2020 Subrahmanyan Chandrasekhar Prize of Plasma Physics

The Division of Plasma Physics (DPP) under the Association of Asia-Pacific Physical Societies (AAPPS) has selected Hyeon Keo Park (Ulsan National Institute of Science and Technology, Korea) as the 2020 Laureate of the Subrahmanyan Chandrasekhar Prize of Plasma Physics. The 2020 Selection Committee consisted of leading plasma physicists, including Amita Das (Indian Institute of Technology Delhi, India) and Gadiyara Chakrapani Anupama (Indian Institute of Astrophysics, Bengaluru, India). The certificate and medal will be given virtually at the Fourth Asia-Pacific Conference on Plasma Physics (AAPPS-DPP 2020, being held online this year due to the coronavirus pandemic, http://aappsdpp.org/DPP2020/index.html) during 26–31 October 2020. The Prize named in honour of the Nobel laureate Subrahmanyan Chandrasekhar was founded in 2014 by AAPPS–DPP and is awarded annually for seminal contribution in the field of plasma physics[1]. The previous laureates are Setsuo Ichimaru 2014; Predhiman Krishan Kaw 2015; Donald Blair Melrose 2016; Chio Zong Cheng and Lou-Chuang Lee 2017; Toshiki Tajima 2018 and Liu Chen and Kazunari Shibata 2019. Predhiman Krishan Kaw is the only Indian to have received this Prize so far[2,3].

The diverse contributions of Park are recognized by the following citation: 'Through his original and pioneering works in fusion plasma diagnostics, the electron cyclotron emission imaging (ECEI) and microwave imaging reflectometry enabled to visualize magnetohydrodynamic instabilities and turbulent fluctuations with unprecedented high-resolution, leading to rich discoveries of novel plasma physics phenomena, for example, in the saw tooth crash process and the edge localized mode events. The plasma physics research assisted by the advanced imaging diagnostics enhanced the synergies with numerical modelling and theories, and elevated fusion plasma research program in Korea. Nowadays the ECEI system is a standard research tool in majority of toroidal devices.'

Park is the first Korean laureate of this Prize. His doctoral thesis was on far infrared laser scattering. Using a multi-channel interferometer/polarimeter, he developed an asymmetric Abel inversion technique for tokamak plasmas. He pioneered the diagnostic development in the tetra hertz regime. He developed a state-of-the-art 2D microwave imaging system for toroidal plasmas[4]. Park and his collaborators have made significant steps towards finding a solution to one of the critical but unsolved fusion plasma physics problems, which is to suppress the potentially harmful plasma edge instabilities (the so-called edge localized modes or ELMs). The study of ELMs has a bearing on the upcoming research reactors, including the International Thermonuclear Experimental Reactor in Cadarache, France (https://www.iter.org/).

Along with the Subrahmanyan Chandrasekhar Prize of Plasma Physics, there are other awards instituted by AAPPS–DPP, including the Plasma Innovation Prize (in recognition for seminal/pioneering contributions in the field of plasma applications, focusing on impacts on industry, established in 2019). The 2020 Prize has been awarded to Masaru Hori of Nagoya University, Japan. The citation is as follows: 'For his outstanding contributions to diverse range of applied and fundamental plasma science and technology using low-temperature plasmas, in particular, for the carbon film mask technology development for plasma etching for semiconductor manufacturing technologies; for invention and commercialization of ultra-compact atomic radicals measurement equipment and high-density radical source for radical controlled plasma processing and synthesis for functionalized materials; and for discoveries related to the use of plasma activated medium/lactic in plasma medicine for selective killing of various cancer cells'. Hori has made contributions in diverse areas of plasma science. He invented the carbon film as a mask material for plasma etching in semiconductor manufacturing, which has application in integrated circuits. He developed techniques for high-density plasma sources. He is also the inventor of plasma activated medium and plasma activated lactic, which can selectively kill various cancer cells such as ovarian, brain, and stomach and pancreatic cancers[5].

The other awards instituted by AAPPS–DPP are the Young Researcher Award (established in 2016 for the age group: 30–40 year), U30 Scientist and Student Award (established in 2018, for the age group under 30 year) and the Poster Prize (established in 2018 and selected from the Annual Asia-Pacific Conferences on Plasma Physics). Indians have been faring well in the aforementioned Prizes. Among the six 2019 U30 award recipients there are two Indians: Sudip Mandal, 'For the significant contribution in understanding of various properties of propagating slow magneto-acoustic waves in hot coronal loops'[6] and Rupak Mukherjee, 'For the significant contribution in recurrence in three-dimensional magneto-hydrodynamic plasma'[7]. Gopal Hazra and Laishram Modhuchandra Singh received the U30 Award in 2018. Dhanya Mahalingam Balaram was one of the four recipients of the inaugural Young Researcher Award (in 2016), 'For her contribution on proton entry into the near-lunar plasma wave for magnetic field aligned flow on observations of protons in the near-lunar and deeper wake, flowing along interplanetary magnetic fields, which could originate from the tail of the solar wind velocity distribution.'

1. http://aappsdpp.org/AAPPSDPPF/index.html
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5. Tanaka, H. *et al.*, *Sci. Rep.*, 2016, **6**, 36282; https://doi.org/10.1038/srep36282.
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Sameen Ahmed Khan, Dhofar University, Department of Mathematics and Sciences, College of Arts and Applied Sciences, Salalah, Sultanate of Oman.
e-mail: rohelakhan@yahoo.com