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Editorial

Recent discoveries in astrophysics and cosmology have generated tremendous excitement in the scientific world. The first high-energy neutrinos of cosmic origin were recorded by the IceCube, a gigantic cubic-kilometre-sized detector in the Antarctic ice at the South Pole. The prize catch of gravitational waves (GW) from merging black holes in LIGO detectors for the first time in 2015 opens a new window to the Universe. The discovery of gravitational waves from the merging binary neutron star in August last year followed by its detection across the electromagnetic (EM) spectrum is an outstanding event in the history of mankind. The detection of light from first stars just 180 million years after the Big Bang, hailed as another great breakthrough, was reported recently by a group of radio astronomers. This observation also hinted at the presence of dark matter. All these observations mark a new era of multimessenger astronomy: the exploration of the Universe through combining information from a multitude of cosmic messengers: electromagnetic radiation, gravitational waves, neutrinos and cosmic rays.

The questions that can be explored through multimessenger observations concern the dynamics of exploding stars, the formation and evolution of black holes, the origin of cosmic rays, relativistic jets, supermassive black holes in the hearts of galaxies, colliding black holes and neutron stars and many others. Multimessenger astronomy also allows us to address the question of why we are here in the first place, by shedding light on the origin of heavy elements and the evolution of galaxies and the Universe.

In the next decade, multimessenger astronomy will probe the rich physics of transient phenomena in the sky, such as the merger of neutron stars and/or black holes, gamma-ray bursts, active galactic nuclei and core-collapse supernovae. India is making a steady progress in multimessenger astronomy with the Giant Metre-Wave Radio Telescope (GMRT) near Pune, a marvel created by Professor Govind Swarup; AstroSat, the first Indian observatory in space and gravitational observatory LIGO, India which is in the making. Furthermore, India is participating and taking lead in building the Square Kilometre Array (SKA), the next generation radio telescope to be co-located in South Africa and Australia, Thirty Metre optical Telescope (TMT) and has strong co-operation with the members of the next generation imaging atmospheric Cerenkov detector consortium, Cerenkov Telescope Array (CTA) with generous support from the Department of Atomic Energy and Department of Science and Technology. Saha Institute of Nuclear Physics (SINP) has been involved in PICASSO/PICO Dark Matter search experiment in SNOLab, Canada since 2009 as well as study of very high energy gamma-ray sources observed with the Major Atmospheric Gamma Imaging Cerenkov (MAGIC) telescope experiment since 2015. Furthermore, SINP along with other institutions is spearheading the Dark Matter search experiment in the underground laboratory to be set up in Jaduguda.

Multimessenger astronomy hence requires a co-ordination of a global network of multimessenger instruments, to develop multimessenger observational strategies and data analysis and an interdisciplinary effort to interpret observations and constrain theoretical models. All this requires tight collaborations between the different GW/EM and neutrino/cosmic-rays communities. The Astroparticle and Cosmology Division of SINP thus aims to bring together these communities together in order to start a discussion on how to co-ordinate these diverse astrophysical activities under the umbrella of multimessenger astrophysics. This is our tribute to Professor Meghnad Saha on his 125th birth anniversary.

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