



YALE NATIONAL INITIATIVE

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Curriculum Units by Fellows of the National Initiative
2005 Volume IV: Astronomy and Space Sciences

Introduction

by Sabatino Sofia, Professor of Astronomy

Astronomy is the science that seeks to understand the physical nature of all objects within the Universe, and even of the Universe itself. To that effect, all of the objects that are found in the Universe, and even those whose existence is merely inferred, (for example, dark matter and dark energy) are legitimate targets of astronomical study.

The tools that are used in Astronomy are those developed by all of the physical sciences, some biological sciences, mathematics, computer sciences, and we make use of observations obtained by means of the most sophisticated instruments in existence both as a guide to model development, and as a test of accuracy of the models developed.

The characteristics of the field described above make astronomy an ideal vehicle for teaching general physical sciences, basic math, and to illustrate the use of the scientific method. Almost any of the basic physical principles is illustrated by an astronomical phenomenon, thus providing immediate relevancy for the principle. Mathematical tools extensively used in astronomy, from the simplest algebra to the most sophisticated numerical and analytical concepts. Also, because we must rely on the observation of whatever aspect of a given phenomenon that nature shows rather than being able to manipulate the conditions studied, for example, in an experiment, we must adhere strictly to the precepts of the scientific method, or else we run the danger of misinterpreting what we observe.

Finally, we call space science any study that uses space either as a platform for observation, or for in-situ exploration. Thus, besides having all the advantages of astronomy as a means of providing relevant illustration to the largest variety of scientific and mathematical concepts, space science offers the excitement of the newest frontier of exploration and adventure.

The Curriculum Units developed in the seminar entitled Astronomy and Space Science, offered by the National Initiative of the Yale New Haven Teachers Institute in the Summer of 2005, and contained within this publication, illustrate the variety of pedagogical objectives achievable in the seminar's context. It includes topic ranging from cosmology, to basic math, physics, astronomy, Earth sciences, astrobiology, and it even includes a unit to teach basic astronomy in French. It is very likely that a seminar offered with the same title another year would include none of the specific topics covered in this publication. However, it is hoped that there is enough commonality of astronomical concepts in all the Units presented here to establish a solid basis for the methods, tools, concepts and current paradigms of astronomy equivalent to what would typically be covered in a general course of astronomy for non-science majors.

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