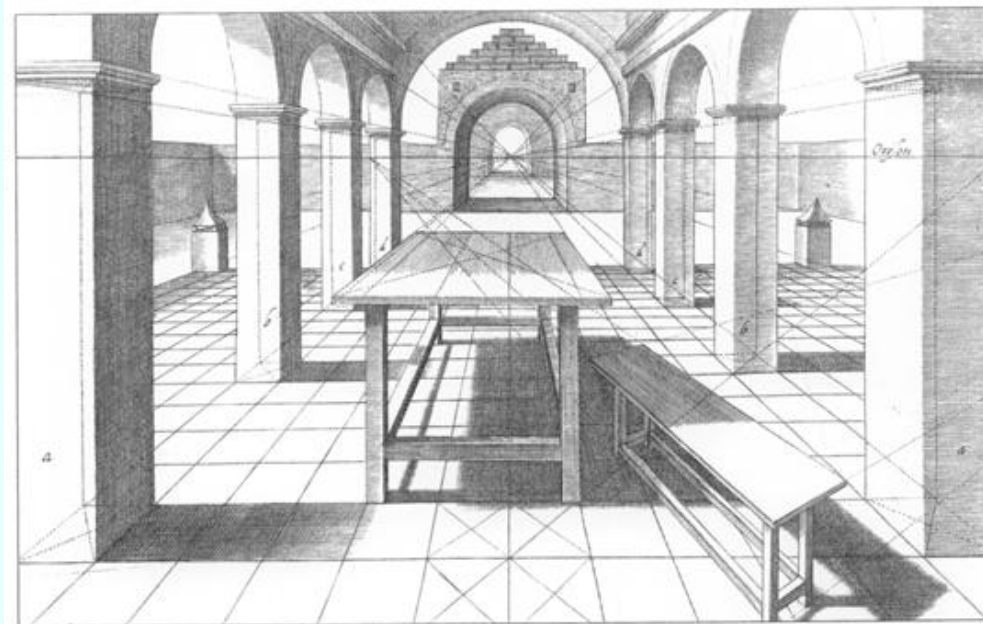
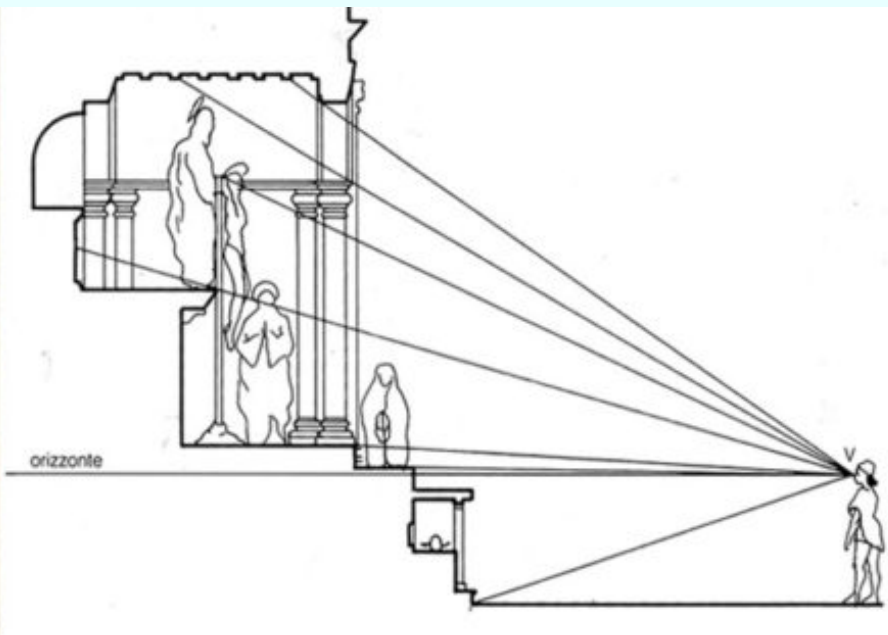


Arte e Matematica

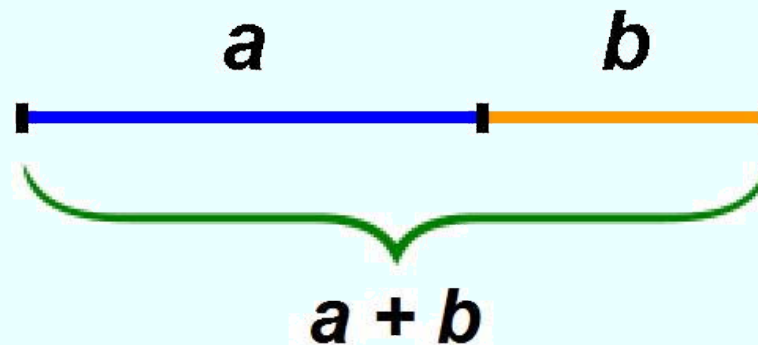
ALBERTO CIALDEA
DIMIE
Università della Basilicata

Matera, 5 Marzo $1^4 + 2^4 + 3^4 + 5^4 + 6^4$





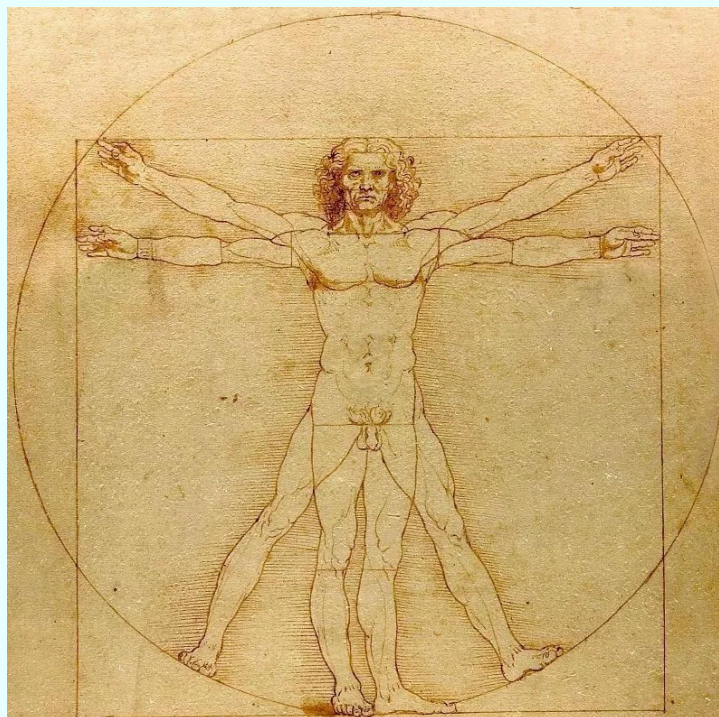
Sezione aurea (costante di Fidia, proporzione divina) ϕ



$$(a + b) : a = a : b$$

$$\phi = \frac{a}{b} = \frac{1 + \sqrt{5}}{2} \sim 1.6180339887498948482$$

Uomo Vitruviano di Leonardo



$$\frac{\text{altezza uomo}}{\text{altezza ombelico}} = \phi$$

$$\frac{\text{altezza fianco}}{\text{altezza ginocchio}} = \phi$$



I numeri di Fibonacci

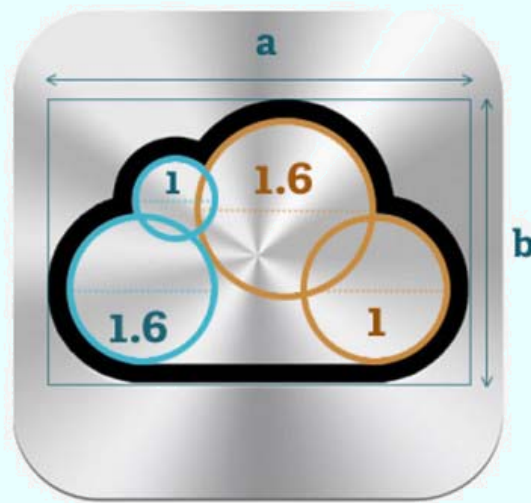
$$F_1 = 1, F_2 = 1,$$
$$F_n = F_{n-1} + F_{n-2}$$

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987 ...

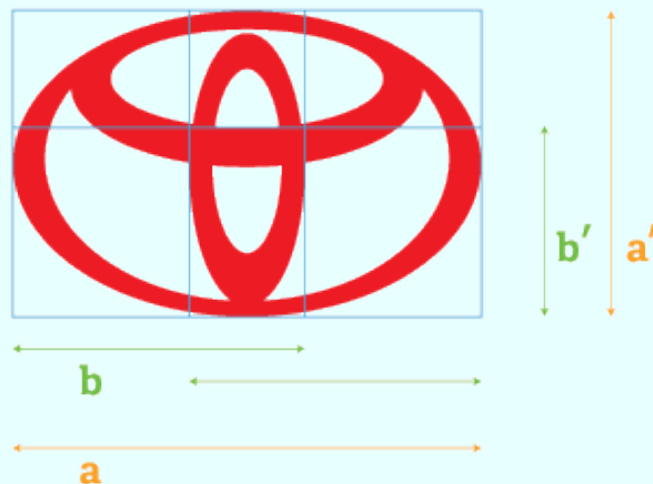
$$\lim_{n \rightarrow \infty} \frac{F_n}{F_{n-1}} = \phi = \frac{1 + \sqrt{5}}{2} \sim 1.6180339887498948482$$

1, 2, 1.5, $1.\overline{6}$, 1.6, 1.625, 1.615384615, 1.619047619, 1.617647059,
1.618181818, 1.617977528, 1.618055556, 1.618025751, ...

