

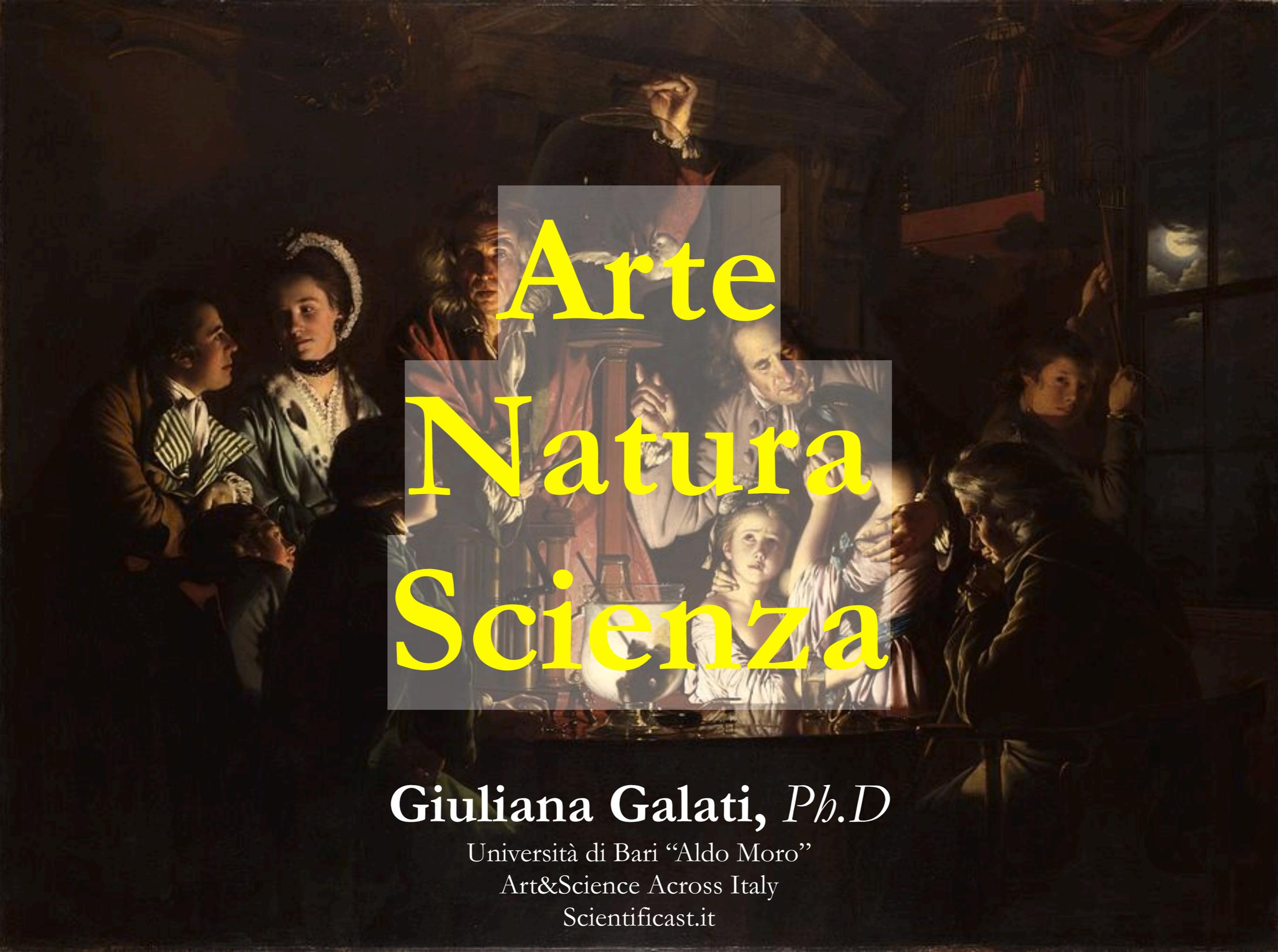


# Giuliana Galati, *Ph.D*

Università di Bari "Aldo Moro"

Art&Science Across Italy

[Scientificast.it](http://Scientificast.it)



# Arte Natura Scienza

**Giuliana Galati, *Ph.D***

Università di Bari “Aldo Moro”

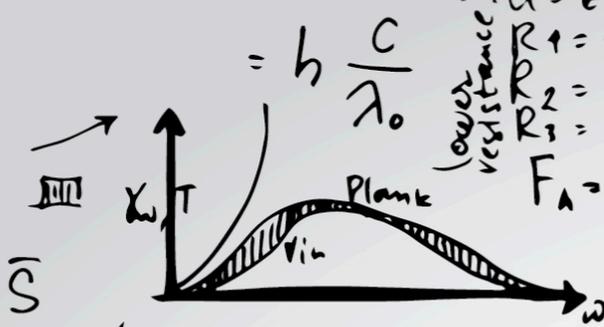
Art&Science Across Italy

[Scientificast.it](http://Scientificast.it)





$U = EB$   
 $R_1 = 13,50 \Omega$   
 $R_2 = 30 \Omega$   
 $R_3 = 20 \Omega$   
 $F_A = \rho g V$   
 $w = D \uparrow$   
 $w = 0$



$P = \bar{S}$

$w^2 = \frac{mgL}{I}$   
 $T = \frac{2\pi}{w} = 2\pi \sqrt{\frac{I}{mgL}}$   
 $x = \rho \cos \varphi, y = \rho \sin \varphi$   
 $\rho = \sqrt{x^2 + y^2}$

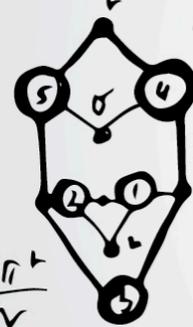


$q = \frac{h}{v - 5m}$   
 $x' = x_0 + mt'$   
 $y' = y_0 + nt'$   
 $z' = z_0 + pt'$



Formula for is

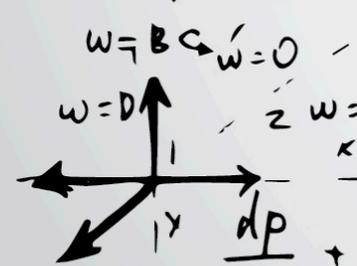
- 1)  $T = \frac{t}{n}$
- 2)  $v = \frac{t}{t}$
- 3)  $T = \frac{1}{v} = \frac{v}{T}$
- 4)  $T = \frac{2\pi t}{v}$



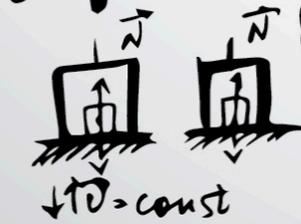
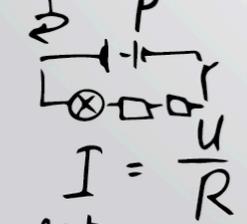
- 5)  $v = \frac{2\pi r}{v}$
- 6)  $v = \frac{v}{2\pi r}$

