INTRODUCTION

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. These fields have been:

(i) Inverse problems in mathematics.

(ii) Invariance principles as applied to the theory of radiative transfer.

(iii) Radically new concepts of the origin and evolution of stars and galaxies.

Key papers in each of these areas are included in this volume.

The landscape of inverse problems can hardly yield to brief description today due to its diversity. However, all ramifications of this topic grow from the same root — the inverse Sturm-Liouville problem, which is a vast and deep mathematical theory in itself. Yet the initial germ for the latter theory was the paper by 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 concentrated on the theory of radiative transfer in the period up to and immediately after World War II and published a number of now classical papers, including papers 7–11 of the present collection. Later, the principles of invariance, discovered and elegantly developed by Ambartsumian, became the main problem-solving tools in the writings of S. Chandrasekhar, G. Munch, R. Bellman, and many others who worked in this field.

Ambartsumian established new directions in both theory and observations for over thirty years. The last few papers included in this collection cover the third area which is of special interest in cosmogony and cosmology.

Many years ago, empirical evidence suggested to Ambartsumian that systems of stars grouped into associations often have positive total energy. He subsequently concluded that they were in fact dispersing; he went on to develop a theory of expanding associations which has been generally accepted. Following this he 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 observation does its work, slowly but steadily. Truly, by their impact on cosmogonical thinking the ideas of Ambartsumian started a revolution of Copernican scale.

Viktor Ambartsumian was born in Tbilisi to Armenian parents. He studied at Leningrad University (now, again the University of St. Petersburg) from 1925-1928 where his greatest interests were in mathematics and astronomy. As well as being one of the giants of astronomical research in the 20th century, Viktor Ambartsumian was also a great leader and organizer of science in Armenia, in Russia, and on the international level. He was Director of the Byurakan Observatory for a very long period. He was a member of the Academy of Sciences of the USSR, President of the Armenian Academy of Sciences for a number of years, and President of the International Astronomical Union in the period 1958-1961. In his lifetime, he was honored in many ways.

Viktor Amazaspovich Ambartsumian died on August 12, 1996, at his beloved Byurakan, and sadly did not see this book in print. I hope that this volume will enable his work to reach a wider audience than has so far been possible.

Geoffrey Burbidge
September 1997

viii