Σ_2 variants of Supercompactness and the HOD Conjecture, Shoshana Friedman

HOD is the class of hereditarily ordinal-definable sets. There is an ongoing conversation in contemporary set theory concerning how far HOD can diverge from V, particularly in connection with Woodin's HOD Hypothesis and the HOD Conjecture.

We will present several definitions and ideas needed to understand these questions. We briefly survey some of the directions in which these divergences have been studied and then focus on the extent to which large cardinal properties are transferred into HOD, particularly in the region between supercompact and extendible cardinals. Since HOD is Σ_2 definable, it is also natural to consider variants of supercompactness that incorporate forms of Σ_2-correctness and to consider how these notions interact with HOD.

Breaking Patterns Revisited (FLINTA* in Academia), Sabine Theresia Köszegi

Ten years after Breaking Patterns? How Female Scientists Negotiate their Token Role in their Life Stories (Haas, Koeszegi & Zedlacher, 2016), the numbers have moved — but the patterns have proven remarkably resilient. Across the EU, women now earn 41% of doctoral degrees in science and engineering, yet account for only 34% of researchers; while they are better represented in the lower academic grades, their share declines with every step of seniority — down to just 20% of full professors in science and engineering (She Figures 2024). This keynote takes stock of these developments and asks why decades of equality initiatives have shifted proportions without dismantling structures. At the centre of my talk lies the problem of identity negotiation. Drawing on token theory and a biographical analysis of the life stories of female scientists, I show that women in male-dominated fields must continuously negotiate conflicting professional and gender identities. Two coping strategies emerge: a similarity strategy of assimilation to masculine norms ("my life is unexceptional") and a difference strategy of emphasizing otherness and struggling for equality ("I am different"). The sobering finding: neither strategy breaks patterns. Both leave the masculine norms of science unchallenged, while placing the burden of adaptation on individuals. Revisiting these findings today also means questioning the framework itself: sameness and difference are two poles of one binary in which masculinity remains the unmarked norm of the "real" scientist — a dilemma that cannot be resolved by choosing a side, and that weighs even more heavily on those whose identities fall outside the binary altogether. Breaking patterns, I argue, therefore requires more than counting and "fixing" the underrepresented: it demands deconstructing the gendered notion of scientific excellence itself, so that belonging in science no longer depends on negotiating one's identity against a norm.

Menas Theorem and Strong Compactness on $P_\kappa(\lambda)$, Catalina Torres

Higher forms of stationarity and reflection on $P_\kappa(\lambda)$ provide natural two-cardinal analogues of classical reflection principles. This talk focuses on their interaction with strong compactness and projection/lifting phenomena in the spirit of Menas' theorem. After briefly recalling the motivation for extending stationary reflection to the two-cardinal setting, recent joint work with Hiroshi Sakai will be discussed showing that strong compactness does not suffice for 2-stationarity on $P_\kappa(\kappa^+)$. It will also be shown that Menas-type arguments behave differently for higher stationarity: while an analogue of Menas' theorem holds for 1-stationarity under suitable assumptions, the corresponding lifting phenomenon for 2-stationarity can consistently fail. These results provide further evidence that higher stationarity on $P_\kappa(\lambda)$ exhibits genuinely new behaviour beyond ordinary stationarity.

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Condensed Sets and the Solovay Model, Dianthe Basak

Recent joint research with Nathaniel Bannister has revealed a connection between the Pyknotic Sets of Barwick and Haine (the truncated versions of the Condensed Sets of Clausen and Scholze) and the Solovay model V(R). Via this connection, formalised as a geometric morphism of topoi, we are able to reproduce certain results of homological algebra in the Pyknotic Sets via automatic continuity results in the Solovay model. In this talk we place this result in context, as the culmination of a long history of dialogue between topos theoretic and set theoretic accounts of the theory of symmetric extensions, and discuss further uses for this formalism.

A Finite Square Principle, Juliette Kennedy

We present a finite square principle that was used to show the independence of the following statements:

1. If M is a structure in a vocabulary of size $\leq \lambda$ and D is a regular ultrafilter on λ, then M^λ/D is λ++-universal. (Keisler & Chang: Open Problem 18)

2. Suppose M and N are structures in a vocabulary of size $\leq \lambda$ such that $|M|, |N| \leq \lambda$. If $M \equiv N$, D is a regular ultrafilter on λ, and $2^\lambda = \lambda^+$, then M^λ/D is isomorphic to N^λ/D. (Keisler & Chang: Open Problem 19)