Physics - 10

Resistance



$\frac{dp}{p} + \gamma \frac{dv}{v} = 0$

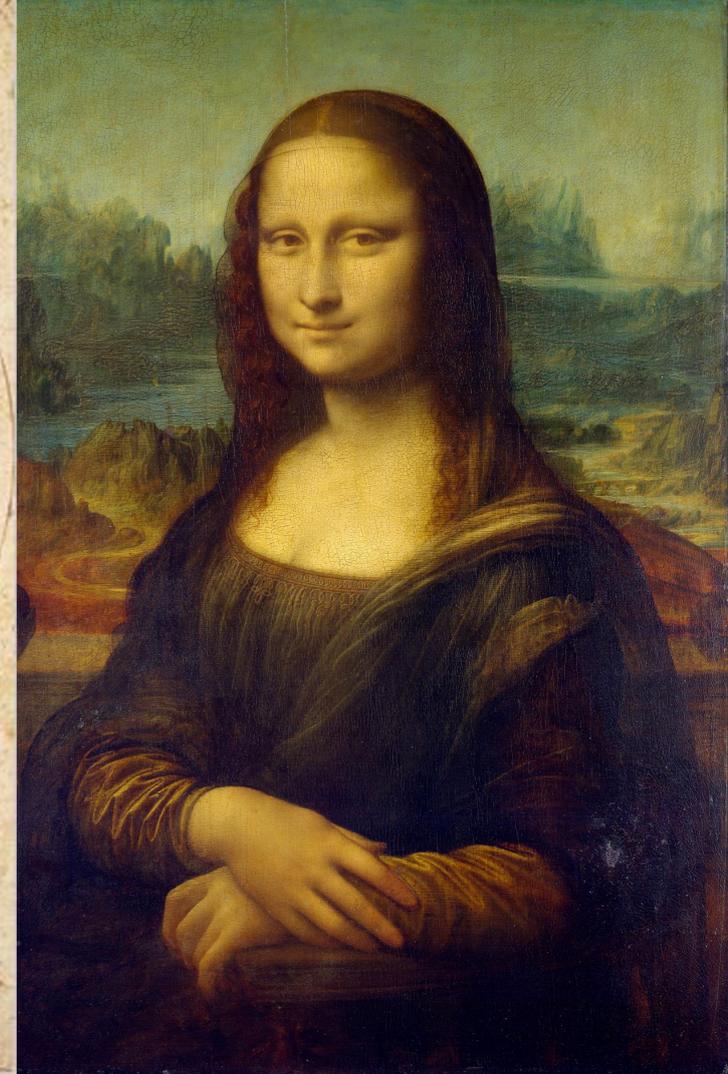
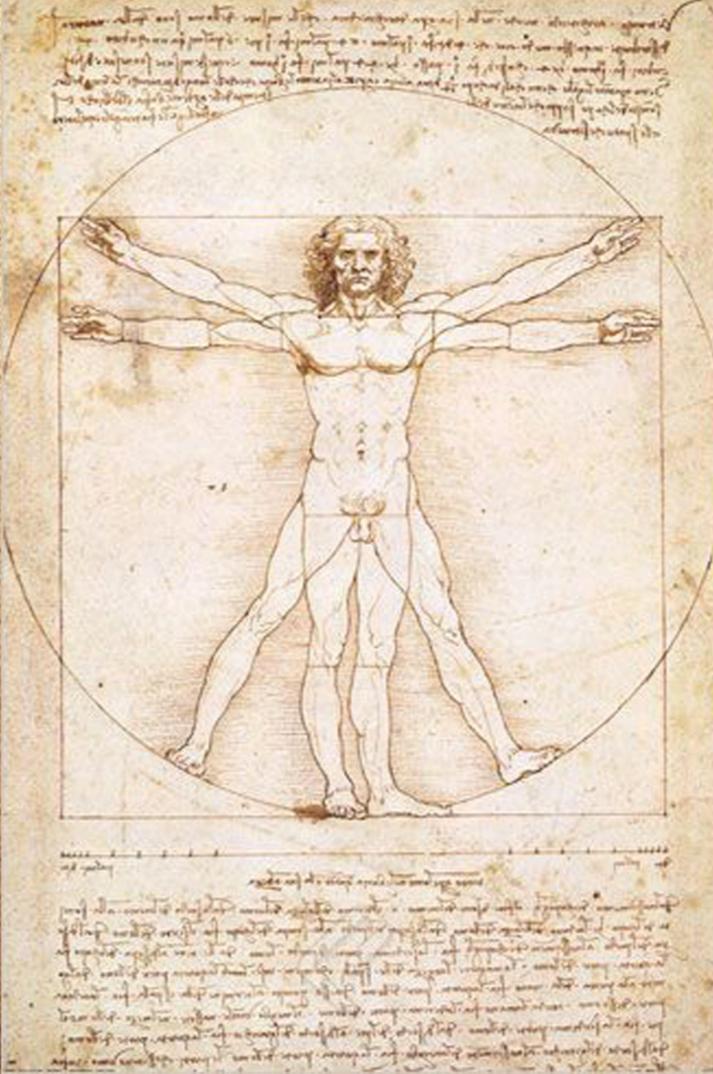
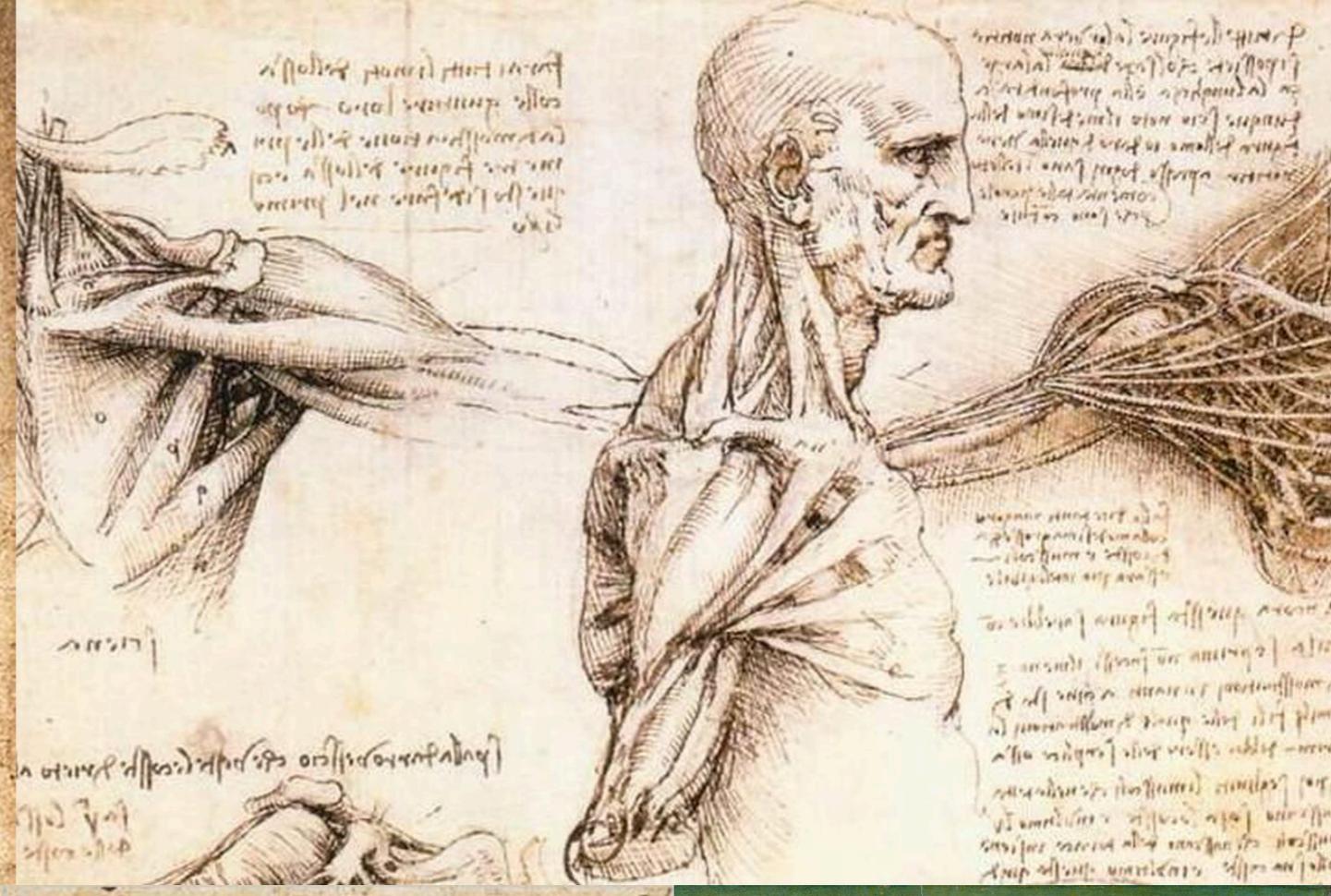


$I = \frac{U}{R}$

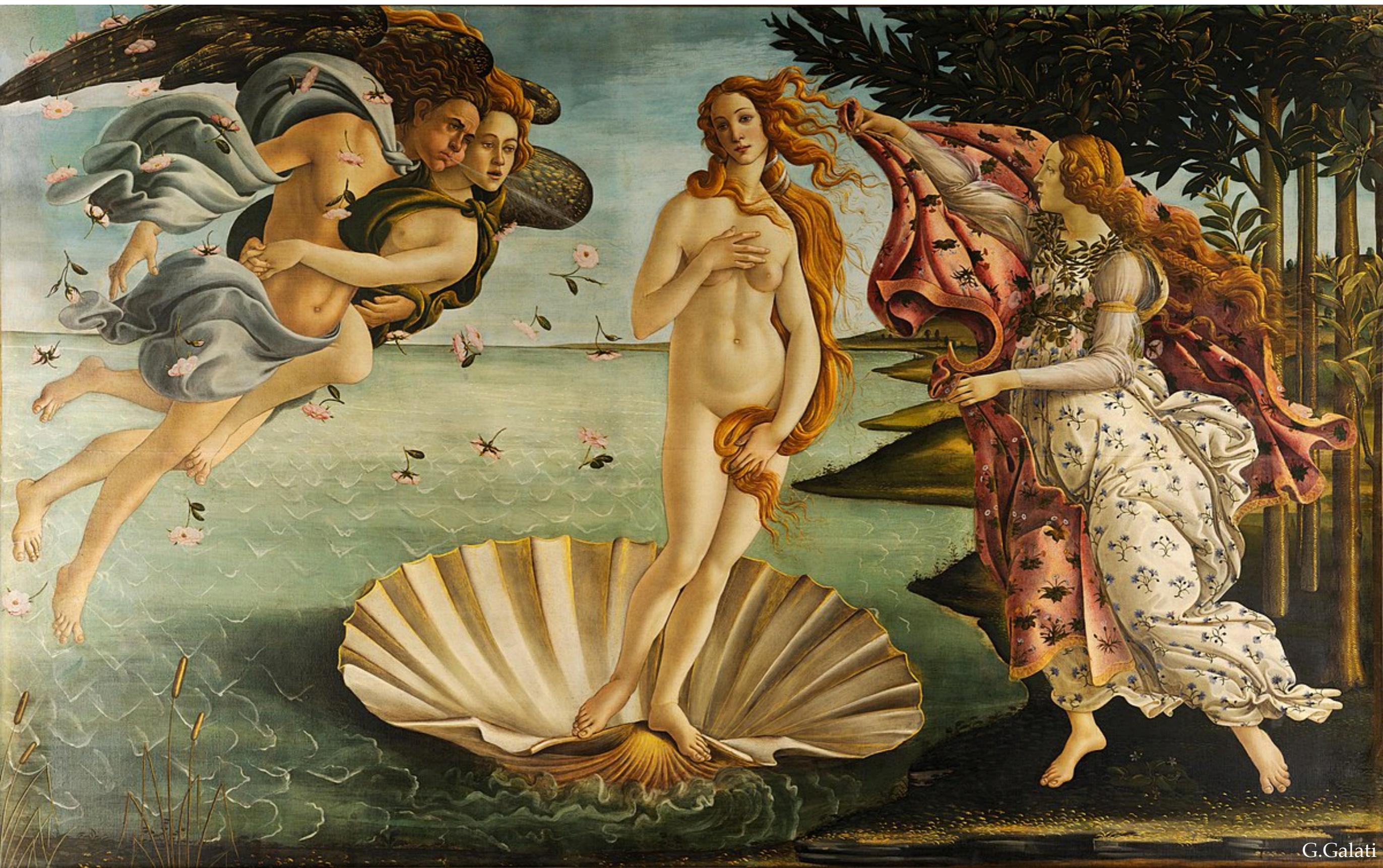
$\sum_{n=0}^{\infty} \exp(-nDw/kT)$   
 Resistance light lower

$R = \frac{\rho \cdot l}{S}$   
 $A m + B n + C p$   
 $S = ?$   
 $\sqrt{m^2 + n^2 + p^2} \cdot \sqrt{A^2 + B^2 + C^2}$