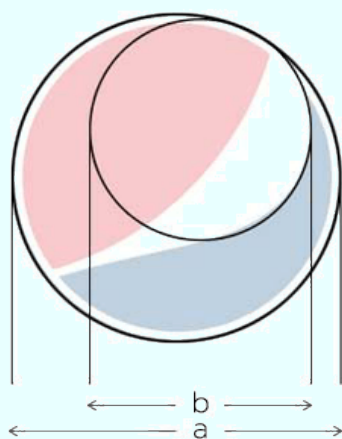
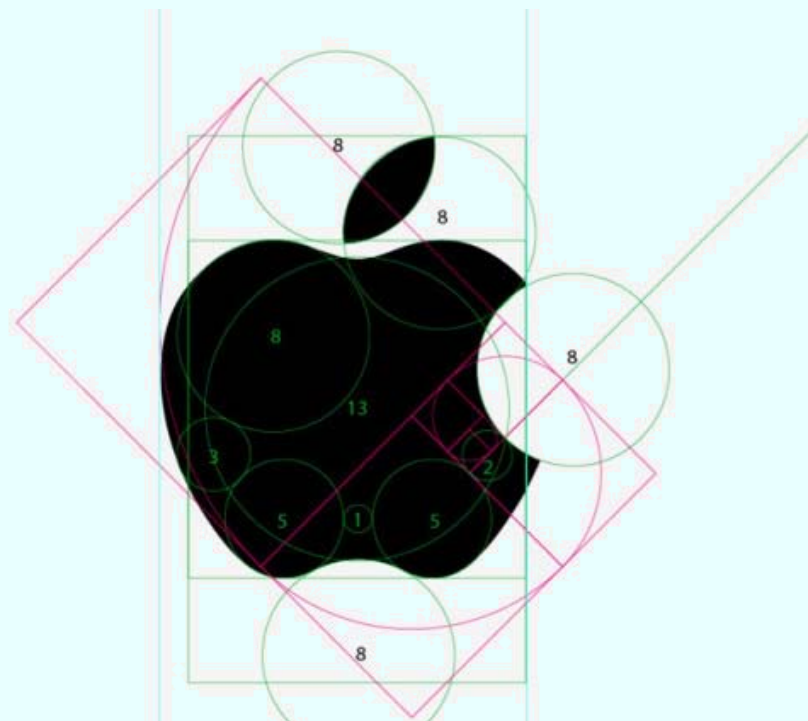
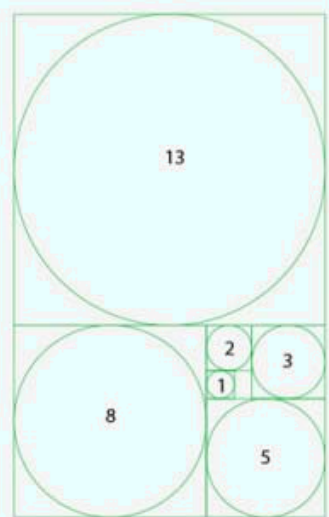




$$\frac{a}{b} = 1.618 !!!$$

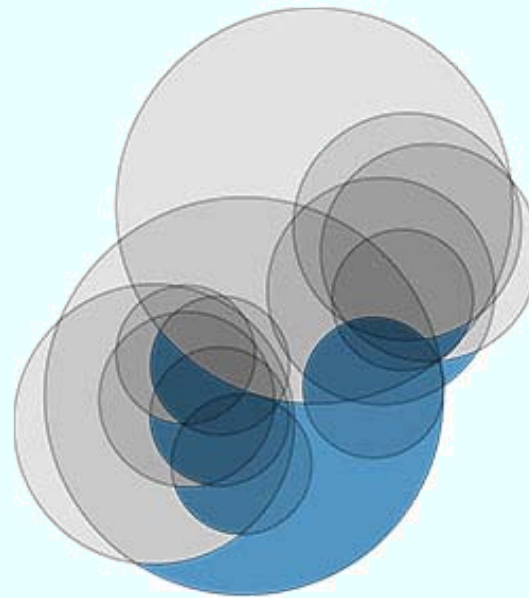
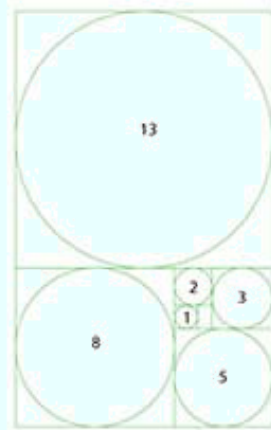


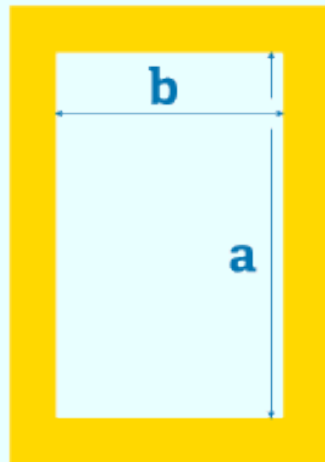
$$\frac{a}{b} = \frac{a'}{b'} = 1.618 !!!$$



$$\frac{a+b}{a} = \frac{a}{b} = 1.61$$







$$\frac{a}{b} = 1.61 !!!$$

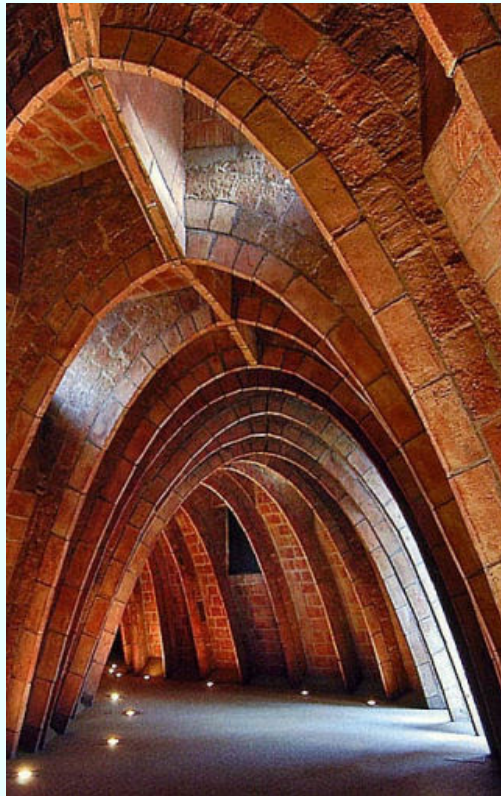


San Tommaso d'Aquino:

“I sensi si diletano con le cose che hanno le corrette proporzioni”



ANTONI GAUDÍ



Casa Milà (La Pedrera)



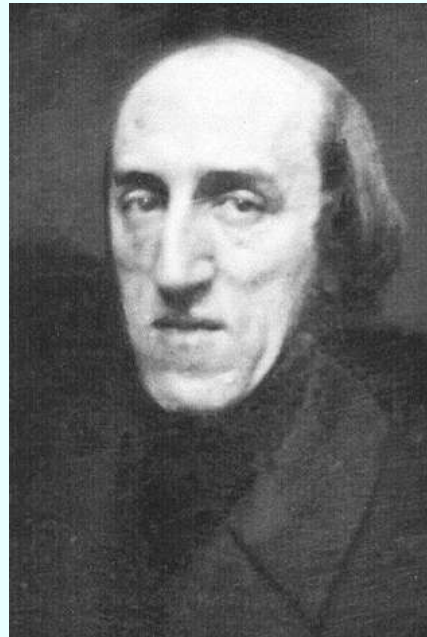
Casa Batlló



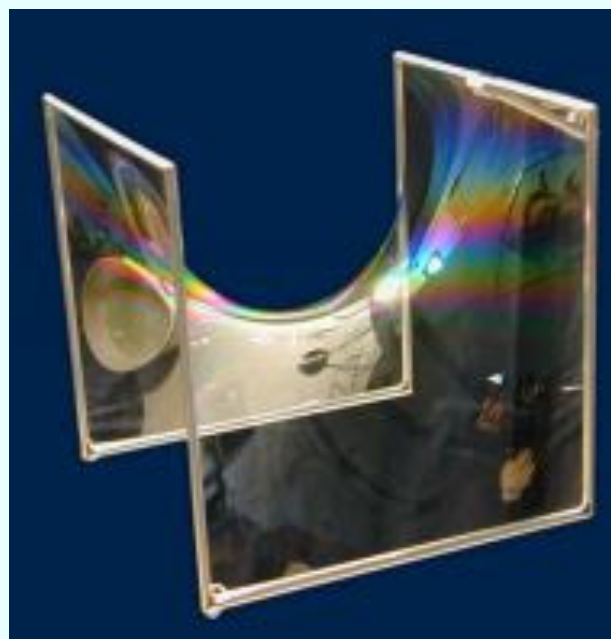
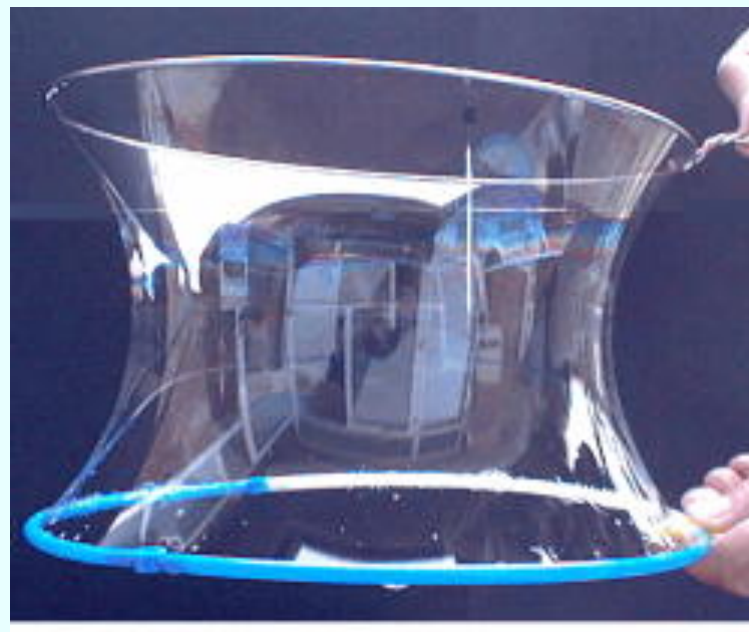
Olympiastadion, Monaco, Germania

