

**Byrne's attempt to simplify the teaching of Euclid's principles resulted in one of the masterpieces of 19th century color printing.**

Byrne, Oliver. *The First Six Books on the Elements of Euclid*. London: William Pickering, 1847. 9 ½ x 7 ¾ inches (242 x 198 mm), 268 pages.

Quintilian for rhetoric, Aristotle for philosophy, and Euclid for mathematics were once the cornerstones of a classical education. These authorities owed their position not merely to their transcendent genius, but to their supreme skill at pedagogy. A teacher who rambles, improvises and drops his notes, may nonetheless be a charismatic lecturer, but the effect upon his audience is evanescent. The wine goes flat: we cherish the intoxication but can remember nothing of the evening. The expert teacher, by contrast, supplies others with a *transferable* skill. Euclid, properly speaking, was a geometer. There was no Euclid of arithmetic. There was, however, a real Euclid, teaching mathematics in Alexandria in the 4th century B.C., although he was, for centuries, confused with a different Euclid, a philosopher of Megara. And while Euclid's theorems were indisputably his (or at least, the results of his classic, definitive formulation), their demonstrations were long thought to have been the work of a distant Alexandrian disciple, the 4th-century A.D. Theon the younger. In short, Euclid's name had long been something of a collective noun.

In early printed books, the inevitable result of such indeterminacy was a fluid text. Not every incunable version included all of the Books, or necessarily any of the apparently apocryphal Demonstrations. The diagrams, without which geometrical concepts are often difficult to understand, might not be printed, or at best only added by hand. It took the resources of the leading liturgical printer of the time, Erhard Ratdolt of Venice, to produce the *editio princeps* (albeit a 13th-century Latin translation of the original Greek) of Euclid's *Elements* (1482). He faithfully published Definitions, Postulates, Enunciations, Demonstrations and Diagrams ... and Uncle Tom Cobleigh and all. Even for a printer accustomed to the intricacies of ceremonial choreography, Euclid's diagrams were troublesome, as Ratdolt noted in his dedicatory epistle to the reigning Doge. The printer had a superb command of red-and-black (the foundation of all printed

endeavor) but confined its use to typography. The diagrams were therefore in simple black, a convention followed by his successors. Color, however, had not been entirely absent from early printed books: several Venetian editions of Sacrobosco's standard astronomical text, the *Sphaera*, for instance, had quasi-geometrical diagrams of planetary motion stenciled by hand in red and ochre.

Thus, when so obscure and isolated a mathematical pedagogue as Oliver Byrne, "Surveyor of Her Majesty's Settlements in the Falkland Islands," decided to print a colored Euclid in 1847 it was an innovation. Byrne was intent on easy assimilation. His crisply printed colors represent a pedagogical ideal that might be imitated by using colored chalk in classrooms, or colored pencil in private study—see **Spread 11, right**. Byrne did not pretend to inhabit any sort of superior New Age geometrico-chromatic Astral Plane. At **Spread 9** he insisted that "Care must be taken to show that colour has nothing to do with the lines, angles, or magnitudes, except merely to name them. A mathematical line, which is length without breadth, cannot possess colour ..." This admission that a mathematical fact may be expressed through the linguistic, hieroglyphic, symbolic, pedagogical, or emblematical use of color, but that color does not equate with geometry itself, is a nuance that some modern art historians, intoxicated by his apparent modernist radiance, would prefer to ignore.

Color printing was costly in the 19th century. Textbooks were expected (at least in those blessed days) to be cheap. There would therefore seem to be little room for a meeting of the two. Indeed, William Pickering's imprint on the title page is almost an admission of "author-subsidy." Pickering eventually went bankrupt as a result of publishing beautiful books of rarified appeal, but he could not have survived some thirty years of innovative, unremunerated, antiquarian publishing without having occasionally lost other people's cash as well as his own. Pickering's house-printer, Charles Whittingham of the Chiswick Press, was one of the very few craftsman in England with the impeccable command of registration necessary to print Byrne's figures. What may now be performed for pennies in China was a considerable technological feat in the mid 19th century.

In its geometrical use of color, Byrne's book glances backward to Heron of Alexandria, who claimed that this was a Pythagorean tradition—on sand, presumably, or

papyrus. At the same time, Byrne looks unwittingly forward to artistic rather than pedagogical achievements, culminating in the geometrical paintings of the Dutch artist Piet Mondrian (1872–1944)—who never, alas, admitted to having heard of Byrne. Even so, the pedagogic lineage cannot be said to be extinct, for Mondrian must surely have inspired (at least indirectly) a teaching innovation of the 1950s, the Belgian Cuisenaire Rods, those delightful and expensive cubes or miniature shafts of wood, beautifully dyed in the genuine elementary Chiswick Press tints, that taught fortunate pupils fifty years ago (usually in private schools) the elements of arithmetic. To learn to add and subtract with them was a mysterious pleasure; to be allowed to play with them for ten minutes after class was very heaven.

Essentially, Georges Cuisenaire's (1891–1976) Arithmetical Rods, or *Réglottes*, as described in his *Les Nombres en Couleurs* (1952), were born of two parents, Oliver Byrne and Maria Montessori—with the innovative Swiss teacher Johann Heinrich Pestalozzi (1746–1827) as godfather. Art historians, dazzled by Byrne's percipient eccentricity, can hardly be blamed for attempting to present their inspiring protégé as a forerunner of certain enticing phenomena of modern art. Byrne's true successor, however—legitimate and stimulating—remains resolutely where that obscure Falklands geometer would have wanted to place it—in the classroom.