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A NEW HALL OF ASTRONOMY IN THE SCIENCE MUSEUM AT UNAM

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Very modern museography, attractive equipment and great astronomical pictures are the signatures of the new astronomy exhibit in *Universum*, the Science Museum at UNAM. Up-to-date simple descriptions are presented of the Sun and stars, of matter between the stars, of clusters and galaxies, and of the Universe as a whole. The main concept is not limited to the description of each component, but also incorporates the idea that all components, including the Universe, are subject to continuous evolution. In addition a representation of the vastness of space, a time line from the Big Bang to the present epoch, and some video clips from local astronomers are included. It is complemented with a section of the history of astronomy.

1. OVERVIEW

The Science Museum was opened 12 years ago and so far, it has received more than 6 million visitors. It houses displays of a wide variety of fields from mathematics, chemistry and biology to energy and conscience of our city. Since its inception it had a Solar System exhibit, but it lacked an equivalent display of objects outside the solar system. Therefore it was our responsibility to prepare an updated exhibit of the cosmos and its constituents. The main target is to capture the interest of young visitors, while allowing for the more experienced ones to dwell deeper in their inquiries.

The exhibit is organized in 3 main sections: (a) stars and interstellar matter, (b) galaxies and the Universe and (c) the tools of astronomers. Besides describing the basic physics of the components, the aim of the exhibit is to communicate that all celestial bodies are subject to continuous modifications, both for the case of individual objects, the aggregates of them and the Universe itself. Some of the techniques of study are explained in order to provide a better understanding of how our knowledge is derived.

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In addition, in order to give a general overview of modern Astronomy, some complementary aspects were included. These comprise a representation of the immense distances of the cosmos, of the time elapsed from the beginning of the Universe and brief interviews of the local astronomers. Lastly, a section of history of astronomy is included.

The exhibit made use of many very attractive astronomical images and videos from different observatories around the world, which were generously allowed to be on display.

2. STARS

The first part of this section is a description of the Sun in great detail, comprising a set of basic data, an outline of its surface phenomena (photosphere, spots and corona), and of its interior, as well as an explanation of nuclear reactions.

In an array of TV monitors stellar evolution is explained as well as its dependence on stellar mass. To reinforce this concept a small interactive game was installed that shows the different evolutionary paths followed by stars of a variety of masses.

By means of a moving gear the young visitor can make a mock lighthouse rotate to depict a compact star rotating at high speed (pulsar).

There is also the extended hyperboloid that mimics the distortions of the geometry of space around and inside a black hole where the visitor can send a ball spiraling inwards.

A NASA video explaining the tenuous gas clouds between the stars, as well as the interaction between the clouds of gas and dust and the stars, is continuously playing.

A image of a globular cluster is included to give the visitor an example of the organization of a stellar aggregate.

An abstract sculpture was specially commissioned. The artist selected the theme *We are stardust* to express that the chemical elements were formed in the stars and from them life emerged.

3. GALAXIES

This section contains several displays to show different aspects of the galaxies. With these installations we aim to explain the present structure of the Universe and the changes to which it has been subjected.

There is an interactive videogame to inquire on the structure of the Milky Way and several representative constituents.

Also on display is a scaled model of the local group of galaxies in a rotating mobile. The various shapes of the galaxies are portrayed. A video to exemplify galaxy cannibalism is continuously on display. To illustrate the large structure of the Universe, a 3-D model was constructed where the galaxies and clusters of galaxies are located along filamentary structures, rather than randomly.

A moving metallic structure is hanging from the ceiling that unfolds upon pulling a lever, representing the expansion of the Universe.

4. TOOLS OF ASTRONOMERS

Selected concepts are described as examples of how we learn about the cosmos, namely: the use of telescopes, the importance of multiwavelength astronomy and the applications of the doppler effect.

Several small telescopes are on display, and there is a detailed scaled model of the dome of the 2.1-m telescope of the Observatorio Astronómico Nacional at San Pedro Mártir, Baja California.

To outline some of the basic concepts of the electromagnetic spectrum several devices were required. These include a mural with the solar spectrum, and a cabinet with 3 different lamps behind diffraction gratings to demonstrate that light is constituted by monochromatic emissions.

To illustrate the importance of studying the cosmos at different colors, an example of famous paintings viewed through three interchangeable filters (red, yellow, blue) is provided. A mechanical game where the visitor can simulate pointing an optical and a radio telescope, showing that the images received from the same object are varied, is available. To extend the concept of the complementary information acquired through the diverse spectral regions, descriptions of gamma rays, X rays, ultraviolet light, visible light, infrared light and radio waves are presented as well as examples of everyday life and astronomical images in each of them. The most engaging display in the hall is an infrared camera coupled to a standard one to show both infrared and everyday images of the visitor; its purpose is to visualize our own body temperature and the effect of clothing, hair and eyeglasses in preventing heat from escaping our bodies. For those that wish to inquire deeper in the knowledge of the astronomical results at each wavelength region there is a videogame where more details about a set of representative objects in the Universe can be learned.

5. OTHER ASPECTS

To convey the immense dimensions of space, a sequence of 27 images was prepared, each one of them a factor of 10 larger than the previous one. It is possible to see the image of an object of 1 cm up to 10^{25} m wide. The sequence of images progresses from the eye of a girl lying on a football field in Mexico City to a galaxy cluster.

A time-line 43 meters long on the floor which can be walked upon illustrates the history of the Universe from the Big Bang up to the present epoch. Selected images highlight assorted events of astrophysical interest as well as some significant ones in the development of life.

A set of cartoons depicting important achievements in the history of astronomy complements the exhibit, including selected prehispanic mesoamerican achievements. There are TV screens where the visitor can select assorted video clips of local astronomers describing their own contributions in the field and answering frequently asked questions in order to bridge the gap between the public and the scientists.

In summary, it is a very interesting hall with up-to-date information, presented appealingly, that can be visited briefly or in a leisurely manner by anyone of a more inquisitive nature.