

RESEARCH STATEMENT

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My research centres around large cardinal axioms and class forcing, although I am also very interested in applications of set theory.

In Kobe, I have started work with Jorge Brendle studying cardinal characteristics for large cardinals. When trying to define analogues of the familiar cardinal characteristics of the continuum for cardinals $\kappa > \omega$, it turns out that in many cases this is only sensible for κ a large cardinal. Some results are known, particularly for κ a supercompact cardinal (and I am still at the stage of finding out what these are), but much more waits to be uncovered.

I am also interested applications of set theory, especially to category theory and algebraic topology. There are a range of results using large cardinals in category theory that have been discovered by category theorists. By bringing a set-theoretic perspective (and in particular by treating elementary embeddings as more than just convenient homomorphisms), Joan Bagaria and I have been able to reduce the required large cardinal axioms and give more streamlined proofs for some of these results. I also have a joint project with Benedikt Lowe and Birgit Richter (an algebraic topologist) studying the *Bousfield lattice* \mathbf{B} . This is an important structure in algebraic topology but it is still very poorly understood. For example, even the precise cardinality of $|\mathbf{B}|$ is not known, only that $\beth_1 \leq |\mathbf{B}| \leq \beth_2$. (Could it consistently be strictly in between? Maybe. But the only reason we have for thinking that is that we really don't know.)

I also have unfinished projects on rank-to-rank embeddings, and Fraisse limits of simplicial complexes, but haven't made much progress on either lately.