



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
1996 Volume VI: Selected Topics in Astronomy and Space Studies

Introduction

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This volume contains the Curriculum Units developed by the participants in the Seminar entitled **Outstanding Problems in Contemporary Astronomy and Cosmology**. The title of this volume differs from the seminar title because, as the seminar evolved, the focus of the topics discussed underwent a fundamental change from what I had originally anticipated. The change was initiated mostly by the interests of the Fellows and their students, but sometimes in response to needs stated in city, state and national standards. The current title better represents the content of the Curriculum Units.

The original intent of the seminar was to discuss outstanding problems and controversies in contemporary Astronomy in general, and Cosmology in particular. To that extent, we started the seminar with a broad overview of the field of Astronomy to provide the context necessary to understand the nature of the controversies. Subsequently, the seminar format evolved towards extensive question, answer and discussion sessions. From these activities, it became clear that the topics originally chosen were too esoteric, both in terms of the interests and concerns of the Fellows, but especially with regard to the interests of their students. While many youngsters are curious about the Solar System, the achievements of space vehicles (both manned and unmanned), interstellar travel, and life in the Universe, they are not likely to be excited about the nature of **dark matter**, or the discrepancy between the age of the oldest stars, and the Hubble age of the Universe. Similarly, educational requirements as stated in various state and national standards also center around the Solar System, scaling processes, Kepler's laws, and on terrestrial events related to Astronomy, such as the seasons and mass extinctions.

As you can see in the present volume, some of the above interests and concerns are reflected in all the Curriculum Units that emerged from the seminar. An interesting byproduct of these selections is that many of the Curriculum Units developed are appropriate for students from the earliest grades to advanced placement courses in high school.

Upon reviewing the teaching units contained in this volume, it will be obvious that the thread of the current understanding of our place within the Solar System, of the Solar System's location within the Milky Way Galaxy, and some ideas about the origin of the Universe in terms of the currently accepted Big-Bang theory exists to some degree in all of the units. What differs from one unit to another is primarily the emphasis placed in each of those concepts, plus complementary material whose purpose is to enhance the appeal of the unit for the young school audience. Thus, in some units the emphasis is in devising projects and activities to convey the scale of the Solar System, the Galaxy and the Universe. What is being taught is the vastness and the dramatic emptiness of these astronomical structures. In other units there is an emphasis on simple

mathematical formulae which relate various properties of the motions of the planets and satellites to their distances from their central bodies in the form of Kepler's laws. This topic is ideal for conveying the relevance of mathematics for describing natural phenomena, and also for illustrating the objective nature of Astronomy and other physical sciences.

Finally, two topics that appear in most of the teaching units refer to life in the Universe and to space travel. According to many Fellows, these issues greatly fascinate their students. Also, the largest modification to notions that the Fellows had prior to the seminar was on these matters. For example, they came to realize the impossibility of intergalactic, and even interstellar travel, and the great likelihood that any alien contact would be in the realm of radio communications.

In summary, I believe that any one of the teaching units from this seminar would cover the basic ideas and concepts relating to our cosmic environment, and at the same time provide some related lively material that would appeal the imagination and the enthusiasm of students from the earliest elementary grades to the most advanced high school classes.

Sabatino Sofia

Professor and Chairman of Astronomy

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