The History of Science and Science Education: a *Planetarium* at School

Enzo Bonacci

Abstract. The Livio Gratton is a small size *Planetarium* (40–seat capacity) located in Latina (near Roma, Italy); it belongs to the Scientific High School G.B. Grassi since its construction in 2003. In less than eighteen months of activity the number of admissions has been superior to 4000, but the situation was rather different previously, when the almost absolute lack of information about the structure and the few visitors induced the headmaster to accomplish a managing, cultural, educational and scientific valorization policy. Such galvanizing experience is worthy to be described from the discouraging premises till the positive response from audience and critics.

Key words: Planetarium, Measurements at School, Valorization policy, Historical astronomical educational elements

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1 A short Introduction

The aspiration to have the night sky at our disposal has been progressively satisfied from the ancient Farnese atlas (Schaefer 2005) until the largest *Planetarium* in the world located in the Nagoya City Science Museum[1].

A modern response to the primeval dream to attain an accurate miniaturization of the celestial sphere is thus supplied by the *Planetarium*, a circular room where suggestive projections onto a domed ceiling make possible to study the many facets of Astronomy at will. The contemporary history of planetariums started with the projector Model I built by the Carl Zeiss company in Jena (Germany) and its first public show held at the Deutsches Museum in Munich on October 21, 1923.

The Italian oldest *Planetarium* was inaugurated on October 28, 1928, in the octagonal *Hall of Minerva* by the *Baths of Diocletian*, with the Zeiss Model II star projector donated by the German government. Today we may admire that original instrument inside the new *Planetarium* of Rome[2]. We may classify the planetariums as follows:

1. Optical–Mechanical, with the traditional star–ball projector.
2. Digital, with high–resolution images processed by a computer.
3. Hybrid, with the star–ball plus a digital video imaging system.

Named after the famous Italian astrophysicist Livio Gratton (1910–1991), the *Planetarium* of Latina was inaugurated on December 20, 2003. It belongs to first type (Optical–Mechanical) and it is equipped with the Gambato's BS3200–A optical system projecting 2400 stars; it has a 6m (19.5') diameter dome and a capacity of 40 spectators.

2 How a *Planetarium* can Work at School

Very briefly, the relevancy of a *Planetarium* at school is related not solely to the interest and emotion which it unfailingly arouses in students, but

[1] Via: www.ncsm.city.nagoya.jp/en/planetarium/index.html

[2] Via:www.planetarioroma.it/il_museo/planetario/il_progetto/progetto_scientifico/zeiss_ii [The previous web–url*s*, and the others hereinafter reported are retrieved at current data].

also to the possible discovery of Astronomy or Astrophysics as a profession. The origin of Science coincides with the systematic observation of the sky and any new cosmological model has represented a fundamental step in this path, it is therefore easy to understand the importance of such a structure within a secondary school.

As key educational tool, since the celestial sphere is the object of study of foundations of science, epistemology and philosophy, a *Planetarium* can become the mainstay of any educational project including a laboratory of Astronomy. In the *Planetarium* Livio Gratton one may observe:

1. The representation of planets of the Solar System.
2. The celestial sphere and the precession of the equinoxes.
3. The movements and the eclipses of the Sun and the Moon.
4. The representation of a supernova and of a type Sc spiral galaxy.
5. The supernova blast, in particular, is reproduced by mixing different size lights from a nebula–like luminescent background on the dome.

3 Notes on the Educational Streams

The last years' experience has confirmed that the *Planetarium* is an effective tool of learning Astronomy and Science available for the whole school community. Static and moving projections, appropriately explained by expert speakers, have allowed students from any grade school to get an actual understanding of the motions of the celestial bodies. Supplementary lessons, in collaboration with qualified scientific societies, have extended the Astronomy teaching beyond the celestial mechanics, e.g., to the astrophysical phenomena. The main educational activities have been the following:

1. The International Year of Astronomy in Latina (2010–04–24)[3].
2. The ESA–HSF project "Greenhouse in Space" (2011–02–17)[4].

[3] Via:www.provincia.latina.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/6039

[4] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=292:greenhouse-in-space-2011&catid=49:latest-news&Itemid=104

3. Grassi's students reaching scientific excellence (2011–03–14)[5].
4. The International Year of Chemistry in Latina (2011–04–30)[6].

