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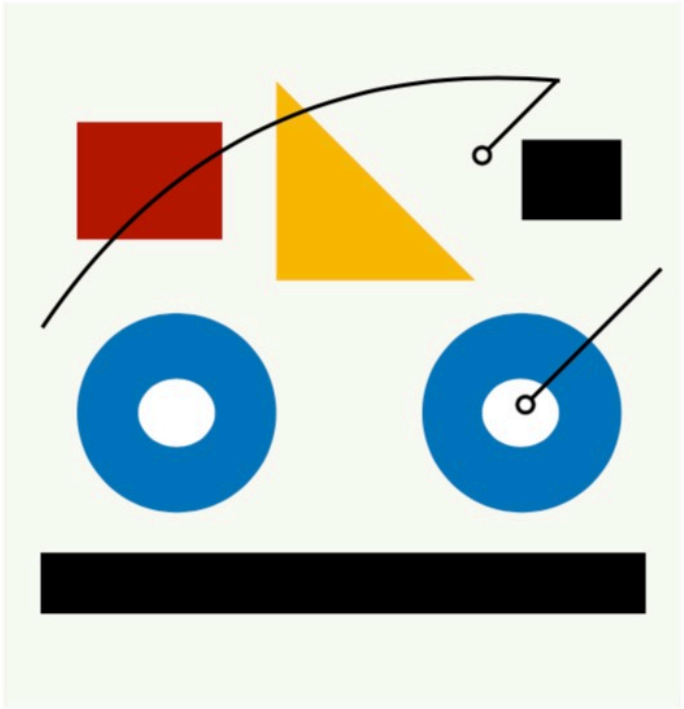
- Helene Goldberg, Amparo Higón, Cheryl Hrudka, Van de Ven



Vector shapes and a Bézier curve

DEFINITION

A ‘digital’ painting is created on the computer using a graphics program, a virtual paintbox with brushes, colors and other supplies. The definition applies to a painting on its primary digital carrier (as a computer file) as well as when it is transferred in a non-manual process to a secondary physical carrier (printed on paper, acrylic glass, aluminum, canvas, etc).

Fig. 2. Transparency
(Fragments of Rainy day, When the going was good, 2019, 2015)

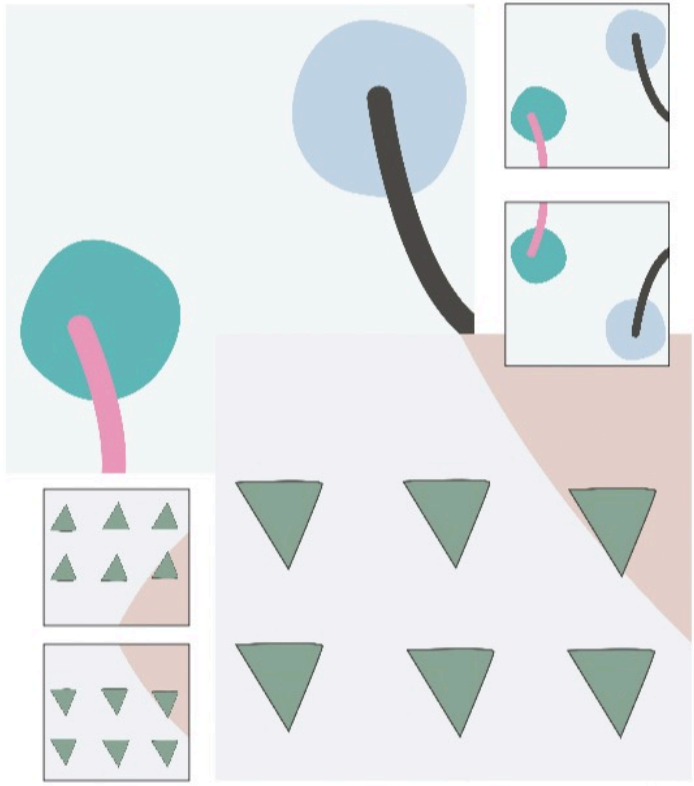


Fig. 3 Symmetry
(Fragments of Particles 3, Particles 4, 2019)

Based on differences in method and appearance, five mainstream directions can be recognized:

1. Computer generated painting
2. Raster painting
3. Vector painting
4. Hybrid vector-raster painting
5. New photography

It should be noted that the terms 'raster' and 'vector' not only indicate painting mediums determining style and appearance of a painting, but also the way in which paintings are stored.

Raster paintings, all photo's and many computer generated paintings are stored on a pixel-by-pixel basis as 'raster'-files. Commonly used raster file types are JPEG, PNG, BPM, GIF and TIFF.

