Research Statement

As a Master student at the University of Bonn, I became interested in forcing. In particular I was interested in the notion of proper forcing and the effects it could have on cardinal invariants. In my Master Thesis, titled *Generic Reals and Proper Forcing*, I demonstrated my understanding of these ideas by giving some concrete examples of forcing, presenting a proof of the iteration theorem of proper forcing, and using them together to construct a model with a nontrivial Cichoń diagram.

At the University of Freiburg I continue to be interested in proper forcing notions. Along the way my readings have already taken me on many detours to better understand some of the results. For example, given a ladder system η, one can construct a forcing notion that is a countable support iteration of proper forcing notions (and thus itself proper) that forces every coloring of η to be uniformizable. The natural questions to arise ask when is there a coloring of a ladder system that is not uniformizable, and when is every coloring is uniformizable. Some answers came when looking at principles like Martin's Axiom (MA), and variations of the $\diamondsuit$ property, like the weak-$\diamondsuit$ introduced by Devlin and Shelah. I am currently investigating the Proper Forcing Axiom (PFA), as well as some weaker notions that follow from it, like the P-Ideal Dichotomy(PID).

It is already known that PID implies that $\mathfrak{b}$ is at most $\aleph_2$. I am interested in whether other cardinal invariants have similar restraints. It's suggested that $\mathfrak{c}$ itself is bounded by $\aleph_2$, but this is only because no known models suggest otherwise. I have shown, using some results from Shelah, that PID implies $\mathfrak{p} = \mathfrak{t}$, but this has since been overshadowed by Shelah's proof that this equality holds already in ZFC.