David Johnson Leisk
1906-1975
Cartoonist
Children's Books
Harold and the Purple Crayon 1952-1965
Mathematician

CROCKETT JOHNSON
PAINTER OF THEOREMS

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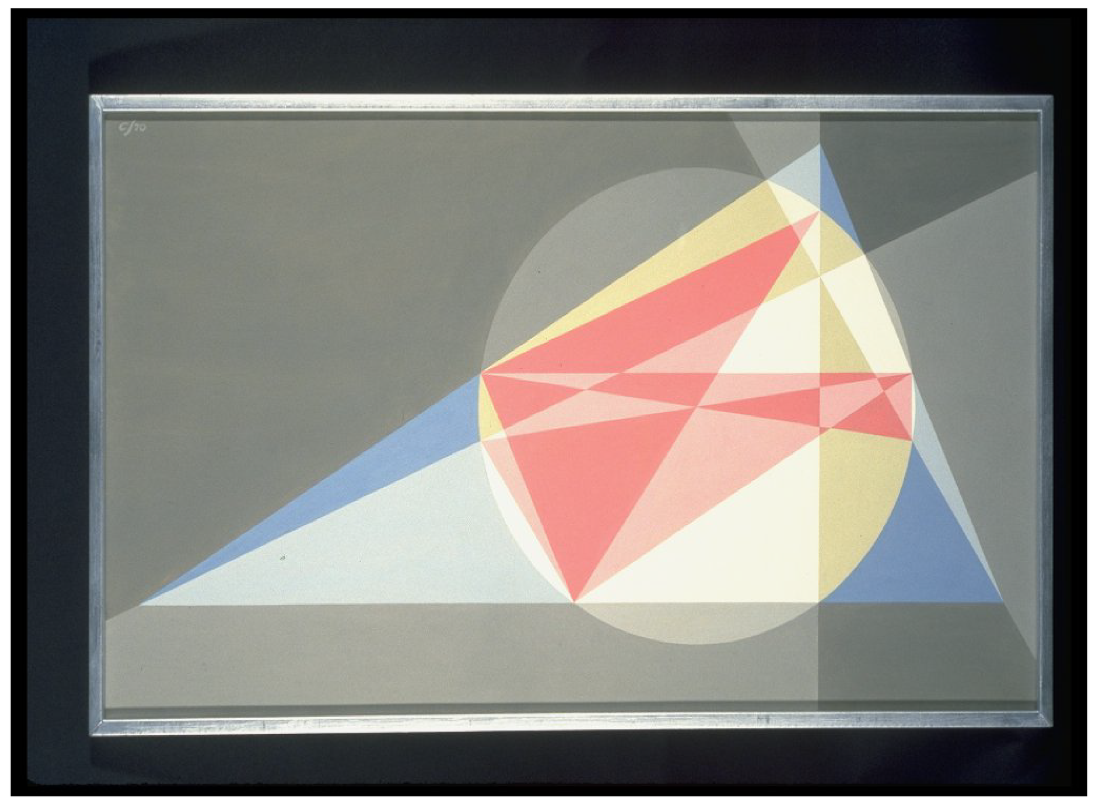
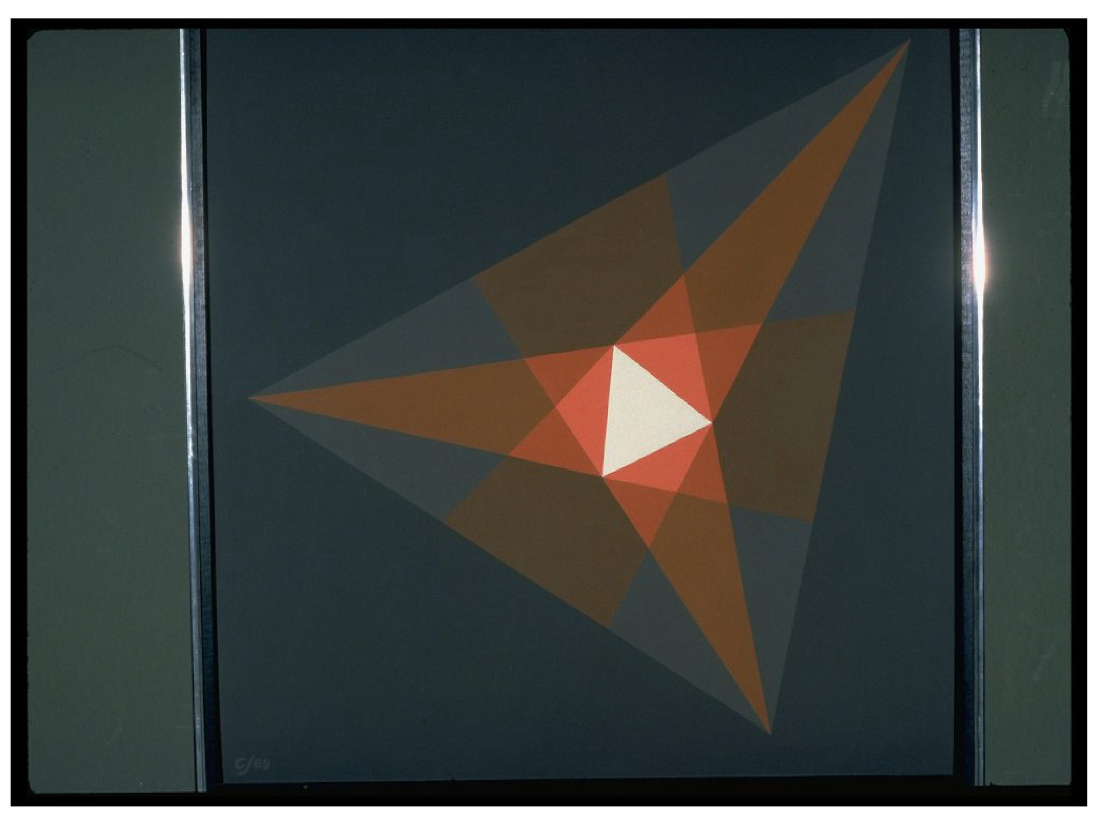
Nine Point Circle



