

Mathematician wins Shaw Prize for prime numbers, symmetry unification

12 September 2007

Herchel Smith Professor of Mathematics Richard Taylor has been awarded the Shaw Prize in Mathematical Sciences for work that unified the diverse fields of prime numbers and symmetry.

Taylor shares the prize with Princeton Professor Robert Langlands, who initiated work in the field that was subsequently built upon by Taylor.

The honor is awarded by the Hong Kong-based Shaw Prize Foundation. The Shaw Prizes are given in three fields: astronomy, life sciences and medicine, and mathematical sciences. They are intended to recognize individuals currently active in their fields who have achieved “distinguished and significant advances, who have made outstanding contributions in culture and the arts, or who in other domains have achieved excellence,” according to the prize’s Web site.

Each prize comes with a \$1 million award, which Taylor and Langlands will share.

The prizes will be awarded Tuesday (Sept. 11) during a ceremony in Hong Kong. Taylor will deliver a 45-minute Shaw Lecture on Wednesday.

Taylor said he learned of the prize in June when he checked his e-mail before going to bed. He said he knew he had been nominated for the prize, but thought it would be awarded to someone who was further along in his or her career.

Taylor’s work examines the properties of prime numbers — those numbers, such as 3, 5, 7, and 11, that are divisible only by themselves and 1. His work seeks to understand why they appear where they do among other numbers.

The explanation, it turns out, involves an entirely different field of mathematics — geometry, specifically the symmetry of curved spaces.

“You wouldn’t have thought that prime numbers,

which is counting, has anything to do with geometry,” Taylor said.

The theories connecting the two fields are quite powerful, Taylor said, and even small advances have helped answer old mathematical problems that don’t appear to be related.

One such problem, Taylor said, was Fermat’s Last Theorem, a mathematical problem that had defied solution for 357 years. Andrew Wiles of Princeton first proposed a proof of the theorem in 1993, but an error was found. He called on Taylor, a former student of his, and together they completed the proof in 1994.

Taylor’s work also led to the solution of another old mathematical problem: the 40-year old Sato-Tate conjecture, in 2006, the work Taylor said may have led to his receiving the prize.

Taylor’s future work will continue to explore the field.

“We’re a long way from finishing,” he said.

Taylor received his doctorate from Princeton in 1988, coming to Harvard in 1996. He was named the Herchel Smith Professor of Mathematics in 2002. He has received numerous awards and honors, including the Fermat Prize for Mathematics in 2001, the Cole Prize for Number Theory in 2002, and the Dannie Heinemann Prize from the Gottingen Academy of Sciences in 2005.

Source: Harvard University

APA citation: Mathematician wins Shaw Prize for prime numbers, symmetry unification (2007, September 12) retrieved 22 November 2019 from <https://phys.org/news/2007-09-mathematician-shaw-prize-prime-symmetry.html>

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