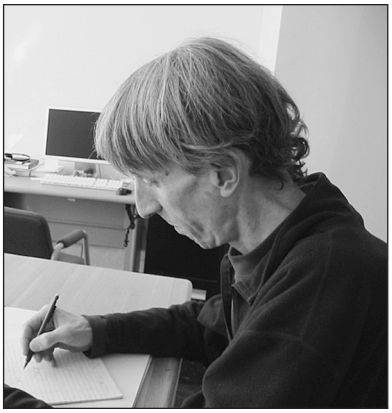
Taubes Receives NAS Award in Mathematics



Clifford H. Taubes

CLIFFORD H. TAUBES has received the 2008 NAS Award in Mathematics from the National Academy of Sciences. He was honored "for groundbreaking work relating to Seiberg-Witten and Gromov-Witten invariants of symplectic 4-manifolds, and his proof of the Weinstein conjecture for all contact 3-manifolds."

The NAS Award in Mathematics was established by the AMS in commemoration of its centennial, which was celebrated in 1988. The award is presented every four years in recognition of excellence in research in the mathematical sciences published within the past ten years. The award carries a cash prize of US$5,000. Previous recipients are Robert P. Langlands (1988), Robert MacPherson (1992), Andrew J. Wiles (1996), Ingrid Daubechies (2000), and Dan Virgil Voiculescu (2004).

The Work of Clifford Taubes

The *Notices* asked D. Kotschick, Ludwig-Maximilians-Universität München, and T. S. Mrowka, Massachusetts Institute of Technology, to comment on the work of Taubes. They responded:

"By his own account, Cliff Taubes would like to be considered a topologist. Ignoring this wish, most of his colleagues see him as a great geometric analyst, whose work has had a profound impact on geometry, topology and mathematical physics.

"Starting out in mathematics with a physics background, Taubes did some of the early foundational work in mathematical gauge theory studying vortices and Bogomolny monopoles and building up a substantial existence theory for the self-dual Yang-Mills, or instanton, equations on four-manifolds. The latter was, of course, crucial in Donaldson's celebrated application of gauge theory to four-dimensional differential topology. Taubes himself proved the existence of uncountably many exotic differentiable structures on R^4; he reinterpreted Casson's invariant in terms of gauge theory and proved a homotopy approximation theorem for Yang-Mills moduli spaces. Taubes also proved a powerful existence theorem for anti-self-dual conformal structures on four-manifolds.

"When Witten proposed the study of the so-called Seiberg-Witten equations in 1994, Cliff Taubes was one of the handful of mathematicians who quickly worked out the basics of the theory and launched it on its meteoric path. From an analyst's point of view, the quasi-linear Seiberg-Witten equations may seem rather mundane, at least when compared to the challenges offered up by the Yang-Mills equations. True to this spirit, Taubes announced at the time that he would never again write a paper more than twenty pages long. Of course, this resolution lasted only for about six months! After that, Taubes wrote a whole series of deep, technical, and very long papers that became known by the slogan 'Seiberg-Witten = Gromov'. These papers establish the most profound results known to this day about the Seiberg-Witten equations, linking their solutions on symplectic four-manifolds to Gromov's pseudo-holomorphic curve theory in a very precise way.

"Taubes's work on the Seiberg-Witten equations remains one of the cornerstones underpinning the current very productive symbiosis between symplectic geometry and low-dimensional topology. Nevertheless, it was a shock to many when Taubes knocked off one of the holy grails of symplectic topology last year. The Weinstein conjecture predicts the existence of periodic orbits for the Reeb flows of arbitrary contact forms on closed three-manifolds. Many special cases had been proved by a variety of methods from symplectic geometry,

and a proof of the full conjecture was one of the ultimate goals of symplectic field theory. However, Taubes's proof follows a rather different line, using gauge theory and deploying a strategy similar to his work on 'Seiberg-Witten = Gromov'. The proof also hinges on a novel estimate for the spectral flow of a family of Dirac-type operators.

"It is in the nature of Cliff Taubes's work that his papers are not usually short or easy to read. Rather they are difficult and original, and technically demanding by necessity. His faithful readers take comfort in the knowledge that Cliff is at least as hard on himself as he is on the readers, and they appreciate his very personal style peppered with what they affectionately refer to as 'Cliffisms'."

Biographical Sketch

Clifford Taubes grew up in Rochester, New York. After his undergraduate education at Cornell University, he received a Ph.D. in physics from Harvard University in 1980. After a Harvard Junior Fellowship, taken in the mathematics department at Harvard, he taught for two years at the University of California, Berkeley. Since 1985 he has been at Harvard, where he is the William Petschek Professor of Mathematics. He received the AMS Veblen Prize (1991) and the Élie Cartan Prize of the French Mathematical Society. He is a member of both the American Academy of Arts and Sciences and of the National Academy of Sciences.

—Allyn Jackson

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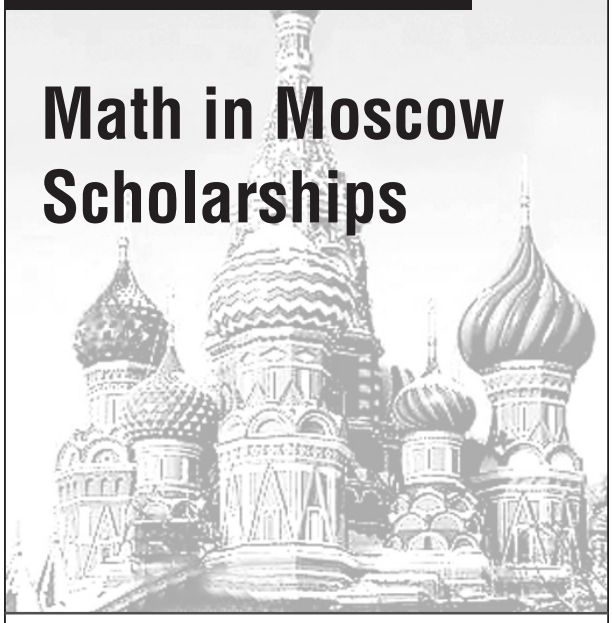

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