# Cos'è la bellezza?





**Early Pleistocene**  
*Animals contemporary*  
*with earliest Man*  
 [before *Homo Sapiens*]

**Hairy Mammoth**

**Reindeer**

**Sabre-tooth Tiger**

**Wild Horse**

**Heidelberg Man**

**Musk Ox**

**Woolly Rhinoceros**

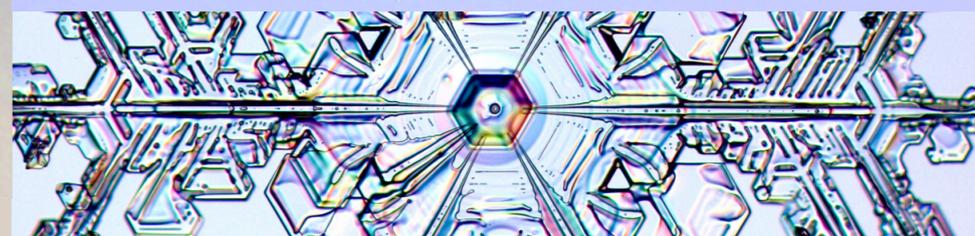
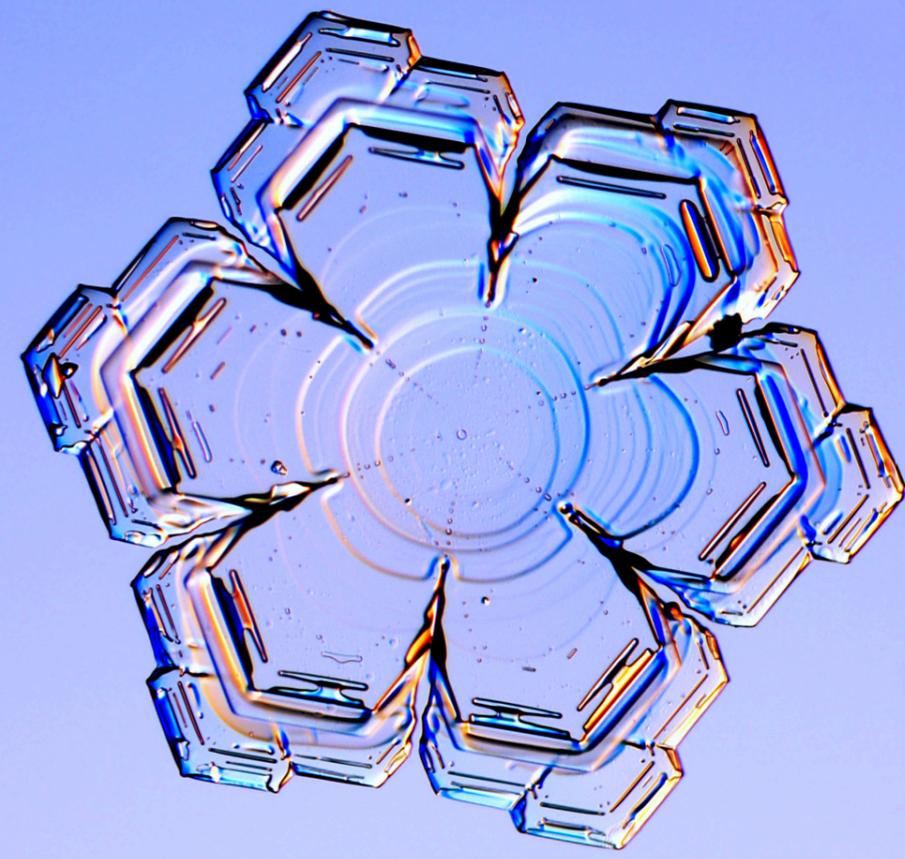
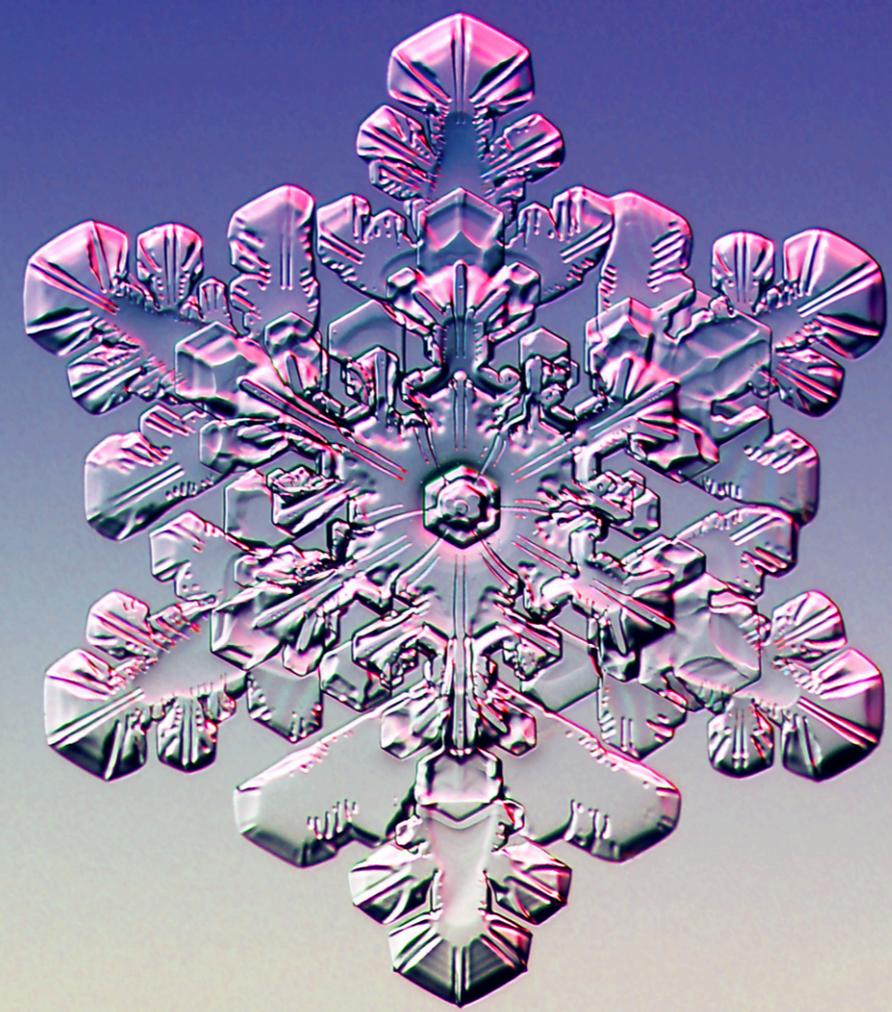
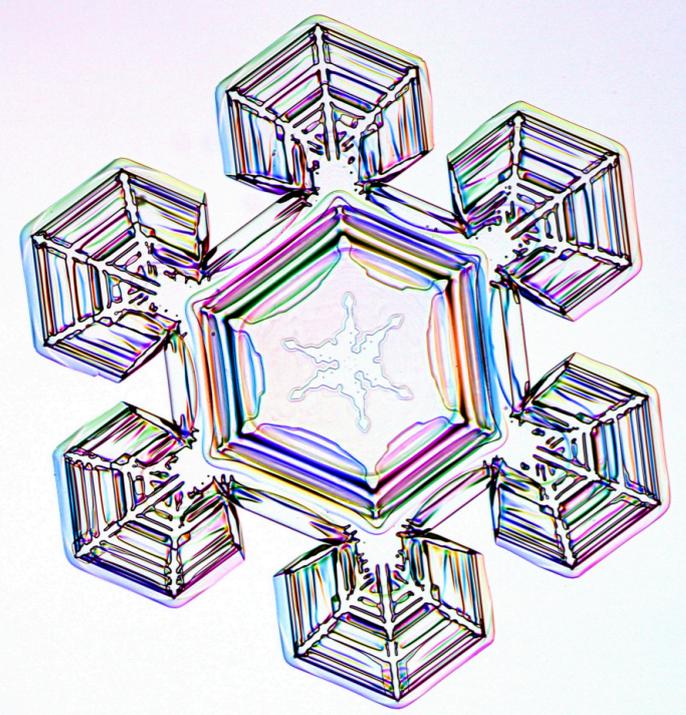
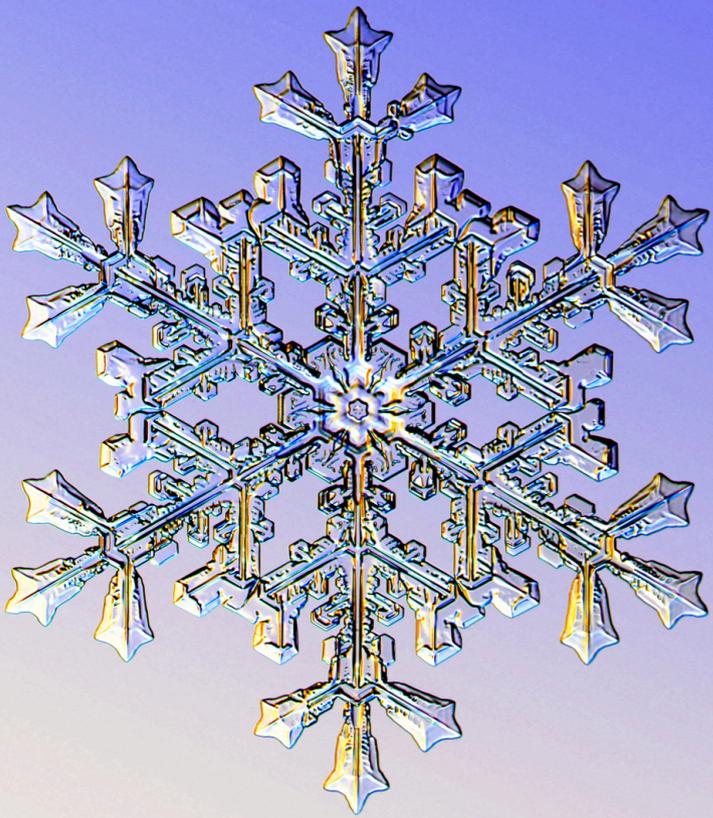
*Six-foot man drawn to same scale.*



