



Second INTERNATIONAL GIREP Seminar

ROUND TABLE 1

The improvement of science teaching and the role of the institutions to improve the quality of pre-service and in service teaching education.

The role of Astronomy in education

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The second half of the twentieth century has witnessed deep social transformations in all Europe. These transformations have been characterized by an ever-increasing dependence on technologies and by global cultural integration. The challenge for educators is to offer a basic education with wide scientific contents, but nonetheless with wide and valid cultural horizons. The availability of science teachers able to develop in their pupils a strong interest in science is one essential condition toward this goal.

The effectiveness of a lecture or a cycle is obviously related to the ability of the lecturer to provide a network of connections with the real world and with the cultural background of the audience. Here I wish to share with you some experience in this direction, using Astronomy to provide connections between various scientific disciplines and the cultural background, in a way as to act as a stimulus to learning.

Let me first start recalling that modern Astronomy is a part of Physics. This is certainly evident from the contribution of Astronomy to Newton's synthesis, the cross-contributions between Physics and Astronomy coming from Spectroscopy, the role of Nuclear Physics in our understanding of stellar structure and evolution, the role of solar physics in the current debate on neutrino mass. This relationship appears even more fascinating in Cosmology, where microphysics determines the large-scale distribution of matter in a Universe dominated by exotic dark matter.

On the other hand, phenomena such as the cycle of day and night, the diurnal rotation, the phases of the Moon and of the tides, the cycle of the Sun and the seasons, can be observed at various levels of sophistication and conscience, appropriate to different age brackets. These are simple observations, which stimulate the interest of students since they produce immediate and very evident results. A gnomon, a simple broomstick, has infinite potentiality. Next to it a teacher can talk of Astronomy, of relative and absolute motion, of Euclidean geometry, of trigonometry and of much more.

Moreover, Astronomy has a strong potential in the whole educational process, as a tool for connecting different disciplines. The invention of the constellations and the myths related to them has probably been among the first educational instruments, invented to teach a practical discipline. Through the tales of Perseus and Cassiopea, Orion, the Septem Triones, our forefathers learned to distinguish the stars, to track in the sky the motion of the Sun, the Moon and the planets, in order to orient themselves in space and time. The use of the stars for such fundamental functions was reflected in all human cultural activities.

From Gilgamesh to Homer to modern times, literature is full of astronomical references and suggestions: approaching Dante or Chaucer could perhaps become more interesting if students were exposed to the cultural foundations of medieval science and astronomy.

History of Art gives more examples of this approach: from classical and renaissance art, to Giotto, depicting Halley Comet, to Van Gogh and Pollock. Artists have always been fascinated by the sky, its myths, its mysteries, its beauty. This capability of Astronomy to relate science and humanistic culture can easily be exploited toward an integrated approach to education.

The Italian Astronomical Society is exploiting this approach in a number of ways. A series of summer schools has joined together high school teachers of scientific as well as humanistic disciplines, to design Astronomy centered integrated curricula that were then experimented in the classroom. In addition, we have organized lectures on Astronomy and Art, and on other interdisciplinary topics. Finally, *Il Giornale di Astronomia*, publishes articles on History, Art, Literature, as well as on Astronomy, especially designed for teachers and their classes.