Superficie minima

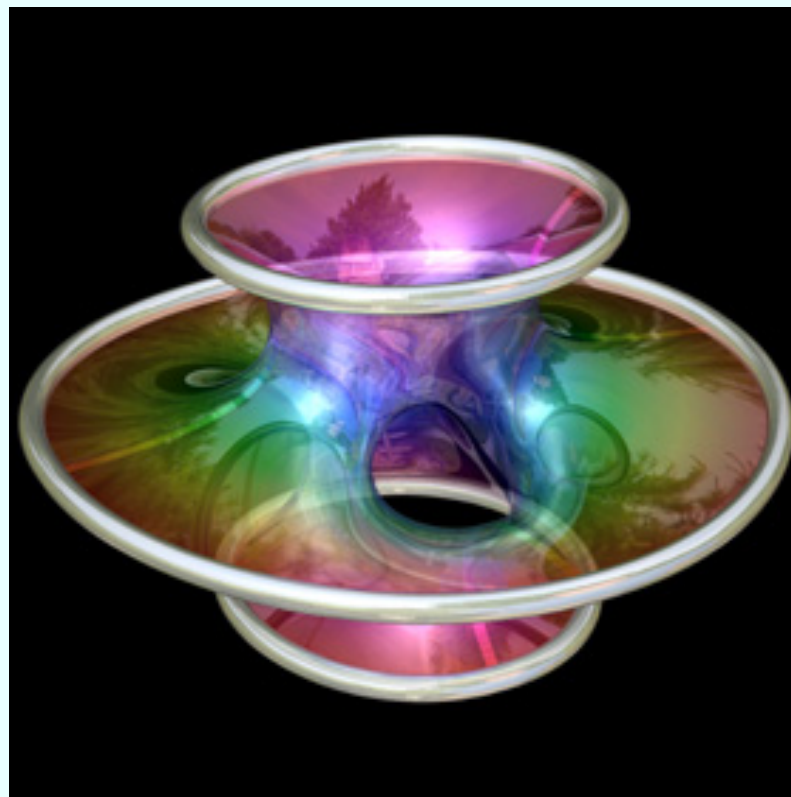
Problema di PLATEAU: come si dispone una pellicola saponata ?

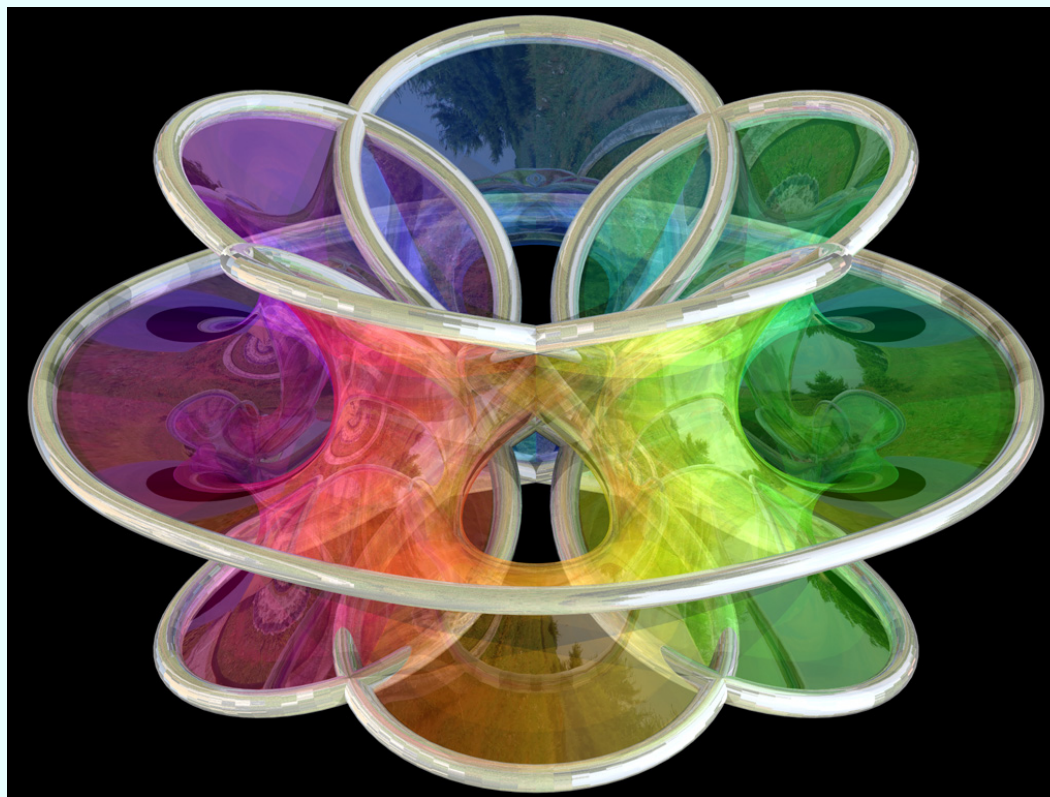


JOSEPH ANTOINE FERDINAND PLATEAU (1801–1883)









LAVA (Laboratory for Visionary Architecture)



