

## TEACHING HUMAN CULTURE THROUGH ASTRONOMY

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One of the phenomena in the development of science in the second half of the twentieth century is the appearance of complex branches of knowledge. This fact along with the accelerated increase of science information called forth well-known integrative processes in education. One of the most widely spread forms of these processes is the incorporation of one school subject in another. In such a way, astronomy in secondary school is incorporated in the subject of physics and sometimes in geography and mathematics. The argument for this, if there exists one, is that nowadays astronomy is astrophysics, *i.e.*, physics of celestial bodies, or that the cosmographical function of astronomy resembles the function of geography.

In this paper, we make an attempt to adhere to the thesis that astronomy is a school subject with wider connections in the human sphere than with only one branch of science (Nikolov, 1986). As a consequence, if the school subject astronomy is incorporated only in a specific discipline, this would limit the possibility of teaching facts or phenomena of other spheres of the human spirit.

On the other hand, people often propose to teach something of astronomy by means of, for example, science fiction (Rolewicz *et al.*, 1986; Roslund, 1986). Our basic idea in this paper is not to teach astronomy by means of something else but to learn something else not only of other sciences but also through teaching astronomy to learn widely of human culture. With reference to the integrative processes mentioned above, this is an integration in which astronomy as a school subject plays the leading role. More properly speaking, we attempt to show how some astronomical subjects are capable of being used to suggest some cultural values of mankind.

One set of subjects that supplies many possibilities in this respect is the planets and their satellites. They are more widely represented than any other astronomical subjects in the school curricula at every level. The names of the planets are taken from the ancient Roman and Greek mythology, which allows teachers to draw parallels with many of the interesting topics of human culture and its history. In the first place, these are the mythological legends and the characters included in them. In the second place, many paintings, drawings, and sculpture represent mythological subjects and/or characters in them. Thus in parallel with learning about the planets and their satellites themselves, we can learn the picturesque mythological legends that are the spiritual wealth of all humanity as well as some of the history of culture, *etc.* The lessons can help cultivate aesthetic taste.

The same possibility exists when you teach about constellations or some stars (variables, doubles, *etc.*) and other objects belonging to any constellation. Wide educational opportunities are supplied by the fact that the mythological personali-

ties whose names we see as constellation names appear in painting, literature, and musical images by many famous artists, writers, and composers.

Here we are able to mention only some of the art masterpieces connected with the planets or with some of their satellites or with mythological persons and events connected with the constellation names.

Let us begin with Mercury. The Greek god Hermes (transformed to Mercury in the ancient Roman mythology) was one of the favorite characters of ancient mythology for many painters and sculptors. Examples in European art during the fifteenth–seventeenth centuries include paintings by Rubens, Velazquez, Rembrandt, *etc.* Also, there exist many Greek sculptures of Hermes or their Roman copies as well as newer paintings on this subject (see for instance Tokarev, 1980; Buslovich, 1971).

As for Venus, it is impossible to count not only all the artistic masterpieces but also the artists dealing with images of Aphrodite. Let us only mention that besides the sculptures and the paintings the image of Venus appears in European literature and music, including a cantata of the second half of the twentieth century.

The planet Jupiter, named after the Roman senior god primary who was also in ancient Greek mythology, gives many possibilities for aesthetic education, too. There exists numerous pictures devoted to the many stories about Zeus. Many drawings visualize Zeus as carrying off Europa but drawings with other beautiful women such as Io and Callisto exist too. So these drawings could be treated when you teach Jupiter and its Galilean satellites. It is well worth remembering that such a famous composer as Mozart named his 41<sup>st</sup> symphony “Jupiter.”

The situation with Saturn and Uranus is somewhat different because of the lack of art masterpieces involving them. Nevertheless, the myth of Uranus as a primary god in the Greek mythology is very interesting in itself and can be very instructive to pupils.

Here I will stop with the planets. As for the constellations, I mention only the story in which the names of the constellations Cepheus, Cassiopeia, Andromeda, Perseus, and others are related in one legend. These mythological subjects have attracted the interest of many artists. Andromeda and Perseus appear not only in all kinds of paintings but also in some literary works as well as in many operas. We could mention here the poem “Andromeda” by Lope de Vega and the operas by Monteverdi in the seventeenth century and by Handel in the eighteenth century.

In conclusion, I think that not only the successful cosmic missions but also the nature of astronomy as a science that was created together at the same time as human culture calls forth that it is time to restore the leading role of astronomy in education. Remember that astronomy was in the “quadrivium” together with arithmetic, geometry, and music among the “seven liberal arts” that were necessary for every intellectual.



Fig. 1. *Perseus and Andromeda*, a painting by Rubens. Similar subjects from Greek mythology were painted by Velazquez, Rembrandt and others. Gemäldegalerie Dahlem, West Berlin; Bildarchiv Foto Marburg.

## References

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 Rolewicz, A., Swyslowski and Mickiewicz, A. 1986, *ibid.*, 379.  
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 Tokarev, S., ed.-in-chief, 1980, *Encyclopedia "Myths of the World Peoples,"* Moscow.

## Discussion

J. Fierro: *I agree with the speaker in the sense that science is part of culture and talking about mythology in class eases and enriches talks.*

M. McCarthy: *The differences between the traditional and the USA approach to astronomical education cited by Prof. Wentzel find a fine confirmation by Prof. Nikolov's paper on culture and astronomy. In Europe, the classical tradition remains strong; in the USA, ignorance of classical mythology is quite extensive. Last*

year, as a classroom assignment at Georgetown, I proposed that each student write an essay on the discovery, orbital features, and mythological background for 2 or 3 of the newly discovered satellites in the planetary system. Several said it stimulated them to do similar research on other satellites. It was fun; I enjoyed reading the essays and let all the students share the findings of their fellows.

H.S. Gurm: *In reference to Professor McCarthy's remarks:*

1. *Wentzel's "traditional" model differentiates the American pattern of education from that of other countries. It is not concerned with the classical pattern in which everything was taught through language or grammar. As such, it should not be confused with the latter.*
2. *The third world has its own cultures; there is no such thing as an under-culture or an over-culture. The question is not teaching culture or "the classics" through astronomy or vice versa. Both need to be covered independently. Teaching astronomy through culture and vice versa would dilute the teaching of astronomy, and would affect the conceptual learning of it.*

B. Curran: *Should there be greater use of the humanities in astronomy classes or greater use of astronomy in humanities classes?*

N.S. Nikolov: My paper deals with the problem of how it is possible to teach human culture by teaching astronomy, *i.e.*, with astronomy classes. But I think the problem may be reversed; it is also possible to teach astronomy in the humanities classes.

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## INTERDISCIPLINARY APPROACHES TO ASTRONOMY

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To understand the motivation for my talk, you must bear in mind what Don Wentzel discussed so eloquently at the beginning of the colloquium. In the U.S., the vast majority of students taking astronomy classes at the college level are *not* science majors. Many students coming into the astronomy courses are afraid and distrustful of science and often see science as a very alien endeavor, quite separate from their everyday lives and other studies.

For such students, it can sometimes be very reassuring and enlightening to show some interesting connections between astronomy and other (nonscience) fields at a few places in the introductory astronomy course. For example, many students are surprised and excited to see the inspiration that astronomy has provided for music, literature, and art and some of the interesting connections between astronomy and psychology, archaeology, and law.