4 Notes on the Cultural Achievements

The cultural exigencies recently shown by Latina, one of the rootless cities founded in Italy last century, have characterized the *Planetarium* Livio Gratton as important cultural centre[7] especially for young people, but not only. The organization of conferences[8] and meetings[9] on astronomical (Bonacci 2011a, 2011b), astrophysical[10], physical (Bonacci 2011c, 2012) and other[11] topics has also involved segments of society never interested in scientific issues before[12]. The principal cultural activities have been the following:

1. A GIREP–EPEC poster on the *Planetarium* of Latina (2011–08–02)[13].
2. A GIREP–EPEC poster on the GHIS project (2011–08–02)[14].
3. An IPS talk on the *Planetarium* experience (2011–09–26)[15].

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[5] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=295:rinascimento-scientifico-del-grassi&catid=49:latest-news&Itemid=104

[6] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=300:liyc2011-al-grassi&catid=49:latest-news&Itemid=104

[7] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=269:audizione-in-commissione-cultura-per-il-planetario&catid=49:latest-news&Itemid=104

[8] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=320:lesperienza-del-planetario-in-finlandia&catid=49:latest-news&Itemid=104

[9] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=352:incontro-caffe-ipazia&catid=49:latest-news&Itemid=104

[10] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=287:stage-di-astrofisica-2011&catid=49:latest-news&Itemid=104

[11] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=356:lamor-che-move-il-sole-e-laltre-stelle&catid=49:latest-news&Itemid=104

[12] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=315:lannus-mirabilis-del-planetarium&catid=49:latest-news&Itemid=104

[13] Via:https://congress.cc.jyu.fi/girep2011/schedule/proceedings/pdf/1012.pdf

[14] Via:https://congress.cc.jyu.fi/girep2011/schedule/proceedings/pdf/1033.pdf

4. An IPS talk on the ESA–HSF project GHIS (2012–09–10)[16].

5 Conclusion

The kind of experiences and presentations of the celestial phenomena obtained by employing the *Planetarium*'s devices[17], in a *spectacular–educational* way, involved equally both *education* and *culture*. Thus, the *Planetarium*'s special activities met a demand for a growing public attention[18] towards astronomy and its history, by giving the spectators a chance to interact with skilled researchers during entertaining performances. The most significance and spectacular events were:

1. The "Moon Watch Party 2010" in Latina (2010–09–18)[19].
2. The Hubble's double anniversary in Latina (2010–11–20)[20].
3. The flight of Yuri Gagarin's 50th anniversary (2011–03–05)[21].
4. The Space Shuttle's 30 years celebrated in Latina (2011–06–04)[22].
5. The "Bon voyage, Voyager–1!" astronomical event (2011–10–29)[23].
6. The "Year of the Solar System 2012" in Latina (2012–03–27)[24].

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[15] Via:http://grassi.deltaeffe.it/images/modulistica/archivio/fisica/esperienza_del_planetario_prof_enzo_bonacci.pdf

[16] Via:http://grassi.deltaeffe.it/images/modulistica/archivio/fisica/Atticon6905_VI_C_1_by_Enzo_Bonacci.pdf

[17] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=333:la-nuova-insegna-del-planetario&catid=49:latest-news&Itemid=104

[18] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=367:il-planetario-del-grassi-tra-i-big-ips&catid=49:latest-news&Itemid=104

[19] Via: www.q4q5.it/modules/news/article.php?storyid=4774

[20] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=265:double-hubble&catid=49:latest-news&Itemid=104

[21] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=288:gagarin-celebrato-al-grassi&catid=49:latest-news&Itemid=104

[22] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=310:30d-dello-space-shuttle-al-grassi&catid=49:latest-news&Itemid=104

[23] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=327:bon-voyage-voyager-1&catid=49:latest-news&Itemid=104

[24] Via:http://grassi.deltaeffe.it/index.php?option=com_content&view=article&id=360:anno-del-sistema-solare-2010-2012&catid=49:latest-news&Itemid=104

Finally the campaign started in 2010 with the launch of the song *Planetarium Experience* by *Tremble rock band* and then continued with the organization of full–immersion shows based on topical subjects.

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