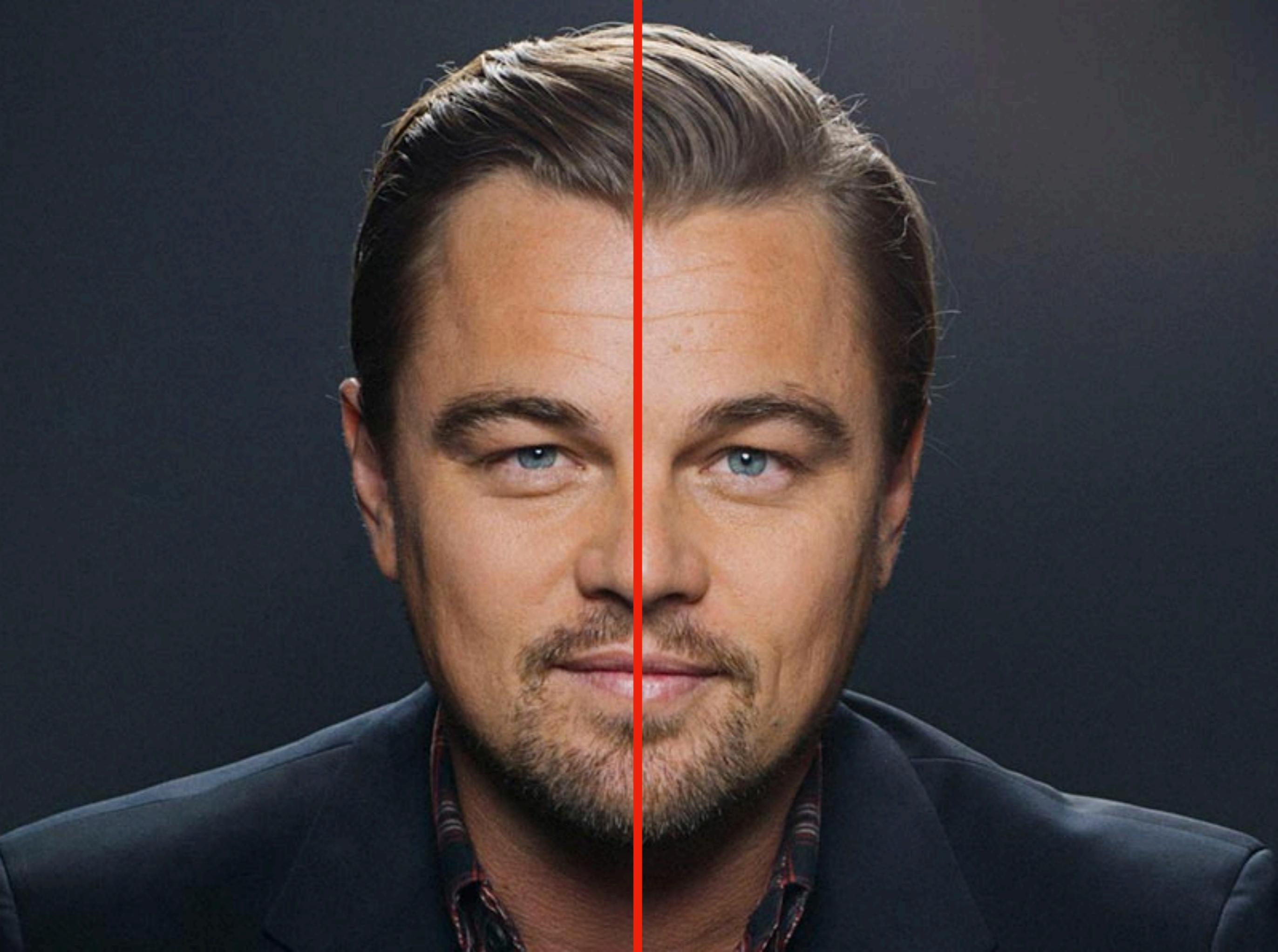










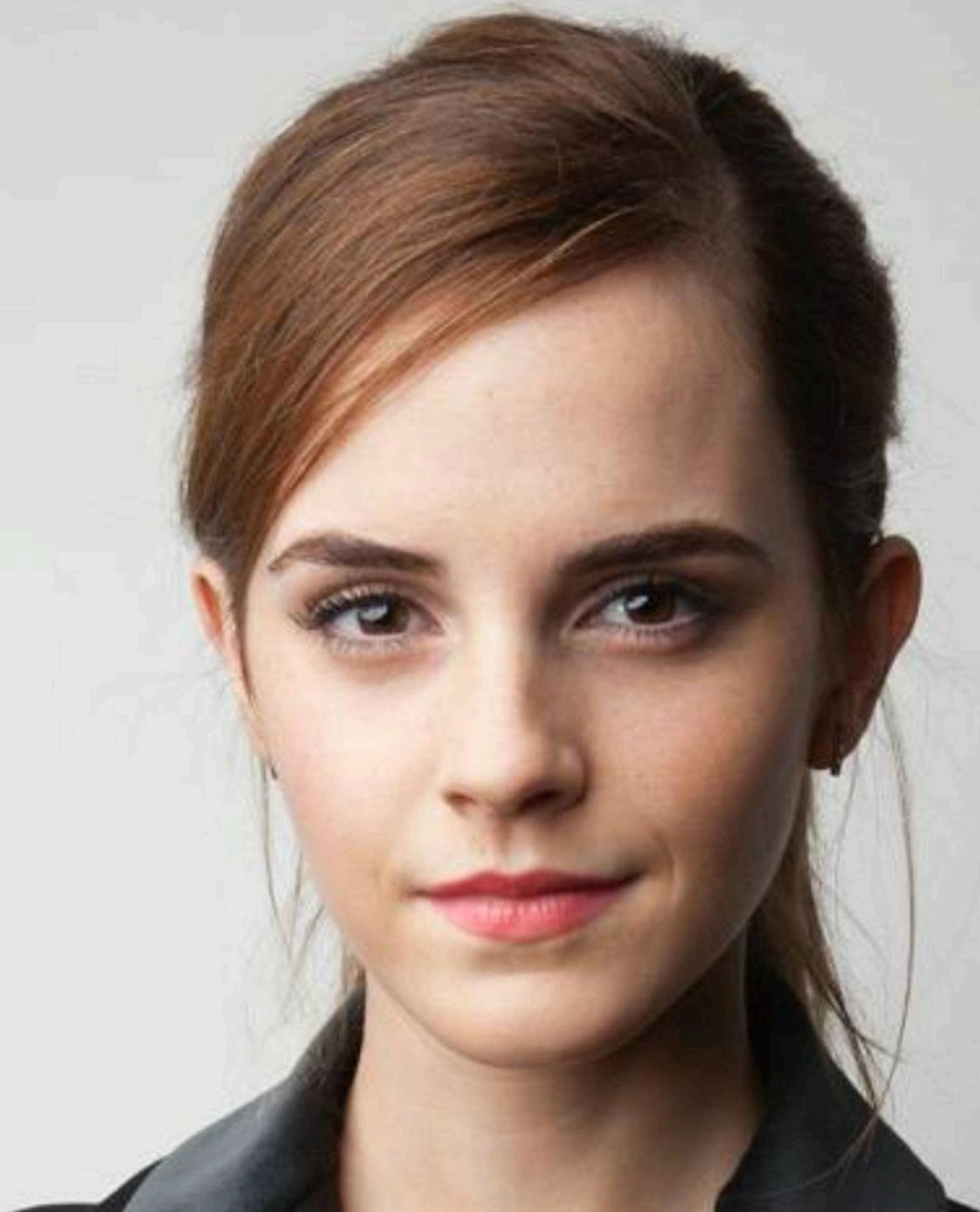


**RIGHT**



**LEFT**





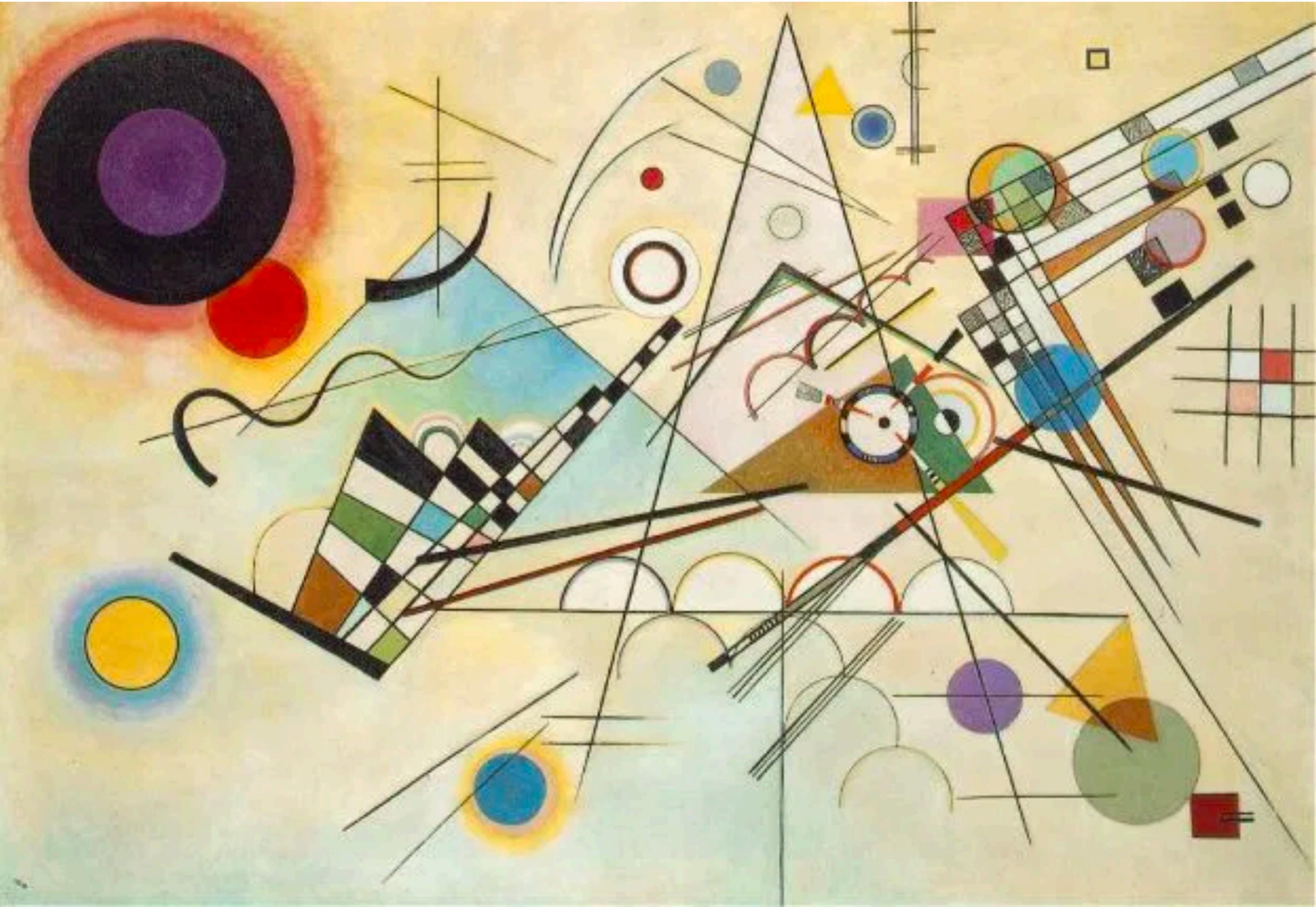
**RIGHT**



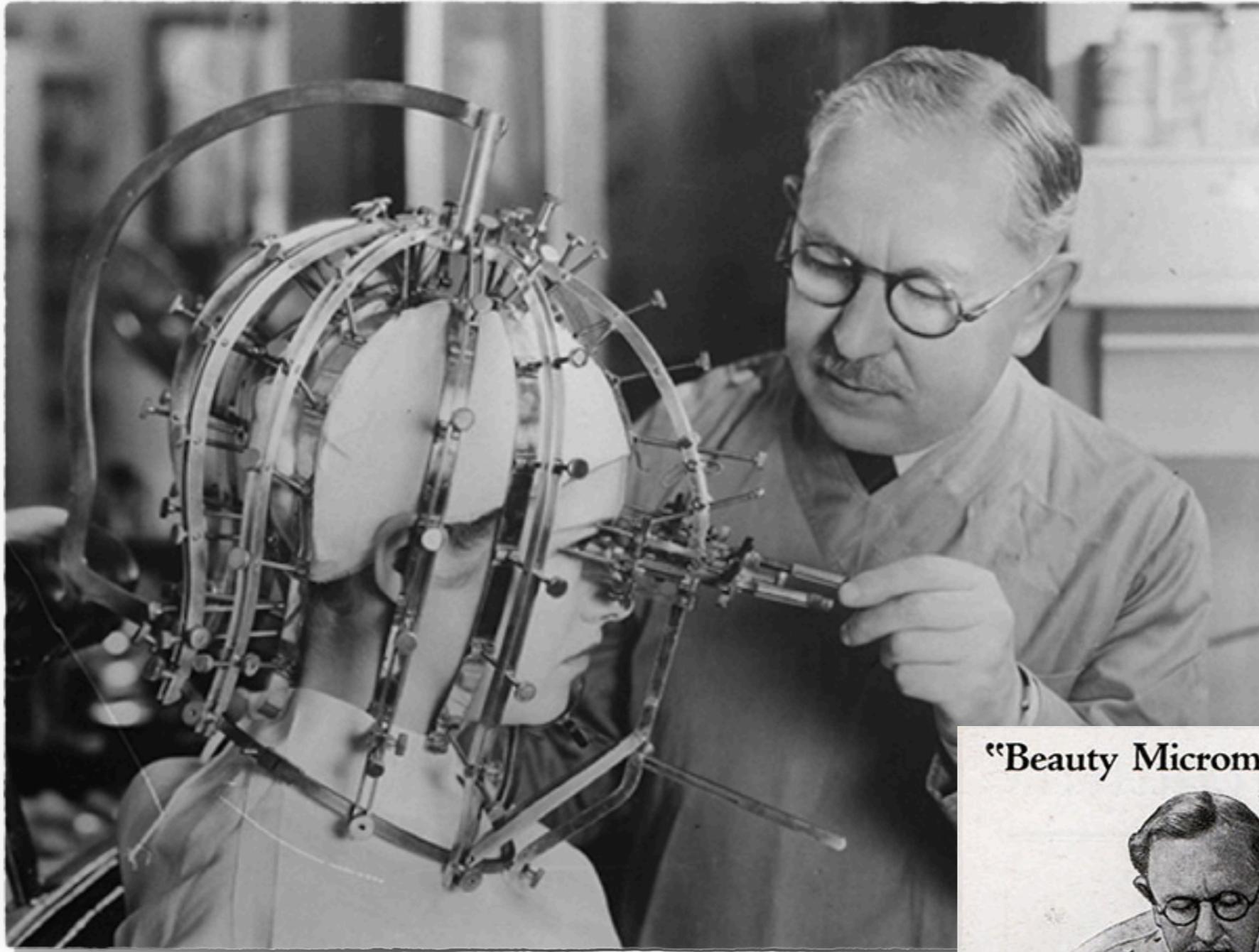
**LEFT**



Vasilij Kandinskij, Composizione VIII (1923)







1935 - Maksymilian Faktorowicz

### "Beauty Micrometer" Analyzes Facial Flaws for Makeup

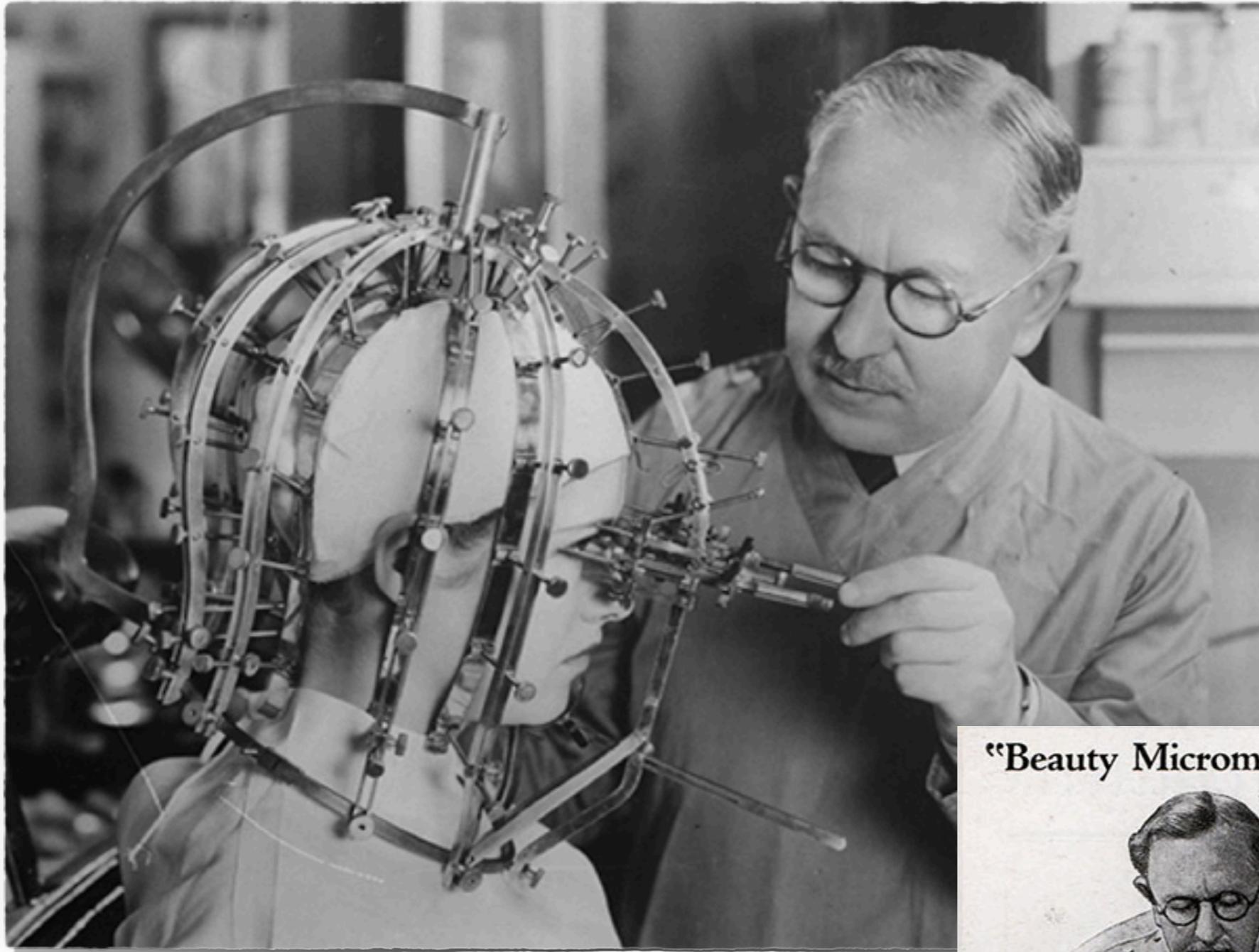


**R**ECENTLY perfected by Max Factor, one of Hollywood's most famous beauty experts, a new instrument, designed to aid makeup men, accurately registers actors' facial measurements and discloses which features should be reduced or enhanced in the makeup process.

Flaws almost invisible to the ordinary eye become glaring distortions when thrown upon the screen in highly magnified images; but Factor's "beauty micrometer" reveals the defects.

The device, remotely resembling a baseball mask, fits over the head and face with flexible metal strips which conform closely to the various features. The strips are held in place by set screws, allowing for 325 possible adjustments. If, for instance, the subject's nose is slightly crooked—so slightly, in fact, that it escapes ordinary observation—the flaw is promptly detected by the instrument and corrective makeup is applied by an experienced operator.

Max Factor, Hollywood makeup expert, demonstrates the "beauty micrometer" which analyzes actors' facial flaws.



# MAX FACTOR

THE MAKE-UP OF MAKE-UP ARTISTS

## "Beauty Micrometer" Analyzes Facial Flaws for Makeup

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1935 - Maksymilian Faktorowicz



