Citation for Christopher Bishop (Senior Berwick Prize)

Short citation

Professor Christopher J Bishop of Stony Brook University is awarded the Senior Berwick Prize for the pair of papers 'Models for the Eremenko–Lyubich Class', published in the *Journal of the London Mathematical Society* in 2015, and 'Models for the Speiser Class', published in the *Proceedings of the London Mathematical Society* in 2017.

Long citation

Professor Christopher J Bishop of Stony Brook University is awarded the Senior Berwick Prize for the pair of papers 'Models for the Eremenko–Lyubich Class', published in the *Journal of the London Mathematical Society* in 2015, and 'Models for the Speiser Class', published in the *Proceedings of the London Mathematical Society* in 2017.

The papers constitute a breakthrough in the understanding of two fundamental classes of transcendental entire functions: the Speiser class S, consisting of those that act as a covering map over the complement of a finite set of 'singular values', and the related but larger Eremenko–Lyubich class B, where the set of singular values is merely required to be bounded. The Speiser class has been studied intensively in complex function theory since the early 20th century, and the class B was introduced by Eremenko and Lyubich in 1992. The dynamical behaviour of functions in these classes turns out to be more tractable than that of general entire functions, and hence they have been the subject of intense research this century. On the other hand, in 2011 Rottenfußer et al constructed functions in B that are topologically far more complicated than previously believed possible.

Before Bishop's work, such results were typically proved by exhibiting a 'model' for the behaviour of the function near infinity (a collection of unbounded simply-connected domains, each mapping to a punctured neighbourhood of infinity as a universal covering) and realising it through the use of a bespoke approximation result. By contrast, there were few techniques available for constructing functions in the Speiser class, despite its long history; for example, it was unclear whether the examples of Rottenfußer et al could arise there. It was also unknown in general which models can be realised in the class B, or what (if any) differences exist between the behaviour of the two classes.

Bishop's two papers answer these questions, using his powerful technique of 'quasiconformal folding'. The *Journal* article greatly expands techniques for constructing functions in the Eremenko–Lyubich class, showing that every model can be realised. The *Proceedings* paper proves the same for the Speiser class, but with a crucial difference: the model must first be augmented with additional domains, hence the resulting function may have richer behaviour. Bishop also illuminates the differences between the two classes by showing that this additional step may be necessary: there is no Speiser function that is large only on a subdomain of a half-strip, while such functions are known to exist in B.

Bishop's papers provide a 'black box' that is now the gold standard for constructing functions in the classes S and B and has been used extensively by other researchers since. His work

represents an extraordinary step-change in our understanding of these two important classes and raises fascinating questions about their subtle differences.