An interview with Paolo Galluzzi

Genesis and contents of the exhibition

Question: How did you come to develop the exhibition The Art of Invention: Leonardo and Renaissance Engineers?

Paolo Galluzzi: The Art of Invention began with an attempt to gather primary sources: thousands upon thousands of beautiful drawings and manuscripts, which the Renaissance artist-engineers had made to address technical problems. These drawings had been buried in our libraries; they simply had not attracted the same attention as portrait and landscape drawings, or drawings of religious subjects. Our first job, then, was to bring together this material, put it into order, and decipher it. These are astonishing drawings, true artworks; but they are not easy to understand, even for trained engineers, and so it took us a considerable effort to read them. At the same time, of course, we were reconstructing the biographies of the artists.

Q: How did you go from that stage of the work to creating the models that are seen in The Art of Invention?

PG: At a certain point in the documentary project, I began to realize we should not keep these drawings to ourselves. We should help a large audience to perceive their beauty. So I began to wonder how to explain these things--not only the operation of the machines that are depicted, but also their context, their role in history.

For example, we have wonderful drawings of the machines used by Filippo Brunelleschi in constructing the dome of the cathedral in Florence. How do you explain them--not only the machines but the dome itself, which is one of the greatest of all engineering marvels? Each year, several hundred thousands of people climb up the 400 steps to the top of the dome, without realizing they're passing through one of the most complicated, technically daring buildings of modern times. They go up, look out over the rooftops of Florence, and then walk...
back down without once understanding they're in the midst of a work of genius. How can you reveal it to them? You can't open the dome.

So we hit upon the idea of building working models, in three dimensions, of the machines, based on the original sources, and linking them to enterprises such as the construction of Brunelleschi's dome. We commissioned the best crafts workers in Florence to construct the models, working in the same way and with the same materials as the craftsmen of the 15th century. We built machines that are similar not only in conception but also in materials and construction methods to what the artist-engineers designed.

We also decided that to help people understand these things, we should use our modern-day language, which is the computer; and so we began to develop multimedia presentations, including computer animation. In combination, these three elements--the primary drawings, the full-scale working models, and the computer models--are extremely eloquent. The drawings, exhibited in large-scale, silkscreen reproductions, arouse respect in viewers, who see that these artists depicted machines with the same beauty as the human figure or natural scenes. The three-dimensional models give viewers a feeling for how the machines worked. The multimedia computer program puts the machines into context--into the fabric of the cathedral dome, for example--and shows the process of work, so the viewer can participate in the building of Brunelleschi's dome and understand the problems of scale and location. Or a visitor to the exhibition can see how a hydraulic machine would have functioned in a river.

Q: How long did this take? What was the chronology of the exhibition?

PG: I started to work on this project in 1984. It took years just to assemble this enormous body of visual documentation, to organize it, to understand it, and to make a selection for the exhibition. At the beginning, we narrowed our focus to Florence and Siena as the places that historically witnessed the appearance of the artist-engineer.

The first outcome of this research was a very nice exhibition in 1987, presenting Leonardo as a theoretician who delved into the principles behind the operation of machines. That exhibition, called *Leonardo da Vinci: Engineer and Architect*, attracted more than 500,000
visitors when it was shown in Montreal at the Museum of Fine Arts. For that exhibition, we constructed some three-dimensional models.

Then we had an exhibition in Siena in 1991, called Before Leonardo, devoted to the Sienese engineers. We built models for that exhibition, too, using the same craftspeople and the same scale. In 1991, we also started to use computer imaging, though only in a rough way, as a third didactic tool.

Finally we began to work on this exhibition, The Art of Invention, which opened in November 1995 in Paris, at the cité des Sciences et de l'Industrie. Some of the material in The Art of Invention had been seen in the two earlier exhibitions, but more than half of it was newly constructed. Moreover the general conception of this presentation is entirely new.

Q: Tell us more about the people who constructed the models.

PG: The three-dimensional models were almost all built in Florence by a group of artisans who are well known for restoring ancient furniture and metal, such as the choir screens in churches, bronze doors, or bronze sculptures. They are art restorers. When I first thought of making working, three-dimensional models of the machines seen in the drawings, I was influenced by the bad impression I'd received from certain previous models. First of all, they were based only on Leonardo's designs, as an outcome of Leonardo-mania. Second, they showed no respect for materials, for scale, for knowledge of the details of construction. And third, they were ugly! I wanted to do something new, to construct models based on a knowledge of the working capabilities of the 15th century. The best people for that job are the art restorers, who are in one sense the heirs to the artist-engineer workshop. They hesitated at first to take on the job, because they felt they lacked the specific knowledge of mechanics. But we provided them with such a detailed set of project drawings produced thanks to the computer that they accepted. And now they're very happy to have accepted the task.

For the computer models, we were helped at the beginning by IBM. Then my own institution, after 1989, developed an autonomous multimedia lab, with a staff of
five. This staff has been oriented toward an application which uses technology for the diffusion of a better public understanding, especially in the field of the history of science and technology. At this moment, we probably have one of the best laboratories in this field in the world. We have taken programs made for high-tech applications and transferred them successfully into a cultural domain. For example, we used a program originally conceived for avionics to shape the Renaissance machines. We also have worked out new ways to allow people to simulate turning a manuscript page, or to get a 360-degree view of the interior of the dome in Florence--anything we could think of to help people use their eyes to understand and appreciate these machines and to put them into context.