

The geological Museum: a tool for teaching Earth Sciences.

Il Museo geologico: uno strumento per la didattica delle Scienze della Terra.

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Abstract: The activities of the Museo Geologico "G. G. Gemmellaro" of the University of Palermo, have been geared towards the creation of exhibitions and educational tours that might render the themes of Earth Sciences more accessible. The scientific collections, opportunely contextualized and enhanced, have become in their different ways a back-up instrument for teachers in the execution of their school syllabi.

In this sense the efforts made over the last few years by the Museum have been aimed at creating a more intelligible expository itinerary, reconciling updated scientific research with correct and comprehensible museum communication; numerous didactic projects (differentiated by age-group) have been devised and organized. The suggested activities are characterized by direct contact with the objects observed during the visit, interaction with experts and the organization of fresh knowledge through hands-on activities. From this viewpoint the European project "Geoschools" has enabled the Museum to set up a refresher course as a further didactic back-up instrument for teachers of Earth Sciences.

Key words: Earth Sciences, scientific dissemination, Museum.

Riassunto: Le attività del Museo Geologico "G. G. Gemmellaro" dell'Università degli Studi di Palermo, sono state finalizzate alla realizzazione di esposizioni e percorsi didattici che rendessero più accessibile le tematiche inerenti le Scienze della Terra. Le collezioni scientifiche, opportunamente contestualizzate e valorizzate, sono diventate in modi differenti lo strumento per supportare i docenti nello svolgimento dei programmi scolastici.

In tal senso gli sforzi effettuati negli ultimi anni dal Museo sono stati volti alla realizzazione di un percorso espositivo più "leggibile", che conciliasse le informazioni delle ricerche scientifiche aggiornate con una corretta e comprensibile comunicazione museale e sono stati ideati ed organizzati numerosi progetti didattici differenziati per fasce di età. Le attività proposte si caratterizzano per il contatto diretto con gli oggetti osservati durante la visita, l'interazione con gli esperti e la strutturazione di nuove conoscenze attraverso l'attività e la manipolazione. In quest'ottica il progetto europeo "Geoschools" ha consentito al museo di sviluppare un corso di aggiornamento che è un'ulteriore strumento di supporto didattico per gli insegnanti di Scienze della Terra.

Key words: Scienze della Terra, divulgazione scientifica, Museo.

INTRODUCTION

University museums like all scientific museums have undergone an evolutionary process closely linked to cultural changes involving the scientific world over the last century (Vomero, 2007). In Sicily, university museums initially emerged in a period straddling the mid-19th century and, as in the rest of the country, had as their sole objective the conservation of collections.

Historical photographs of the museums of that period portray great exhibition areas, in which countless items are displayed more or less chaotically, and surrounded by cupboards in which the collections are stored. Another of the institutional duties of university scientific museums in that historical period was research, and for this reason university researchers were the only ones to have access to the collections.

Times change and museums have also changed, no longer being simple containers existing between the territory in which they are located and the local population. Gradually the museum started to be considered a place to be used naturally by the general public. The collections and objects exhibited constitute a heritage belonging to the whole of humanity and as such they should be rendered visible and available for individual and collective cultural growth. Museums have thus supplemented their institutional activities of conservation, study and research, with the creation of temporary and permanent exhibitions which take into account local realities, providing the visitor with information about the history of his/her own region. Since its re-opening in 1985, communication with the general public, especially scholastic, has also

represented a priority interest for the Museo Gemmellaro. Over the last few years the Museum has intensified its didactic activity, becoming, via exhibitions and workshop activity, an instrument of support and improvement for teachers of earth sciences.

EXHIBITIONS AT THE UNIVERSITY OF PALERMO MUSEO G. G. GEMMELLARO

The Museo Gemmellaro is a geo-paleontological museum founded in 1860 by Gaetano Giorgio Gemmellaro. His main objective was to convey knowledge regarding the territory on which the museum stood and, in particular, the history of the shaping of Sicily, using a wealth of geological and paleontological collections (over 600,000 items).

The geology of Sicily and, more generally, the geological evolution of the western Tethys, over the last twenty years have been the object of numerous scientific publications, which have partly altered and updated the overall picture of this area. A new exhibition lay-out has now been conceived, with the aim of informing the visitor about the geological history of Sicily through something which can often seem rather dull, i.e. the valorization of fossils in museum collections. At the same time, however, there was a resolve not to neglect the accuracy of information and scientific updates. Therefore, the museal displays of these collections offered a challenge, to reach a compromise between the complex world of scientific knowledge and the interests of the general public, represented principally by schoolchildren.

Setting up an exhibition provides a moment of synthesis of a museum's principal functions, such as scientific research, conservation and restoration of collections, documentation and publication of data, welcoming visitors and advertising, but, above all, educating the general public. Over the last few years there has been a progressive dumbing-down with regard to the scientific content in exhibitions; this excessive simplification of contents has often completely estranged the true role of a scientific museum.