# تاج محل



تاج محل

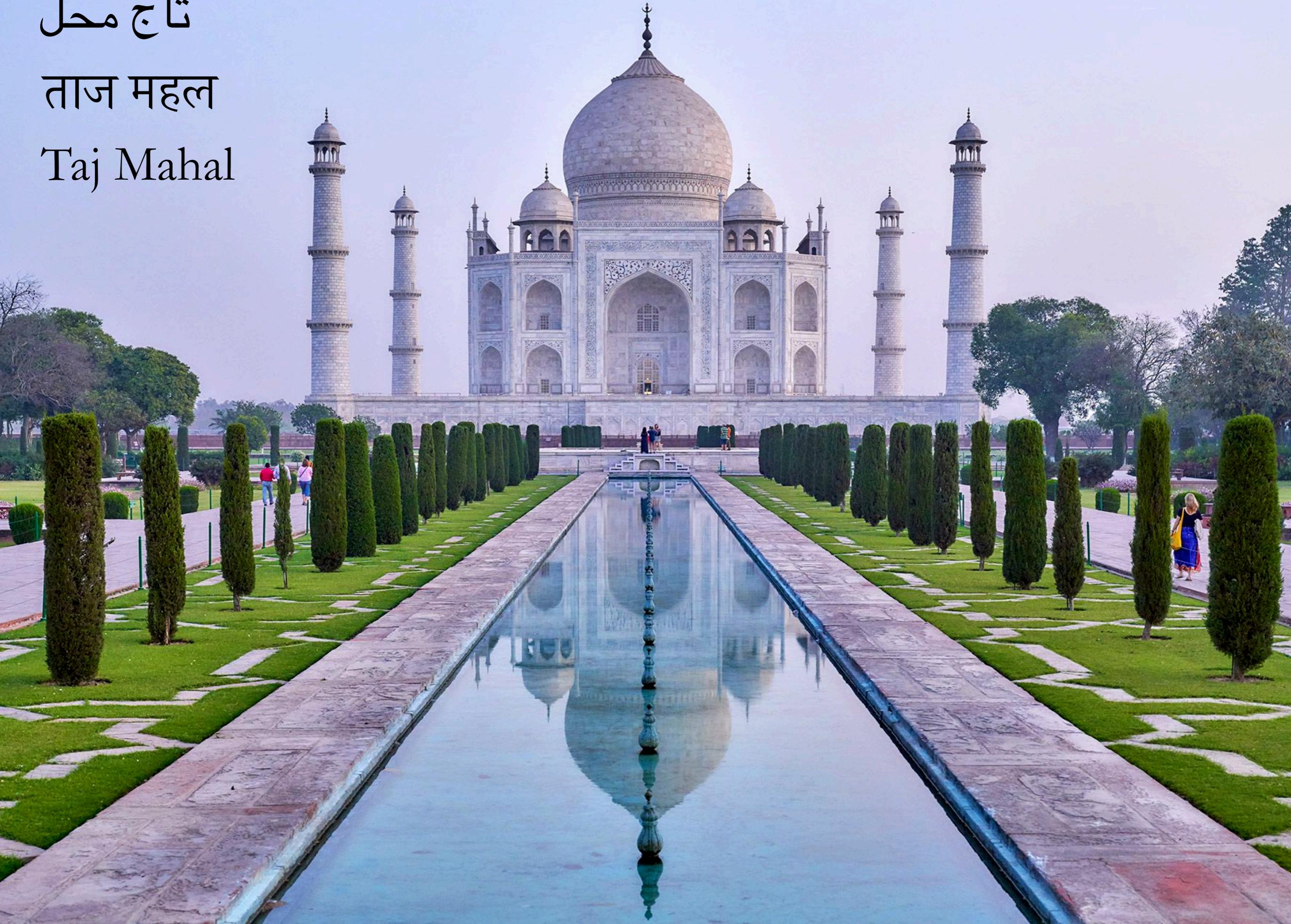
ताज महल



تاج محل

ताज महल

Taj Mahal



تاج محل

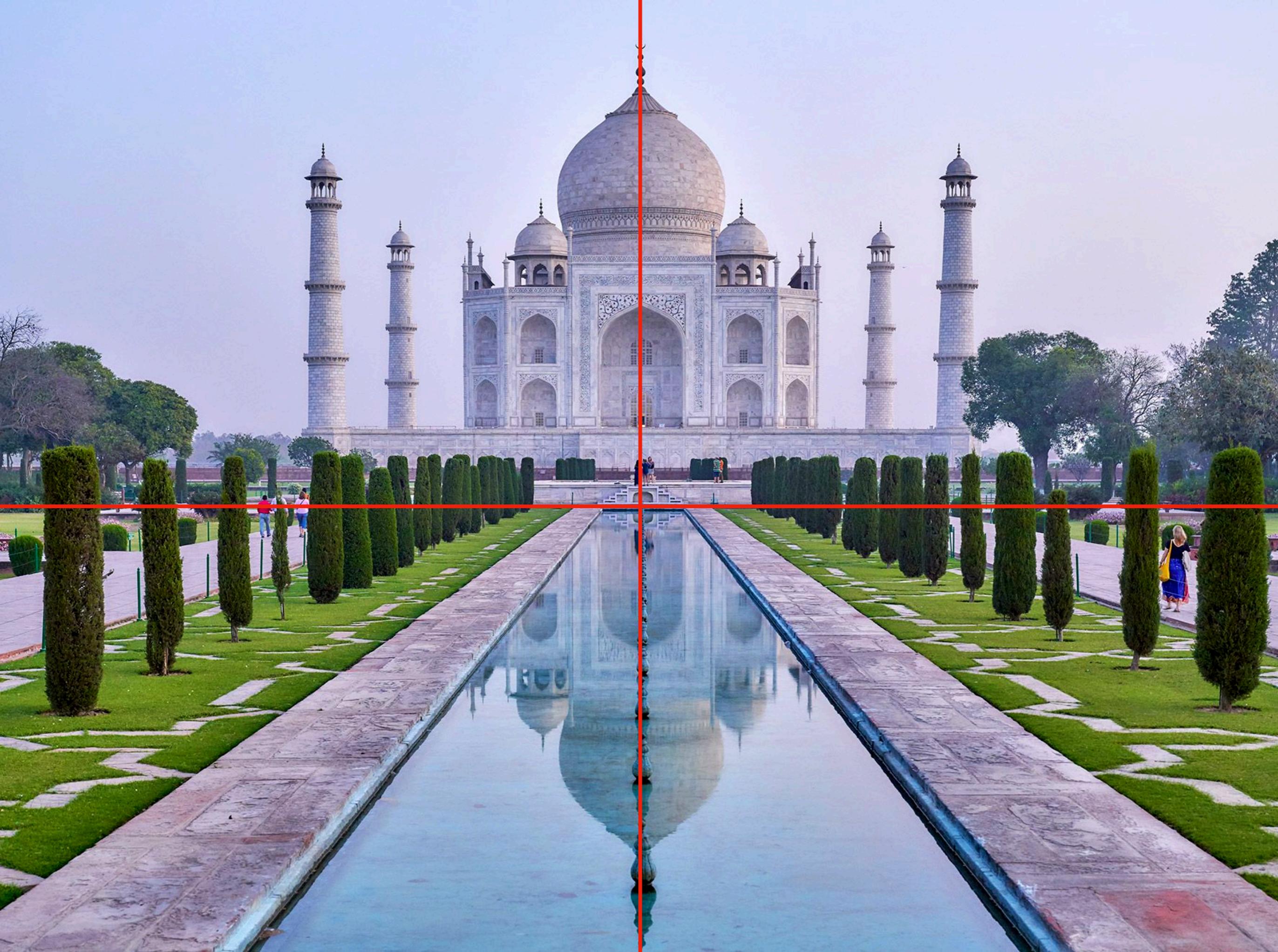
ताज महल

Taj Mahal

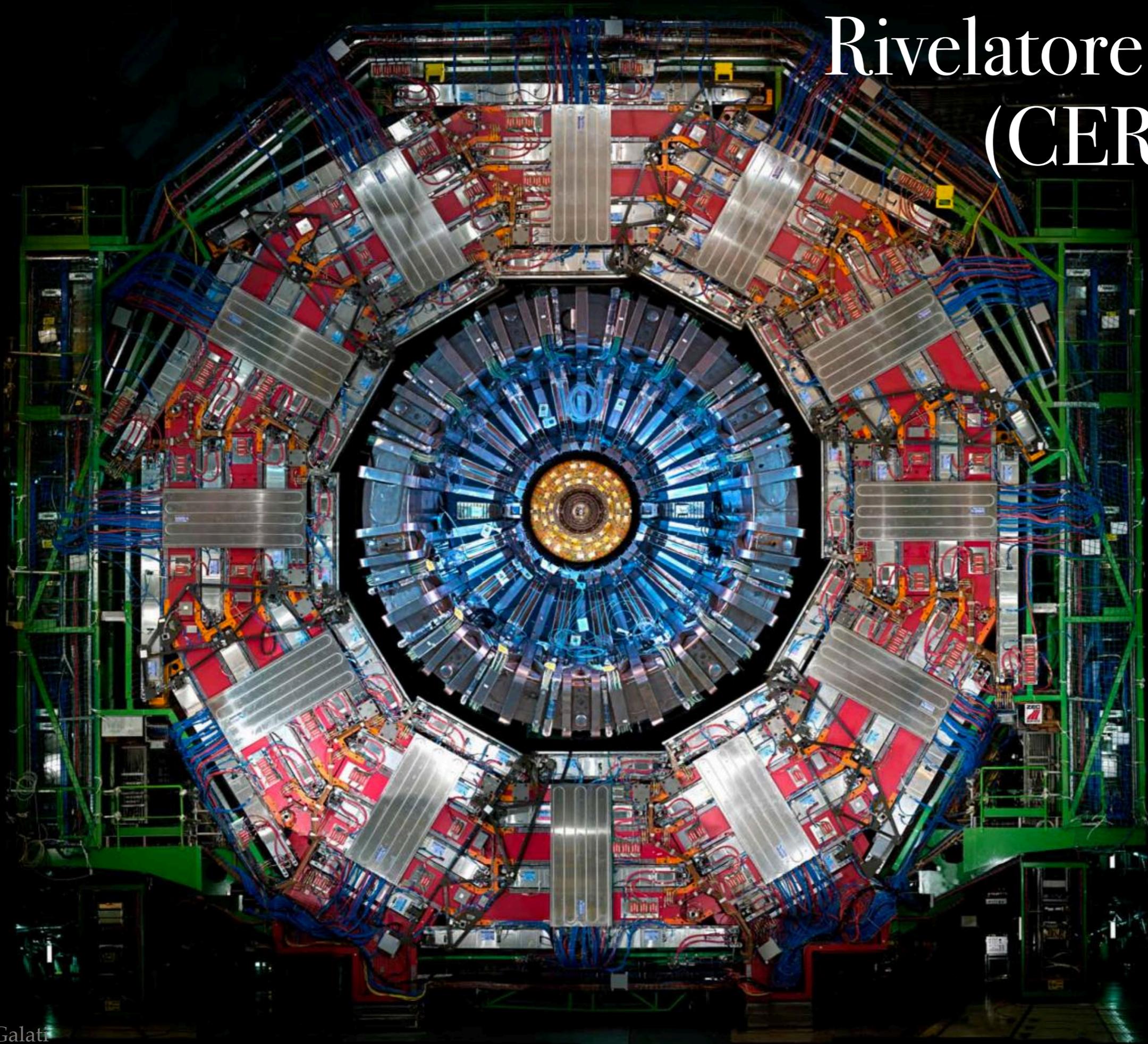


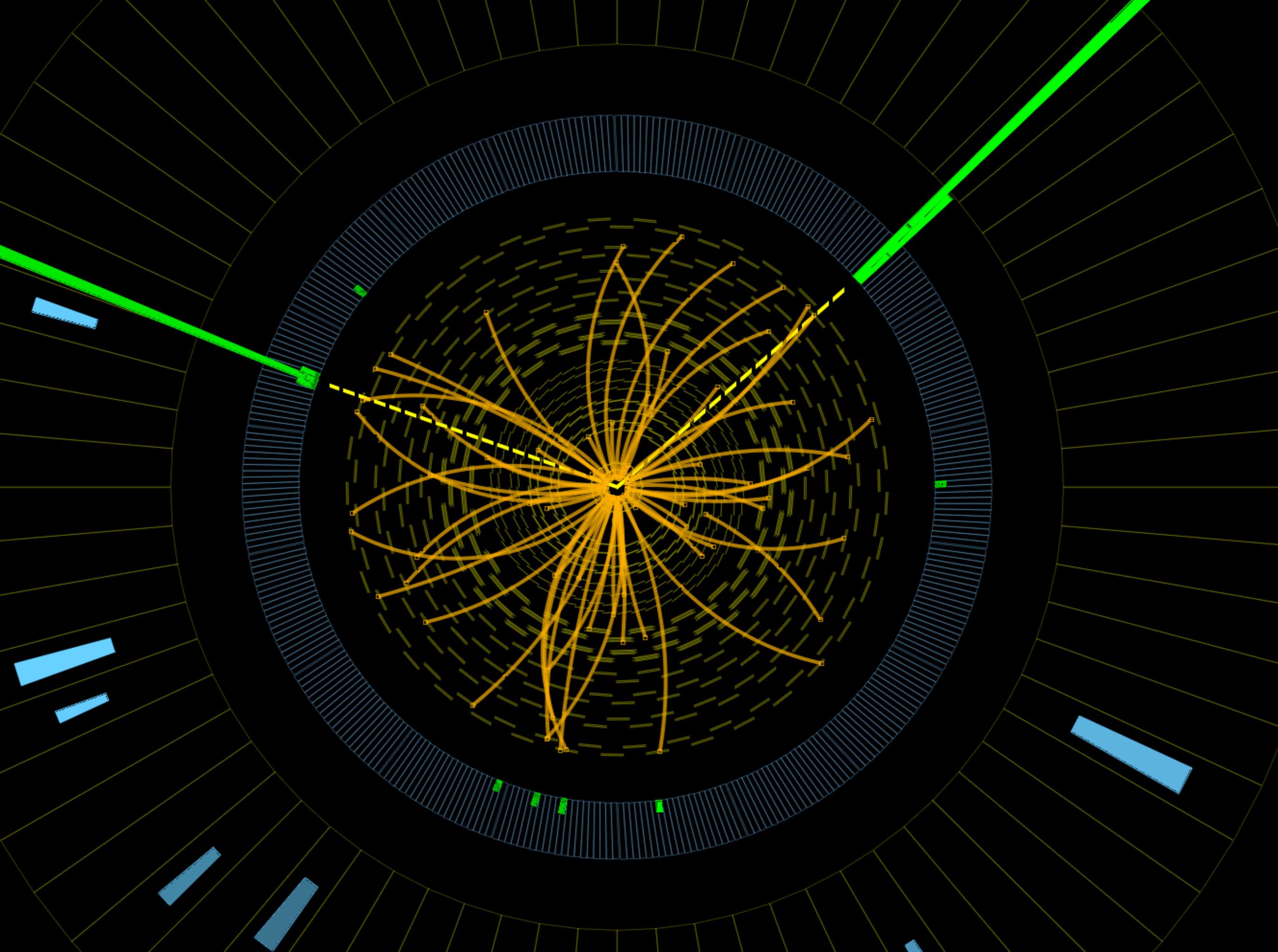


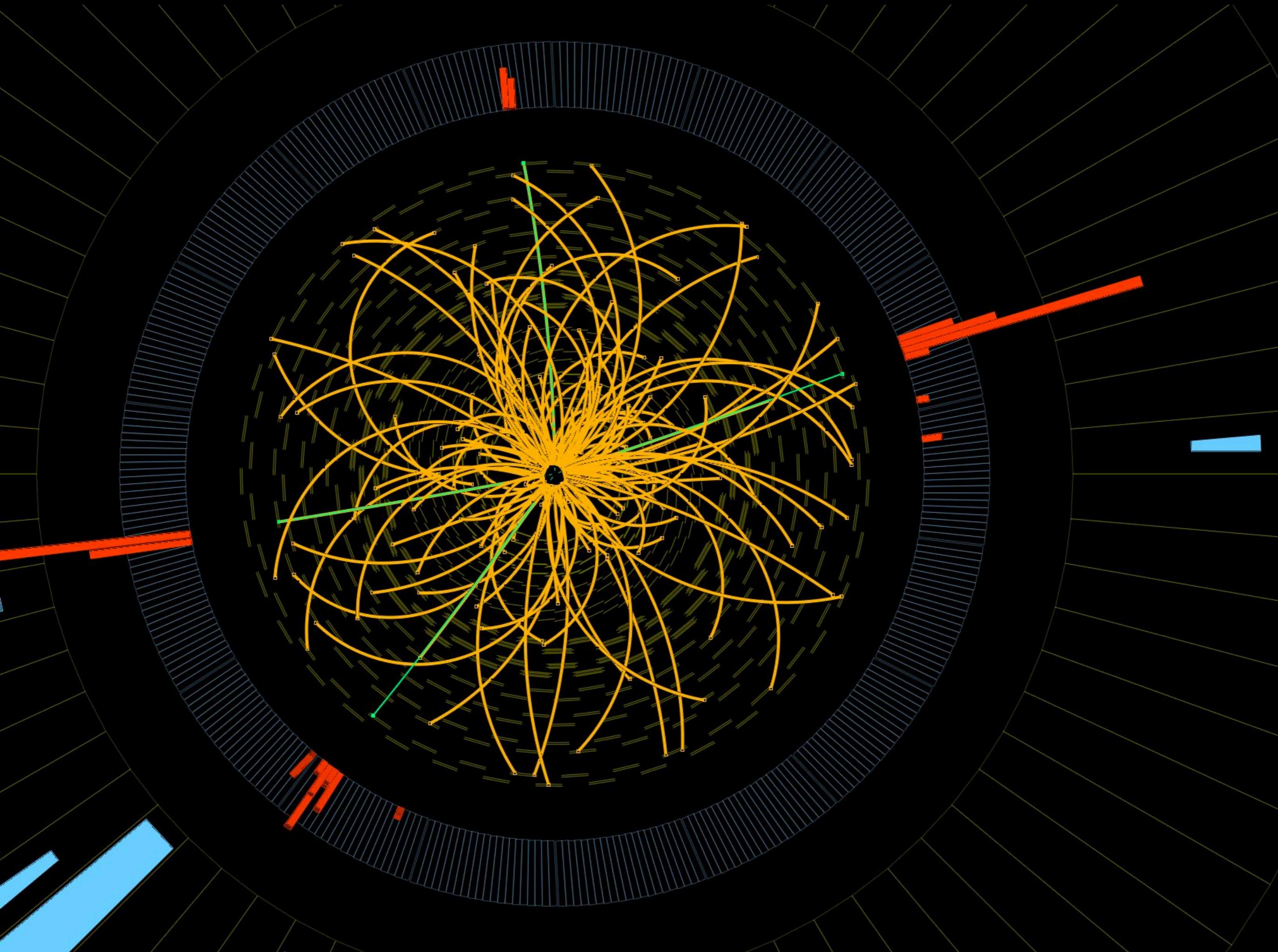




# Rivelatore di CMS (CERN)





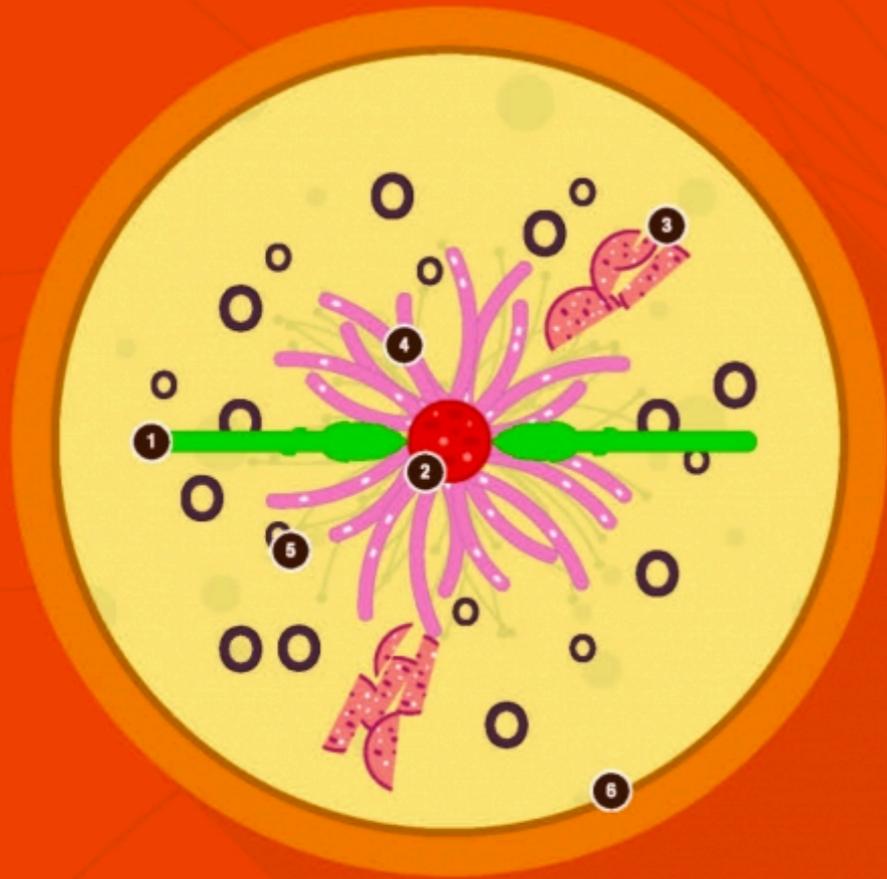


# Higgs Boson Pizza Day

## at CERN

### What's happening on my Ham & Cheese pizza?

A two asparagus (proton-proton)<sup>1</sup> collision produces a spicy Higgs boson (chorizo)<sup>2</sup> decaying into two high-energy salami (photon)<sup>3</sup> clusters and a lot of charged (sliced ham)<sup>4</sup> and neutral (olive)<sup>5</sup> particles that are detected in the pizza (detector)<sup>6</sup> entirely covered with mozzarella sensors.



Asparagus  
Proton



Chorizo  
Higgs boson



Salami  
Photon



Ham  
Charged particle



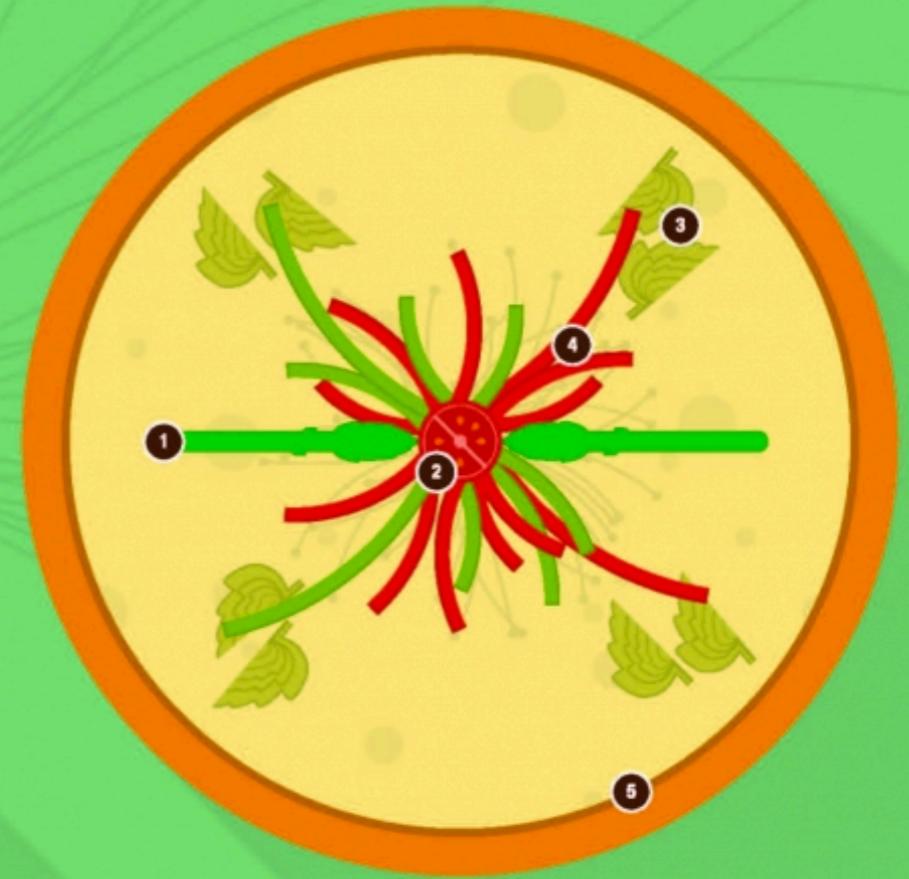
Olive  
Neutral particle



Cheese  
Detector

### What's happening on my Vegetarian pizza?

A two asparagus (proton-proton)<sup>1</sup> collision produces a juicy Higgs boson (cherry tomato)<sup>2</sup> decaying into four high-energy peppers (muon)<sup>3</sup> chambers and a lot of charged (red and green peppers)<sup>4</sup> particles that are detected in the pizza (detector)<sup>5</sup> entirely covered with mozzarella sensors.