Joint work with Saharon Shelah, Jouko Väänänen

Filter extension games with mini supercompactness measures, Victoria Gitman

Several classical smaller large cardinals κ, among them weakly compact, ineffable, and Ramsey cardinals, can be characterized by the existence of measure-like filters on κ-sized families of subsets of κ. It suffices to consider families that arise as $P(\kappa)^M$ for some κ-sized $\in$-model of a sufficiently large fragment of set theory. Isolating patterns in the properties of these filters has led to a better understanding of the classical large cardinals and the definition of new ones. Holy and Schlicht introduced the filter extension games of length 1 up to κ^+ in which the first player plays an increasing sequence of these κ-sized models and the second player responds by choosing an increasing sequence of filters for them. They, and later Nielsen and Welch, used the existence of a winning strategy for one of the players in these games to characterize (or imply) classical large cardinals and define new ones. The existence of a strategy for the second player can be used to characterize (or imply) versions of generic measurability, including, as shown by Foreman, Magidor, and Zeman, the existence of precipitous ideals.

We generalize the filter extension games to the two-cardinal setting by considering corresponding filters on λ-sized families of subsets of $P_\kappa(\lambda)$ (arising as $P(P_\kappa(\lambda))^M$ for λ-sized $\in$-models). We show that the existence of a winning strategy for the second player in these games characterizes (or implies) several large cardinal notions in the neighborhood of a supercompact, including, nearly λ-supercompact, completely λ-ineffable and λ-Π^1_n-indescribable cardinals. We also connect the existence of winning strategies for the second player in these games with various notions of generic supercompactness, including the existence of precipitous ideals. This is joint work with Tom Benhamou.

On the definability and cardinality of mad families, Julia Millhouse

Maximal almost disjoint families—i.e., collections of infinite sets of integers with pairwise finite intersection, which are maximal with respect to inclusion—have been a ubiquitous object of study in set theory for the past half century. Aside from their applications in topology and functional analysis, one can ask about the possible uncountable cardinals for which there exists a mad family of that size, and one can also wonder as to the potential definability of mad families, in the sense of classical descriptive set theory. Each of these questions has and continues to motivate two rich body of research in set theory of the reals and descriptive set theory, respectively; see, for example, [8], [11], [3], [5], and [9], [12], [10].

More recently, authors such as Brendle, Fischer, S.D. Friedman, Khomskii, and Zdomskyy have been interested in combining these two interests, namely by asking how to construct models of set theory in which we control the realization of the set sp(a) = $|A|$: A is a mad family, while also ensuring that for some $\kappa \in$ sp(a), there is a projectively definable mad family with definition of minimal descriptive complexity. In this talk I will briefly overview some known results connecting definability, cardinality, and almost disjointness, discussing the obstacles one may encounter and strategies to overcome them. In particular, I will delve into a construction from my thesis, giving a model in which the mad spectrum contains only two cardinals, each of whom is witnessed by a projective mad family with an additional strong combinatorial property.

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Structural Infinite-Exponent Partition Relations and Weak Choice Principles, Lyra Gardiner

It has been known since at least [ER52] that infinite-exponent partition relations (IEPRs) are inconsistent with AC, i.e. that no higher analogue of Ramsey's theorem can hold for colourings of infinite tuples; in ZF without AC, however, such relations can hold. The same is true of structural IEPRs, i.e. ones in which the "tuples" being coloured are the isomorphic copies of some given structure inside a larger structure. In this talk we will discuss some particular structural IEPRs which are consistent with ZF but which imply failures of fragments of Choice such as the Kinna-Wagner Selection Principle and the Ordering Principle.

This is joint work with Jonathan Schilhan, and appears in [GS26].

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Descending Distributive Forcing, Calliope Ryan-Smith

Distributivity is a fundamental property of notions of forcing that describes the (non)-creation of new sequences of ground model elements. The utility and importance of this cannot be overstated, with an archetypal application being the forcing of the Continuum Hypothesis without adding new real numbers. Descending distributivity is a weakening of this property, more closely related to the (non)-creation of fresh sequences. Much as freshness is a notion of 'new functions added locally at an ordinal', descending distributivity is tied closely to locally new behaviour in the forcing extension. We will introduce descending distributive forcing, some of its properties, and its applications to fresh functions (in an AC context) and the axiom of extendable choice (in a non-AC context).

Diagonalising Generic Filters Over ω^κ, Heike Mildenberger

We investigate various kinds of countably closed forcings that add generic filters over ω^κ. In particular we are interested which of these generic filters can be diagonalised or at least destroyed while preserving other P-points.

