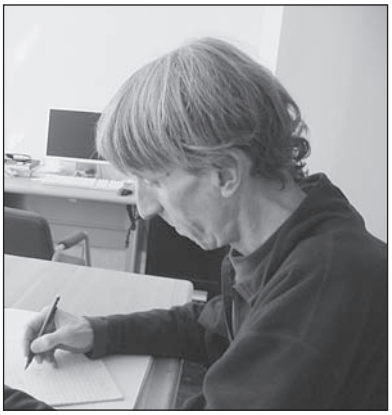
Donaldson and Taubes Receive 2009 Shaw Prize

Simon K. Donaldson



Clifford H. Taubes

On June 16, 2009, the Shaw Foundation announced that it would award its annual Shaw Prize in Mathematical Sciences to SIMON K. DONALDSON and CLIFFORD H. TAUBES "for their many brilliant contributions to geometry in three and four dimensions". The prize carries a cash award of US$1 million.

The Shaw Prize in Mathematical Sciences committee made the following statement:

"Geometry and physics have been closely related from the earliest times, and the differential calculus of Newton and Leibniz became the common mathematical tool that connected them. The geometry of two-dimensional surfaces was fully explored by these techniques in the nineteenth century. It was closely related to algebraic curves and also to the flow of fluids. Extending our understanding to three-dimensional space and four-dimensional space-time has been fundamental for both geometers and physicists in the twentieth and twenty-first centuries.

"Simon K. Donaldson and Clifford H. Taubes are the two geometers who have transformed the whole subject by pioneering techniques and ideas originating in theoretical physics, including quantum theory.

"Electromagnetism is governed by the famous differential equations of Clerk Maxwell, and these equations were used in the early twentieth century by William Hodge as geometric tools. They were particularly useful in the geometry associated with algebraic equations, extending the work of the nineteenth-century mathematician Bernhard Riemann.

"The physical forces involved in the atomic nucleus are governed by the Yang- Mills equations, which generalize Maxwell's equations but, being nonlinear, are much deeper and more difficult. It was these equations which Donaldson used, basing himself on analytical foundations of Taubes, to derive spectacular new results. These opened up an entirely new field in which more and more subtle geometric results have been established by Donaldson, Taubes, and their students. The inspiration has frequently come from physics, but the methods are those of differential equations.

"A key strand of this newly developing theory is the close relation that has been found between solutions of the Yang-Mills equations and the geometry of surfaces embedded in four dimensions. A definitive result in this direction is a beautiful theorem of Taubes, which essentially identifies certain 'quantum invariants' with others of a more classical nature. Many old conjectures have been settled by these new techniques, but many more questions still pose a challenge for the future. Donaldson and Taubes between them have totally changed our geometrical understanding of space and time."

Simon K. Donaldson, born in 1957 in Cambridge, United Kingdom, is currently the Royal Society Research Professor of Pure Mathematics and President of the Institute for Mathematical Sciences at Imperial College, London. He received his B.A. from Pembroke College of Cambridge University in 1979 and his Ph.D. from Oxford University in 1983. In 1986 he was elected a Fellow of the Royal Society.

Clifford H. Taubes, born in 1954 in Rochester, New York, is currently the William Petschek Professor of Mathematics at Harvard University. He did his undergraduate studies at Cornell University and received his Ph.D. in Physics from Harvard in 1980. He is a member of the National Academy of Sciences.

The Shaw Prize is an international award established to honor individuals who are currently active in their respective fields and have achieved distinguished and significant advances, who have made outstanding contributions in culture and the arts, or who have achieved excellence in other domains. The award is dedicated to furthering societal progress, enhancing quality of life, and enriching humanity's spiritual civilization. Preference is given to individuals whose significant work was recently achieved.

The Shaw Prize consists of three annual awards: the Prize in Astronomy, the Prize in Life Science and Medicine, and the Prize in Mathematical Sciences. Each prize carries a monetary award of US$1 million. Established under the auspices of Run Run Shaw in November 2002, the prize is managed and administered by the Shaw Prize Foundation based in Hong Kong.

Previous recipients of the Shaw Prize in Mathematics are Vladimir Arnold and Ludwig Faddeev (2008), Robert Langlands and Richard Taylor (2007), David Mumford and Wen-Tsun Wu (2006), Andrew Wiles (2005), and Shiing-Shen Chern (2004).

—From Shaw Foundation announcements