OBITUARIES

Prepared by the Historical Astronomy Division

VICTOR AMAZASP AMBARTSUMIAN, 1912-1996

Eminent Armenian scientist and astronomer, Prof. Victor Ambartsumian (also spelled Ambartsumyan and Ambarzumyan), Honorary President of the Armenian National Academy of Science, died on the 12th of August, 1996. He was an honorary or foreign member of academies of sciences of more than 25 countries and held honorary degrees from many well-known universities. The scientific community recognized his activities by electing him president of the International Astronomical Union (1961-64) and president of the International Council of Scientific Unions (1970-74). His book *Theoretical Astrophysics* (1958, Pergamon Press) became a bible for a generation of astronomers.

Ambartsumian was born on 18 September 1908 in Tbilisi, Georgia. He wrote his first papers on "The New Sixteen-Year Period for Sunspots" and "Description of Nebulae in Connection with the Hypothesis on the Origin of the Universe" when he was only an 11-year old schoolboy. His talent was recognized very soon, and his father sent him to Leningrad where he obtained his higher education, receiving a first degree from Leningrad University and carrying out postgraduate studies at Pulkovo Observatory in 1928-31. His first collaborators and friends were A. Kozyrev, D. Ivanenko, and M. Bronstein. During the short period 1928-30, while still a student, Ambartsumian published 22 papers in *Astronomische Nachrichten, Zeitschrift fuer Physik, MNRAS,* and other journals. One of these (*Z. Phys.* 53, 690, 1929) was, in effect, the first paper in the theory of inverse spectral problems associated with Sturm-Liouville operators.

Prof. V. A. Ambartsumian at the commissioning of the 2.6m telescope in Byurakan (courtesy Byurakan Observatory and Garik Israelian).

Ambartsumian had broad research interests from the beginning. His work "The Quantization of Space" was reported at the International Conference in Odessa, where Summerfeld, Pauli, Jordan, Dirac, and many others were present. After the meeting, Pauli told him, "Colleague Ambartsumyan, at the moment the position of quantum electrodynamics appears hopeless. However, in a conversation with Mr. Tamm, I said that just a few ideas are needed like those of the English mathematician Ursell and yours to make the study of quantum mechanics possible again." In another paper, published in 1930 (when neutrons had not yet been discovered), Ambartsumian and Ivanenko argued against the presence of electrons in atomic nuclei. Soon he became a lecturer at Leningrad State University, and he was made a professor in 1934 at the age of 26. He then organized and headed the department of astrophysics at Leningrad (the first in the Soviet Union). His first PhD student was V.V. Sobolev (known for the Sobolev approximation in radiative transfer). It is commonly accepted that V.A. Ambartsumian was a father of the Soviet school of Theoretical Astrophysics. The most important steps in his scientific career can be given as:

1. Early papers published in the 1930's and devoted to radiative transfer and stellar dynamics. After many years, Edward A. Milne would write in *Observatory* that he had never imagined that the theory of radiation transfer, on which he, too, had been working, could have attained the level of development and beauty which it had achieved in the hands of Ambartsumyan.

2. First numerical inversion of the Radon transform (*MNRAS* 96, 172, 1935, communicated to the RAS by Arthur Eddington). This involved the 3D velocity distribution of stars in the Galaxy. After many years, A. Cormack (Dept. of Physics, Tufts University) would write in this connection: "Even in 1936 computed tomography might have been able to make significant contributions to, say, the diagnosis of tumors in the head....it seems to me quite possible that Ambartsumian's numerical methods might have made significant contributions to that part of medicine had they been applied in 1936" (*Computed Tomography, Some History and Recent Developments, Proc. of Symposia in Applied Mathematics*, Vol. 29, p. 35, 1985).

3. First idea about the patchy structure of interstellar absorption, 1938. S. Chandrasekhar wrote in this connection: "Ambartsumian's marvelously elegant formulation of the fluctuations in brightness of the Milky Way in the limit of infinite optical depth, showed that the probability distribution of the fluctuations in the brightness of the Milky Way is invariant with respect to the location of the observer." Ambartsumian introduced for the first time the now commonly accepted notion that interstellar matter ocurs in the form of clouds.

4. The Principle of Invariance, 1943. The power of this method introduced in a theory of radiation transfer has been applied in other sciences (optics, mathematical physics, etc.) allowing people to handle easily very complex mathematical problems. The method was successfully developed later by S. Chandrasekhar in his book *Radiative Transfer.*

5. Discovery of Stellar Associations, 1947. V. Ambartsumian originally introduced the term Stellar Association, dividing them into two groups: OB and T associations. He recognized that they are star forming regions at a time when the whole idea of star formation as an ongoing process was regarded as very speculative. This interpretation of groups of stars with positive total energy, in combination with ideas that can be traced back to his thesis advisor, A. A. Belopolsky, played a role in his eventual interpretation of quasars and other active galaxies as due to explosive expansion from some dense core rather than as accretion-powered sources.