Automorphism groups of Fraïssé structures and ultrametric spaces, Aleksandra Kwiatkowska

We start with a general introduction to Fraïssé structures and their automorphism groups. Of particular interest for us will be universal homogeneous ultrametric spaces. Here, we view ultrametric spaces as two-sorted structures consisting of a set of points and a linearly ordered set of distances, and equip them with distance-carrying (”dc” for short) embeddings. We prove that the automorphism group Aut(U) of the ultrametric space U obtained as a Fraïssé structure admits a comeager conjugacy class, or in other words, it has a generic dc-automorphism. To show that, we examine the cofinal amalgamation property for partial automorphisms and characterize amalgamation bases. Time permitting, we will outline a broader categorical framework for establishing cofinal amalgamation and discuss the non-existence of a generic pair of dc-automorphisms. This talk is based on recent joint work with A. Bartoš, W. Kubiś, and M. Malicki.

Topological realizations of CBERs, Allison Wang

In a recent paper, Frisch, Kechris, Shinko, and Vidnyánszky proved many results about topological realizations of countable Borel equivalence relations (CBERs). We discuss some of their results about compactly graphable CBERs and make partial progress toward the question of whether every aperiodic CBER has a compactly graphable realization.

On lifting maps to the Wallman compactification, Elena Pozzan

The Wallman compactification provides a natural T1-compactification of a T1-space. Given a T1-space X, its Wallman compactification W(X) is the compact T1-space whose points are the minimal prime filters of its topology, endowed with the topology generated by the sets F — U belongs to F, for every open U of X.

Although this construction may be regarded as a T1-analogue of the Stone–Čech compactification, its functorial behaviour is more subtle: not every continuous map between T1-spaces lifts to a unique continuous map between the corresponding Wallman compactifications. This naturally raises the question, posed by Herrlich and studied by Harris, of identifying a natural class of maps for which such liftings exist. This led to the class of WC-maps: continuous maps admitting a closed continuous lifting between the corresponding Wallman compactifications. The problem of giving an intrinsic characterization of this class has remained open, to the best of our knowledge.

In this talk, we show that the Wallman construction fits into the general pattern of Stone-type dualities. The key point is that, in the Wallman setting, the relevant points are minimal prime filters rather than prime filters, as in classical Stone duality. This yields a duality between compact T1-spaces with closed continuous maps and a suitable category of bounded distributive lattices.

We then show that this duality extends to a contravariant adjunction between T1-spaces with WC-maps and bounded distributive lattices with suitable morphisms. This leads to an intrinsic characterization of WC-maps, thereby solving Harris's problem.

This is joint work with Mai Gehrke and Matteo Viale.

Determinacy and Large Cardinals: Connections, Obstacles and Scenarios for Solutions, Sandra Müller

The inner model program is one of the central pillars of modern research in set theory. Grounded in Gödel's work, it aims at reaching stronger and stronger canonical inner models for large cardinals. These inner models provide a controlled environment to study the structural behaviour of large cardinals and can be regarded as witnesses for their consistency. Their construction relies on a deep relationship with models of determinacy. But this relationship is facing serious obstacles, resulting in the failure of established methods even below a Woodin limit of Woodin cardinals. In this talk we will describe these obstacles as well as scenarios for solutions for a non-expert audience.

Strong Logical Axioms and Self-Distributive Algebras: Recent Results and Open Problems, Sheila Miller Edwards

In this talk we will introduce a family of strong logical axioms called rank-to-rank embeddings and the relationships between these large cardinal embeddings and left distributive algebras. There are many examples of left distributive operations in classical mathematics, including group conjugation and the weighted mean. Those operations are idempotent, however, and hence not free. In the late 1980s Richard Laver showed that the closure of a single rank-to-rank elementary embedding under an application operation generates a free left distributive algebra and demonstrated the linearity of a particular ordering on terms of the free left distributive algebra (given the existence of such embeddings). Patrick Dehornoy subsequently used the braid group on infinitely many generators to show the linearity of that ordering relation within ZFC. The consistency strength of other related theorems is still unknown; it remains possible that a theorem about finite left distributive algebras has large cardinal strength—that is, cannot be proven from the usual axioms of set theory. David Larue later extended that work to demonstrate braid group representations of the free left distributive algebra on n generators, for any natural number n. Still elusive was an algebra of embeddings isomorphic to a free left distributive algebra on more than one generator. We discuss an inverse limit construction of such a free, two-generated left distributive algebra of embeddings from a slightly stronger large cardinal assumption than the one used by Laver (joint work with Andrew Brooke-Taylor and Scott Cramer) and the extension of that result to countably-many and continuum-many generators (joint with Brooke-Taylor), and state two additional, related results (joint work with Scott Cramer, Meng-Che "Turbo" Ho, and Nam Trang). We conclude with statements of open problems about left distributive algebras.