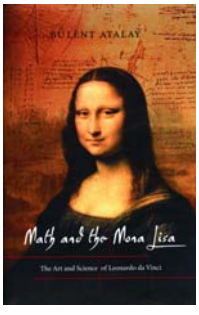
Strokes of Genius Behind the Canvas

Math and the Mona Lisa: The Art and Science of Leonardo da Vinci

Bülent Atalay
Smithsonian Books, Washington, DC, 2004. $24.95 (314 pp.). ISBN 1-58834-171-2

Reviewed by Alan E. Shapiro

In *Math and the Mona Lisa: The Art and Science of Leonardo da Vinci*, physicist and artist Bülent Atalay aims to bridge the gap that divides two cultures. To achieve the desired conciliation of art and science, he takes da Vinci, the archetypal Renaissance man, as his prime example of someone who truly bridged science and art, and he tries to apply to our era the lessons learned from the great master.



The scope of *Math and the Mona Lisa* is broad. Besides studying da Vinci's art and science, Atalay examines creativity and the nature of art and science and surveys the entire history of the mathematical sciences. The central theme of the book, though, is the place of mathematics in art, science, and nature. That theme is developed in two largely independent ways: first, by presenting the role mathematics plays in art and second, through the familiar story of the mathematization of nature by physicists. The first line of development is more original and is pursued by Atalay because he believes the confluence of art and science is found in the common, quantifiable, and mathematical grounds of the two cultures. He discusses mathematical aspects of art, such as symmetry, proportion, and perspective. But what most fascinates him is the "divine" or "golden" proportion in which a magnitude has been divided so that the ratio of the whole magnitude to the larger part equals the ratio of the larger part to the smaller part.

Throughout his book, Atalay shows how that proportion manifests itself in art by examining numerous paintings (by da Vinci, Diego Velázquez, Georges Seurat, and Marc Chagall, for example), the great pyramids of Egypt, the facade of Notre Dame cathedral, and much more. He even presents psychological evidence that people have an intrinsic preference for the golden rectangle over other rectangles and prefer faces that obey the golden proportion. To me, such an argument appears to be numerology, with its apparently arbitrary choice of points and placement of lines—the world of Dan Brown's *The Da Vinci Code* (Doubleday, 2003). But whenever I was about to lose my patience with the book, Atalay disarmingly assured the reader that artists' use of the divine proportion is, for the most part, unconscious and concedes that a concern for the golden ratio can be taken too far.

Yet da Vinci is one of those artists Atalay justifiably believes may have consciously used the divine proportion in his art: He executed many elegant drawings of polyhedra for an important book of the same name, *De divina proportione*, which was written in 1509 by his friend, the mathematician Luca Pacioli. Atalay proposes that Renaissance artists, with their concern for direct observation of nature and their integration of art, science, and engineering, helped to launch modern science.

Although I believe that he overemphasizes da Vinci's significance and originality as a scientist and engineer—as many do—his assessment of the role Renaissance artist-engineers played in launching modern science is on the mark. Unfortunately, much of the rest of Atalay's history of science, which carries the burden of his second major line of development—scientists' mathematization of nature—falls far wide of the mark. For example, he tells us that the medieval Arabic contributions to optics were unsurpassed until the work of Isaac Newton and Christiaan Huygens in the late 17th century, but he ignores the seminal contributions made earlier in the century by Johannes Kepler, who introduced the modern theory of vision and demonstrated that an inverted image is formed on the retina. In another example out of very many, Atalay repeats the canard that Kepler stole Tycho Brahe's data: On the contrary, Kepler had legal title to it.

While much of *Math and the Mona Lisa* is entertaining, it fails to bridge the two cultures of science and the humanities. Despite the presence of mathematics in some aspects of artistic works, humanists—and probably most scientists—will not be convinced that mathematics is an essential feature of art. Whatever the true nature of art may be, mathematics appears to be only incidental to it, both as a means of analysis and as a tool.

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Zoological Physics: Quantitative Models of Body Design, Actions, and Physical Limitations of Animals

Boye K. Ahlborn
Springer-Verlag, New York, 2004. $79.95 (430 pp.). ISBN 3-540-20846-1

When I was asked to review Boye Ahlborn's *Zoological Physics: Quantitative Models of Body Design, Actions, and Physical Limitations of Animals*, I was tremendously excited. I have taught courses in biomechanics for the past 25 years and have long been captivated by the yin and yang complementarity of biology and physics. Physics has clearly constrained biological evolution, but organisms have also repeatedly come up with bizarre