

2021 King Faisal International Prize for Science and Medicine

The King Faisal Foundation in Riyadh, Saudi Arabia has awarded the 2021 King Faisal International Prize for Medicine (topic: Regenerative medicine in neurological conditions) to Stephen Mark Strittmatter and Robin James Milroy Franklin. The Science prize in the field of physics is awarded to Stuart Stephen Papworth Parkin. The prize comprises a 24-carat gold medal, weighing 200 grams; and a cash award of 750 thousand Saudi Riyal (USD 200,000).

Regenerative medicine covers a multitude of therapeutic approaches and technologies intended to regrow, repair or replace diseased or damaged cells, tissues or organs^{1,2}. Spinal cord injury (SCI) and stroke can lead to permanent disabilities and the World Health Organization estimates that there are about quarter to half million such cases each year worldwide. Axon (also called nerve fibre) is that portion of a neuron (nerve cell) that carries nerve impulses away from the cell body. After the SCI, axon regeneration in the mature mammalian central nervous system is extremely limited by many extrinsic and intrinsic factors. Hence, there is no single therapy to enable significant regeneration of damaged axons.

Strittmatter was born in 1958 in St. Louis, Missouri, USA. He is the Vincent Coates Professor of Neurology and Professor of Neuroscience at Yale School of Medicine, Yale University in New Haven, Connecticut, USA. He co-founded the Yale Program in Cellular Neuroscience, Neurodegeneration and Repair, where he is serving as the Founding Director. He also holds the position of Director at the Yale Memory Disorders Clinic. Strittmatter is awarded the prize for his fundamental contributions to the molecular understanding of failed axonal growth and limited recovery following SCI. He has worked on Alzheimer's disease and other dementias and disorders of memory functions. He identified the Nogo Receptor pathway that plays a central role in determining the ability of axons to regenerate and re-connect after injury. The aforementioned discoveries have led to novel therapeutic approaches³.

Franklin was born in 1962 in Hertfordshire, UK. He is the Professor of Stem Cell Medicine at the Wellcome Trust-Medical Research Council Cambridge

Stem Cell Institute, University of Cambridge, UK. Myelin is the fatty covering that insulates and protects nerve cells. His research focuses on the remyelination (myelin regeneration) lost due to injuries or otherwise. He also investigates the response of neural stem cells in adults to ageing. His contributions in the areas of myelin biology have significant applications for clinical neurology and diseases such as multiple sclerosis, which is an autoimmune disease in which the body's own immune cells mistakenly attack and damage the myelin sheath. Using a wide range of *in vitro* and *in vivo* models, Franklin and collaborators have examined extrinsic (environmental) and intrinsic (transcriptional, epigenetic) factors that govern the differentiation of adult neural stem cells into oligodendrocytes and other glia following injury to the central nervous system. This line of research has the potential to provide treatment to currently untreatable secondary progressive phase of multiple sclerosis and certain ageing related disorders⁴.

Parkin was born in 1955 in Watford, UK. Since 2014, Parkin is a director at the Max Planck Institute of Microstructure Physics in Halle and a professor at the Institute of Physics at the Martin-Luther-University Halle-Wittenberg, Germany. His initial work was on superconductors. He made fundamental contributions to the understanding of the giant magnetoresistance (GMR), which is a quantum mechanical magnetoresistance effect observed in multilayers composed of alternating ferromagnetic and non-magnetic conductive layers. The GMR effect was discovered in 1988 by Albert Fert and Peter Grünberg and they were awarded the 2007 Nobel Prize in Physics. In 1997, while at the IBM Corporation, Parkin initiated the commercialization of the GMR effect in the form of hard disk reading heads. Parkin's work focuses on the exploration and discovery of novel spintronic materials. In traditional electronics, the electron's charge is exploited and in spintronics, both the charge and the spin are exploited leading to novel applications. Parkin is awarded the prize for his fundamental discoveries and innovations enabling spin-engineered storage devices which have resulted in a thousand-fold increase in the

storage capacity of magnetic disk drives^{5,6}.

Out of 122 KFIP Science/Medicine, 21 are Nobel Laureates^{7,8}. Mudumbai Seshachalu Narasimhan is the only Indian to have received the KFIP science prize (for mathematics in 2006) and the only Asian to have won it for mathematics⁹. Sajeed O. John of Indian origin, now based in Canada received the Science prize in the category of physics in 2001. Vamsi Krishna Mootha of Indian origin, now based in the USA received the Science prize in the category of biology in 2016. The other notable science prizes established in the Middle East are the Mustafa Prize for Science from Iran¹⁰ and the UNESCO Sultan Qaboos Prize for Environmental Preservation from Oman¹¹. For the year 2022, the topic for the Medicine prize is 'Gene Editing Technologies'¹² and the Science prize is in the field of mathematics (see <http://kingfaisalprize.org/>).

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