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Subject: Letter of support for the project proposal “Foundations of Directed Type Theory”

I am writing to express my strong support for the above research proposal submitted to EPSRC by Altenkirch, Buchholtz and Kraus. The focus of my research is type theory, more specifically studying the metatheory of type theory in an abstract, intrinsic setting. I pioneered the use of gluing-style normalisation proofs in such setting. This was a major step forward in carrying out the metatheory of type theory in type theory itself. I also developed type theories with internal parametricity aiming towards a new presentation of Homotopy Type Theory (HoTT) featuring computationally well-behaved univalence principle.

Both parametricity and univalence formalise notions of representation-independence / abstraction, neither of them is more general than the other, their exact relationship is not well understood. This is a difficult and deep foundational issue, and it is not clear what is the best way to tackle it. I am excited about the possibility of clarifying their relationship via directed type theory. Directed type theories developed so far ended up in extremely complex languages, which shows that new approaches with fresh ideas are sorely needed. The project proposes such a fresh approach by first developing synthetic 1-category theory, which is a tractable goal, and then extending this to the high dimensional setting via insights from Higher Observational Type Theory.

My collaboration will focus on WPs 3–6 where I believe that the expertise of Altenkirch, Kraus and Buchholtz can be fruitfully combined with my experience. I have been collaborating with Altenkirch for several years now: we worked together on the metatheory of type theory, on parametricity and on the universal quotient inductive-inductive type which is a special case of a higher inductive-inductive type. Together with Kraus, I developed a new technique for formalising metatheoretic proofs. I plan to visit the UK in person at least twice during the project, as well as keep in regular contact by the usual academic means.

Overall, I think this is an outstanding proposal, and the research team has the expertise to carry out the proposed research successfully. I will be delighted to collaborate with them. Together with my research group in Budapest, I am proposing to spend around 10 days a year on this project, which corresponds to an in-kind contribution of around GBP 20,000.