

Handwritten notes in a cursive script, likely in Italian, located at the bottom left of the page. The text is difficult to decipher but appears to be related to the architectural or mechanical drawings.

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SEVERAL students of da Vinciana, including an anonymous deponent in the *New Yorker* and our own Francis de N. Schroeder, have baldly asserted that engineering was Leonardo's calling—the thing he liked and wanted to do—and only because there was no money in it in his day, except for periods of building pugilistic toys for the Borgias and Sforzas, he was forced to paint for a living. Since da Vinci's exceptional energies went to fill thousands of notebook pages with his mental pursuits rather than his memoirs, we can only speculate. We do know, however, that the binding idea which built Leonardo's love of art and science into a tongue-and-groove structure was *saper vedere*, "to know how to see."

Despite the schism between this maxim and the one pronounced on doors and desks at International Business Machines, the world's foremost producer of electrical thinking recently acquired—lock, stock and ornithopter—an impressive collection of models of da Vinci's "inventions." Some 66 working replicas of the artist's investigations into the science of practically everything, made from the original sketches by Dr. Robert A. Gualdini, an Italian da Vinci enthusiast and engineer himself, were exhibited at IBM's New York headquarters. The collection

is now on display at New York's Metropolitan Museum; after May 11, for an indefinite time, it will tour the nationwide IBM circuit.

It is no belittlement of Leonardo's artistic merit that Big Business is concentrating, for a change, on his mechanical and not spiritual wizardry. In this country, Leonardo's paintings—The Last Supper and Mona Lisa leading the list—have been catalogued as the apogée of his genius; his scientific obsession has been pigeonholed as an amusing and somewhat anachronistic sideline which is tolerated, like Winston Churchill's paintings, more for its therapeutic than intellectual worth. But as Ludwig Heydenreich points out in his comprehensive essay accompanying the exhibition, Leonardo was the first to approach science as an artist, to make the study of nature corollary to being a painter. Da Vinci's ability to see, his omniscient eye, forced him to see both ideal beauty and brutality, reasoned proportion and grotesqueness. As his devouring perfectionism drove him after more detailed knowledge, he was obviously seeking more than the simple information he needed to represent Saints, Madonnas, and the ethereal world in which they dwelled. Consumed by the quest for knowledge, Leonardo's self-chosen goal was to grasp the underlying forms and

laws of all nature, and set them down in drawings which would visualize the invisible.

The fact that his pencil served his science, and still produced designs of good proportion and drawings of casual but articulate beauty, is for the 20th century man to ponder. This is not a sly attempt to force Renaissance man into the mold of modern motivations. Da Vinci was not an industrial designer in our sense of the word, nor was he bound by contract to streamline a ship's hull or a bridge. He was simply seeking knowledge, however it was packaged; he was an empiricist exploring the practical to reach the theoretical, so that the theory might be reapplied to the next problem. He supported his search for reason with an adept hand, but the drawings, whether scribbled or rendered with fine concern for line and perspective, were just a by-product.

We see this particularly in his architectural studies, where art and technical knowledge were permanently combined. Like Buckminster Fuller, who engineered (but did not design) a geodesic structure to span more space efficiently, Leonardo studied the theory of the structural arch, its defects, and ways of engineering better spatial forms with the dome.

If the lodestar of the Renaissance was

an exhibition about the science of an artist who knew how to see, think, and create

## SAPER VEDERE

SEVERAL students of da Vinciana, including an anonymous deponent in the *New Yorker* and our own Francis de N. Schroeder, have baldly asserted that engineering was Leonardo's true calling—the thing he liked and wanted to do—and only because there was no money in it in his day, except for periods of building pugilistic toys for the Borgias and Sforzas, he was forced to paint for a living. Since da Vinci's exceptional energies went to fill thousands of notebook pages with his mental pursuits rather than his memoirs, we can only speculate. We do know, however, that the binding idea which built Leonardo's love of art and science into a tongue-and-groove structure was *saper vedere*, "to know how to see."

