# BOOK PRESENTATION
by Rouben V.Ambartsumian

I am going to present a book of exceptional scientific value, prepared with much care and elaboration:

## A LIFE IN ASTROPHYSICS
**Selected Papers of Viktor A.Ambartsumian**
Edited by Rouben V.Ambartsumian
with an Introduction by Geoffrey Burbidge
published 1998 by ALLERTON PRESS, Inc.
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In fact, the presentation could well be limited to citations from the book itself. For the book's two Introductions (by Geoffrey Burbidge and myself), as well as the Epilogue by Viktor Ambartsumian, informally expressing his general scientific views, contain enough bright, vivid material perfectly suitable for this purpose. However, I would prefer to start with citations from a brochure by Allerton Press, specially created for the purpose same as of my today's talk.

The Byurakan Astrophysical Observatory is situated not far from Mt.Ararat. It was here that Viktor Ambartsumian began his second great career as Founder and Director of this world-famous observatory. His leadership role in the inportant work carried out there is well known. It was here also that he died on August 12, 1996.

Before coming to Byurakan, Ambartsumian already distinguished himself as a pioneer and innovator in such areas as physics of gaseous nebulae and star shells, star-cluster dynamics, theory of light scattering, and theory of interstellar light absorption. At Byurakan, he turned his attention to star associations, extragalactic astronomy, nonstationary processes in galaxies, and cosmogony. *Indeed, astrophysics in the second half of the 20th century is saturated with Ambartsumian's profound, original and bold ideas*. It is easy to believe that the magnificent view of Byurakan influenced his imagination during the decades of his work there.

Most of the papers in this collection were selected by the great astrophysicist himself months before his death, and some of them appear in English for the first time. A number unquestionably have had tremendous impact on astrophysical thinking in this century. At the same time, Ambartsumian seems also to have given preference to those papers, which, he felt, have potential for further development or express ideas too unusual for immediate acceptance. Did he intend these as a challenge to new generations of astrophysicists?

The papers are presented chronologically and take the reader successively from individual stars, multiple systems and star clusters, associations and superassociations into the world of galaxies. Throughout, there is evident that rare combination of physical insight and mathematical elegance that characterizes Ambartsumian's work.

The collection closes with an Epilogue, in which Ambartsumian summarizes the three main directions of his theoretical work: *(1) the invariance principles as applied to the theory of radiative transfer, (2) the inverse problems in astrophysics, and (3) the empirical approach to problems of the origin and evolution of stars and galaxies.*

In recognition of Viktor A.Ambartsumian's contributions to world astronomy, numerous foreign academies, societies and universities elected him as an honorary member. He was elected President of the International Astronomical Union, and also President of the International Council of Scientific Unions.

*The volume befittingly reconfirms the preeminent position of Viktor Ambartsumian in 20th century astronomy, and astronomers and astrophysicists throughout the world will welcome it.*

From the preface by Geoffrey Burbidge:

I am very happy to write this introduction to the publication of a small collection of the most important papers by a great astronomer. In science, to open a new path that expands over decades and develops into a broad avenue of inquiry is a rare accomplishment. Viktor Ambartsumian has been a pioneer in not one but three perpetually expanding fields, where his outstanding creative contributions are widely acknowledged...

Key papers in each of these areas are included in this volume... The initial germ for the theory of the "inverse Sturm- Liouville problem" was the paper of Ambartsumian which opens the present collection. Reading this book produces the impression that with this, his first publication, young Ambartsumian set the standard for the scientific level of his own work in subsequent years.

Ambartsumian saw much more clearly than others in the 1950s and 1960s that many groups and clusters of galaxies also appear to have positive total energy. He therefore concluded that they too are coming apart, though the common point of view has been that in general such systems are bound by unseen matter. Ambartsumian also applied the same arguments to what appear to be violent outbursts in the nuclei of galaxies. His conclusion was that these explosions were the manifestations of creation events. In all these ideas he was initially alone. For many it is still not easy to admit the possibility of changing the traditional paradigm. But the pressure of the observations does its work, slowly but steadily. Truly, by their impact on cosmogonical thinking the ideas of Ambartsumian started a revolution of Copernican scale.