'Vector'-files store information of vector paintings as mathematical formula's. Common file types are EPS, PDF, WMF, SVG or VML.

1. Computer generated painting

'Computer-generated' does not necessarily mean that the computer creates the image. The somewhat confusing term 'generated' only refers to the indirect painting method: the artist doesn't create the artwork by hand but instructs the computer how to do it. Like a composer who creates music, not by playing it on an instrument but by writing music notes on a score. The method goes back to the early days of artificial intelligence, when prescriptions for all forms and lines had to be manually described by a mathematical formula. Since the 1970s, the formulas and calculations that are needed to construct the image are taken care of 'behind the screen'. The influence that the artist exerts on the final result varies from 0 to 100 percent.

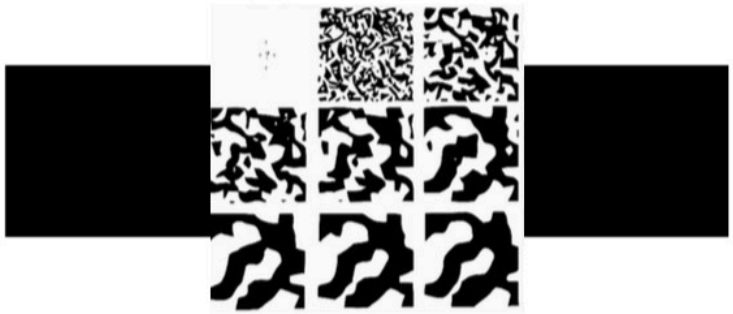


Fig. 17 Early computer generated art
(Leo Geurts and Lambert Meertens: Cristalstructuren)

Fractals

The essence of 'generated' art is the possibility to instruct the computer, in a language of formulas, to create lines, forms and colors. Some of these formulas generate patterns that infinitely repeat themselves. However far you zoom in, you will always see new fragments of the same pattern. These self-repetitive forms are called fractals: geometrical shapes that can be split into parts, each of which is a reduced-size copy of the whole. Fractal mages are created in a process of play and selection.

Fig. 18 Fractals *(Source Google images)*

Mandelbrot set

An infinitely self-repetitive pattern was first studied around 1918 by the French mathematicians Pierre Fatou and Gaston Julia. Their pioneering work was forgotten until Benoit Mandelbrot mentioned them 60 years later in his work about fractal geometry. In honor of Mandelbrot's work, others named the specific points generated by Mandelbrot's equation (that was similar to that of Fatou and Julia) the 'Mandelbrot set'. In 1978 the American mathematician Robert Brooks first programmed a visualization and thereby introduced fractals in the field of arts.

The process to generate Mandelbrot images is predetermined, based on the Mandelbrot equation. Personal choices are possible for colors but not for forms. Images are the result of a process of selection.

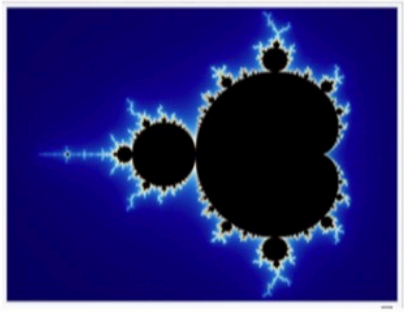


Fig. 19 Mandelbrot set (in black)

Fig. 28 Vector
Amparo Higón: *Los últimos días del verano/The last days of summer*
(size-independent, 2015)

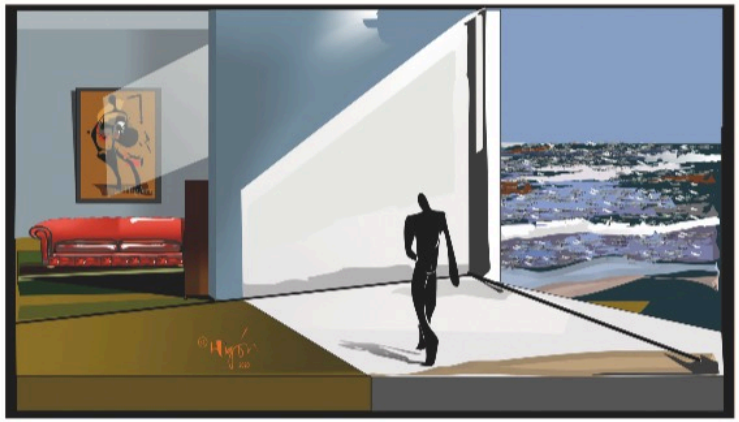


Fig. 29 Vector
Amparo Higón: *Luz de mar/Sea light*
(size-independent, 2020)