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»As far as mathematical theorems are dealing with reality, they are not certain, and in so far as they are certain, they are not related to reality.« Albert Einstein, 1921

Principles of Construction

Iteration

Self-similarity

Scaling

Questioning

Which phenomena in nature, technology and design show these principles?

How strict can the principles be applied?

How can the principles be systematized?



Koch curve, Koch snowflake, photographs of snow flakes





Pont du Gard, photograph and rendering Architectural Fractals – Daniel Lordick, TU Dresden





5 Euro bill



Tetrahedron inside of a cube From: Zeitler/Neidhardt: Fraktale und Chaos



Stars by M.C. Escher



Fractal of the tetrahedron, steps 0 to 3, the first step is the Stella Octangula





Fractal of the cube, three-dimensional analogon to the Koch curve, Illustration from: Zeitler/Neidhardt, Fraktale und Chaos – eine Einführung

Rendering after four iterations



Kazimir Malevich, Architecton



Koch curve of regular hexagons in steps 1 through 3. From: Zeitler/Neidhardt, Fraktale und Chaos



Fractal of the Oktahedron, steps 1, 2 and 3



Sierpinski carpet constructions on several polygons



Menger sponge, the fourth iteration of the construction process





Proposal for a fractal roof according to the sierpinski carpet



Steven Holl, Simmons Hall, Massachusetts Institute of technology (MIT) Cambridge, MA, United States, 1999-2002

Natural sponge, fractal curve



Architectural Fractals – Daniel Lordick, TU Dresden









Pinwheel fractal. Being obtained from substitutions, the pinwheel tiling can also be seen as a fractal.



Lab Architecture Studio, Ronald Bates und Peter Davidson: Melbourne Federation Square, 1997-2002



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The façade makes use of the Pinwheel tiling, an aperiodic tiling proposed by John Conway and Charles Radin.

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A sequence of scales, relevant for: Architecture



Continent



Drawer

Box

Traffic routes

Highway Interstate road Main road Minor road / side street dirt road / Zufahrt Hallway / Corridor Room





»Goldsmith drawings of Basle«. From: Paul Naredi-Rainer, Harmonie – Maß, Zahl und Proportion in der abendländischen Baukunst





Louis I. Kahn, traffic scheme, project, Philadelphia, Pennsylvania, 1951-53









Le Corbusier

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Le Corbusier, plan voisin, Paris









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Manhattan, detail







Eiffel Tower, drawing, detail











Fractals in Berlin River Spree railing Cieling of the New National Gallery (Mies van der Rohe) Bridge of the transportation system





DIN-paper format (proportion 1 : sqrt (2)



Girder fractal



Container fractal in space (proportion: 1 / 2^(1/3) : 1 : 2^(1/3))

Module for the container fractal



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Container fractal with tubular module





Castle fractal, based on the two-dimensional Cantor dust













Y-fractal, made with a 3-d-printer at the 3D LAB B25, Institute of Geometry, TU Dresden





Branching fractals, 2006









Yuken Teruya, Notice-Forest 2005, cover, detail





Yuken Teruya, Notice-Forest 2004, cover, detail





Town hall Osnabrück, Lower Saxonia, window

(One Location of the end of the Thirty Years' War. On 15 May 1648, the Treaty of Osnabrück was signed.)





Landscape of Corse with a fictional building