Green Void
Sydney Customs House

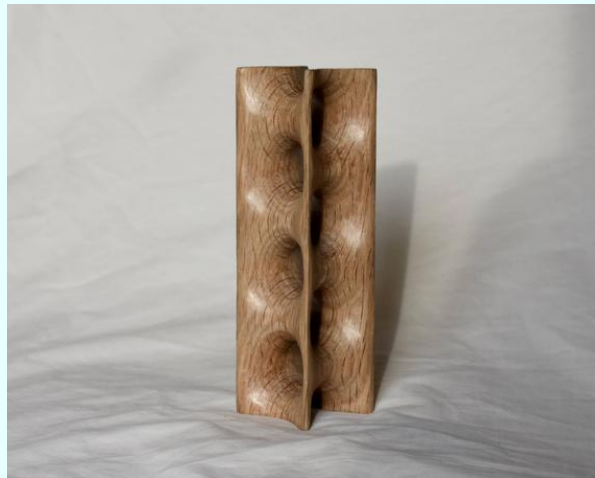
HELAMAN FERGUSON



Invisible Handshake
Macalester College, St. Paul, Minnesota, USA

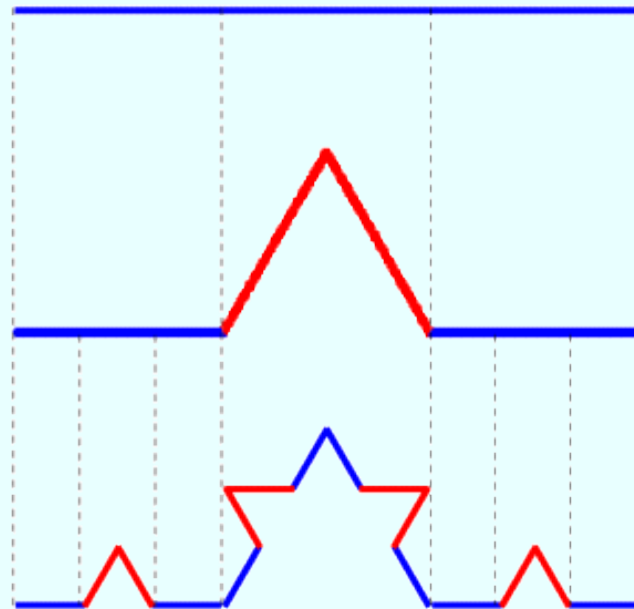


Costa Surface
FERGUSON ET AL., 1999



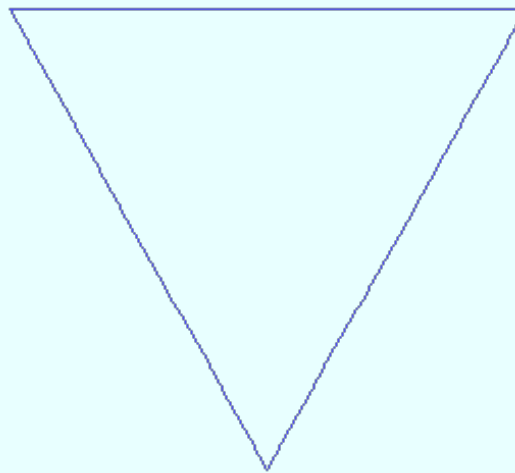
Frattali

Fiocco di Neve o Curva di Koch



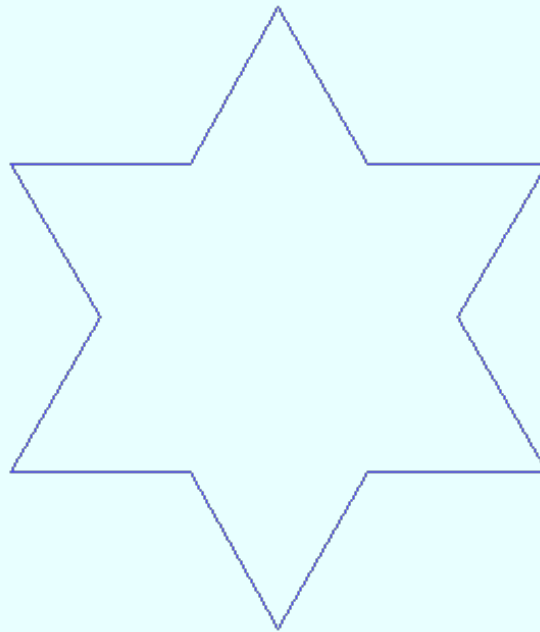
Frattali

Fiocco di Neve o Curva di Koch



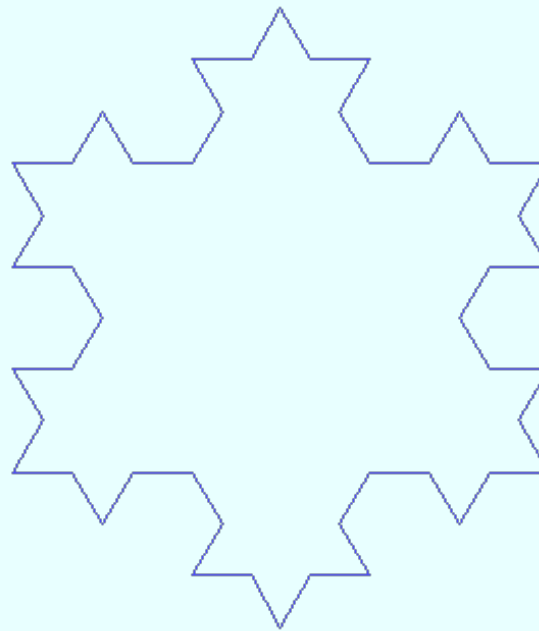
Frattali

Fiocco di Neve o Curva di Koch



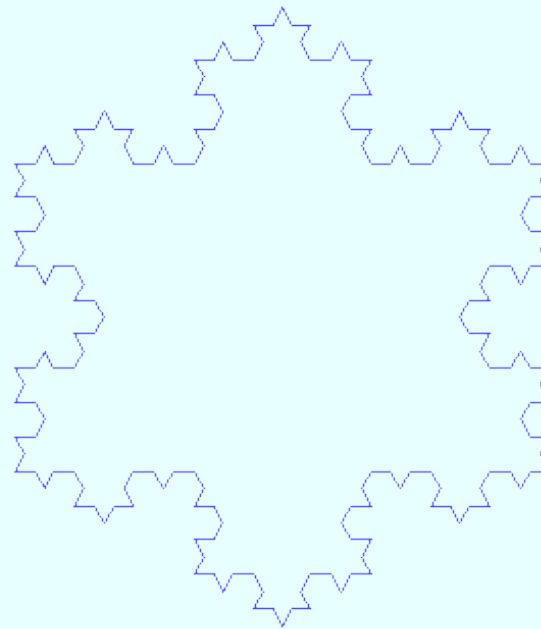
Frattali

Fiocco di Neve o Curva di Koch



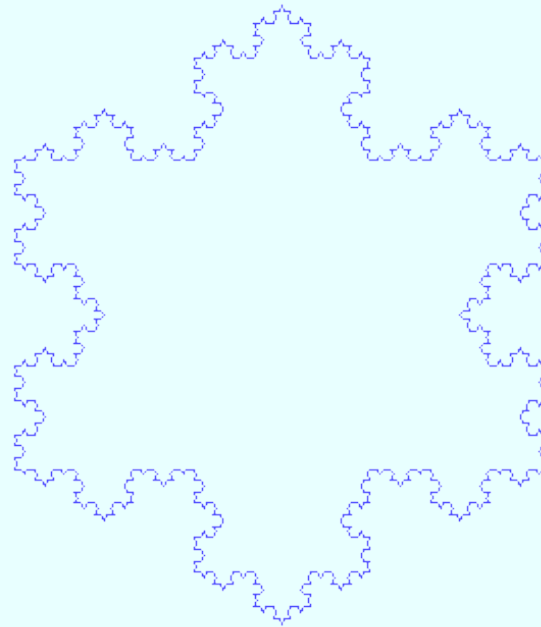
Frattali

Fiocco di Neve o Curva di Koch



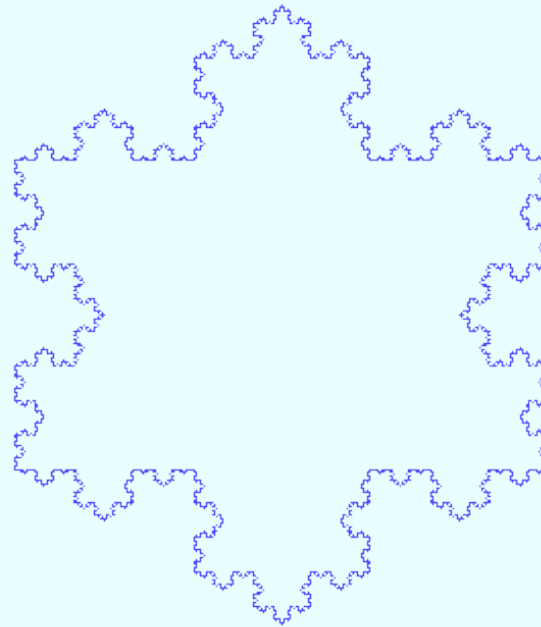
Frattali

Fiocco di Neve o Curva di Koch



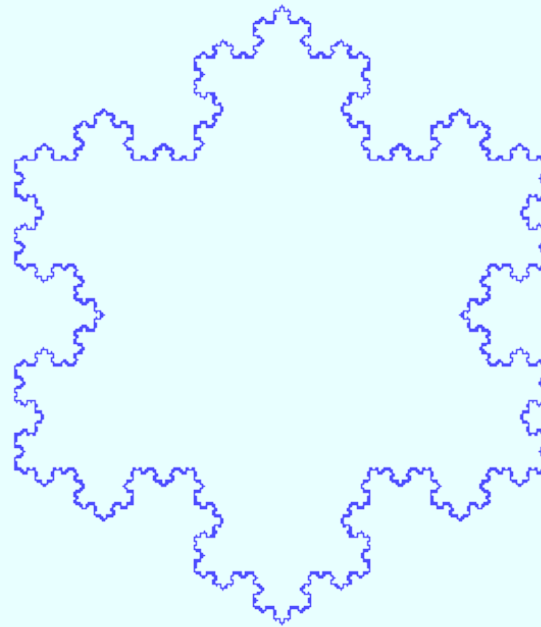
Frattali

Fiocco di Neve o Curva di Koch



