

writes that the essential point in Leonardo's founding of true fluid dynamics, "is his unambiguous indication of the importance of the formation of singular discontinuous phenomena. These can take the form of vortices, hydraulic jumps, breakers, vortex-filaments, and so forth, out of apparently continuous wave motions. . . . The relevance of the formation of a discontinuity in a fluid is not purely a philosophical issue. It implies the creation of the right or wrong technology."

As De Paoli shows, and as Lyndon LaRouche has emphasized many times in *EIR* and other publications,⁸ it is the singularities, the discontinuities, that are the essence of continuing creation—contrary to the view of the Newtonians. Looking at the formation of vortices in water and air, for example, Leonardo did not see incomprehensible chaos and disorder, as many do today, but rather a leap to a new ordering principle, as matter organizes itself into what Leibniz and his followers would call least-action pathways. This approach to hydrodynamics continued in later centuries with the work of Bernhard Riemann and Ludwig Prandtl—in opposition to the English school of Newton, Rayleigh, and Kelvin.

The present catalogue properly identifies Leonardo as a forerunner of Christiaan Huygens, the associate of Leibniz who was very familiar with Leonardo's work, and who, in 1673, elaborated a law of wave motion, according to which each point struck by a wave becomes the origin of a new disturbance, all of which determines the shape of an advancing wave front.

But Leonardo's study of waves leapt even farther than that. Using the metaphor of water, Leonardo came to the conclusion that light, too, propagated by means of waves—contrary to the view at the time, that it was composed of tiny particles. "Just as a stone thrown into water becomes the center and cause of various circles," he wrote, "so every body placed within the luminous air spreads itself out in circles and fills the surrounding parts with an infinite number of images of itself, and appears all in all and all in each part."⁹

Leonardo's wave theory of light, one of the most important ideas in the history of science, was buried until the end of the 17th century, when Huygens, Leibniz, and the Bernoullis developed it further; but the growing hegemony of Isaac Newton in the 18th century generally suppressed this line of investigation, until the existence of light waves was established, to the satisfaction of even the empiricists, by Thomas Young in 1800, nearly 300 years after Leonardo asserted it.

The Codex Leicester is a milestone in the history of science. Most important, it gives the modern student a glimpse at the method which produced such wonderful discoveries.

write to *EIR*. See also Lyndon H. LaRouche, Jr., "Beethoven as a Physical Scientist," *EIR*, May 26, 1989.

8. Lyndon H. LaRouche, Jr., "The Essential Role of 'Time-Reversal' in Mathematical Economics," *EIR*, Oct. 11, 1996.

9. Codex Atlanticus, fol. 9v, cited by Argentieri, in Istituto Geografico, *op. cit.*, p. 405.

Leonardo for children

Leonardo da Vinci's work is "a natural" for children, since he was without doubt the most playful scientist in world history. The American Museum of Natural History, with the help of the Eli Whitney Museum in Hamden, Connecticut, has prepared an excellent series of hands-on exhibits, to demonstrate principles of Leonardo's water investigations.

There are also Saturday workshops in which children can build models of Leonardo's machines. Those still to come, on Dec. 15, include "Leonardo's Fountain," "Leonardo's Violin," "Leonardo's Catapult," and "Bathtub Leonardo."

Children's books on Leonardo are a mixed lot. My favorite for young children is the ingenious pop-up book *Leonardo da Vinci*, by Alice and Martin Provensen (New York: Viking, 1984), now, unfortunately, out of print.

A new release, *Leonardo da Vinci*, by Diane Stanley (New York: Morrow Junior Books, 1996, hardbound, \$16.00), is a disappointment. Although the author researched her subject carefully, she has no real understanding of Leonardo. Her illustrations are dreadful: The most alive-looking picture is that of the cadaver on Leonardo's dissecting table. In her painting of Leonardo's underwater frogman with snorkel, not a ripple moves—not the water, not the frogman, not even the fish that happens to be in the neighborhood. It is as if all the participants had suddenly been trapped in ice. How totally un-Leonardian!

Her text describes Leonardo as though he were a child of the 18th-century Enlightenment, with its division between "religion" and "science," "natural science" and "the arts." Characterizing the Middle Ages as a time when people were guided by a deep religious faith, she writes that when Leonardo was born, "faith and tradition gave way to learning and curiosity." One has only to look at Renaissance paintings, including Leonardo's, to see how absurd a view that is of the Renaissance.

For children 10 and up, I recommend Richard McLanathan's beautiful book *Leonardo da Vinci*, in the "First Impressions" series (New York: Harry N. Abrams, 1990, hardcover, \$19.95). It uses only Leonardo's own paintings and drawings by way of illustration (who could improve on these?), does not try to be cute, and the text is informative.—*Susan Welsh*