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4 Young Mathematicians Win Prestigious Fields Medals



Mahesh Kumar A., AP Photo

At the International Congress of Mathematicians, in Hyderabad, India, the 2010 Fields Medals were awarded to, from left, Elon Lindenstrauss of Hebrew University, Stanislav Smirnov of the University of Geneva, Cédric Villani of the Henri Poincaré Institute, and Ngô Bảo Châu of the University of Paris XI. At right are two Indian government leaders, including the country's president (far right).

By Josh Fischman

The 2010 Fields Medals, considered mathematics' equivalent of Nobel Prizes, were awarded on Thursday to a multinational group of four mathematicians. The medals, which are presented every four years to scholars age 40 or younger, recognize important work and—befitting the relative youth of the winners—are intended to encourage further achievements.

The four medalists, who received the news at the International Congress of Mathematicians, in Hyderabad, India, have diverse international backgrounds. They are Elon Lindenstrauss of Hebrew University of Jerusalem, in Israel; Ngô

Bảo Châu of the University of Paris XI (Paris-Sud), in Orsay, France; Stanislav Smirnov of the University of Geneva, in Switzerland; and Cédric Villani of the Henri Poincaré Institute, in Paris.

Mr. Lindenstrauss, who turned 40 this month, has developed powerful tools for use in ergodic theory, a field of mathematics developed to understand how systems change over time. He demonstrated ways to compute those changes. Though abstract, they are tools that mathematicians have started to use in a wide variety of situations.

Mr. Ngô, age 38, had been considered a Fields favorite this year. He recently proved something called the "fundamental lemma." The term, in mathematics, refers to a steppingstone that can be used to develop a larger theory. In this case, Mr. Ngô demonstrated a basic building block that mathematicians can now use in a longstanding project: an attempt, known as the Langlands Program, to unify almost all fields of modern mathematics.

Mr. Smirnov, age 40, has made life easier for mathematical physicists. They frequently work with two-dimensional lattices—think about a chess board—that stretch to infinity, and wondered whether basic properties of the lattices remained unchanged as the lattices grew or took on different shapes such as triangles instead of squares. Mr. Smirnov proved that they do keep certain properties. That has some down-to-earth implications: It can help scientists calculate, for example, when water will flow through a stretch of soil, and when it will be blocked.

Also working at the intersection of mathematics and physics, Mr. Villani, age 37, has focused on bringing order to disorder, specifically on a better understanding of entropy. His work demonstrated not only that entropy increases, like when gas escapes from a container, but that sometimes it does so faster and other times it does so slowly. He developed the mathematics to explain those different patterns.

The medals, first awarded in 1936 and founded at the behest of the Canadian mathematician John Charles Fields, come with 15,000 Canadian dollars in prize money, or about \$14,500, far less than the Nobels. But their value to mathematicians is extremely high.