

2014 King Faisal International Prize for Science and Medicine

The King Faisal Foundation in Riyadh, Saudi Arabia has announced the King Faisal International Prize (KFIP) for the year 2014. Mathematics was the topic for the 2014 Faisal Prize in science, which was presented to Gerd Faltings. The prize for Medicine has been awarded to Yuk Ming Dennis Lo for non-invasive diagnosis of foetal diseases. The prize consists of a certificate, hand-written in Diwani calligraphy, summarizing the laureate's work; a commemorative 24 carat, 200 g gold medal, uniquely cast for each prize, and a cash endowment of Saudi Riyal 750,000 (about US\$ 200,000). The winners will receive their awards in March in a ceremony in Riyadh, under the auspices of the King of Saudi Arabia.

The prize committee stated that Faltings' work combines ingenuity, vision and technical power. He has introduced stunning new tools and techniques which are now constantly used in modern mathematics. His deep insights into the p -adic cohomology of algebraic varieties have been crucial to modern developments in number theory. His work on moduli spaces of abelian varieties has had great influence on arithmetic algebraic geometry. He has introduced new geometric ideas and techniques in the theory of Diophantine approximation, leading to his proof of Lang's conjecture on rational points of abelian varieties and to a far-reaching generalization of the subspace theorem. Professor Faltings has also made important contributions to the theory of vector bundles on algebraic curves with his proof of the Verlinde formula.¹

Born in 1954 in Gelsenkirchen-Buer, Germany, Faltings received his Ph D in 1978 from the University of Münster, under the supervision of Hans-Joachim Nastold. Faltings spent a year at Harvard University as a postdoctoral fellow and returned to Germany in 1979, taking up an appointment as professor of mathematics at the University of Wuppertal. Faltings shot to fame in 1983 as a 29-year-old, when he proved the long-standing Mordell conjecture. By proving this, Faltings showed that $x^n + y^n = z^n$ could

have only a finite number of solutions in integers for $n > 2$. This was a major breakthrough in proving Fermat's last theorem that this equation has no natural number solutions for $n > 2$. He received the Fields Medal in 1986. One of Faltings' major results since the Mordell conjecture is his solution to a conjecture of Tate from the late 1960s. This is the 1988 paper entitled ' p -adic Hodge theory'. In 1991, in the paper 'Diophantine approximation on Abelian varieties', he proves a conjecture of André Weil (also conjectured by Serge Lang), showing that if A is an Abelian variety over a number field k and X is a subvariety that satisfies a certain natural condition, then X must contain only finitely many k -rational points. This paper introduced many modern techniques into the theory of Diophantine approximation. Amongst the fruits of this paper was, 'Diophantine approximations on projective spaces', which contains, amongst other things, a new and simpler proof of Schmidt's subspace theorem, which is a measure of its depth. Since 1994, Faltings has been the Director of the Max Planck Institute for Mathematics in Bonn. In 1996, he received the Gottfried Wilhelm Leibniz Prize of the Deutsche Forschungsgemeinschaft, which is the highest honour awarded in German research.

Dennis Lo received his Bachelor of Arts degree from the University of Cambridge and the Doctor of Medicine and Doctor of Philosophy degrees from the University of Oxford. In 1997, Lo was able to demonstrate the presence of high concentrations of cell-free foetal DNA in the plasma of pregnant women, which could then be sampled and tested. He elucidated the fundamental characteristics of such molecules, developed the technologies for their analysis, conceptualized their use and brought non-invasive prenatal diagnosis to a reality. This discovery opened up new possibilities for non-invasive prenatal diagnosis, and has effectively reduced our reliance on previous invasive and potentially risky methods. Lo has transformed the field of prenatal genetic diagnosis through his discovery of cell-free foetal nucleic acids

in the maternal blood and identification of their placental source. He built upon this pivotal discovery to develop and translate techniques for risk-free determination of foetal aneuploidy and monogenic disease, and ultimately the sequencing of the full foetal genome from cell-free DNA. He was able to adapt this technology to use RNA, instead of DNA, to detect Down's syndrome in unborn fetuses where previous methods could cause a miscarriage. Dennis Lo is the Director of the Li Ka Shing Institute of Health Sciences, the Li Ka Shing Professor of Medicine and Professor of Chemical Pathology of The Chinese University of Hong Kong (CUHK). He is also the Associate Dean (Research) of the Faculty of Medicine of CUHK.

The prizes are named after the third king of Saudi Arabia, to recognize dedicated men and women whose contributions make a positive difference, including scientists and scholars whose research results in significant advances in specific areas that benefit humanity. Each year awards are given prizes for service to Islam, Islamic studies, Arabic literature, medicine and science. The prize for science rotates among the fields of physics, mathematics, chemistry and biology¹. The previous winners for mathematics are: Michael Atiyah (1987), Dennis P. Sullivan (1994), Andrew J. Wiles (1998), Yuri I. Manin and Williston Shor (2002), Simon Kirwan Donaldson and Mudumbai Seshachalu Narasimhan (2006) and Enrico Bombieri and Terence Chi-Shen Tao (2010). Narasimhan is the only Indian to have won the KFIP in the science category². Several of the KFIP laureates in science and medicine have gone on to receive the Nobel Prize.

The science prize for the year 2015 will be in the field of chemistry. The topic for the medicine prize is 'Intestinal microflora and human health'. The deadline for all nominations is Thursday, 1 May 2014 (<http://www.kff.com/>).

1. Khan, S. A., *Curr. Sci.*, 2013, **104**(5), 575.
2. Malhotra, R., *Curr. Sci.*, 2010, **99**(3), 323–331.

Sameen Ahmed Khan