

Research Paths in Physics: How Can We Exhibit Them?

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Introduction

Paradoxically, while research products become more and more tangible and their influence on our ordinary life is always increasing, the interest for science of the young generations appears to be dramatically declining. Initiatives are therefore spreading out that attempt to bring science near to the general public, devising new ways of involving and stimulating a wider audience.

What can professional physicists do? Which contribution can we give as people directly involved in doing physics?

We started from the idea that it was somehow possible to communicate to anybody the nature and the results of research in physics as part of the human culture and tried to implement this idea by designing the structure of a 'research exhibition' to be held in our town (Bologna, Italy) during the 2005 World Year of Physics.

What we mean by exhibiting physics research

The first aim of a 'research exhibition' is to give the public at least an idea of what "doing physics" means, of what sort of job is this that we find so intellectually exciting and challenging.

For this purpose a series of interviews have been collected in a short movie, where young and less young researchers tell their ideas about research in physics, the story of how they decided to become a physicist, the glories and the dark sides of their career as researchers. The aim was to point out not only the professional but also the human side of the researcher and to emphasize that the passion for one's own job is a main feature of people involved in research.

A second aim of the exhibition is to allow the visitor to recognize peculiarities of the different research areas and at the same time to realize that there is a common thread which gives Physics its status as specific subject and its nature of art of investigating nature.

Objects and techniques should be shown in the exhibition as the result of a continuous process of searching for answers to questions that become more and more specific as the answers obtained from nature produce new questions for further investigation.

But today's research is rooted in the past and it is also important to realize that science is the product of a long non-linear process where some special people played important roles.



Figure 1: Board in the section on Elementary Particle Physics (size 2.75 x 4 meters)

Therefore a section of the exhibition was planned to illustrate "the roots of the present", showing the contributions of the main scientists who lived and worked or at least stayed in Bologna for some time from the XVIII to the XX century. The aim was also to show that at times the town buildings themselves were important partners in the history of Physics: the places, the squares, the buildings, the well known Two Towers of Bologna became at some time the instruments, the laboratories for investigation in physics.

The exhibition becomes reality

The first support for making the exhibition real was given by the Department of Physics of the University and the Research Institutions of Bologna. Then a fundamental contribution arrived from the consortium created by the university and the municipality of Bologna in order to promote a "science week" in the town, where the exhibition found its place together with many other events for promoting science to all citizens.

The structure of the space allocated to the exhibition is approximately a wide circular corridor with a lateral entrance (around 600 square meters). The different areas have been therefore necessarily put one after the other and the path across the exhibition runs naturally from one to the other.

Each research area has selected a few objects to be the focus of the space devoted to their research topic: samples of apparatus actually used for research or small-scale versions of the

real research objects (see figures 2, 5, 6). Some apparatuses can be made actually work during the visit in order to show some features of the research in practice.

In each area video materials are also shown continuously to illustrate some specific research topics.

At the border between the modern and the historical part of the exhibition, the movie mentioned above with the interviews to physics researchers is shown on a big screen. Its impact is really remarkable: visitors enjoy looking at professional physicist as "normal" people and the screenplay of the movie is very effective for this purpose.

Finally all the walls have been covered with big beautifully coloured boards containing evocative pictures and short sentences about the specific research questions related to each area (see figures 1, 3, 4): the impression is to be surrounded by a pleasant environment that can be enjoyed even at a purely aesthetical level.

Doctoral students in Physics act as guides to the exhibition both for the general public and the schools, tailoring their presentations according to the audience requests.

During the period of the exhibition a series of seminars were held in the room opposite to the exhibition entrance: some seminars are meant to illustrate present research problems, others to encourage a discussion between physicists and specialists of other fields of research (literature, art, philosophy, etc.). All of them were intended for a general though motivated audience.

