
Simon Donaldson

Dr. Simon Donaldson received his PhD in 1983 from Oxford University under the supervision of Nigel Hitchin and Michael Atiyah. After that, he was appointed a Junior Research Fellow at All Souls College, Oxford, he spent the academic year 1983–1984 at the Institute for Advanced Study in Princeton, and returned to Oxford as Wallis Professor of Mathematics in 1985. After spending one year visiting Stanford University, he moved to Imperial College London in 1998. In 2014, he joined the Simons Center for Geometry and Physics at Stony Brook University in New York. He is one of the greatest geometers whose research interests include differential geometry, algebraic geometry and gauge theory.

Donaldson received the Junior Whitehead Prize from the London Mathematical Society in 1985 and in the following year he was elected a Fellow of the Royal Society and, also in 1986, he received a Fields Medal. He was awarded the 1994 Crafoord Prize. In 2006, Donaldson was awarded the King Faisal International Prize for science. In 2009 he was awarded the Shaw Prize in Mathematics. In 2010, he was elected a foreign member of the Royal Swedish Academy of Sciences. He was elected as a member of the National Academy of Sciences in 2000 and a Fellow of the American Mathematical Society in 2012. In 2014, he was awarded the Breakingthrough Prize in Mathematics. In 2019, he was awarded the Oswald Veblen Prize in Geometry.

I first met Professor Yau in 1982 but I will begin a couple of years before, in 1980 when I began as a new graduate student in Oxford, working with Nigel Hitchin. One of the books that Nigel gave me was the volume of the French journal *Astérisque* [1] giving an exposition of the Calabi conjecture and Yau's proof, which had come out a few years before. Standing back, it is hard to overstate the influence of Yau's result on the development of differential geometry over the past 40 years. It was the milestone marking the wholesale invasion of the subject

by nonlinear partial differential equations, changing the axis of research in differential geometry. Thus, nowadays almost every young differential geometer acquires some degree of proficiency in nonlinear PDE, quite different from the 1970s. I can write here from the viewpoint of someone who was just entering the subject in this transformational period. The material in the *Astérisque* volume—with the heavy calculations required for the *a priori* estimates—was quite different from any kind of mathematics I had seen before (which emphasised algebraic topology, functional analysis and abstract machinery generally). At the same time the result proved by Yau which, as just one example, gives metrics of zero Ricci curvature on K3 surfaces, had a huge impact on Oxford mathematics at that time in both the “Atiyah” and “Penrose” schools. The like can be said for the Schoen-Yau proof of the Positive Mass theorem, from the same era.

It was thus a memorable day for me when I was introduced to Yau by Nigel Hitchin at the 1982 British Mathematical Colloquium. This was the year before the International Congress in Warsaw where Yau received the Fields Medal. We met on a number of occasions in that period: one memory that I treasure is of a lunch with S. S. Chern and Yau in San Francisco Chinatown. Then, in the academic year 1983–1984, Yau was my mentor in the Institute for Advanced Study in Princeton, where I learnt hugely from the seminar that he ran with Schoen. Over the years since I have enjoyed many interactions with Yau, one highlight being the great privilege of sharing the 1994 Crafoord prize with him. These interactions enable me to appreciate his vast contribution to all aspects of our subject. I will mention just two of these wider contributions. First, the *Journal of Differential Geometry*, which was transformed by Yau into the journal of record for many important developments—for example many of the major papers on 4-manifold topology in the 1980s and 1990s appeared there. Second, Yau's survey articles, with their seminal insights, problem lists and conjectures. In particular

another book which formed a key part of my education as a graduate student and postdoc was the *Annals of Math. Studies* volume [2] arising from the 1982 seminar in Differential Geometry at the IAS, concluding with Yau's extraordinary problem list, covering the whole realm of differential geometry. Somewhat later, from around 1990, Yau's conjecture on the link between stability of algebraic varieties and Kähler-Einstein metrics provided the direction for much of my own research. At the same time, Yau's research results has continued to drive the frontiers of the subject in a multitude of different directions: one thinks (for one example) of the Strominger-Yau-Zaslow picture of Mirror Symmetry which has inspired a huge

amount of work and will continue to do so for many decades to come. Finally, beyond mathematics, it is a pleasure for me to remember the great kindness and support that Yau has given to me over all these years.

Happy 70th Birthday, Professor Yau, and long may you continue to inspire us!

References

- [1] *Première classe de Chern et courbure de Ricci: preuve de la conjecture de Calabi*, Astérisque **58**, Soc. Math. de France, Paris, 1978
- [2] S.-T. Yau ed., *Seminar on Differential Geometry*, Ann. of Math. Stud. **102**, Princeton Univ. Press, Princeton, 1982.