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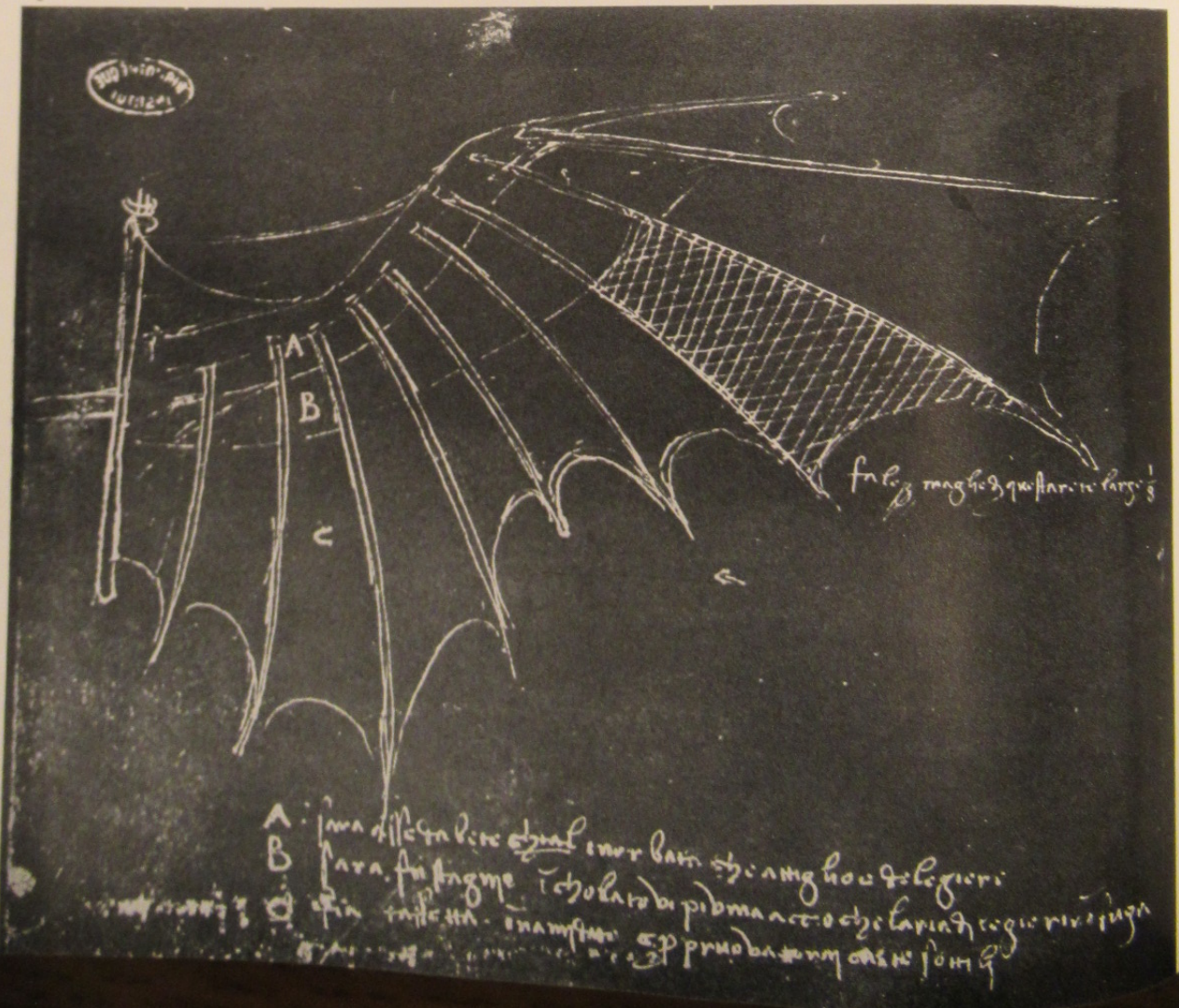
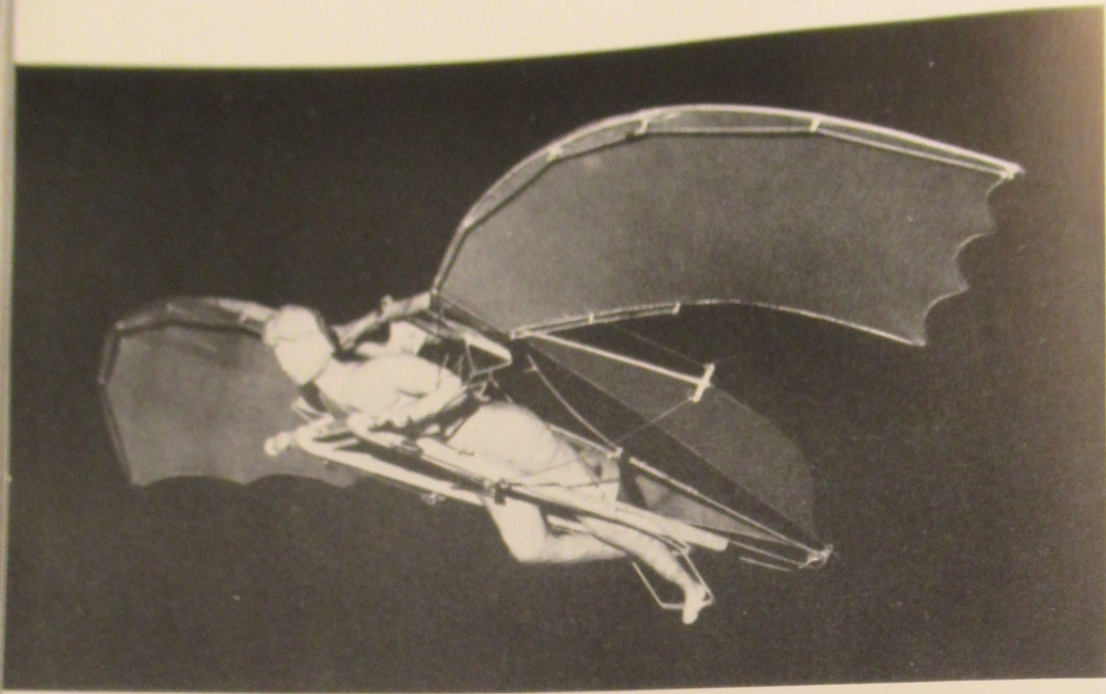
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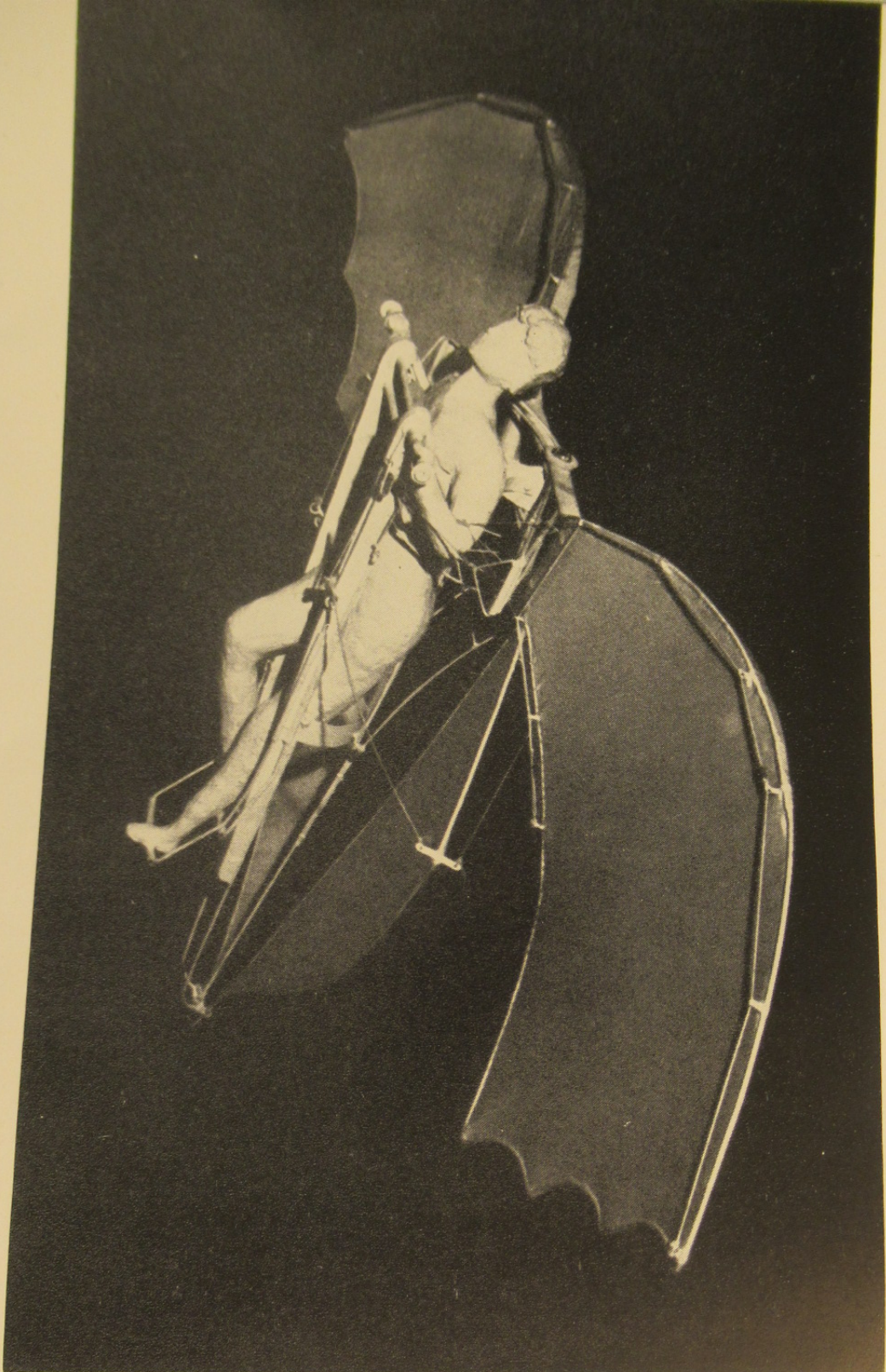
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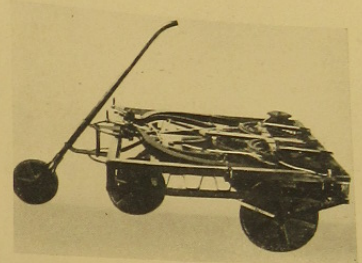
... today's may be the machine. machine-made deformity besets us on all sides, until it has produced a race of slaves with a perpetual wish to slumber. A few with their perceptions still intact (we call them artists and critics) concentrate on the creation of music, or literature, or painting, or architecture, or even mundane things like chairs, tables and cars which are dulling everyone's sensibilities in the first place. Very few of them can straddle two worlds of knowledge and sensitivity at the same time, it is not surprising that the leading minds of one province often show themselves to be on totally alien ground when they stray (as they inevitably do, when unable to live one-dimensional lives) into the spheres of taste and creativity in which they have not been formally trained. The world is a bigger place than it was in 1500, and man is a smaller animal by contrast. Universal talent may be too much to expect, but a little broadening of perceptions is not. The truly Universal mind is as rare an *avis* as a Unicorn's, and it must combat the curse of specialization on one hand, effete dilettantism on the other. But, even when it survives in the Chaim Weizmanns, Albert Schweitzers and Frank Lloyd Wrights we can thankfully boast, the extent of Leonardo's vision is barely touched by the comparison.

