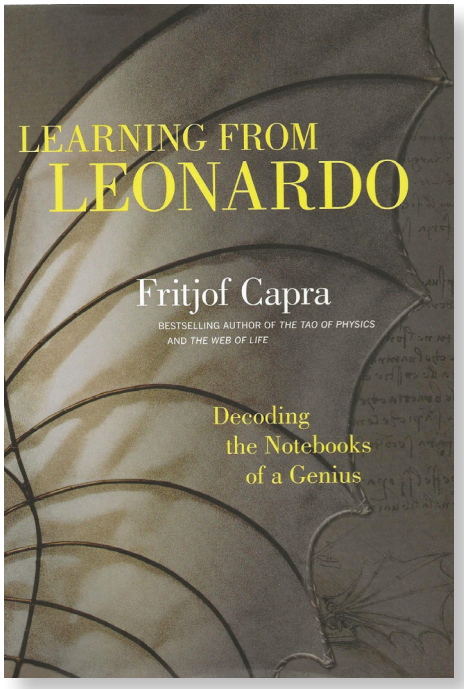
Da Vinci's notebooks contain numerous highly detailed and beautiful drawings of muscles, nerves, arteries, organs, the brain and skeletal structures. He drew them from different angles and in multiple layers. Isaacson speculated that had not the anatomist that Leonardo worked with on dissections not died young in 1511 from the plague, they may have produced a treatise that would have "preceded and surpassed" Andreas Vesalius's groundbreaking 1543 book *On the Fabric of the Human Body* (p. 424). During a period of anatomical study from 1508 to 1513, "Leonardo made 240 drawings and wrote at least 13,000 words of text, illustrating and describing every bone, muscle group and major organ in the human body for what would have been, if it had been published, his most historic scientific triumph." (p. 400)

In the concluding chapter, Isaacson suggested lessons that da Vinci's life offers. These lessons, in Isaacson's words (pp. 519-524) with a few reviewer explanatory comments in brackets are as follows: Be curious, relentlessly curious. Seek knowledge for its own sake. Retain a childlike sense of wonder. Observe. Start with the details. [Isaacson noted that da Vinci described how he achieved his amazing powers of observation. Start with one detail and when that is known, proceed to the next detail.] See things unseen. [Engage your imagination.] Go down rabbit holes. [Allow yourself seemingly inordinate efforts attempting to track down an answer.] Get distracted. Respect facts. [Test your ideas with experiments.] Procrastinate. [It takes time for ideas to fully form.] Let the perfect be the enemy of the good. [Don't settle for good enough.] Think visually. Avoid silos. [Don't get too specialized. Allow yourself to ponder all areas of the arts, sciences and humanities.] Let your reach exceed your grasp. Indulge fantasy. Create for yourself, not just for patrons. Collaborate. Make lists. Take notes, on paper. [Many of da Vinci's paper notebooks still exist. Electronic social media are ephemeral.] Be open to mystery.



Learning from Leonardo: Decoding the Notebooks of a Genius. Fritjof Capra. San Francisco: Berrett-Koehler, 2013. ISBN-13: 978-1-60994-989-1. 380 pages. Hardcover, $29.95.

The book is attractively produced. Among the 144 numbered figures are some reproductions of da Vinci's paintings and drawings, as well as some of his notebook pages. Isaacson is University Professor of History at Tulane, with published books that include biographies of Albert Einstein, Benjamin Franklin, Steve Jobs and Henry Kissinger. This book is highly recommended and a must for anyone seeking a better understanding of da Vinci.

Learning from Leonardo: Decoding the Notebooks of a Genius.
Fritjof Capra. San Francisco: Berrett-Koehler, 2013.

The book opens with a description of the characteristics which made da Vinci so remarkable–his intense curiosity, great enthusiasm for discovery and understanding, intense concentration, attention to detail, tremendous patience and holistic memory ("ability to memorize large amounts of information in the form of a coherent whole"). (pp. 2-4) In addition, he "developed a new empirical approach to science, involving the systematic observation of nature, logical reasoning and some mathematical formulations–the main characteristics of what is known today as the scientific method." (p. 5)

The author of this book is Fritjof Capra, a physicist and author of several books, including *The Tao of Physics* (1975), *The Web of Life* (1996), and *The Science of Leonardo* (2007). In this book Capra discusses da Vinci's studies in fluid dynamics, geology, botany, mechanics, aerodynamics, human anatomy and ecology. Da Vinci did not get around to publishing his scientific work, so the discoveries he recorded in his notebooks were rediscovered decades or centuries later by scientists such as Bernoulli, Newton, Helmholtz, Lyell, Huygens, Joule, Coulomb, Galileo and William Harvey. Da Vinci's studies on optics and vision were discussed in Capra's previous book *The Science of Leonardo* (reviewed in the April, 2008 issue of *Hindsight*, vol. 39, no. 2, pp. 78-80).