Frattali

Fiocco di Neve o Curva di Koch



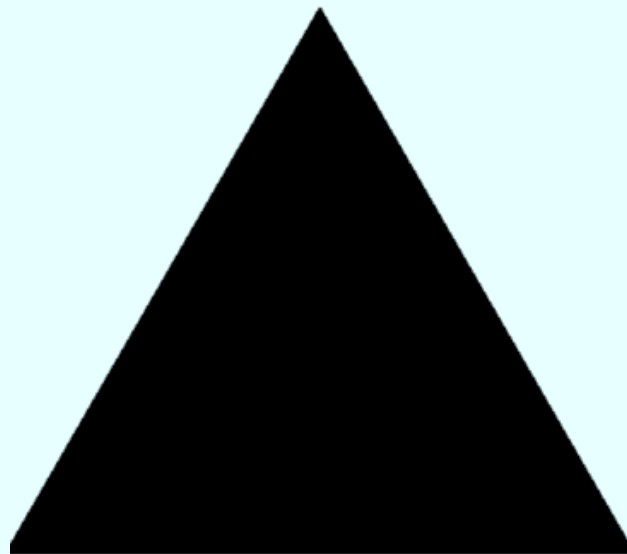
Frattali

Fiocco di Neve di Koch

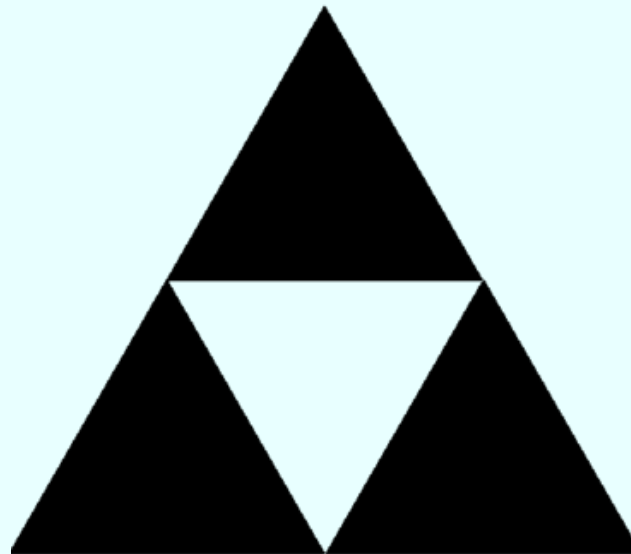
Autosimilarità



Triangolo di Sierpiński



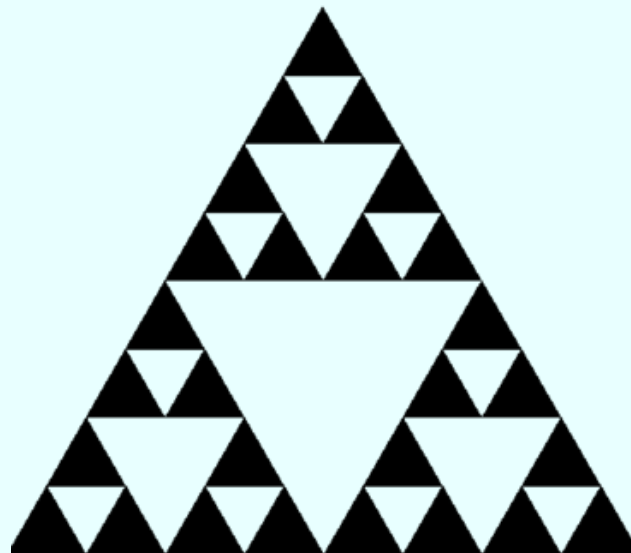
Triangolo di Sierpiński



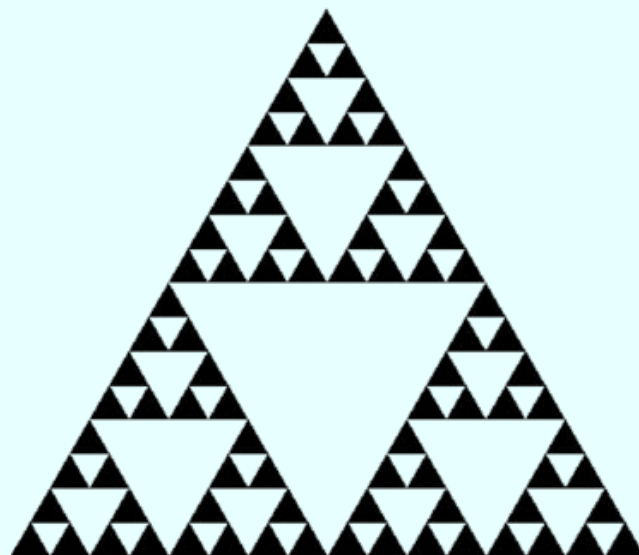
Triangolo di Sierpiński



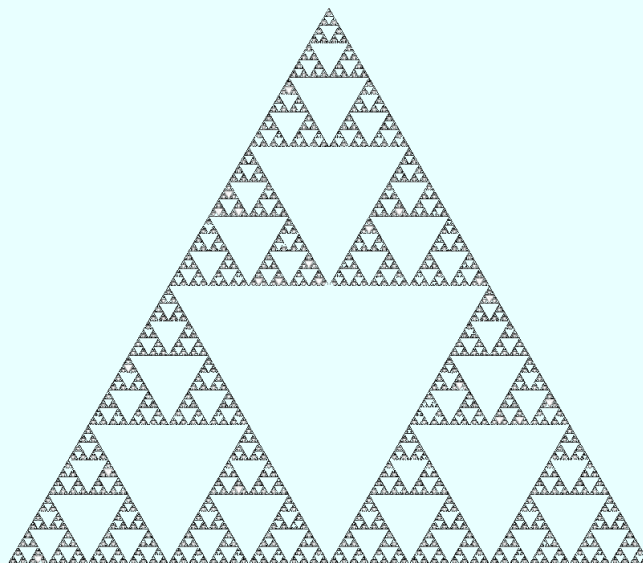
Triangolo di Sierpiński



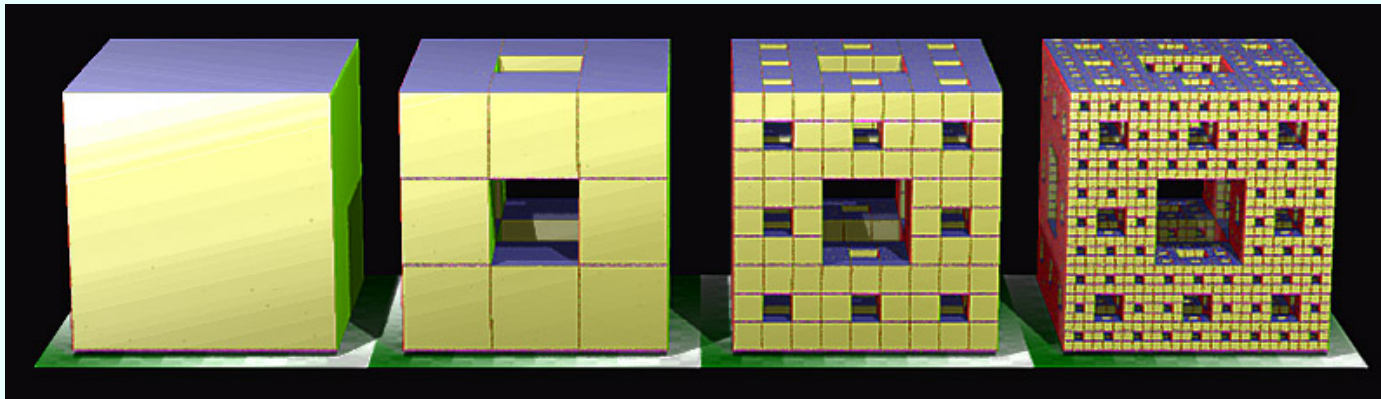
Triangolo di Sierpiński



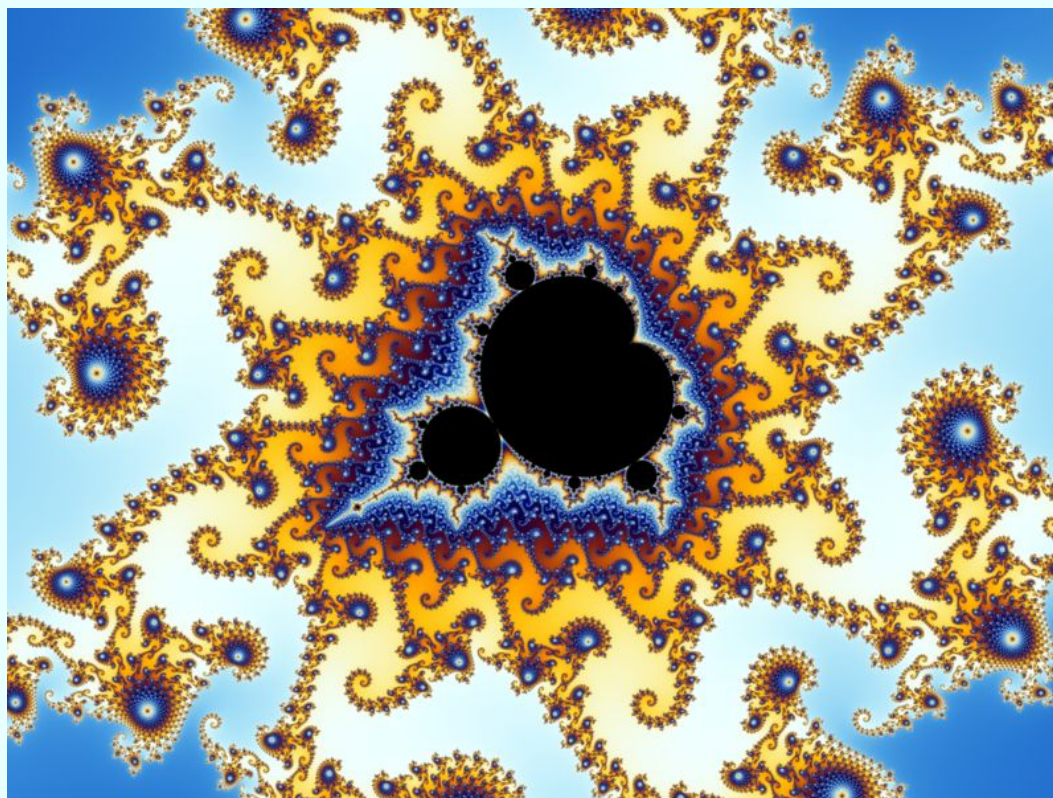
Triangolo di Sierpiński



Spugna di Menger (di Sierpiński)



Insieme di Mandelbrot



$$f_c(z) = z^2 + c$$

$$0 \rightarrow f_c(0) = c$$

$$c \rightarrow f_c(c) = c^2 + c$$

$$c^2 + c \rightarrow f_c(c^2 + c) = (c^2 + c)^2 + c$$

$$(c^2 + c)^2 + c \rightarrow f_c[(c^2 + c)^2 + c] = [(c^2 + c)^2 + c]^2 + c$$

...