On these pages you will find some of the wings from Leonardo's tree of inventions, in their original spirit and in Guatelli's incarnation, including the fruits of his fascination with motion, gravitation (or defiance of it) man's dreams of conquering the fourth dimension through flight, vision, and the weather. If some of the sketches appear untidy, lacking the elegant precision and emotion of "art", they may at least be called beautiful for the honesty of their perception and the craft which expresses it. Leonardo was a bold servant, not cloven by that artistic schizophrenia which separates beauty in the pure sense from beauty, proportion and taste in tangible and natural things. Borsose said it: "The real merit of an artist is not the making of masterpieces. . . . but his artistic activity in itself, his capacity for living artistically, deeply, in short, morally." A man who knew how to see as Leonardo did couldn't have invented ugly things if he'd tried.—J. F.

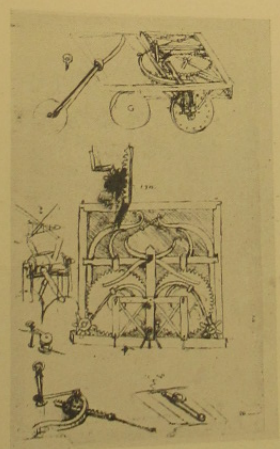
and transportation . . .



in the air: an early helicopter



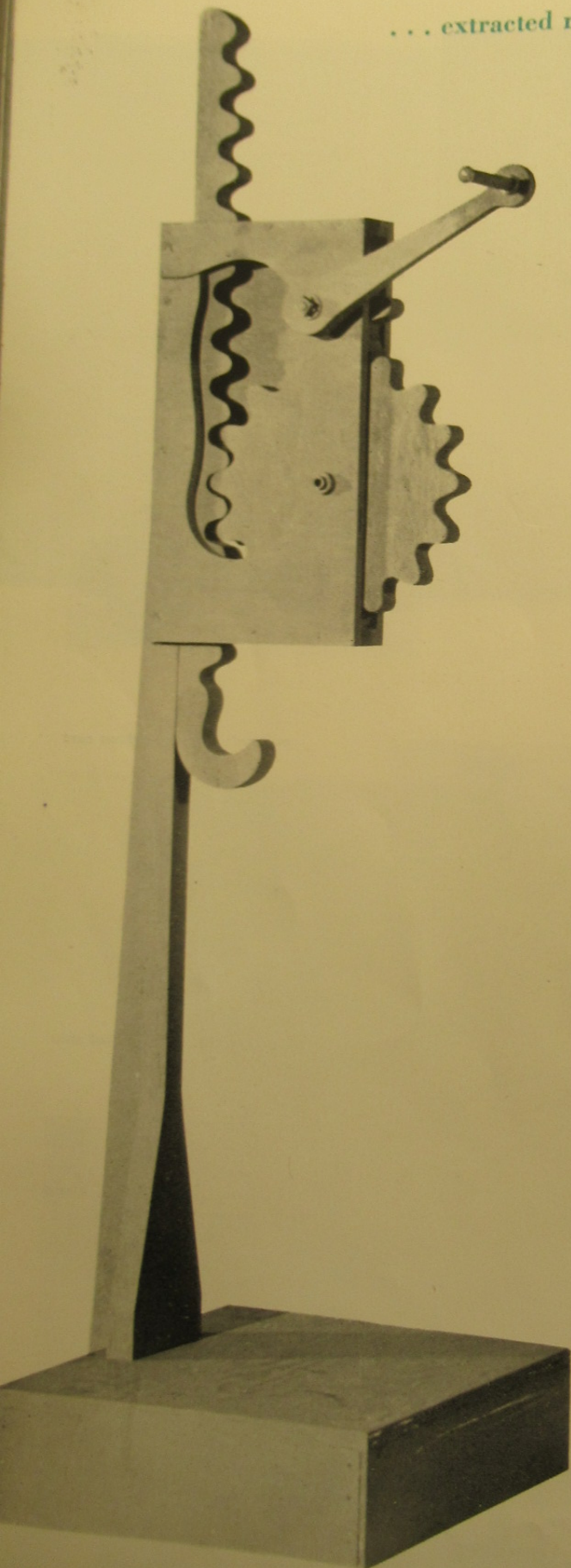
on land: a spring-driven cart



on the sea: a two-hulled ship

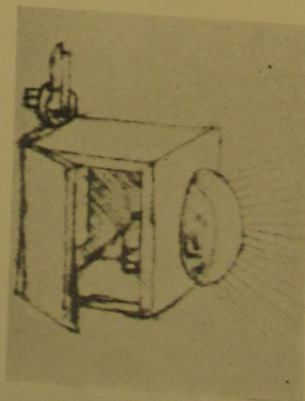
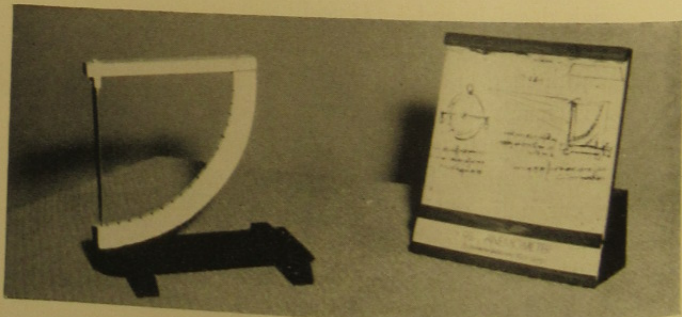


... extracted mechanical principles from everyday problems ...



