BRAZILIAN WINS TWAS-LENOVO PRIZE

Artur Avila received his PhD at 21, and at the age of 36 has already made great waves in multiple mathematical fields. The Brazilian prodigy-turned-professor won the Fields Medal in 2014. Now, he has been honoured with the TWAS-Lenovo Prize.

by **Sean Treacy**

Brazilian mathematician Artur Avila's has solved daunting mathematical mysteries such as how chaos emerges from simplicity. Now, he has been named winner of the 2015 TWAS-Lenovo Science Prize, one of the most prestigious honours given to scientists from the developing world.

Avila's work has helped resolve some major mathematical quandaries and helped to bring a global awareness of the quality of mathematical research in Brazil. He also won the Fields Medal in 2014 and the TWAS Prize for Mathematics in 2013.

"Artur Avila is clearly an exceptional talent in the world of mathematics," said TWAS President Bai Chunli. "But he also is a symbol of the remarkable creativity that we can find among young researchers in the developing world. At TWAS, we are proud of our links to this scholar, and we are confident that he has many more years of important work ahead of him."

The annual prize includes an award of USD100,000 provided by Lenovo, the global leader in consumer, commercial and enterprise technology and the largest PC company in the world.

"I am very impressed by Dr. Artur Avila's achievements and contributions to his specialty areas such as dynamical systems and analysis," said Senior Vice President George He. "And I equally admire his collaborative spirit in working with peers around the globe to conquer world-class open mathematics problems. As a China-rooted global company, Lenovo knows well the power of globalization and believes this holds true for business as well as science. I am glad to see more and more young talents like Dr. Avila from developing countries originally are playing increasingly important roles in the arena of science today."

▼ TWAS-Lenovo Prize Winner Artur Avila. (Photo provided)

At the age of 36, Avila is already one of mathematics' most prominent problem-solvers. Among his major accomplishments was a landmark work in dynamical systems — a branch of mathematics that studies how complex and seemingly chaotic behavior can arise over time from simple systems. Through his work, mathematicians now have a proof that can describe, for example, how a population of organisms will grow or decline over time.

Avila said it was an honour to receive the prize, and that it sends a message about the quality of mathematics being done in the developing world. He hopes it will help inspire mathematically gifted young people in developing countries to pursue research in pure mathematics, even though such a career can seem out-of-reach.

"Whenever we have such a prize, it gives us something to show to the larger public," Avila said, "to show that we are doing good mathematics in Brazil."

HOW EXPOSURE CAN SPARK A CAREER

Avila's parents were among those who had never heard of a career in pure mathematics. But Avila took strongly to the subject in school as a child while struggling mightily in other subjects. A teacher saw his potential, and encouraged him at age 13 to enter the Mathematical Olympiad. He excelled, and two years later went to the International Mathematical Olympiad in Toronto, Canada, where he won a gold medal.

Just as importantly, Avila said, the Olympiad exposed him to researchers from Brazil's Institute of Pure and Applied Mathematics (IMPA), and he was inspired to join them someday as a mathematician himself. Avila still does much of his research work as a fellow at IMPA, splitting his time between IMPA in Rio De Janeiro and the French National Centre for Scientific Research (CNRS) in Paris, where he is a research director.

A great many people, especially in developing nations, don't even think of mathematics as a potential career, he said, and the field thus loses out on the pool of potential talent.

"It's not on the spectrum of possibilities for many people," said Avila. "People have their talents, and people that might be attracted to mathematics, you can't just expect them to be, say, a biologist. People start in math for several reasons. They're not necessarily thinking of the applications."

Avila's research also focuses on the dynamics of points in one dimension. This includes elements of mathematics that describe the movements of subatomic particles in models for quasicrystals, materials that have a more orderly molecular structure than a liquid, but less than a crystal. One of the questions solved by Avila is tied to the behavior of electrons in quasicrystals. It had been considered so difficult that late Polish mathematician Mark Kac had dubbed it the "Ten Martini Problem", offering 10 martinis to anyone who could solve it.

> "Even the purest mathematics still has consequences. Everything's connected in the mathematics world."
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> *Artur Avila, 2015 TWAS-Lenovo Prize winner*

Avila's work is purely conceptual. But it could have untold ripple effects throughout a number of scientific fields. Discoveries in pure, theoretical mathematics can later be used by applied mathematicians, which in turn can be used across many fields, from engineering to chemistry. So part of the excitement of Avila's discoveries is that we may some day see how they become useful in day-to-day life.

"A lot of mathematics, and particularly the kind of research that I do, is not with direct applications in mind. We do research not particularly likely to lead to direct applications," he explained. "Even the purest mathematics still has consequences. Everything's connected in the mathematics world." ◘

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