Mathematical Logic and Its Applications

September 26 – 29, 2016, RIMS, Kyoto University

Program & Abstracts

September 26 (Monday)

11:00-11:50 T. Miyamoto (Nanzan U.)
A Couple of Hypothetical Structures and Constructions in Set Theory (J)

13:30-14:20 J.D. Hamkins (CUNY)
The Modal Logic of Set-Theoretic Potentialism

Abstract: Set-theoretic potentialism is the ontological view in the philosophy of mathematics that the universe of set theory is never fully completed, but rather has a potential character, with greater parts of it becoming known to us as it unfolds. In this talk, I should like to undertake a mathematical analysis of the modal commitments of various specific natural accounts of set-theoretic potentialism. After developing a general model-theoretic framework for potentialism and describing how the corresponding modal validities are revealed by certain types of control statements, which we call buttons, switches, dials and ratchets, I apply this analysis to the case of set-theoretic potentialism, including the modalites of true-in-all-larger-Vβ, true-in-all-transitive-sets, true-in-all-Grothendieck-Zermelo-universes, true-in-all-countable-transitive-models and others. Broadly speaking, the height-potentialist systems generally validate exactly S4.3 and the height-and-width-potentialist systems validate exactly S4.2. Each potentialist system gives rise to a natural accompanying maximality principle, which occurs when S5 is valid at a world, so that every possibly necessary statement is already true. For example, a Grothendieck-Zermelo universe Vκ, with κ inaccessible, exhibits the maximality principle with respect to assertions in the language of set theory using parameters from Vκ just in case κ is a Σ_3-reflecting cardinal, and it exhibits the maximality principle with respect to assertions in the potentialist language of set theory with parameters just in case it is fully reflecting V$\kappa \prec$ V.

This is joint work with Øystein Linnebo, which builds on some of my prior work with George Leibman and Benedikt Löwe in the modal logic of forcing. Our research article is currently in progress. Questions and commentary can be made on my blog at http://jdh.hamkins.org/the-modal-logic-of-set-theoretic-potentialism-kyoto-september-2016/.

14:30-15:20 K. Higuchi (Nihon U.)
Computably Represented Structures

15:30-16:20 K. Takeuchi (Tsukuba)
Properties Characterized by Generalized Indiscernible

September 27 (Tuesday)

10:00-10:50 T. Arai (Chiba)
Introducing Prof. Kakuda into Proof Theory (J)

11:00-11:50 M. Itai (Tokai U.)
Get Started in the Midwest in the Mid 80's, Praising Model Theory; Its Past and Future (J)

13:30-14:20 F. Wagner (Lyon)
Bad Groups, Sad Groups, and the Golden Ginger Ale

Abstract: I shall report on two recent developments in the study of groups of finite Morley rank. A 40-year old question by Gregory Cherlin asks whether there is a simple group of Morley rank 3 other than PSL(2,K) for some algebraically closed field K. This would be the smallest counter-example to the Cherlin-Zilber algebraicity conjecture possible, as groups of rank 2 are soluble. Recently, O. Frécon has given a negative answer; I shall present a silmplified version of his proof. Another question concerns possible actions of groups of finite Morley rank on abelian groups I shall present a general result classifying infinite sets of uniformly definable endomorphisms as subsets of definable twisted endomorphism rings. This is joint work with B. Poizat and A. Deloro.

14:30-15:20 K. Yokoyama (JAIST)
On the Proof-Theoretic Strength of Ramsey's Theorem for Pairs

Abstract: In the filed of reverse mathematics, many people studied the strength of Ramsey's theorem and related combinatorial principles. Especially, determining the strength of Ramsey's theorem for pairs is a long-standing project. Recently, there are many important results on this topic both from computability theoretic view points and proof-theoretic view points. In this talk, I will mainly focus on the proof-theoretic strength and report some recent progress.