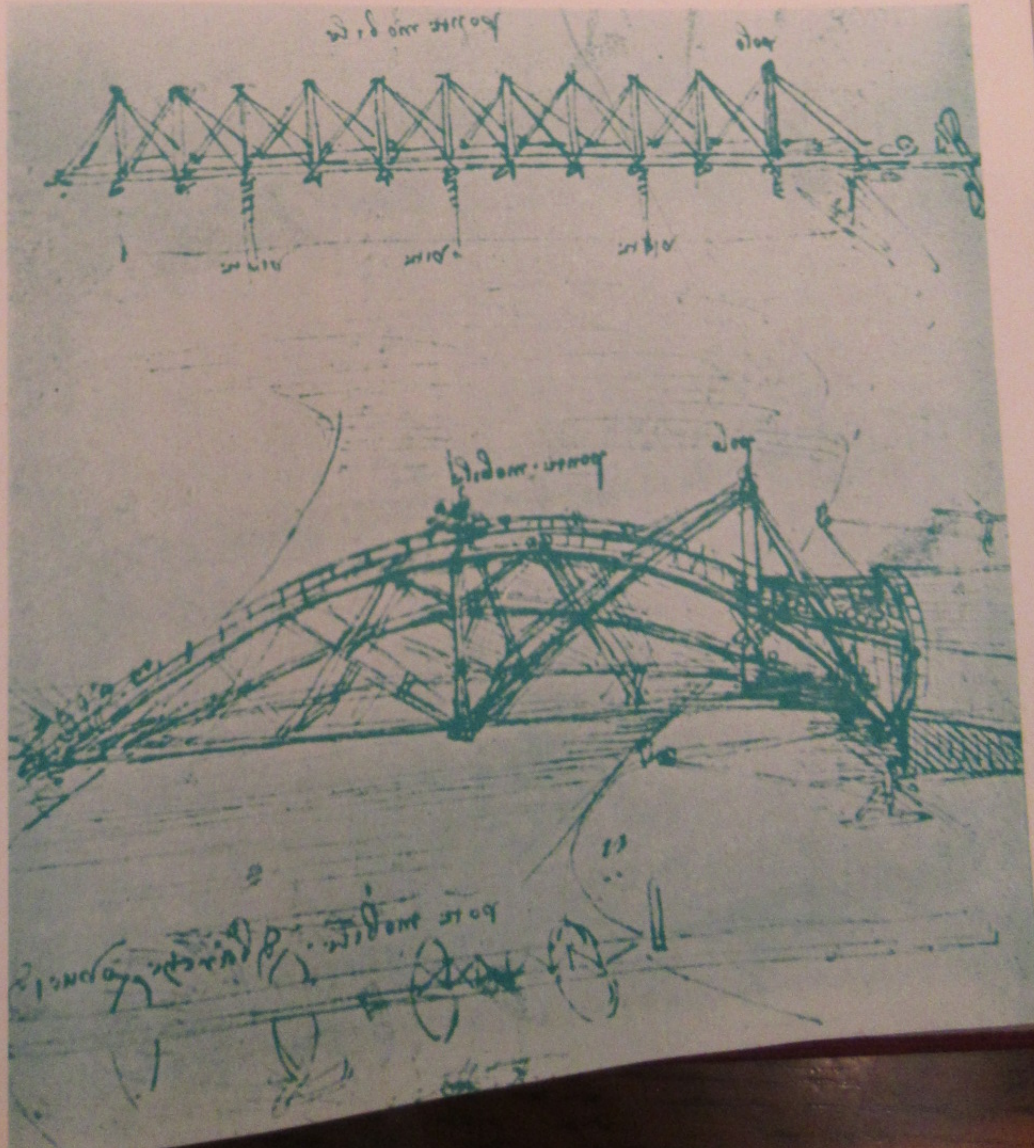
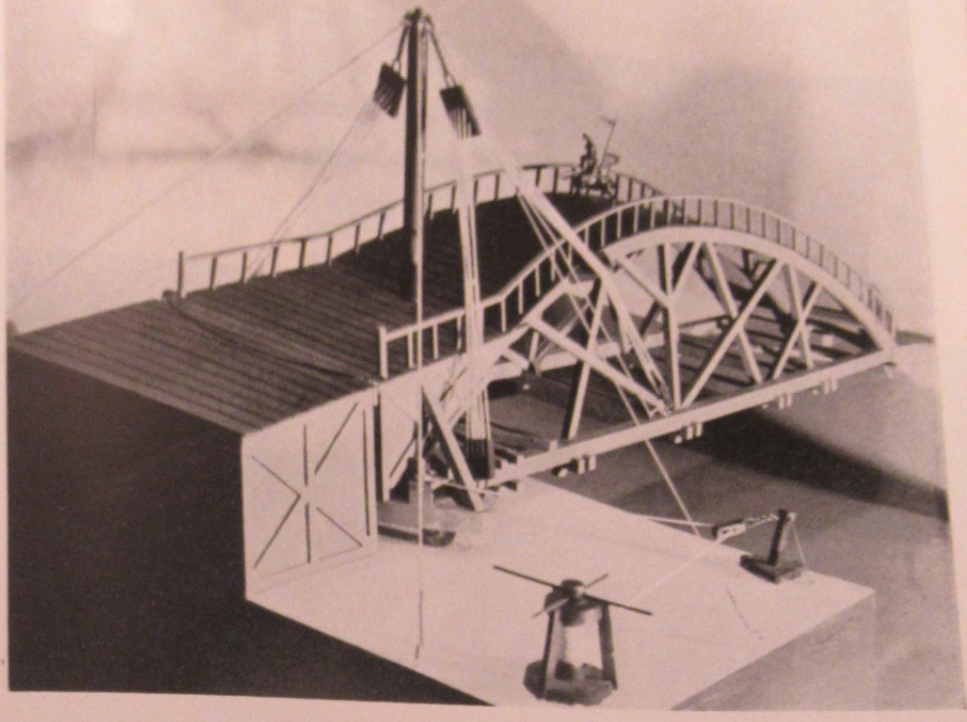
Leonardo's learning embraced four general fields: mathematics and optics as the basis of all observations; mechanics as the science of all forces in organic and inorganic nature; biology as the science of life and growth; cosmology as the study of inorganic forms and the forces at work in them.