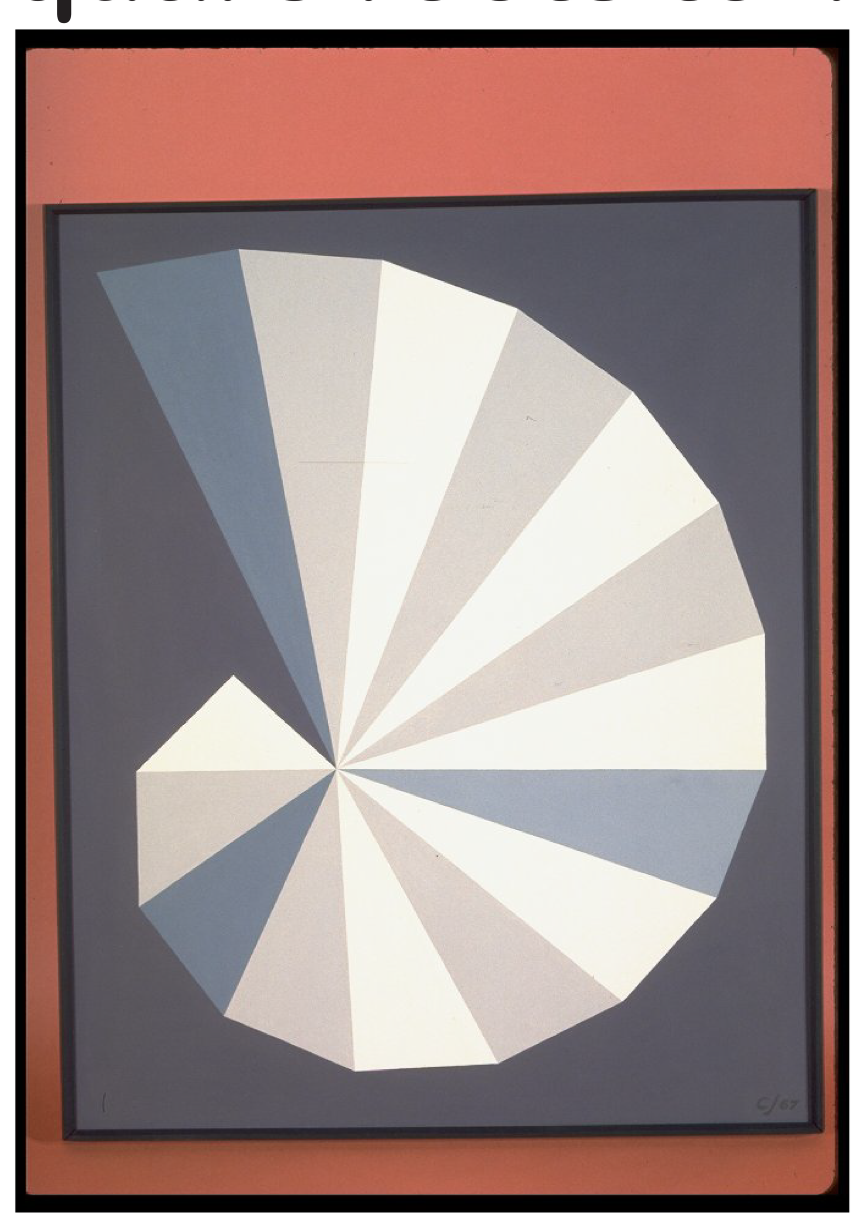
Morley's Triangles



Squared Circles

Parabolic Triangles

Square roots to 16

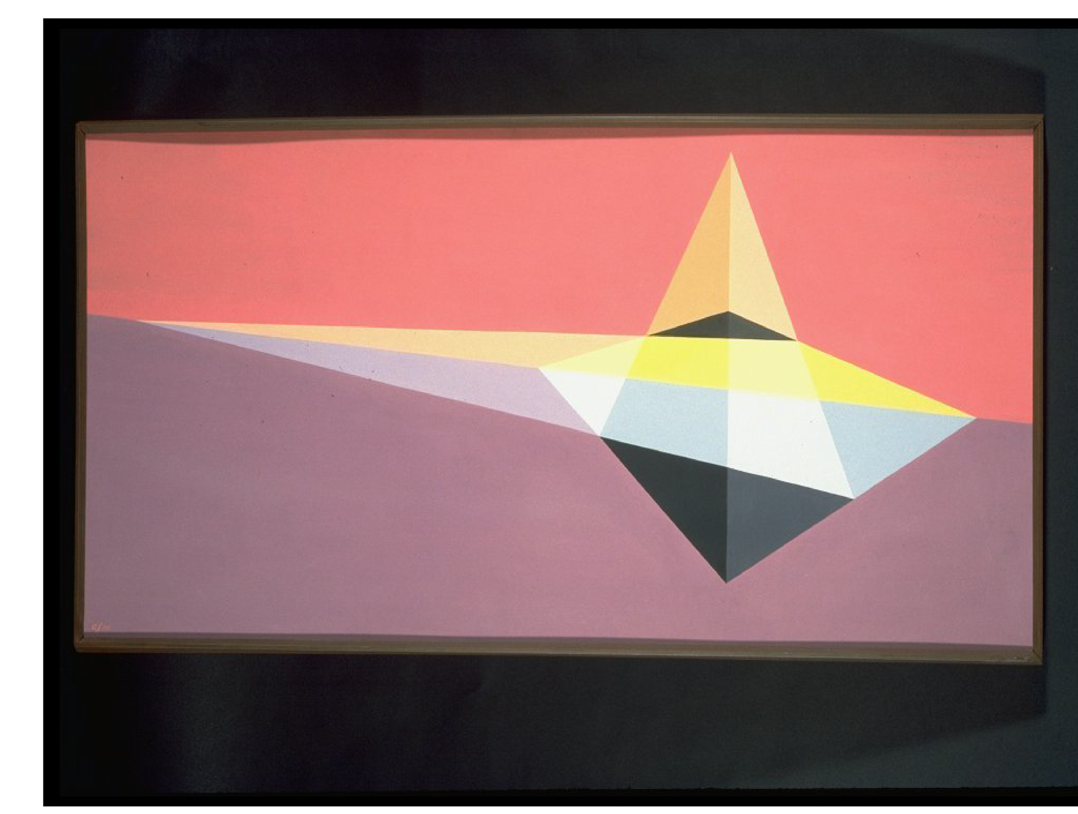


Mystic Hexagon

Measurement of the Earth

Pythagorean Theorem

Aligned Triangles



Squared Lunes

AMATYC 2010 Boston

Robert McGee
Kathleen Ambruso Acker, Ph.D.

