RESEARCH STATEMENT

David Chodounsky

My main research interests are in forcing, set theory of the reals and infinitary combinatorics, cardinal invariants of the continuum and ultrafilters on countable sets.

While progressing towards my PhD, I concentrated mainly on the so called Katowice problem, i.e. the question about relative consistency of existence of isomorphism between Boolean algebras $P(\omega)/Fin$ and $P(\omega_1)/Fin$ [6]. I managed to build a forcing extension, where several consequences of existence of such isomorphism hold simultaneously. Among these are existence of a strong-Q-sequence of size ω_1 (also called uniformizable AD system, see [8]) together with $\mathfrak{d} = \omega_1$. However, the general problem remains still unsolved.

A topic with possible relation to the Katowice problem are non-trivial automorphisms of $P(\omega)/Fin$. In collaboration with A. Dow we developed an alternative presentation of ω^ω bounding forcing for killing non-trivial automorphisms [1]. I plan to continue this work and look into it's relation with recent work of I. Farah, S. Shelah and J. Steprans on this topic ([4, 7]).

Another direction of my research are forcing notions connected with union ultrafilters on $\mathbb{F} = [\omega]^{<\omega} \setminus \emptyset$. A set $A \subset \mathbb{F}$ is an FU-set if there is a disjoint sequence $s = \{s_i : i \in \omega\}$ such that $A = \{\bigcup\{s_i : i \in F\} : F \in \mathbb{F}\}$. An ultrafilter $\mathcal{U}$ on $\mathbb{F}$ is union ultrafilter if it has a base consisting of FU-sets. For $\mathcal{U}$, $\mathrm{core}(\mathcal{U})$ is the filter generated by $\{\bigcup A : A \in \mathcal{U}\}$ [3]. Among problem, we would like to solve, is the relative consistency of existence of an union ultrafilter with meager core. This is a joint work with P. Krautzberger.

A different focus of my research are towers in $P(\omega)/Fin$. I proved a strengthening of the classical game characterization of non-meager p-filters [5] for filters generated by towers. This new characterization turned out to be useful for certain fusion-like forcing arguments [2].

A tower $\langle T_\alpha \rangle_{\alpha<\omega_1}$ (not necessarily maximal) is special if there is a subtower $\langle T'_\alpha \rangle_{\alpha<\omega_1}$ such that $T'_\alpha \not\subset T'_\beta$ for each $\alpha, \beta \in \omega_1$. There seems to be a theory around special towers, which is somewhat analogous to theory around destructible and in destructible (ω_1, ω_1) gaps. However, the theory is not yet fully understood. This is a joint work with P. Borodulin-Nadzieja.

References

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[4] I. Farah, S. Shelah, *Trivial automorphisms*, arXiv:1112.3571.

[5] C. Laflamme *Filter games and combinatorial properties of strategies,* Set theory, 5167, Cont. Math., 192, A. M. S. (1996)

[6] P. Nyikos, *Cech-Stone remainders of discrete spaces*, in: Open Problems in Topology II, Elliott Pearl, ed., Elsevier B.V., Amsterdam, 2007, 207–216.

[7] S. Shelah, J. Steprans *Nontrivial automorphisms of $slP(\mathbb{N})/[\mathbb{N}] < \aleph_0$ from variants of small dominating number*, preprint

[8] J. Steprans *Strong Q-sequences and variations on Martins Axiom*, Canad. J. Math. **37** (1985) no. 4, 730–746.