The re-design of the Museo Gemmellaro was an opportunity to create an exhibition lay-out that reconciled information from updated scientific research with correct and comprehensible museum communication.

The new expository lay-out and the criteria adopted

The new expository lay-out, organized into various thematic areas, occupies three floors of the building, and is geared towards the reconstruction of the geological history of Sicily and the evolution of habitats, beginning in the Permian, about 300 million years ago, and until the appearance of the first human presences in Sicily, about 15,000 years ago. The first steps in creating this new lay-out consisted in transforming internal areas of the building (previously used as classrooms) into exhibition space. At the same time work was begun on the actual expository lay-out, with analysis of the collections in order to select the most representative items to be included in the proposed systematic tour. In order to better contextualize these items, a series of

diorami were created, reconstructing the most significant settings from the past with regard to the geological history of Sicily. All the dioramas were devised and produced in the Museum laboratories, beginning with the fossils selected for display. With this in mind, molds for the fossils were made, integrating broken or missing parts where necessary. This long and laborious work was accomplished with the great help of volunteers, who, over the last few years, were carrying out their national civil service at the Museum.

In order to facilitate an understanding of the value of the paleontological finds it seemed important not only to frame the item in its geological context of belonging, but also to reconstruct (exploiting all the information that fossils can provide) the living habitat of the item and consequently, more generally, the ancient environment. Great attention was placed in drafting the texts, by trying to use language that was simple but, at the same time, scientifically correct. To capture the visitor's attention and at the same time facilitate comprehension the panels were adorned with images and three-dimensional inserts.

Furthermore, in the newly-refurbished rooms, the panels were provided with a brief supplementary summary in English for the benefit of foreign visitors.

In synthesis we can sum up the expository criteria in two main groups:

Criteria inherent to the choice of exhibits and the creation of the dioramas:

- Exhibition of finds from the most scientifically important Sicilian paleontological sites;
- Repositioning of organisms in actual life position,
- Reconstruction of original fossil habitat (Fig. 1);



FIGURE 1. *Reconstruction of a Cretaceous period environment.*

- 3-dimensional reconstruction of the paleogeographical lay-out during each geological period;
- Comparison of Sicilian paleontological items with contemporaneous items from other geographical areas.

Criteria for constructing explanatory panels and posters:

- General framing of item in geological period;

- Listing and treatise of geological peculiarities of several of the Sicilian locations from which finds originate;
- Paleogeographical framework for fossils in the period of their existence in life;
- Reconstruction of the discovery and history of the paleontological sites from which the exhibited items originate;
- Geological comparison of the areas in which the Sicilian fossils were left in sediment with other contemporaneous areas.



FIGURE 2. Example of explanatory panel in the exhibition halls.

Thematic areas

Enzo Burgio Hall (ground floor)

In the initial part of the room lithogenic processes responsible for the fossilization of organisms, are illustrated.

In the lower part the itinerary begins with showcases devoted to illustrating various types of rocks: sedimentary, metamorphic and igneous. The showcases in the central area contain living corals from tropical seas. A cross section of the terrestrial globe shows the interior of the earth.

The itinerary proceeds to the galleries with a systematic review of various animal groups starting from foraminifers, proceeding with gradually more complex organisms, and finally arriving at vertebrates and paleobotany.

Halls with sicilian fossils from the Paleozoic e Mesozoic (first floor)

This exhibition area extends over 250 sq m, on the first floor, divided into inter-connecting 4 rooms, which reconstruct the geological history of Sicily and the evolution of habitats and living creatures from the Permian, about 300 million years ago, up to the Cenozoic, about 20 million years ago, immediately before the drying-up of the Mediterranean.

Crystal Hall (first floor)

This room is devoted to illustrating what is known as the “drying-up of the Mediterranean”, an event occurring about 6 million years ago in conjunction with several factors that transformed the present Mediterranean into an enormous salt lake, with

evaporation of the waters and the precipitation of great quantities of salt.

Hall of Man (first floor)

The room is devoted to the earliest presence of Man in Sicily. The outstanding exhibit is that of “Thea”, the first known woman in Sicily. This skeleton of a female, who lived in the upper paleolithic (about 14,500 years ago), is in an exceptional state of conservation.

Elephant room (second floor)

This room is devoted to continental fauna living in Sicily during the mid-upper Pleistocene (between 500 and 12,000 years ago).

The most significant fossil remains are represented by the elephants, which are a peculiarity of the fossil fauna of the period, especially as regards the presence of the smaller-sized species (the so-called dwarf elephants).

