Leonardo: Foxy, or Fallible?

An Exchange

JÖRG M. WILLS AND DIRK HUYLEBROUCK

The Mathematical Intelligencer *encourages comments*.

Letters should be sent to the Editor-in-Chief.

To the Editor:

Dirk Huylebrouck's article on Leonardo's geometric "slip-up" is interesting (*The Mathematical Intelligencer* 34, No. 4 (2012), 15–20). In fact the discovery of Leonardo's "false" polyhedron by Rinus Roelofs is a little sensation. But the conclusion, that this polyhedron is false and that Leonardo made a mistake, is doubtful, and probably false itself. The polyhedron is only false if we, the viewers, insist that the base polyhedron is the rhombi-cuboctahedron, that is, one of the 13 Archimedean solids. If the "pseudo-rhombi-cuboctahedron" (the so-called 14th Archimedean solid) is taken as base, then Leonardo's polyhedron is correct and it corresponds to his own label. Any undergraduate student with some geometric intuition can deduce this solid from the rhombi-cuboctahedron. So it is very likely that Leonardo (or Pacioli or some other Renaissance artist) knew this "14th solid," and that Leonardo constructed his (correct) polyhedron on purpose from this base. Why might Leonardo have done this? The answer is quite simple: Riddles and puzzles in paintings were common in the Renaissance and in later times. (Another famous Renaissance example is the enigmatic polyhedron in Albrecht Dürer's "Melencolia" with the hidden golden section.) Leonardo may have constructed his correct polyhedron to confuse the viewer, and to make her or him think about geometry. He could not know that it

would take 500 years until Rinus Roelofs "rediscovered" this polyhedron.

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Dirk Huylebrouck replies:

I thought I had, in my article, refuted similar allegations. Allow me to present two new arguments.

First, I recently attended the conference "Leonardo on Nature," organized by the Max Planck Institute in Firenze. In his talk, Prof. Frank Fehrenbach, a German Leonardo specialist teaching at Harvard who reads Renaissance Italian, said something along the following lines: Leonardo distinguished artistic painting from scientific drawing. In the latter, he wanted to be exact as possible in order, as Leonardo wrote, "not to fall into the trap of astrology and the *perpetuum mobile*." That is, Leonardo did not pose riddles or insert mythical messages into his scientific drawings. Second, there are even greater errors in the drawings attributed to Leonardo in *De Divina Proportione*. I have compared the three known versions, the Geneva and Milan manuscripts and the printed version (and also papers submitted to several journals about this study). They differ remarkably in, for example, the ropes on which the polyhedra are or are not suspended. The shadows on the polyhedra are best represented in the Milan version, less well in the Geneva version, and sometimes simply wrong in the printed version. Still other differences appear in the representations of the planar versions of some skeleton versions, such as for the pyramids and triangular prisms. And not only the stellar rhombicuboctahedron, but also the stellar cuboctahedron, stellar icosidodecahedron, and truncated icosahedron are wrong, with more or fewer mistakes depending on the version, although in several cases in all three versions. So: would Leonardo have posed a riddle in one version and a less complicated riddle in the others, sometimes about the same solid?

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