6. It was in the early 1950's when Prof. Victor Ambartsumian first raised the issue of Activity of Nuclei of Galaxies (AGN). In his famous report at the Solvey Conference on Physics (Brussels 1958), Ambartsumian said that enormous explosions take place in galactic nuclei and as a result a huge amount of mass is expelled. In addition, if this is so, these galactic nuclei must contain bodies of huge mass and unknown nature. During a break in the session, Walter Baade spoke to Ambartsumian and said: "Prof. Ambartsumian, you have come from the Soviet Union and I from America. Logically speaking, you should be a materialist, and I, an idealist. But what you have said is nothing other than a pure idealism! It's fantastic! You speak about some kind of 'non-stellar' objects which no one has seen. So it must be something inexplicable, mysterious." The concept of AGN was widely accepted a few years later. One of the students of Ambartsumian, B. Markarian (known for Markarian galaxies) completed a survey for galaxies with UV excess using the 1-m Schmidt telescope of the Byurakan Observatory. IAU Symposium No. 29 and 121 were hosted by the Byurakan Astrophysical Obsrevatory in 1966 and 1986, 10 and 30 years after Ambartsumian's pioneering ideas about AGNs.

Ambartsumian returned to Armenia from Leningrad, and in 1946 founded the Byurakan Astrophysical Observatory on the slopes of Mt. Aragats (4090 m above sea level), rising from the valley of Mt. Ararat. Soon he became President of the Armenian Academy of Science, serving from 1947 to 1993 and as honorary president thereafter. In 1985, about 20,000 scientists were working in this small republic of fewer than 3.5 million people, most of them in institutions part of the Academy system. Ambartsumian founded the journal *Astrofizica (Astrophysics)* and remained its editor-in-chief as well as director of Byurakan until the mid 1980's.

It is generally recognized that Ambartsumian's papers were very original and revolutionary, striking in their mathematical beauty and accuracy. Congratulating him on his 80th birthday, Chandrasekhar wrote: "The only other astronomer of this century who compares with Academician Ambartsumian in his constancy and devotion to astronomy is Prof. Jan Oort; but they would appear to be dissimilar in every other way. It will be a worthy theme for a historian of science of the 21st century to compare and contrast these two great men of science. He is an astronomer *par excellence.* There can be no more than two or three astronomers in this century who can look back on a life so worthily devoted to the progress of astronomy" (*Astrofizica* 29, 408, 1989).

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JENO M. BARNOTHY, 1904-1996

Jeno Barnothy, an outstanding pioneer of cosmic ray research and noted astrophysicist died on 11 October 1996 at the age of 92 in Evanston, Illinois. He was born on 28 October 1904 in Kassa, Hungary (now Slovakia) and received his PhD in 1939 at the Peter Pazmany (now Loránd Eötvös) University, Budapest, Hungary. He was awarded of merit of the Hungarian Academy of Sciences in 1939 and the Eötvös Order in 1948. He worked from 1935 to 1948 in the Institute for Experimental Physics of the Loránd Eötvös University, first as an assistant professor and later as an associate and full professor.

Jeno Barnothy and a colleague, Madeleine Forro, became interested in research on cosmic rays using the coincidence technique that had been developed recently by Bothe and Kohlhorster. They built large Geiger-Müller counters and designed one of the first cosmic ray telescopes to study the isotropy of cosmic rays, their sidereal time periodicity, and their energy spectrum up to very high energy. Barnothy and Forro also explored the absorption of cosmic rays in the atmosphere and deep underground in the Dorog coal mine near Budapest and started a cosmic ray research center in Hungary that attracted a growing number of students. Their scientific achievements were cited in many papers in the cosmic ray literature and in handbooks including those of W. Heisenberg and L. Janossy.

Madeleine Forro and Jeno Barnothy married in 1938, becoming husband and wife and scientific colleagues for the rest of their long lives. After World War II, the Barnothys, both faculty members at the Roland Eötvös University, attempted to re-establish cosmic ray research in Hungary, but were unable to gain support from the authorities. They therefore left Hungary for the United States in 1948, where they first taught physics at Barat College, Lake Forest, Illinois, from 1948 to 1953, before settling in Evanston.

Once in America, the Barnothys' scientific interest shifted from cosmic rays to astrophysics. Their major achievement in this field was the prediction that high luminosity and rapid variability of quasars was partly due to their being gravitationally lensed. In a series of papers published in the 1960s and 1970s, they were among the first few astronomers to promote the idea of gravitational lensing.

In addition to their involvement in cosmic ray physics and astrophysics, the Barnothys became interested in biophysics, carrying out a number of experiments concerning the effects of magnetic fields on living creatures and founding the Biomagnetic Society. Jeno was active in a number of other American and international organizations, including the AAS, the American Physical Society, the German Astronmical Society, and the IAU. The Barnothys invited large numbers of scientists to their home in Evanston and also organized small seminars. They had relatively few collaborators