Prize Citations for the 2022 K-Theory Foundation Prizes

by the Prize Committee

July, 2022

Citation for Akhil Mathew:

Akhil Mathew's background is in chromatic homotopy theory combined with algebraic geometry. He has made important contributions to algebraic K-theory, trace methods, structural properties of topological Hochschild homology, and p-adic cohomology.

He has settled several conjectures in his work, and his results have been applied in many K-theoretical contexts. The following are three highlights:

1. In work with Clausen, Naumann, and Noel, Mathew determined when the descent morphism in algebraic K-theory becomes an equivalence after a suitable chromatic localization. This verifies several cases of Galois descent, and it supports the Ausoni-Rognes red-shift conjecture.

2. In work with Land, Meier, and Tamme and with Clausen, Naumann, and Noel, Mathew proves a remarkable purity property in telescopically localized algebraic K-theory.

3. Together with Clausen and Morrow, Mathew proved that the fiber of the trace map from algebraic K-theory to topological cyclic homology satisfies henselian rigidity after p-completion. This extends results by Dundas–Goodwillie–McCarthy on relative K-theory and Gabber–Gillet–Suslin–Thomason's rigidity theorem.

Citation for Zhouli Xu

By training Zhouli Xu is a classical homotopy theorist; his spectacular early papers, including a long article in the *Annals*, are about the computation of stable homotopy groups by cleverly using classical results.

The recent work has been mostly about applying the techniques of $\mathbb{C}$-motivic stable homotopy theory to make much more far-reaching progress in classical homotopy theory. The scope of the results is amazing in its improvement on what was known classically. Once again, the work has appeared in highly prestigious journals, including *Acta Mathematica* and the *Proceedings of the National Academy of Sciences*.

Xu's most recent article, which just appeared *Annals of Mathematics*, is a departure from the earlier work. It defines and studies a certain t-structure on the category $SH(k)$ of motivic spectra over an arbitrary field k. This represents a generalization of the earlier work in several directions, and perhaps the most striking is that the new theory works over arbitrary fields k, not only $\mathbb{C}$. It opens the door to potential number theoretic applications.