RESEARCH STATEMENT

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I have been investigating the interaction between GCH patterns, large cardinals, and forcing.

Scott proved that GCH cannot first fail at a measurable and it has become typical to expect that properties a measurable cardinal κ will reflect below κ. Contrary to this, Levinski showed that from a measurable cardinal κ one can obtain a forcing extension preserving the measurability of κ in which GCH fails at every regular cardinal below κ and yet holds at κ. I have proven several generalizations of Levinski's theorem including analogs for partially supercompact cardinsl, tall cardinals, and more. Arthur Apter and I have shown that an even more unexpected situation can happen with if one is willing to start with a stronger hypothesis. An easy argument, modulo the Foreman-Woodin construction of a model in which GCH fails everywhere and there is a measurable cardinal, shows that indeed from large cardinals, a measurable cardinal can be the first cardinal at which GCH holds (that is GCH fails *everywhere* below κ). I am currently working with Arthur Apter on showing that the situation in which GCH does not reflect below a measurable cardinal can obtain in many diverse models, such as in the identity crisis models of Magidor as well as models in which there a many or few measures on κ.

Woodin showed that the existence of a measurable cardinal at which GCH fails is equiconsistent with the existence of a cardinal κ that is κ^{++}-tall, where a cardinal κ is called *θ-tall* if there is a nontrivial elementary embedding $j : V \to M$ with critical point κ such that $j(\kappa) > \theta$ and $M^\kappa \subseteq M$ in V.

I have extended Woodin's method of surgically modifying a generic filter to the context of supercompactness embeddings. I have used this method to determine the precise consistency strength of the existence of a λ-supercompact cardinal κ such that GCH fails at λ.

Theorem 1. *For any cardinals λ and θ, the existence of a λ-supercompact cardinal κ such that $2^\lambda \geq \theta$ is equiconsistent with the existence of a λ-supercompact cardinal κ that is also θ-tall.*

I am also interested in looking at the interaction between the tree property, GCH patterns, and large cardinals.