The permanent Oriented World Globe installation at Roma Tre University

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Educational Oriented World Globes

The *Oriented World Globe* (or *Parallel Globe*) is a common terrestrial globe whose axis is inclined with respect to horizontal plane at an angle equal to the latitude of the site (for Roma approximately 42°) and oriented along the meridian. I this way the axis will point towards North Celestial Pole, **N.P. (Fig. 1)** and will result parallel to the terrestrial axis.

Placing the line of the meridian of the site represented on the globe map in coincidence with the true local meridian, the globe will show in real time the pattern of illumination of the Earth's surface and its diurnal and seasonal variations.

Since the terrestrial radius is negligible respect to the Earth-Sun distance, with good approximation we can consider the globe to be placed in the centre of the Celestial Sphere.

Nevertheless such a Ptolemaic view, the globe turns out to be an ideal tool for a modern interdisciplinary teaching and meaningful learning of Astronomy, Geometry, Mathematics, Physics and Natural Sciences. For this reason small oriented world globe are commonly used in educational activities at school.

The globe located in the centre of the *Chiostro* garden of the Physics Department *E. Amaldi* has been designed following the criteria recently proposed in the field of Architecture (Bozic et al. 2005) on the possible direct educational role of the indoor and outdoor spaces of schools and universities when these are arranged according to the principles of hands-on experiments.

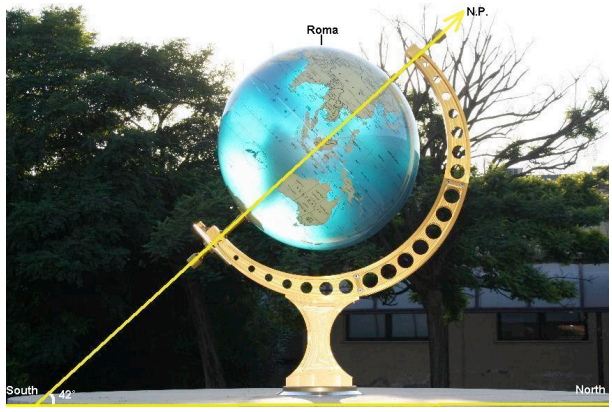

Fig. 1

The Oriented World Globe at Roma Tre University
Note the inclination and orientation of the axis and position of Roma at the top of the globe

Characteristics of the Roma Tre Oriented Globe

Our globe is at the same time a world map and a spherical sundial. The sphere, 76 cm in diameter, in acrylic material, resistant to the atmospheric agents, has been produced by *Artline Globes* (USA) and it is supported by a aluminium alloy (Anticorodal 6082) equatorial mounting which was CAD designed and produced at the mechanical workshop of the Physics Department by F. Marinilli. The installation is unique for the accuracy of the mechanical structure and for the possibility to rotate with good angular precision around the polar axis in order to perform accurate goniometric measures.

In the garden is also placed an electronic controlled *Polifunctional Equatorial Mounting*, which can support different telescopes for diurnal and nocturnal didactic observations. The telescopes are equipped with several CCD cameras, a web cam, UBVRI and interferential filters and with diffraction grating for spectroscopy. In this way the garden is shaped like an open air laboratory devoted to university and school educational activities.

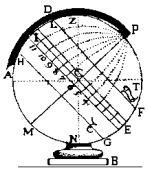

Fig. 2

Left: The modern replica of Matelica's globe in Saracinesco (courtesy of Marina Mele)
Center: A design showing a Spherical Sundial (XVII cen)
Right: Modern replica of Jefferson's Spherical Sundial (©Thomas Jefferson Foundation)

Ancient prototypes

The oldest prototypes of the oriented world globes are probably two hellenistic marble globes: the *Sphere of Matelica* (29.6 cm in diameter) which was discovered in 1985 by D. Baldini in the homonymous city near Macerata, and the *Globe of Prosymna* (Greece) discovered in 1939 by C. Blegen. Although the last one has a greater diameter, both were probably solar clocks and tools for astronomical calculations (Carusi & Baldini 1989). A modern replica in greater scale of the Matelica's globe is located in Saracinesco, a village near Roma (see Fig. 2 and reference [3]).

Other examples of old oriented globes (Fig. 2) are the Spherical Sundials between which is worthwhile to remember the wooden globe of about 27 cm in diameter realized at the beginning of XIX century by T. Jefferson, third president of the United States (W. Beiswanger 2002) in Monticello (Virginia).

Educational Activities at Roma Tre Oriented Globe

Oriented world globe is a powerful tool to carry out simple and incisive educational paths for students of every age (e.g. L. Corbo 2004 and N. Lanciano 2002).

We are developing a set of activities addressed to secondary school consisting in suitable selections of the following steps:

a) preliminary orienting in the garden;
b) determination of the cardinal points and identification of the local meridian;
c) understanding the inclination of the globe axis respect to the horizontal plane;
d) the oriented globe, the Earth and the Celestial Sphere;
e) the path of the Sun in the sky;
f) measure and comparison on the globe of the shadows at different latitudes and longitudes;
g) understanding diurnal and seasonal variations of shadows pattern;
h) measures of angles, determination of the true solar time and comparison with the medium solar time;
i) diurnal and seasonal solar irradiation conditions at ground;
j) solar energy utilization and the environment;
k) telescopic observations of the solar photosphere and chromosphere.

References

[1] M. Bozic, L. Vuskovic, D. Pantelic, S. Nikolic, V. Majic, 2005, The Phys. Teacher 43, 36
[2] A. Carusi e D. Baldini 1989, L'Astronomia, 92, 30
[3] www.tibursuperbum.it/ita/escursioni/saracinesco/MuseoTempo.htm
[4] W. Beiswanger 2002, Monticello Newsletter 13, 1
www.monticello.org/gallery/innovations/sundial.html
[5] L. Corbo, 2004, Scuola e Didattica, 17, 38
[6] N. Lanciano 2002, *Strumenti per i giardini del cielo,* ed junior, p. 47

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