess and Allen Hazen concerning how much of Peano arithmetic is predicatively justifiable.