

AN ASTRONOMY COURSE FOR MEXICAN HIGH-SCHOOL-LEVEL TEACHERS

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1. Introduction

In 1985, the National University of Mexico (UNAM) created a series of updating courses for high-school level teachers, both as an answer to an explicit demand of the teachers themselves, who asked for “fresh” information in their fields, and as an effort to improve the general level of undergraduate students, whose grades in the entrance examinations to the University had been secularly decreasing for years. To date, three “packages” of intensive 50-hour courses have been offered (during the three summer vacation periods) and Astronomy has been present in all of them. However, it should be mentioned that this presence was due only to the personal interest of the director of the project, since the subject “Astronomy” is *not* included in the official programs. In the following, we present a brief description of the courses and some interesting results.

2. Program and Bibliography

The original purpose of the course was to provide a more or less complete perspective of the most recent and spectacular results of astronomical research, such as accretion disks around black holes, the early universe (strings and axions), active nuclei, *etc.* However, it was soon found that the astronomical background of all the “students” was essentially zero, a fact that prevented them from following even the most elementary arguments if astronomical concepts were involved. It was thus decided to abandon the original program and to give, instead, a “canonical” introductory course on astronomy. At this point, a new problem arose when the students rejected the proposed bibliography (Abell, Zeilik, Shu, *etc.*) because “they are in English,” and a suitable bibliography in Spanish had to be looked for. The final decision was to lecture without an “official” text, although references to “Cosmos” (Sagan), “The First Three Minutes” (Weinberg), “Introduction to Science” (Asimov), *etc.*, were liberally made.

3. Attendance and Interest

The original registration and the actual attendance in the courses were as follows: in 1985 — 8 and 6; in 1986 — 17 and 11; in 1987 — 22 and 16. It is evident that the numbers are rather poor, particularly if we consider that there are some 5000 high-school teachers in the University system. This problem, however, has not been restricted to astronomy; in fact, it has been general. The most “crowded” course, for instance, has always been computer science, and its “record” is 40 participants. Also,

an average of 7 courses, out of a total of 25, have been canceled every year because their registration was precisely zero. Taking this into account, and remembering that astronomy is the only course whose subject is not taught in high schools (*i.e.*, there are no astronomy teachers), our average attendance of 15 turns out to be excellent.

The basic preparation of those attending was: in physics, 19 per cent; in chemistry, 53 per cent; in other subjects, 28 per cent. It is interesting to note that about one-fourth of the students do not teach subjects directly related to astronomy. We have had biology teachers, philosophy teachers, aesthetics teachers and even a French teacher. This shows, again, that astronomy (as we already knew) is as appealing to the scientific mind as it is to the artist or philosopher.

The lack of previous preparation in astronomy posed no problem with regard to interest. In fact, there were so many questions and discussions that the proposed program has never been completely covered.

4. Method and Evaluation

All the lectures consisted of an oral presentation accompanied by numerous slides. The main idea was to motivate the students to participate, and questions were not only allowed at any moment, but also were stimulated. The dialogue, once established, was used to extend, to complement, or to deepen the concept under discussion.

It was very interesting to discover that teachers hate to be evaluated. In spite of their resistance, a couple of tests were prepared by the instructors and left as "homework," with a formal promise from the students that they would do them alone (some didn't). A final result, which was either "yes" or "no", was derived from the examinations and from their participation and interest during the course. There were only a few failures in each course.

5. Results and Conclusions

First of all, it should be mentioned that we all enjoyed the course. There was always lots of discussion and interest didn't seem to decay, even when the lectures lasted for three straight hours. These long discussions also revealed some unexpected facts, the most interesting (in our opinion) being the following:

a) All the teachers, independently of their specific subject, were equally ignorant about the simplest motions of the celestial sphere. In fact, they had never noticed the diurnal motions of the stars (they knew, of course, that the Earth rotates, but they had never associated this motion with actual observable motions). Most of them also thought that the phases of the moon were eclipses and, as a final example, not a single one understood the mechanism that produces the seasons. (Ed. note: *See also Sadler paper, this volume*).

b) A biology teacher turned out to be the most ardent enemy of Darwin I have ever met. We had many of the typical (and useless) discussions that occur when faith confronts scientific fact and which always end with each protagonist believing

the same thing he believed before the discussion started.

c) Two chemistry teachers (chemists themselves) were absolutely convinced of the influence of the moon on the growth of plants and hair.

d) About 50 per cent of the total attendance were firmly convinced of the validity of astrology (and, of course, they also accepted pyramidology, the Bermuda Triangle, *etc.*).

e) UFOs were accepted, and defended, by some 25 per cent of the total attendance. After a discussion on relativity and interstellar trips, there were still lots of phrases like "it could be, anyway," and "scientists have been wrong before," *etc.*

A final comment, which follows from the preceding results, is that this kind of course should be given as frequently as possible and that, in addition, it should be compulsory for all high-school level teachers to attend.

THE DIDACTIC ACTIVITIES OF THE ITALIAN ASTRONOMICAL SOCIETY

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The Italian Astronomical Society is one of the oldest Italian scientific associations: founded in Rome in 1871 as the Society for Italian Spectroscopists, it includes professional as well as amateur astronomers and teachers among its 800 members.

In the last 10 years, the Society has been concerned with the problems of teaching, as a result of the enormous demand from schools where astronomy is often not well taught at any level because of a lack of suitable qualified teachers.

To meet this need, the Society publishes a quarterly journal entitled *Il Giornale di Astronomia*, which includes news of astronomical events, informative articles and accounts of didactic experiences as well as other information that may be helpful to teachers of astronomy.

Issues on single topics have also been published, such as *Observation of the Sky*, *Astronomical Exercises*, *The Planetary System*, *Astrophysics*, *Analysis of Electromagnetic Waves in Astrophysics*, *etc.*, as well as a series of teaching aids that are easy to consult and practical to apply.

The Society periodically organizes refresher courses for teachers in schools of all levels. These courses are held in cities throughout Italy by professional astronomers and experts in educational problems. Summer residential courses were held, in collaboration with the Ministry of Public Education: in Asiago in 1986 for physics teachers with the topic "Analysis of Electromagnetic Waves in Astrophysics," and