A citation from Editor's Introduction, commenting on the principles supposedly applied by Viktor Ambartsumian in his choice of the papers for the collection:

For this collection V.A.Ambartsumian selected several papers which have already proven to have a tremendous impact on their respective fields. Ambartsumian also gave preference to those which, in his opinion, retain potential for future development. In earlier years he would often advise me to spend more time reading the scientific classics of the past. He firmly shared the old belief that, along with seeds which have since grown and produced scientific fruit, those classical works still contain many other seeds that remain hidden and await their chance for development. I assume that this belief, as applied to his own work, influenced my father's selections.

I present two items from Viktor Ambartsumian "scientific folklore" (partly incorporated in the Editor's Introduction). In his paper "Computed Tomography: Some History and Recent Developments" published in Proceedings of Symposia in Applied Mathematics, Volume 27, 1982 wrote the father of computer tomography Nobel laureate A.M.Cormack:

In 1936... the well known Armenian astronomer, V.A.Ambartsumian, posed the following question which he attributes to Eddington. If one looks in a particular direction in space, one sees many stars and these are moving relative to one another and to the sun. Astronomers would like to know their distribution of velocities but ... one can only measure their radial velocities, which are deduced from the Doppler shifts of their spectra. The problem then is to deduce the actual distribution of velocities in three dimensions in space from the distribution of radial velocities in various directions. This is just Radon's problem in the three dimension velocity space rather than ordinary space....
Ambartsumian gave ... the first numerical inversion of the Radon transform and it gives the lie to the often made statement that computed tomography would be impossible without computers. Details of this calculation are given in Ambartsumian's paper, and they suggest that even in 1936 computed tomography might have been able to make significant contributions to, say, the diagnosis of tumors in the head.

From the book by R.E.Bellman, R.E.Calaba and M.C.Prestrud "Invariant Imbedding & Radiative Transfer in Slabs of Finite Thickness" published by Elsevier in 1963:

In a fundamental paper published in 1943, the astrophysicist Ambartsumian presented a radically new approach to the mathematical formulation of these problems which yielded a new and vastly improved computational treatment for certain geometrical configurations of the medium. This novel and ingenious approach, based on the use of functional equations and physically intuitive principles of invariance, exploited the multistage aspect of the physical process involved in the radiative transfer. As a result of this pioneering work, new analytic treatments were made available, and simplified

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computational solutions were obtained. These ideas were further developed and extensively generalized by Chandrasekhar in a series of fundamental papers and in 1950 in his book... Many otherwise intractable problems were tamed, and great advances were made.

From the Epilogue:

It is natural to try to uncover the secrets of nature by observing the key points where they are hidden. We can hardly achieve this aim only by theorizing. Observations produce almost innumerable evidence in favor of ejections and explosions and are rather scantly regarding the processes of condensation and collapse. The facts are pronouncing an indictment against the ideas connected with the condensation process: in the observable Universe the opposite phenomena, i.e. expansion and diffusion, are responsible for the majority of changes now taking place.

A passage from Editor's Introduction commenting on the main principles of editorial work:

The papers are presented with minor editorial changes and abridgements. The general purpose in editing was to make the text more precise. Among the texts now in this book, those which existed only in Russian have been translated from the three-volume collection of Ambartsumian's papers published in 1960 (volumes 1 and 2) and 1988 (Volume 3) by the Armenian Academy of Sciences, Yerevan. In cases where an English version existed, it has been used here. However, some minor changes have been made in conformity with the corresponding texts in the Armenian Academy volumes. The original papers and translations were not always uniform in style and format, as well as in form of citation, and much of that variation have been preserved.

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