$$0, c, c^2 + c, (c^2 + c)^2 + c, [(c^2 + c)^2 + c]^2 + c, \dots$$



$$f_c(z) = z^2 + c$$

$$0, c, c^2 + c, (c^2 + c)^2 + c, [(c^2 + c)^2 + c]^2 + c, \dots$$

$$c = 0$$

$$0, 0, 0, 0, 0, \dots$$

$$c = 1$$

$$0, 1, 2, 5, 26, 677, 458330, 210066388901, \dots$$

$$c = -1$$

$$0, -1, 0, -1, 0, \dots$$



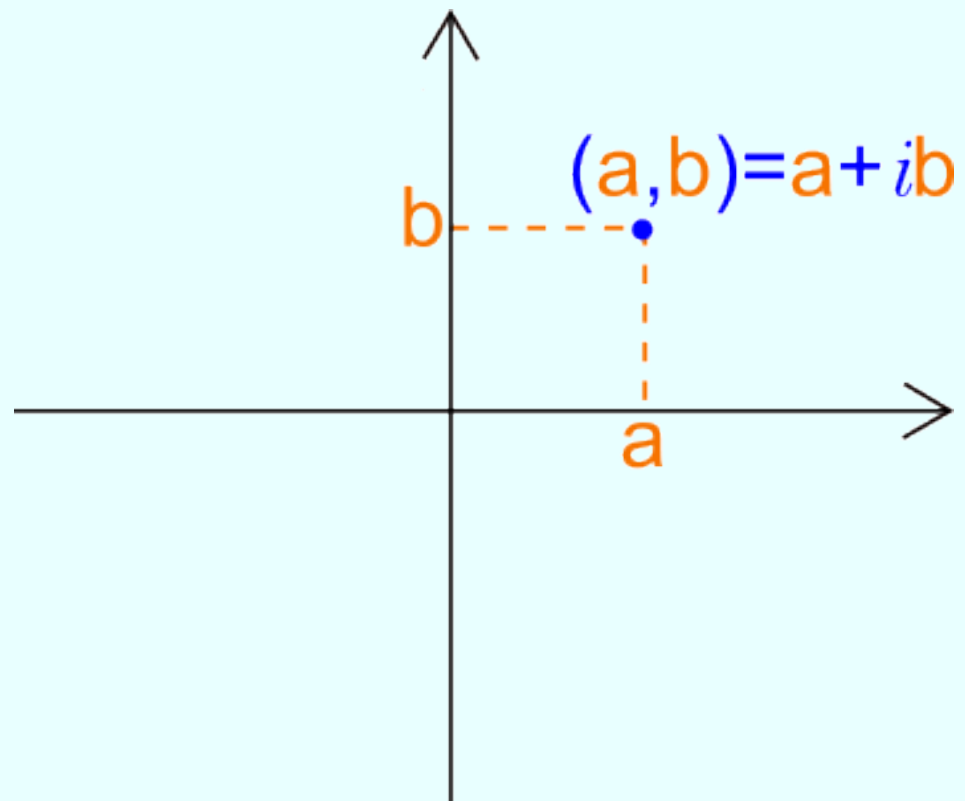
$$f_c(z) = z^2 + c$$

$$0, c, c^2 + c, (c^2 + c)^2 + c, [(c^2 + c)^2 + c]^2 + c, \dots$$

$$\begin{cases} |z_n| \leq K & n = 0, 1, 2, \dots \\ |z_n| \rightarrow +\infty \end{cases}$$

$$c \in M \iff |z_n| \leq K, \quad n = 0, 1, 2,$$





$$z = a + ib, \quad a, b \in \mathbb{R}; \quad i^2 = -1$$

$$f_c(z) = z^2 + c$$

$$0, c, c^2 + c, (c^2 + c)^2 + c, [(c^2 + c)^2 + c]^2 + c, \dots$$

$$c = i$$

$$0, i, -1 + i, -i, -1 + i, -1, \dots$$



```
In[1]:= f[z_, c_] = z^2 + c
```

```
Out[1]= c + z^2
```

```
In[20]:= g[z_] = f[z, -0.1 + 0.1 I]
```

```
Out[20]= (-0.1 + 0.1 i) + z^2
```

```
For[n = 1, n < 30, n++, Print[Nest[g, 0, n]]]
```

```
-0.1 + 0.1 i
```

```
-0.1 + 0.08 i
```

```
-0.0964 + 0.084 i
```

```
-0.097763 + 0.0838048 i
```

```
-0.0974656 + 0.083614 i
```

```
-0.0974917 + 0.083701 i
```

```
-0.0975012 + 0.0836797 i
```

```
-0.0974958 + 0.0836823 i
```

```
-0.0974973 + 0.0836827 i
```

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-0.0974971 + 0.0836823 i
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-0.0974971 + 0.0836824 i
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-0.0974971 + 0.0836824 i
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-0.0974971 + 0.0836824 i
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-0.0974971 + 0.0836824 i
```