As an inventor, playing with purely workable ideas, he either studied and improved machines in common use in his day, explored mechanical principles, or created experimental gadgets to demonstrate his own theories. The famous flying machine was based on his own combination of mechanical principles, plus ropes, pulleys, and wings; it was to be operated by movement of the feet. Mathematics and physics went into the anemometer (below) which measured wind velocity. He discovered the principle of the reversed image in his projection apparatus (bottom). The rotating bridge was to cut off the enemy's approach to an island fortress.

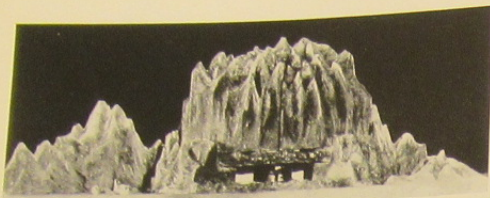


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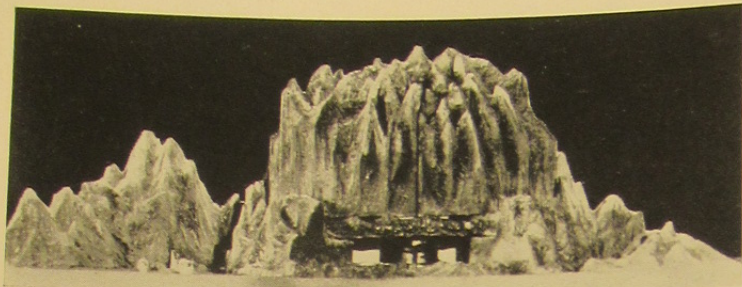




Among da Vinci's duties in the service of Lodovico Sforza, Duke of Milan, was the production of pageants and plays. His most dazzling achievement was a revolving stage for the *Paradiso* of Bellincioni, in 1496, and into it Leonardo invested his full resources of invention and artistry. On first impression, the stage was a huge mass of wood, plaster and cloth. This slowly parted to reveal a gilded and starry celestial dome whose air was filled with music from instruments of Leonardo's invention. This was Paradise. Below it was the nether world, its artificial fires produced by colored candlelight. Boats filled with singers floated on an artificial stream encircling the stage. The effects were more than scenic, for the acoustical qualities of the dome and the water made the voices and sounds fully audible. Paradoxically, Leonardo had a pioneer's mind without a pioneer's spirit. Except when he was hired to engineer these spectacles, concoct war machines, or cool Beatrice d'Este in her boudoir, he was apparently unconcerned about applying his ideas to the betterment of man. Perhaps it is just as well, for visionary minds are often frustrated into inactivity when they realize that a discovery ahead of its time, even the most profound discovery, usually gains its greatest importance in historic hindsight.

... and built paradise on earth for the duke of milan





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