INTERVIEW WITH TIGRAN ARSHAKYAN

Scientific Consultant

NAS RA Byurakan Astrophysical Observatory after V.A. Ambartsumian

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"I want to encourage young scientists to use my resources to the fullest."

1. How would you describe your career path?

In my youth, I was very curious and loved to ask endless questions to which I did not always get satisfactory answers. The latter was the impetus for my development as a scientist. Already at school I was fascinated by the starry sky and in the eighth grade I made my first eight-centimeter refractor telescope and observed the moon and planets with the village boys. Even then I decided that I would become an astronomer observer. But fate decreed otherwise, after defending my master thesis in theoretical astrophysics, I started working in the theoretical department of the Byurakan Astrophysical Observatory under Viktor Ambartsumian's supervision. I defended my PhD thesis in 1992 under the supervision of Dr. Ruben Andreasyan on the topic of studying radio pulsars and classical double radio sources using the inverse problem approach. In 1996, I was awarded the Royal Society Fellowship and moved to Cambridge, Cavendish Laboratory, and

worked with Prof. Malcolm Longair on development of asymmetric relativistic model of classical double radio sources. In 2001, I was awarded the Alexander von Humboldt Fellowship to study the relativistic jets of active galactic nuclei (AGN) at the Max-Planck Institut für Radioastronomie (in Bonn, Germany) with Prof. Anton Zensus and then continued working there on different projects related to AGN and magnetic fields in star-forming galaxies until 2010. Then I moved to the University of Cologne to work on the development of a wavelet-based weighted cross-correlation method to study the structure scaling in the maps of star-forming clouds. During my scientific career, I have participated in several local and international projects regarding the study of relativistic jets of blazars and their central active nuclei in the radio, optical and X-ray ranges, as well as the evolution of magnetic fields in star-forming galaxies in the frame of the Square Kilometer Array (SKA) design studies.

2. What projects are you currently involved in?

I am currently involved in two international projects to study the formation, dynamics and emission mechanisms of relativistic jets in active galactic nuclei. The MOJAVE (Monitoring of Jets in Active galactic nuclei with VLBA Experiments) project is led by Purdue University (USA) and includes countries such as Germany, Russia, Finland and Spain. It is a long-term program to monitor radio brightness and polarization variations in jets with the highest resolution telescope VLBA (Very Long Baseline Array) at 15 GHz, which is able to separate the headlights of your car, as seen by an astronaut on the Moon. It allows the investigation of evolution and magnetic field structures of jets on subparsec/parsec scales and association of radio flares with changes in optical emission, MeV Gamma-ray and neutrino detection at GeV Gamma-ray. Another project with INAOE (Mexico) is related to optical spectroscopic monitoring of jetted active galactic nuclei to investigate the link between the jet characteristics and changes in optical continuum emission and broad line regions.

3. What does it mean to be a scientific consultant of the Byurakan Astrophysical Observatory? Isn't it difficult to cooperate remotely?

During my career, I accumulated experience in supporting and consulting students and professionals in preparation of master theses, annual reports, grant applications, and organization of scientific workshops. I gained experience in critical reading and revision of scientific material

by refereeing for astronomical journals, and revising projects and scientific papers of coauthors and colleagues. I am happy to share my knowledge and experience with the staff members and young generation of astronomers at the BAO. My duties as a Scientific Consultant include:

- Scientific advice in the areas of active galactic nuclei, relativistic jets, magnetic fields of star-forming galaxies, radio pulsars, methods of mathematical and statistical analysis
- Advice with preparation of scientific documents, such as abstracts, manuscripts
- Assistance in finding the resources for scientific grants and preparation of grant proposals
- Checking and (if required) revising documents with regard to language, content, completeness, consistency, and standards compliance.

I want to encourage young scientists to use my resources to the fullest, please, do not hesitate to contact me by E-mail (arshakian@ph1.uni-koeln.de) or any online meeting application (Zoom, Webex, Skype, etc.). Remote collaboration proved to be useful in case of regular online meetings. My experience with remote supervising of my master student from the Yerevan State University and cooperation with astronomers from different countries shows that it can be effective when conducted on a regular basis.

4. What do you think is the essence of Astronomy in human development?

This is a very voluminous question, but I will try to summarize my thoughts. Rapid development of computation and information technology has tremendous influence on Astronomy and many other fields. From a practical point of view, the development of astronomy contributes to the development of other sciences and vice versa and contributes to the emergence of interdisciplinary fields such as astroinformatics, astrobiology and others. It stimulates the growth of the economy and the living comfort of the humans. This knowledge is used for the exploration of the solar system, and in the foreseeable future, it will be used extensively for space travel and space exploration outside the solar system.

From the philosophical point of view, the importance of astronomy is in the development of the human consciousness, which may illuminate the eternal question: “Who am I?”. Accumulation of knowledge about the universe discloses the evolution and holistic nature of the universe and thereby contributes to the development of intellect and transformation of individuals’

consciousness into collective consciousness, cosmic consciousness and lastly to consciousness of unity.

5. It is known you are specializing in the study of radio galaxies and magnetic fields, what recent scientific achievements in this field would you highlight?

I would like to mention our last study of the BL Lacertae observed at 15 GHz with the VLBA interferometric telescope. The latter is capable of mapping the radio jets on sub-parsec scales. Monitoring of BL Lacertae has revealed that the base of the jet consists of a bright radio core followed by a quasi-stationary radio component (QSC) at a distance of 0.34 parsecs from the radio core. Very little is known about trajectory of the QSC. We analyzed and modeled the dynamics and brightness asymmetry of the QSC and found that the motion of the QSC is similar to the behavior of a nozzle of rapidly shaken whip, which makes a swinging motion and drags the jet outflow. Another study I want to point out is the development of a model of cosmological evolution of small- and large-scale magnetic fields in star-forming galaxies. This work is of growing interest among radio astronomers' community, since for the first time it provides predictions of evolutionary scenarios for the amplification and ordering of magnetic fields in various types of star-forming galaxies, which can be tested with measurements of polarized radio emission and Faraday rotation with the world's largest upcoming radio telescope SKA, which is believed to lead to revolutionary discoveries.

By Meline Asryan