This book includes 11 color plates and many monochrome illustrations reproduced from da Vinci's notebooks. Included among the illustrations are many of da Vinci's' elegant anatomical drawings. Capra distinguishes between da Vinci's anatomical drawings and those of Andreas Vesalius in his heralded book *On the Fabric of the Human Body*, published in 1543, 24 years after da Vinci's death. Capra refers to da Vinci's drawings as composite-synthetic, and those of Vesalius as dissective-analytical: "Whereas Leonardo shows us, say, a system of blood vessels in relationship to adjacent

bones and in proportion to the body as a whole, Vesalius concentrates on the analysis of the anatomical parts per se, treating every anatomical system in isolation." (pp. 147-148) As a consequence, Vesalius's drawings tend to have a "cold and macabre effect." (p. 149) In comparison, because of da Vinci's approach and his artistic skill: "Harmony, beauty, and a sense of 'aliveness' are intrinsic to all his anatomical figures." (p. 150)

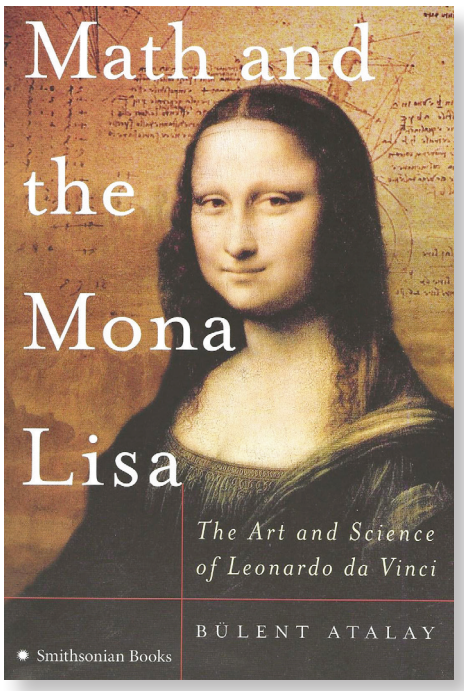
According to the author, in da Vinci's "systemic thinking," understanding a phenomenon requires "connecting it with other phenomena through a similarity of patterns." (p. ix) He argues that "Leonardo's greatest legacy to us may be his systemic thinking, together with his deep respect for nature and life…" and that today "we urgently need a science that honors and respects the unity of all life, recognizes the fundamental interdependence of all natural phenomena and reconnects us with the living Earth. Indeed, what we need today is the kind of science that Leonardo da Vinci anticipated and outlined five hundred years ago." (p. 323)

This book, along with Capra's previous *The Science of Leonardo*, provide a very interesting review of the scientific studies da Vinci recorded in his notebooks. They effectively communicate his ardent curiosity and extraordinary intellect.

Math and the Mona Lisa: The Art and Science of Leonardo da Vinci.
Bülent Atalay. New York: HarperCollins, 2006.

The author of this book supports the view of many present-day scientists who see da Vinci as "the first modern scientist." (p. 19) da Vinci had a wide variety of interests in science, art and engineering, and he sought to understand the connections between them through experimentation. The author noted that this book uses "Leonardo's model to seek again the consilience of science and art." (p. xvii) The author suggested that in the integration of art and science, architecture, astronomy, biology, chemistry, geology, engineering, mathematics, philosophy and physics were to Leonardo "branches of the same tree, part of a grand unified structure." (p. 14)

The reader should not expect a book exclusively about da Vinci, as the author notes that "although Leonardo's system…serves as a unifying theme throughout the book, only three chapters [out of thirteen] are devoted exclusively to Leonardo." (pp. xviii-xix) The book's "task involves applying elements of modern science and mathematics to the analysis of perspective, proportions, patterns, shapes, and symmetries underlying art and nature." (p. xviii) Examples of the topics examined in the book are the origin of numbers, the Fibonacci series, the golden rectangle, the logarithmic spiral, symmetry in architecture and in nature, facial aesthetics, perspective in art, optical illusions, brain function of artists, the physics of motion and gravity, and modern physics as art.



Math and the Mona Lisa: The Art and Science of Leonardo da Vinci. Bülent Atalay. New York: HarperCollins, 2006. ISBN-13: 978-0-06-085119-4. 314 pages. Softcover, $12.95.

The author states that da Vinci was fascinated by the eye and visual function. Da Vinci's interest in optics and vision provide a good example of how he merged investigations of various sciences with his art. He did dissections of the eye; investigated reflection, refraction, shadows cattering of light; and studied the science of perspective. The author states that da Vinci's paintings reflect his "surpassing mastery of light." (p. 210) Leonardo's notebooks also contain the idea of a refracting telescope and even what appears to be the suggestion of a reflecting telescope, both ahead of their time.

This book presents some interesting thoughts on the underlying connections of art and the sciences and uses da Vinci's work as an example of how an appreciation of those connections can stimulate creativity in art and in science. The book contains black and white illustrations, as well as 16 pages of color images. The author is a professor of physics at the University of Mary Washington and has also produced art which has appeared in several exhibitions.