A Brief Description of the Paintings on the Poster

We present here a brief description of the 10 paintings on our poster. For more detail please visit the website for the Smithsonian Institution where all 80 of Crockett Johnson's paintings now displayed.

Nine Point Circle The midpoints of the sides of a triangle, the feet of the altitudes on the sides, and the midpoints between the orthocenter and the vertices lie on a circle**.** The orthocenter is the point of concurrency of the altitudes of a triangle.

Morley Triangle The intersections of adjacent pairs of angle trisectors in a triangle are the vertices of an equilateral triangle.

Parabolic Triangles (Archimedes) The theorems that Archimedes proved were that the area of the parabolic section was equal to 2/3 the area of the parabolic triangle and 4/3 the area of the inscribed triangle. The parabolic triangle is obtained by drawing the tangents to the parabola at the endpoints of the base of the parabolic section.

Square Roots to 16 This figure starts with the small white right triangle with each side having length one. The hypotenuse therefore has length square root of two. A perpendicular of length one is dropped and a triangle with hypotenuse square root of three is formed. The process continues until the last triangle has hypotenuse square root of sixteen.

Mystic Hexagon (Pascal) The three points of intersection of the opposite sides of a hexagon inscribed in a conic section lie on a straight line.

Measurement of the Earth (Eratosthenes) Eratosthenes observed that at one town at noon the sun cast no shadow, while at the same time in a town 5000 stadia away the shadow cast was 1/50 of a full circle. From this he calculated the circumference of the earth to be 250,000 stadia or approximately 25,000 miles.

Pythagorean Theorem This picture is based on Euclid's proof of the Pythagorean theorem, Proposition 47 in Book I of the ELEMENTS.

Aligned Triangles The painting is based on Desargues Theorem which states that if corresponding vertices of two triangles ABC and XYZ lie on concurrent lines, the corresponding sides, if they meet, meet in collinear points.

The following problems which required constructions using just a straightedge and a compass date from the 5th century B.C.:
Quadrature of a circle, Duplication of a cube, Trisection of an arbitrary angle
To this list could be added the following problems: Quadrature of a Lune, Construction of a regular polygon of n sides. Their resolution was not proven until the 19th and 20th centuries and required results from the fields of algebra and number theory. The problems themselves generated a considerable amount of mathematics.

Crockett Johnson's painting **SQUARED LUNES** depicts Hippocates of Chios proof of the quadrature of a particular lune. Quadrature refers to the construction of a square equal in area to a given figure , in this case a lune. Hippocrates showed that the two white lunes were equal in area to the black triangle. Hence one of the lunes was equal to half the triangle. At this point the Greeks had techniques to construct a square equal in area to the triangle. There are only 5 lunes that can be squared.

In **SQUARED CIRCLES** Crockett Johnson attacked the problem of the quadrature of a circle. He knew that the problem could not be done. This picture represents the diagram that he uses in which he constructed a square whose area differed from that of a given circle by less than .0001. Not only did Crockett explore this construction artistically, he published his findings in *The Mathematical Gazette: The Journal of the Mathematical Association,* in 1970.

Crockett Johnson on His Paintings
"A decade ago upon belatedly discovering the aesthetic values in the Pythagorean right triangle and Euclidean Geometry, I began a series of geometrical paintings from famous mathematical theorems, both ancient and modern. Theorems generally are universal in application and can be adapted in constructions of nearly any size and shape. The paintings were executed, as is my current work, in hard edge and flat mass , with colors focusing in intensity or contrast upon the sense of the theorems." *Leonardo 5*, 1972.