```
In[1]:= f[z_, c_] = z^2 + c
```

```
Out[1]= c + z^2
```

```
In[23]:= g[z_] = f[z, 0.5 - 0.1 I]
```

```
Out[23]= {0.5 - 0.1 i} + z^2
```

```
In[24]:= For[n = 1, n < 30, n++, Print[Nest[g, 0, n]]]
```

```
0.5 - 0.1 i
```

```
0.74 - 0.2 i
```

```
1.0076 - 0.396 i
```

```
1.35844 - 0.898019 i
```

```
1.53893 - 2.53981 i
```

```
-3.58236 - 7.91717 i
```

```
-49.3482 + 56.6243 i
```

```
-770.564 - 5588.72 i
```

```
-3.064 × 107 + 8.61293 × 106 i
```

```
8.64628 × 1014 - 5.27801 × 1014 i
```

```
4.69008 × 1029 - 9.12703 × 1029 i
```

```
-6.13058 × 1059 - 8.5613 × 1059 i
```

```
-3.57118 × 10119 + 1.04971 × 10120 i
```

```
-9.74366 × 10239 - 7.49744 × 10239 i
```

```
3.872729684870732 × 10479 + 1.461049105567629 × 10480 i
```

```
-1.984684136759179 × 10960 + 1.131649648437118 × 10960 i
```

```
2.658340195895674 × 101920 - 4.491934211244498 × 101920 i
```

```
-1.311070036103408 × 103841 - 2.388217854214036 × 103841 i
```

```
-3.984679879618502 × 107682 + 6.262241736694396 × 107682 i
```

```
-2.333799782576073 × 1015365 - 4.990605729902677 × 1015365 i
```

```
-1.945952412618531 × 1030731 + 2.329414913473954 × 1030731 i