EDUCATIONAL ITINERARIES

Over the last few years there has been growing pressure on the part of schoolteachers at all levels, requesting workshops to round off visits. For this reason numerous differentiated teaching projects have been devised and set up. The teaching projects conceived for junior schools and secondary schools concern topics that are closely correlated with earth-sciences and life-sciences. The proposed activities are characterized by direct contact with the objects observed during the visit, interaction with experts and the structuring of new knowledge via educational games and handling of exhibits. The projects are arranged into two separate phases: the first represented by the guided visit, differentiated by age-group, the second represented by workshops in which the pupils can examine more deeply the themes emerging during the tour and come into direct contact with the original objects. The didactic offerings are conceived as a useful tool for teachers to apply in their syllabus. Among the various opportunities there are also multi-disciplinary projects that tackle themes relating to natural sciences, the history of art and architecture. These itineraries were devised in order to provide a fresh interpretation, which might consent a better understanding of more complex earth science topics in the local region. Workshop activities are based on notions learnt during the guided tour and are often reintroduced in the shape of games for kids. Among the various workshop activities there are:

“**Let’s learn from cartoons**” : a game for smaller children, who learn to recognize animals and their habitats, beginning with the best-known characters from animated films;

“**Fossil bingo**”: a fun game in which kids have to individuate the fossils exhibited in the halls, following clues provided by the person in charge;

“**From era... to era**”: a game which winds its way through various geological periods and in which one can only advance by answering the questions asked;

“**The grand Gemmellaro quiz**”: a team game divided into two phases in which the kids engage in a race to reconstruct a jigsaw puzzle with images of items exhibited and subsequently in a series of paleo-quizzes;

“Let’s meet Thea”: Thea is the name affectionately given to the oldest skeleton so far found in Sicily (of a woman) and exhibited in the Hall of Man. A series of activities, such as making objects in clay, graffiti, painting with natural pigments and artifacts made of bone, aim to help us better understand how primitive man lived.

“From a bone we can discover that...”; by handling and comparing the Museum’s osteological collections we can learn to recognize animal skeletons and understand the differences, and discover how we can obtain a wealth of information from one single simple item.

“Smile and I’ll tell you what you eat...”: comparing items and using osteological charts we learn to recognize the teeth of various mammals and discover their eating habits and other peculiarities.

“Infinitely small: the invisible world”: an area devoted to micro-fossils, which are often fundamental in the dating of rocks. Armed with microscopes and tweezers off we go in search of microfossils, which can even be found in a handful of sand; with the comparative charts we can then learn to recognize and date them (Fig.3).



FIGURE 3. *Infinitely small: students observe microfossils.*

“Evolution of life on earth”: studying fossils and their characteristics we can reconstruct the basic stages in the story of life on earth. What is a fossil? How and where is it formed? How many and which are the processes of fossilization? Observing and handling certain items one ends by discovering secrets from the past buried in the rocks.

“Create your own fossil” : traversing geological eras with the aid of fun learning activities we can learn to create a mold from some of the most representative fossils exemplifying the long history of this planet.

“One day as a paleontologist”: complete course in the fascinating world of fossils, which involves all students in a simulation of a paleontological dig (fig. 4).

Retrieving fossils and analyzing them, recognizing them and compiling a dig-diary, the student experiences in close-up the work of the paleontologist.

“Rocks and minerals” : with the aid of the Museum’s petrographic and mineralogical collections, by observing thin sections of the principal rock groups through the microscope, we can learn to recognize the main features of rocks and their relevance in the economy and daily life.



FIGURE 4. *One day as a palontologist: excavation simulation.*

THE GEOSCHOOLS PROJECT AND THE MUSEO GEMMELLARO

The European project “Geoschools-teaching Geosciences in Secondary Schools” has enabled the Museum to develop a free, refresher course representing an ulterior teaching-support tool for teachers of earth sciences.

The course was open to 20 teachers from secondary schools, chosen on the basis of criteria laid down during the initial phases of the project; it was organized over two days, the first at the museo Gemmellaro and the second consisting of excursions to important sites in western Sicily. Four lecturers from the Degree course in Geological Sciences gave talks on topics that had proved (in the student surveys) to be the most popular in the initial phases of the project.

risultati più graditi nell’interest ricerche sottoposto agli studenti nelle fasi iniziali del progetto.

The talks aimed to demonstrate how to prepare lessons in the field of geological sciences employing a modern and practical approach to the teaching of earth sciences including museum visits and discovering the landscape surrounding the urban areas in which their schools are located. The afternoon was taken up with the guided tour following the suggested itinerary around the Museum and the teachers’ workgroups; these two stages served to illustrate how the exhibitions and the didactic workshops might be used as a support for teachers of earth sciences as part of the set school-programme.

The second day witnessed the excursion to three sites situated in the Provinces of Palermo and Trapani, with the aim of demonstrating how it is feasible to give geology lessons in the field and involve the students directly. The excursion ended in the town of Alcamo, which, with its residential and historic buildings provides a positive example of the relationship between a town’s architectural development and the outlying areas.

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