At the time we are writing this contribution the exhibition is still open to the public. In the first four weeks many students (around 700) have already taken advantage of the opportunity

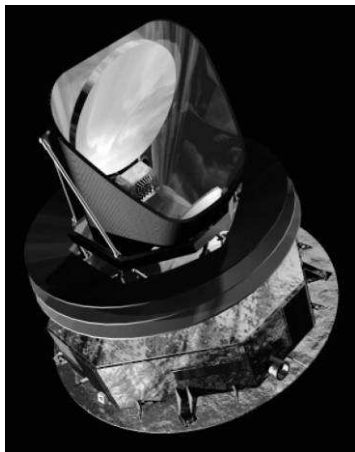


Figure 2: A model of the satellite Plank shown in the Astrophysics section.
(size 1:8)

of guided tours specially devoted to school classes and more have booked their visit for the days to come. Besides the students, more than two thousand people have seen the exhibition and the number is bound to increase notably during the last weekend.

The catalogue

The design and realization of the catalogue has been one of the major efforts done by the physicists' community of Bologna.

Rather than a guide to the exhibition, the catalogue appears to be its complement: a detailed and carefully selected review of all the researches done at the Bologna University and Research Institutions, written not for the specialists of the area but for all people interested in knowing how physics contributes to our knowledge of the world and to the style of our ordinary life. A section about history of Physics that involved the town of Bologna is enclosed in the catalogue, enriched by many pictures of the people who made it possible and of the places and instruments that were used at that time.

To illustrate the ideas that were at the basis of the exhibition design, the catalogue contains three short essays: "Passion for investigation", "The scientist as the artist of questioning", "Knowing the reality, changing the world".

To suggest transversal cross-area reading of the materials related to the exhibition, three unifying themes are also briefly discussed in the catalogue, each one based on an apparent antinomy: "big/small", "simple/complex", "visible/invisible".

Finally, the catalogue contains a short description of the birth and development of all the Research Institutions that are involved in physics research in Bologna and who contributed to making the exhibition and the related events possible.



Figure 3: Board illustrating the kind of apparatus used in Elementary Particle Physics (size 4 x 2.75 meters)



Figure 4: Board in the Physics Education section (size 2 x 2.75 meters)

Conclusions

We have briefly described the research basis of the exhibition "Research Paths: Physics comes across Bologna" organized by the Physics Department, University of Bologna, in 2005 World Year of Physics from October 7 to November 13. The exhibition aim is to illustrate to a wide audience of students, teachers and citizens in general the main areas and trends of research (Astrophysics; Nuclear and sub-nuclear Physics; Structure of matter – microelectronics and nanostructures; Earth Physics; Physics & Medicine; Physics & Cultural Heritage; Physics Education) presently carried out by physicists who work in the Bologna University and other Research Institutions, documenting also the inheritance from the past that allowed present research to develop and flourish.

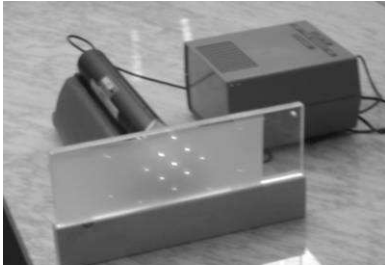
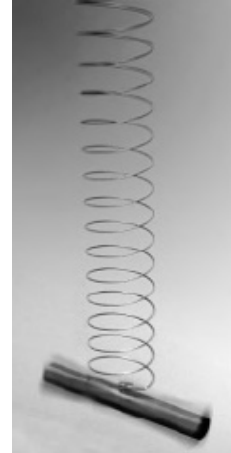


Figure 5: Apparatus to show diffraction in the Structure of Matter section.

An important result of this effort is that the exhibition design has been an opportunity for Physicists to look at their profession from a critical perspective, searching for the features of one's own research that can prove most effective in giving meaning and substance to the expression "Physics is culture".

The exhibition is a challenge the Bologna researchers



have taken with great enthusiasm and commitment; the audience will tell whether or not they attained their goal.

Figure 6: The Wilberforce pendulum, an example of how complex phenomena can become understandable by using real time acquisition systems (size 0.4 x 2 meters).

Acknowledgments

We wish to thank Stefania Varano and Marilisa Giordano for their extraordinary commitment to the success of the exhibition and the catalogue production. We also wish to acknowledge that the exhibition was supported by the University and the municipality of Bologna within Cronobie – the big event devoted to science, held in Bologna at the beginning of October 2005.