15:30-16:20 Y. Maruyama (Kyoto)
Dynamics of Duality: How Duality Emerges, Changes, and Breaks

Abstract: Duality abounds in science, both pure and applied: in mathematics there is duality between space and algebra; in physics there is duality between states and observables; in information science there is duality between systems and properties/behaviours; in logic there is duality between models and theories; and even in philosophy there is duality between realism and antirealism (Dummett), or substance metaphysics and process/function metaphysics (Whitehead/Cassirer). They look akin at a level of abstraction, and yet, taking a closer look at subtleties involved, one may find a parting of the ways.

In this talk, we shall look into the grand universe of dualities through the lens of foundations of mathematics, thus elucidating fundamental issues, from the traditional Hilbert's programme, to a more recent multiverse view of mathematics, and to the recently uncovered realm where the laws of Reason and the laws of Nature meet, the idea of which may be traced back to the Hilbert's 6th problem, the axiomatisation of physics, or to the logical positivist's bankrupt ideal of unified science revitalised in developments of categorical logical positivism and pluralistic unified science as its goal. (No prior knowledge shall be assumed beyond the undergraduate level.)

September 28 (Wednesday)

10:00-10:50 K. Mukai (Keio U.)
Relating the Abstract Design Theory to Barwise's Model Theoretic Semantics (J)

Abstract: Based on the notion of membership in the set theory, we can afford basic concepts of relation, function, and number, among uncountably many others for doing mathematics. In parallel, based on the support relation, Barwise/Seligman's Channel theory has been developed so that we will get mathematically rigorous and clear concepts on flow of information in distributed systems.

It is remarkable that Kakuda's Abstract Design Theory is aimed at the important but subtle notion of design itself based on the Channel theory. To encourage students and researchers to pursue and develop further the Abstract Design Theory, I will talk on some episodes and experiences from situation semantics, non-well-founded set theory and logic programming which involved me in my life.

11:00-11:50 Y. Kanai (Yamato U.)
Wandering Around One Corner of Axiomatic Set Theory (J)

13:30-14:20 B. Khoussainov (Auckland/Kyoto)
Computably Enumerable Structures: Domain Dependence

Abstract: We investigate dependence of algebraic structures on the domains given as quotient sets on natural numbers. We show that properties of structures over these domains depend on algorithmic properties of domains. We also compare the domains in terms of algebraic structures they permit to represent. This defines various partially ordered sets that depend on classes of structures under consideration. We investigate some algebraic properties of these partially ordered sets.

14:30-15:20 N. Hoshino (Kyoto)
Geometry of Interaction and Higher Order Functions

15:30-16:20 D. Mejia (Shizuoka)
Several Values in Cichon's Diagram

Abstract: We review some finite support iteration techniques of ccc posets (hopefully without being too technical) that can be applied to obtain models where several cardinals in Cichon's diagram assume pairwise different values. In particular, we show a quite recent result (jointly with V. Fischer, S. Friedman and D. Montoya) which states that there is a model where the cardinals of the diagram assume 7 different values, see http://arxiv.org/abs/1609.05433

September 29 (Thuesday)

10:00-10:50 Y. Sato (TUS)
On Quantifier Elimination Algorithm and Current Situation of its Computation (J)

Abstract: We introduce two important subjects of computer algebra. One is the theory of Groebner bases, the other is the theory of quantifier elimination. We introduce recent research progress of quantifier elimination algorithm using Groebner bases computation.

The first quantifier elimination algorithm was discovered by Alfred Tarski. Since then by enormous amount of the following researches (containing the work of Paul Cohen), we now have sufficiently practical quantifier elimination programs in several computer algebra systems.

11:00-11:50 M. Kumabe (OUJ)
On the Turing Degrees of Generic Sets (J)

13:30-15:20 P. Welch (Bristol)
Generalised Squares and Higher Stationarity

Abstract: We give an account, due to Brickhill, which generalises Jensen's characterisation of weak compactness in L to higher levels of indescribability using a notion of n-club corresponding to a (variant) of n-stationarity due to Bagaria-Magidor-Sakai. This incorporates a definition of coherent square sequences using n-clubs.

Talks with the symbol (J) will be given in Japanese and include tutorial for recent developments, stories of the good old days, and memories of Professor Kakuda.