```

```
-1.639443046938988 × 1061462 - 9.06586114172846 × 1061462 i
```

```
-7.950206473694539 × 10122925 + 2.972592602664214 × 10122925 i
```

```
5.436947619296055 × 10245851 - 4.726544990671507 × 10245851 i
```

```
7.220171866127121 × 10491702 - 5.139595506905429 × 10491703 i
```

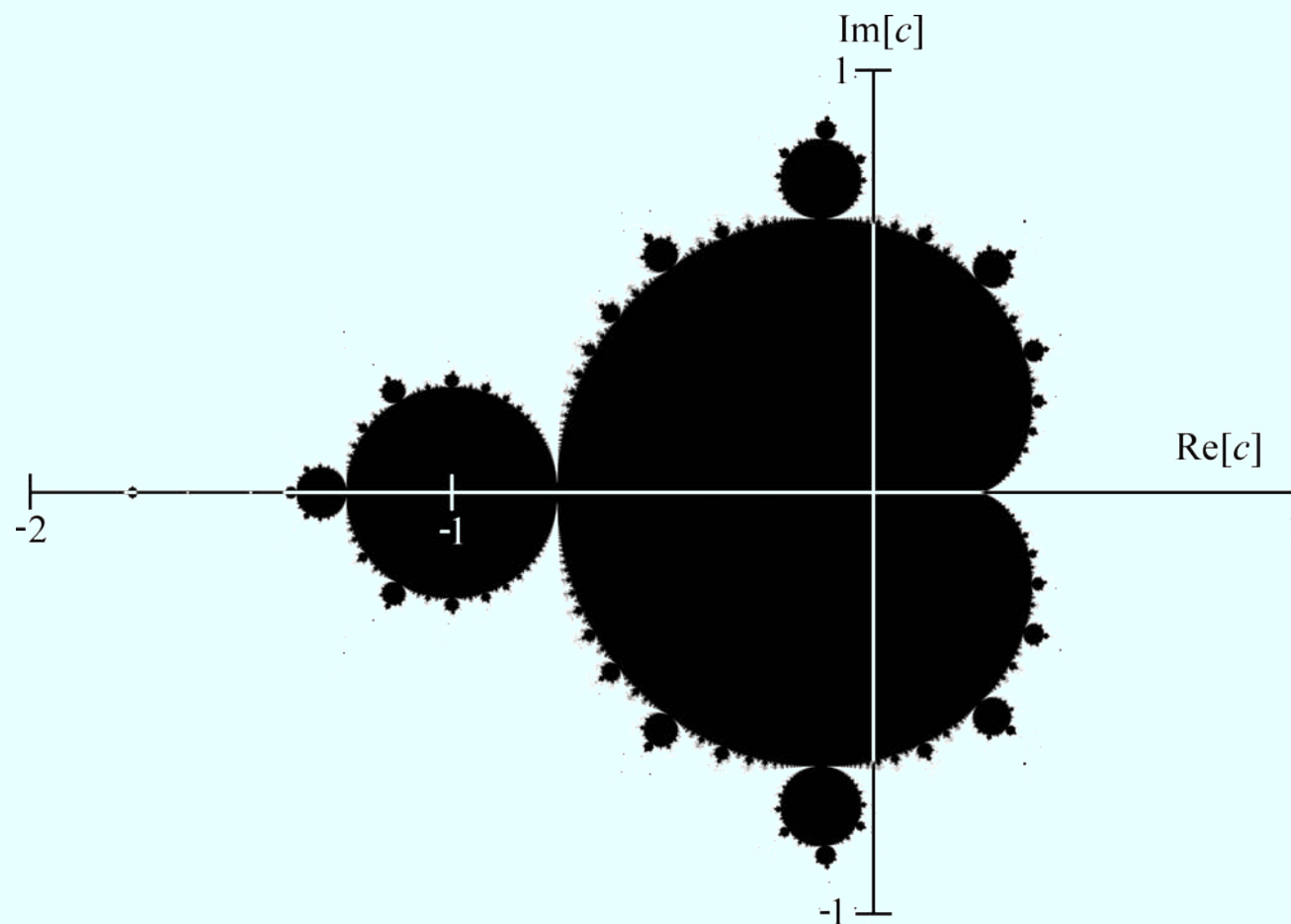
```
-2.589413315683834 × 10983407 - 7.421752576446387 × 10983406 i
```

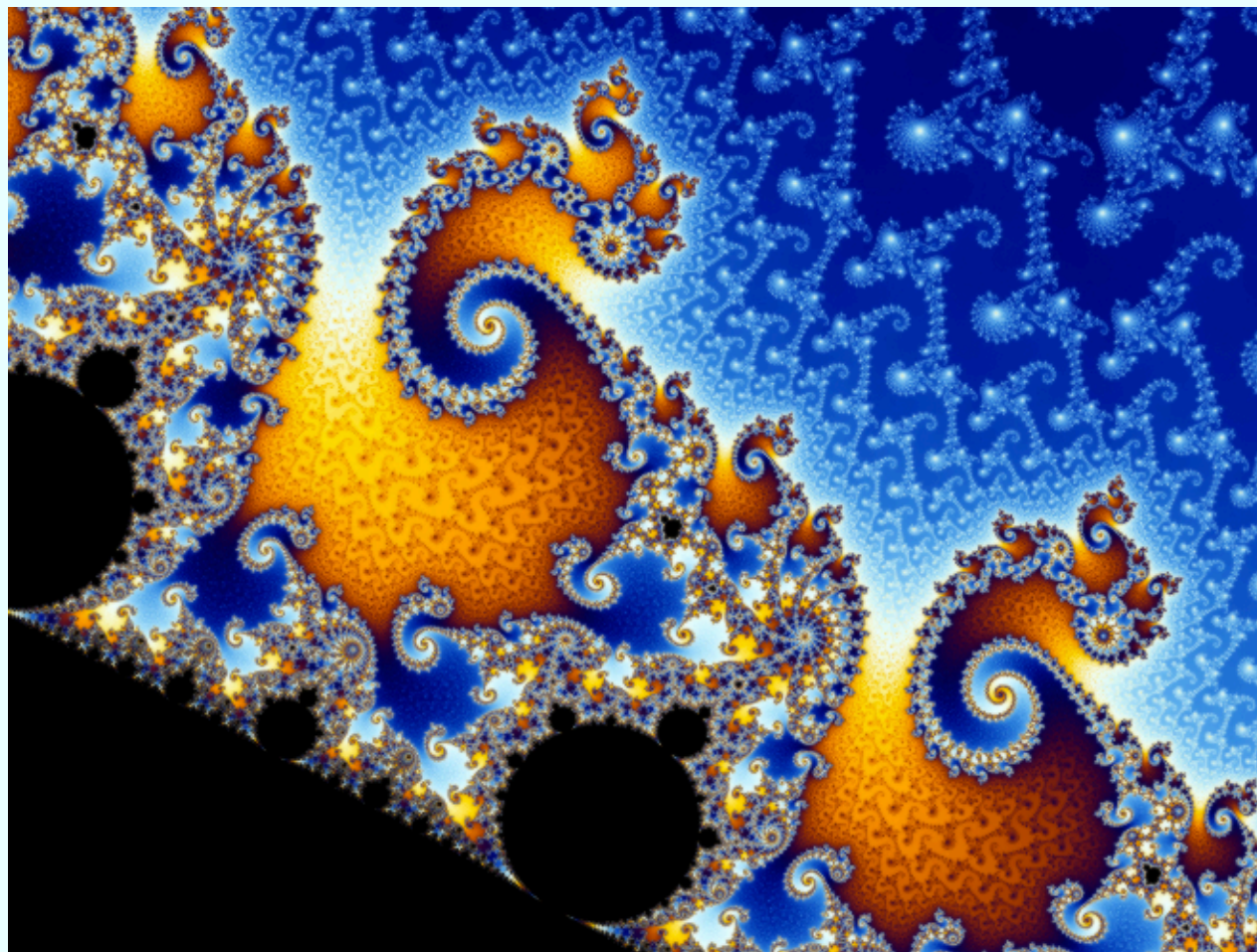
```
6.154237206380860 × 101966814 + 3.843596989432215 × 101966814 i
```

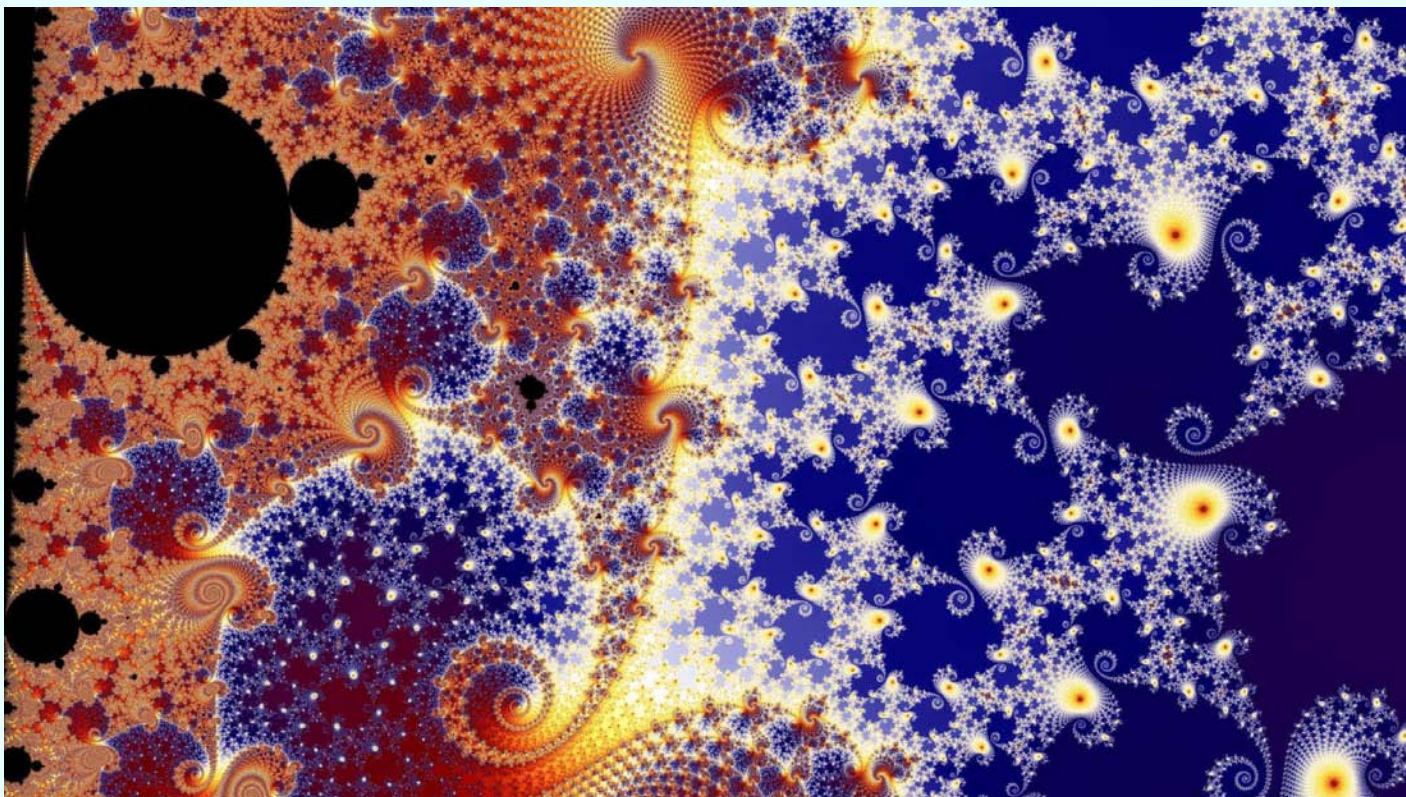
```
2.310139777523011 × 103933629 + 4.730881519739440 × 103933629 i
```

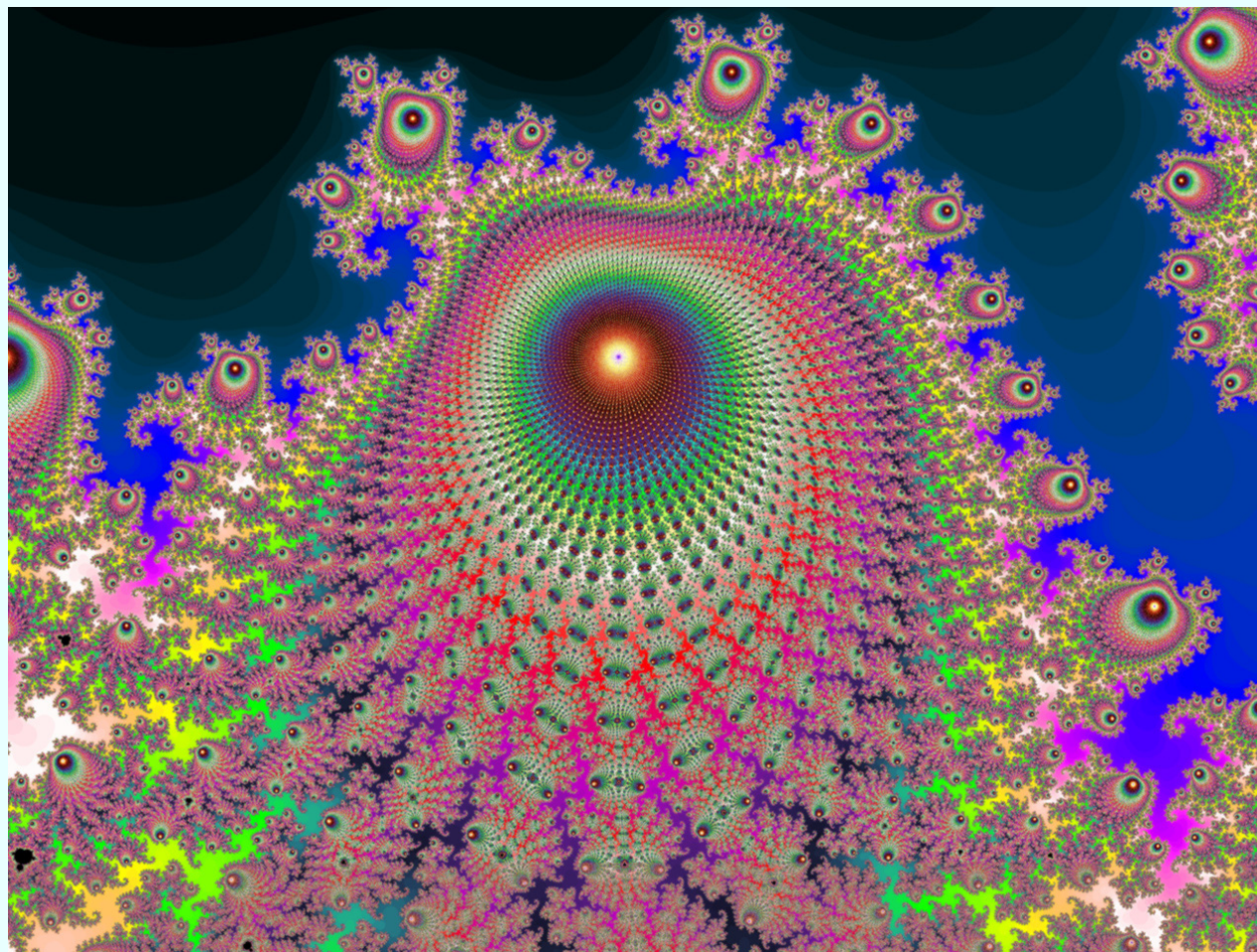
```
-1.704449416211809 × 107867259 + 2.185799516299719 × 107867259 i
```

Insieme di Mandelbrot









Jackson Pollock



Jackson Pollock



Blu Poles, Number 11

Jackson Pollock



Lavander mist No. 1

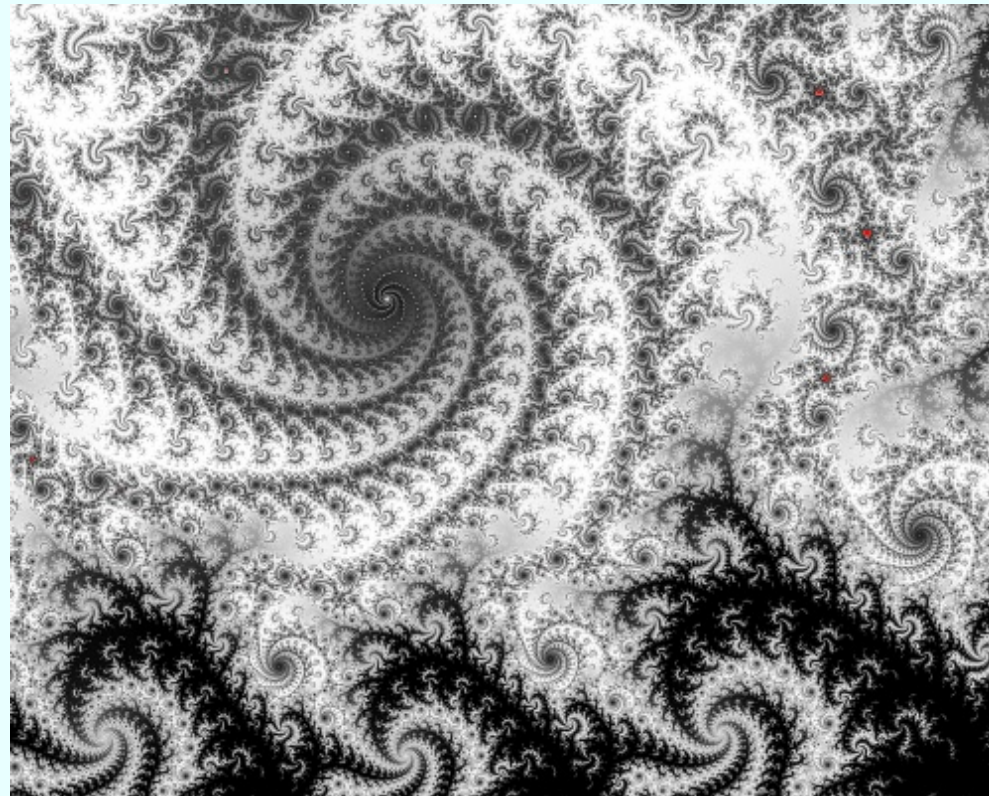
Gianni D'Anna



Decomposizione Binaria



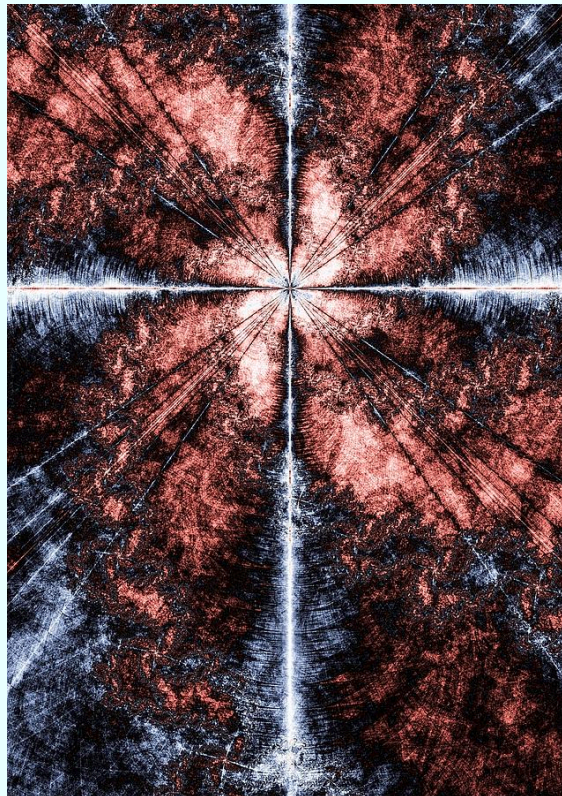
Kerry Mitchell



Above and Below



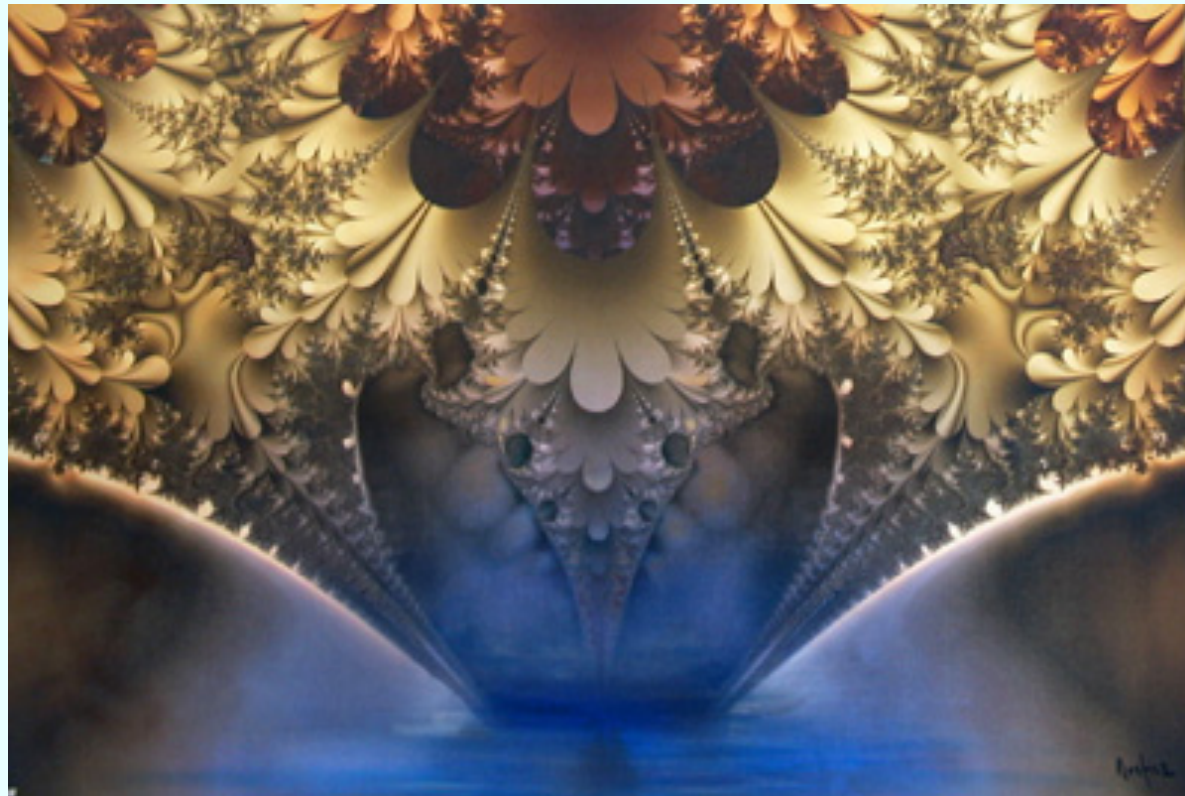
Kerry Mitchell



Miracle



Giorgio Orefice



Mare Frattale



