Biomimetic Design Process

Fractals: Recucing Urban Heat Island Effect

“Just saying that a structure is fractal doesn’t bring you any closer to understanding how it forms. There is an unique fractal-forming process, nor a uniquely fractal kind of pattern. The fractal dimension can be a useful measure for classifying self-similar structures, but does not necessarily represent a magic key to deeper understanding” (Ball, 2001, p. 117)
Urban Heat Island Effect

- Lack of vegetation, lack of evaporative cooling, shading
- Anthropogenic heat released from heated or cooled buildings
- Heat released by traffic
- Tall buildings trap air in to the street canyons and reduce wind speed within the city
- Building materials store solar heat and release it at night
- Long-wave radiation is reflected from walls back to street level

Due to the UHI a city centre can be over 10 degrees warmer than the surrounding countryside

How Nature Produces Shade

smaller surfaces have a larger heat exchange capacity, thus cool quicker and absorb less heat.

Fractal generated dappled light below a forest canopy
Typical Shade Cloth 10-12° C Warmer

- Fractal Shade
- wind
- effective temperature
  -12.4°C
- fractal shade

conventional sheet

https://www.youtube.com/watch?v=LFqsFbbE5Fg
Histogram Comparision Shows Comparable Results Between Fractal Shading Structure and Natural Dappled Light

[dappled sunlight]

[fractal shade]

https://www.youtube.com/watch?v=LFqsFbbE5Fg
Simple, Elegant, and Easy to Apply

Fractal Shade

https://www.youtube.com/watch?v=LFqsFbbE5Fg
Computational Simulation of Natural Shade
Dr. Satoshi Sakai

Canphora

Zelkova
Product: COMOLEVI
Manufacturer: Lofsee Co.
Designer: Dr. Satoshi Sakai
ELYTRA FILAMENT PAVILION
Comfort Mapping:

http://www.elytra-pavilion.com/#movement
Environmentally Responsive Robotic Construction to Real Time Sensors

http://icd.uni-stuttgart.de/?p=16443
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