



Editorial

Astrophysical jets are largely known as outflows of ionized matter and are observationally seen as extended beams of emission among many sources such as galactic and extragalactic. These sources include Active Galactic Nuclei (AGNs), X-ray binaries (XRBs-microquasars), Gamma-Ray Bursts (GRBs) and Young Stellar Objects (YSOs) and are key ones to understand powering mechanisms and formation of jets at diverse astrophysical scales. Jets from a variety of these sources share different physical scales (e.g., spanning over a few orders of magnitudes in length, velocity, energies, etc.) and underlying processes. Despite their diverse physical scales, these astrophysical sources share strong morphological similarities and are valuable resources. Very recent studies of the central Black Hole to M87 (Virgo A or NGC 4486) using Event Horizon Telescope Network at radio frequencies provide more details about such large-scale jets and underlying mechanisms followed by the first discovery of this object by H. B. Curtis back in 1918. Underlying physics behind these enigmatic sources is one of the least understood areas and needs more attention to improve our present knowledge about such interesting sources.

Apart from theoretical and computational advancements, considerable progress is made in the light of multi-wavelength observations of these objects during the last several decades. In India, a sizable fraction of astronomers work in the field of astrophysical sources like AGNs, microquasars, GRBs, YSOs, etc., and they make use of a range of multi-wavelength data using national and international facilities. The workshop ‘Astrophysical Jets and Observational Facilities: National Perspective’ 05–09 April 2021 was hosted at ARIES quite timely when we have several world-class observational facilities providing valuable data for these astrophysical objects across the electromagnetic spectrum including Gamma/X-ray wavelengths using on-board instruments in

ASTROSAT to radio wavelengths from upgraded-Gaint Meter Radio Telescope (uGMRT) and recently at deeper limits to optical-NIR wavelengths with the 3.6m Devasthal Optical Telescope (DOT). With the help of these multi-wavelength facilities, the Indian astronomical community has been able to explore this research field in a much better way, taking advantage of these facilities and other observational facilities from international collaborations.

During the workshop, data reduction/analysis techniques, instrumentation and recent results obtained using Indian multi-wavelength observational facilities were presented by several experts in their research field along with discussions utilizing sophisticated methods like machine learning. Presentations and discussions during this workshop were mainly focused on our understanding of observational aspects of a diverse class of astrophysical jets including those from AGNs, X-ray binaries, GRBs, etc., and to emphasize broad and open common questions related to their physical origins. Most of the presentations and discussions were based on some of the recent results obtained using ASTROSAT, uGMRT, 3.6m DOT and other such Indian facilities. During the sessions, discussions were made regarding utilizing observational resources in a better way to enhance the science outcomes and to attract more young students towards ongoing and upcoming astronomical projects in the country. A good portion of the workshop schedule was dedicated to discuss the existing and upcoming observational facilities in the country. Several presentations were made by the experts to review the existing and ongoing ground-based facilities including GMRT, 2.0m HCT, 3.6m DOT, ASTROSAT and historical aspects of the Indian balloon-based infra-red astronomy. Some of the near-future Indian projects like 2.5m PRL optical telescope, 8–10m National Large Optical Telescope (NLOT) and ground-based gamma-ray astronomy projects like

Major Atmospheric Cherenkov Experiment (MACE), etc., were also presented during the workshop. International projects with Indian participation like Thirty Meter Telescope (TMT), Square Kilometer Array (SKA) and Laser Interferometer Gravitational-Wave Observatory (LIGO)-India project-based presentations and discussions were also conducted during the workshop. Upcoming Indian space-based missions were also discussed in detail along with individual talks on upcoming missions like INSIST, XPoSAT and DAKSHA missions in near future.

Participation of more than 225 astronomers, post-doc fellows and young students from around 40 Institutions/Universities during the second wave of COVID-19 was very encouraging and fruitful and discussions have occurred at length followed by talks for all five days in online mode. This workshop was indeed one of the most successful ones hosted on this subject area in recent years, thanks to the scientific organizing committee and related institutions for their

support and encouragement. The guest editors express their sincere thanks to all the authors/co-authors for their contributions. The contributions in the form of review talks/invited talks/contributory and poster sessions are presented as original research articles as a special issue of the *Journal of Astrophysics & Astronomy* titled “Astrophysical Jets and Observational Facilities: National Perspective”. The guest editors are also thankful to the Chief Editor and staff of the journal for providing all the help and support to prepare this special issue during this tough pandemic time. This national workshop is considered as a monumental occasion for all the participating institutions/organizations to commemorate “75 years of independence: Azaadi ka Amrit Mahotsav”.

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