

The Foundations of Mathematics and Art: Form, Logic, Intuition

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Abstract

In the nineteenth century, the discovery of non-Euclidean geometries by German, Hungarian, and Russian mathematicians, together with Georg Cantor's discovery of a non-Euclidean arithmetic of infinite sums, raised the question: what are the foundations of mathematics? There were three main answers—form, logic, and intuition—each of which inspired early modern art. David Hilbert conceived of mathematics as a formal axiomatic system which is an internally consistent, self-contained arrangement of abstract, meaning-free, replaceable signs. Russian Constructivist artists adopted a formalist aesthetic and made paintings and sculptures composed of meaning-free colors and forms arranged within an autonomous realm. German logician Gottlob Frege and his follower, British mathematician Bertrand Russell, declared that mathematics is based in logic. Logicism developed into British analytic philosophy, which was expressed by the sculptor Henry Moore. The leading intuitionist mathematician, the Dutchman L.E.J. Brouwer, declared that abstract objects exist only in the human mind and are known by intuition, an idea that inspired De Stijl painter Piet Mondrian. Of the three answers, form has had the most lasting impact on mathematics and art, such as the Swiss Concrete artist Karl Gerstner.

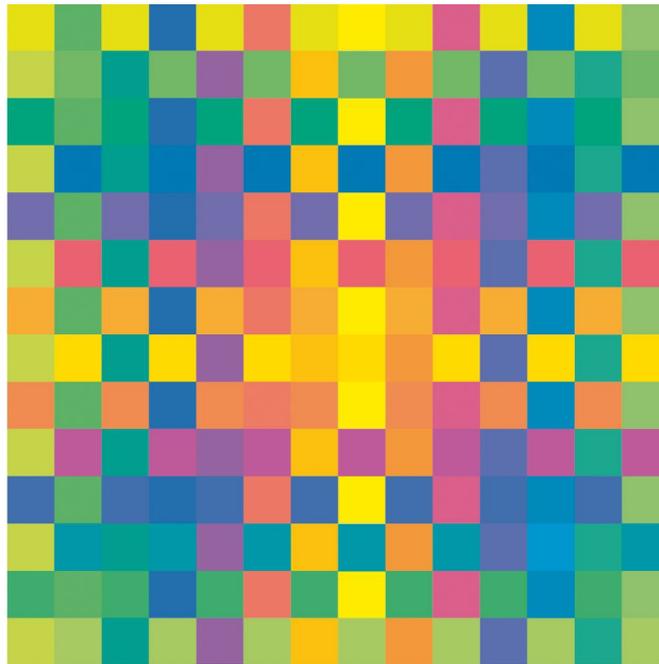


Figure 1: Karl Gerstner (Swiss, 1930-2017), *Polychrome of Pure Colors*, 1956-58. Printer's ink on cubes of Plexiglas, $1 \frac{1}{4} \times 1 \frac{1}{4}$ in. (3×3 cm) ea., fixed in a chrome-plated metal frame, $18 \frac{7}{8} \times 18 \frac{7}{8}$ in. (48×48 cm) ea. Courtesy of the artist..