Abel Prize 2017

The Abel Prize is widely regarded as the Nobel Prize of Mathematics, and the Abel Prize 2017 has been awarded to Yves Meyer, of the École normale supérieure Paris-Saclay "for his pivotal role in the development of the mathematical theory of wavelets." Announced on March 21, Yves Meyer received the award on May 23 from His Majesty King Harald V.

Established by the Norwegian Academy of Science and Letters, the Abel Prize is the recognition of those who give "contributions of extraordinary depth and influence to the mathematical sciences". Manned by a 5 member choosing committee, the first award was given in 2003, the bicentennial of Niels Henrik Abel's birth, whom this award is in memory of. Every laureate receives a reward of 6 million Norwegian Krone (about US$750,000 or €600,000).

Yves Meyer is one of the visionary leaders of wavelet analysis, a subject that converges mathematics, computational science and information technology. His first major contribution was the construction of a smooth orthonormal wavelet basis. Originally shrouded with doubt, its construction, seemingly simple, appears rather miraculous. Later, in collaboration with Stéphane Mallat, Meyer systematically developed multiresolution analysis, which places many of the earlier constructions on a more conceptual footing, by making a flexible and general framework for constructing wavelet bases.

The first significant discovery of wavelets was in the late 1970s, when seismologist Jean Morlet analysed reflection data obtained for oil prospecting, and empirically introduced a new class of functions, now called "wavelets", obtained by both dilating and translating a fixed function. While Fourier analysis provides a useful way of decomposing a signal or function into simply-structured pieces such as sine and cosine waves in a concentrated frequency spectrum, such pieces are very spread out in space. Wavelet analysis provides us with a way of cutting up functions into pieces that are localised in both frequency and

space. In less than 20 years wavelet analysis had developed into a coherent theory, and in the decades after that is it now applied in fields so diverse, ranging from applied and computational harmonic analysis to data compression, noise reduction, medical imaging, archiving, digital cinema, deconvolution of the Hubble space telescope images and the recent LIGO detection of gravitational waves created by the collision of two black holes.

This isn't the first prize for the 78-year-old French mathematician. He has been awarded the Salem Prize in 1970 and the Gauss Prize in 2010, "for advances in mathematics impact outside the field". His greatest contribution, pre-wavelets, is his proof, with Ronald Coifman and Alan McIntosh, of the L^2-boundedness of the Cauchy integral on Lipschitz curves, therefore solving the major open question in Calderón's program. Meyer is a member of the French Académie des Sciences since 1993, and has been an invited speaker in the International Congress of Mathematicians in 1970 (Nice), 1983 (Warsaw) and 1990 (Kyoto). He is also a foreign associate of the US National Academy of Sciences since 2014.

Coming first in the entrance examination, Yves Meyer entered the élite Ecole Normale Supérieure de la rue d'Ulm in Paris in 1957. He later said "If you enter ENS-Ulm, you know that you are giving up money and power. It is a choice of life. Your life will be devoted to acquiring and transmitting knowledge." He later became a high school teacher in a military school, but he felt it was a job unsuited for him. Meyer was uncomfortable to be the one who was "always right". "To do research", Meyer said, "is to be ignorant most of the time and often to make mistakes". He joined the University of Strasbourg as a teaching assistant, and received his PhD in 1966. He first became a professor at the Université Paris-Sud, then later in the Ecole Polytechnique, then the Université Paris-Dauphine. In 1995, he moved to the ENS Cachan (now renamed the ENS Paris-Saclay), at the Centre of Mathematics and its Applications (CMLA) until 2008 when he formally retired. However, he is still an associate member of the research centre. Curious, energetic, generous and open to other fields, he has inspired a generation of mathematicians who have gone on to make important contributions in their own right. "You must dig deeply into your own self in order to do something as difficult as research in mathematics," Meyer claims. "You need to believe that you possess a treasure hidden in the depths of your mind, a treasure which has to be unveiled."

Sources:
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