Asparagus  
Proton



Cherry tomato  
Higgs boson



Artichoke  
Muon



Pepper  
Charged particles



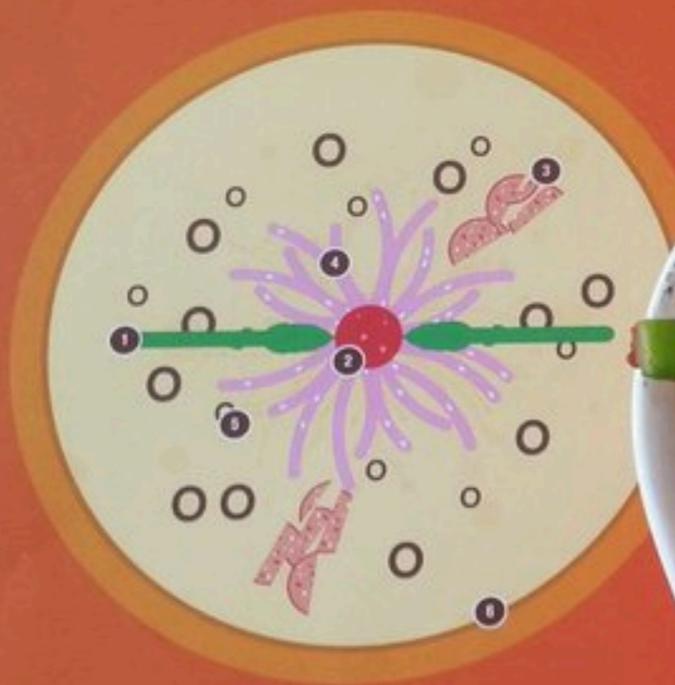
Cheese  
Detector

# Higgs Boson Pizza Day

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Asparagus  
Proton



Chorizo  
Higgs boson



Salami  
Photon



Ham  
Charged particle



Olive  
Neutral particle



Cheese  
Detector

Original recipe discovered in Nov...



# Forza ELETTRICA

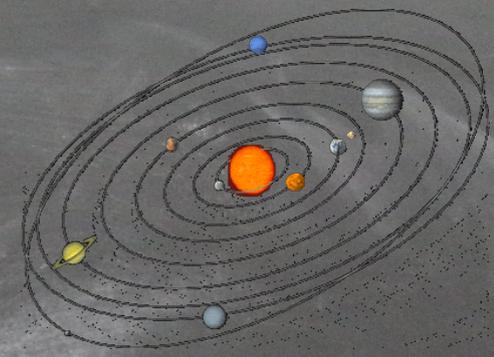
$$F_E = k \frac{q_1 q_2}{r^2}$$



# Forza GRAVITAZIONALE

$$F_g = G \frac{m_1 m_2}{r^2}$$





# Forza ELETTRICA

# Forza GRAVITAZIONALE

$$F_E = k \frac{q_1 q_2}{r^2}$$

$$F_g = G \frac{m_1 m_2}{r^2}$$



Sia attrattiva  
che repulsiva



Solo attrattiva



# Il Modello Standard delle Particelle

## ELEMENTARY PARTICLES OF THE STANDARD MODEL:

Handwritten mathematical notes and diagrams covering quantum mechanics and particle physics. The page is filled with complex equations, wave functions, and energy level diagrams.

**Key Equations and Concepts:**

- Schrodinger Equation:** 
$$-\frac{\hbar^2}{2m} \nabla^2 \Psi + U(x) \Psi = E \Psi$$
- Energy Levels:** 
$$E_n = \frac{n^2 \pi^2 \hbar^2}{2m l^2} \quad (n=1, 2, 3, \dots)$$
- Wave Functions:** 
$$\Psi(x) = A \sin kx, \quad k = n\pi/l$$
- Probability Density:** 
$$W = |\Psi|^2$$
- Energy Difference:** 
$$\Delta E_n = E_{n+1} - E_n = \frac{\pi^2 \hbar^2}{2m l^2} (2n+1) \approx \frac{\pi^2 \hbar^2}{m l^2} n$$
- Wave Number:** 
$$\beta = \sqrt{2m(U_\infty - E)}/\hbar, \quad D = |A_3|^2 / |A_1|^2$$
- Angular Momentum:** 
$$L = \hbar l$$
- Spin:** 
$$S = \hbar s$$
- Dirac Equation:** 
$$(\gamma^\mu \partial_\mu + m) \psi = 0$$
- Relativistic Energy:** 
$$E = \sqrt{p^2 c^2 + m^2 c^4}$$
- Compton Wavelength:** 
$$\lambda_C = \frac{h}{m c}$$
- De Broglie Wavelength:** 
$$\lambda = \frac{h}{p}$$
- Heisenberg Uncertainty Principle:** 
$$\Delta x \Delta p_x \geq \frac{\hbar}{2}$$

**Diagrams:**

- Energy Level Diagrams:** Two diagrams labeled (a) and (b) showing energy levels  $E_1, E_2, E_3$  and corresponding wave functions  $\psi_n(x)$  for a particle in a potential well.
- Probability Density Diagrams:** Two diagrams labeled (a) and (b) showing the probability density  $W = |\psi_n(x)|^2$  for the same potential well.
- Wave Function Diagrams:** Several plots showing wave functions  $\psi(x)$  and their probability densities  $W(x)$  for different states.

# Il Modello Standard delle Particelle

	I	FERMIONS II	III
QUARKS	 $u$ UP QUARK	 $c$ CHARM QUARK	 $t$ TOP QUARK
 $d$ DOWN QUARK	 $s$ STRANGE QUARK	 $b$ BOTTOM QUARK	
LEPTONS	 $\nu_e$ ELECTRON-NEUTRINO	 $\nu_\mu$ MUON-NEUTRINO	 $\nu_\tau$ TAU-NEUTRINO
 $e^-$ ELECTRON	 $\mu$ MUON	 $\tau$ TAU	

# Il Modello Standard delle Particelle



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# Il Modello Standard delle Particelle

**NUCLEONS**

**PROTON**  
We would not be here without her positivity.

**NEUTRON**  
He insists on remaining neutral.



**The PARTICLE ZOO** Sewing the fabric of spacetime

**ELEMENTARY PARTICLES of THE STANDARD MODEL:**

	I	II	III	
<b>QUARKS</b>	 $u$ UP QUARK	 $c$ CHARM QUARK	 $t$ TOP QUARK	
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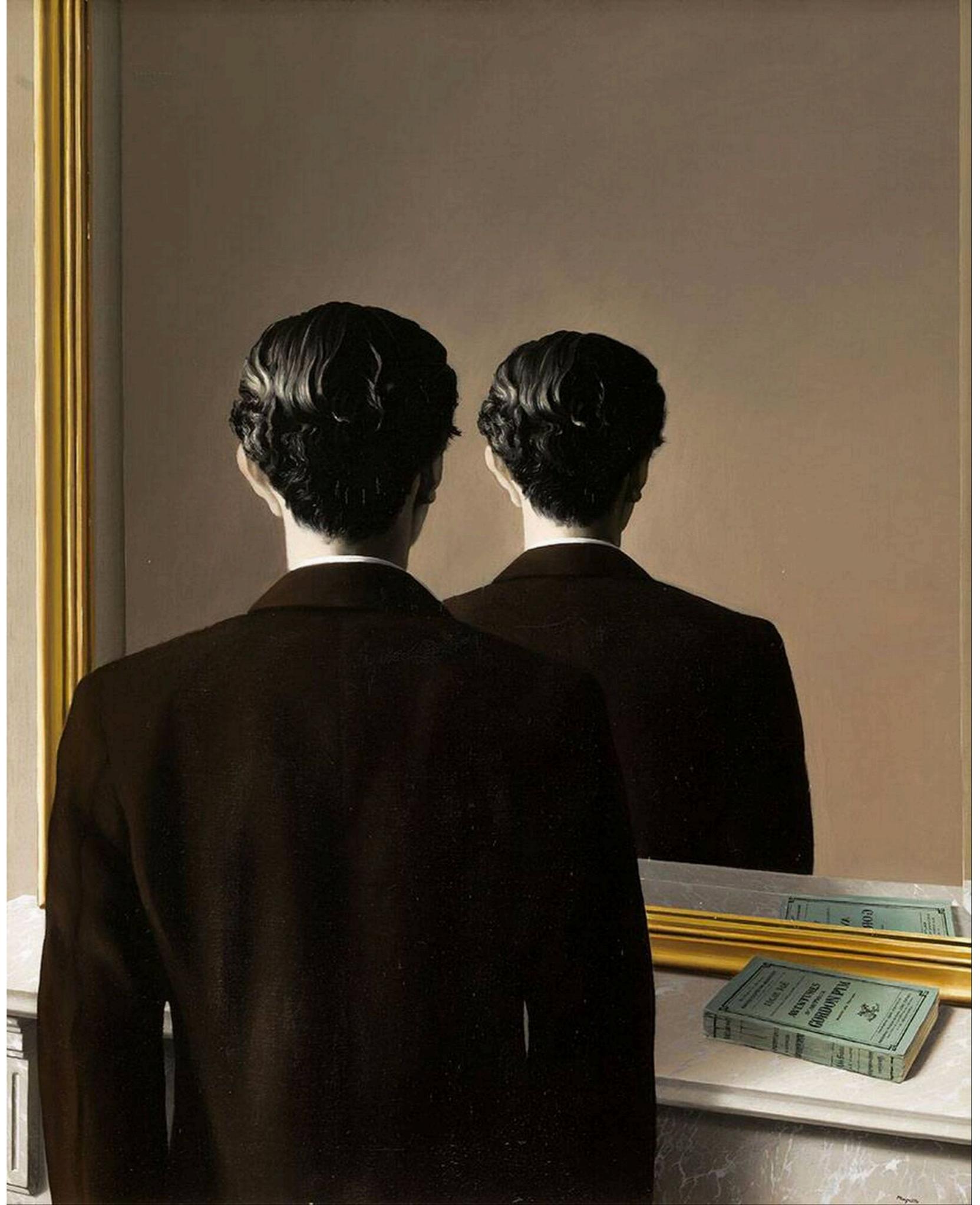


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**René Magritte**  
**La reproduction interdite**





La **simmetria** è l'insieme  
delle proprietà di un  
oggetto che rimangono  
**inalterate** al variare di  
qualcosa

*Emmy*

*Noether*



*1918*



Prof. Walter Lewin (MIT)





Prof. Walter Lewin (MIT)





Prof. Walter Lewin (MIT)





Prof. Walter Lewin (MIT)

Invarianza  
temporale delle  
leggi fisiche



Conservazione  
dell'energia

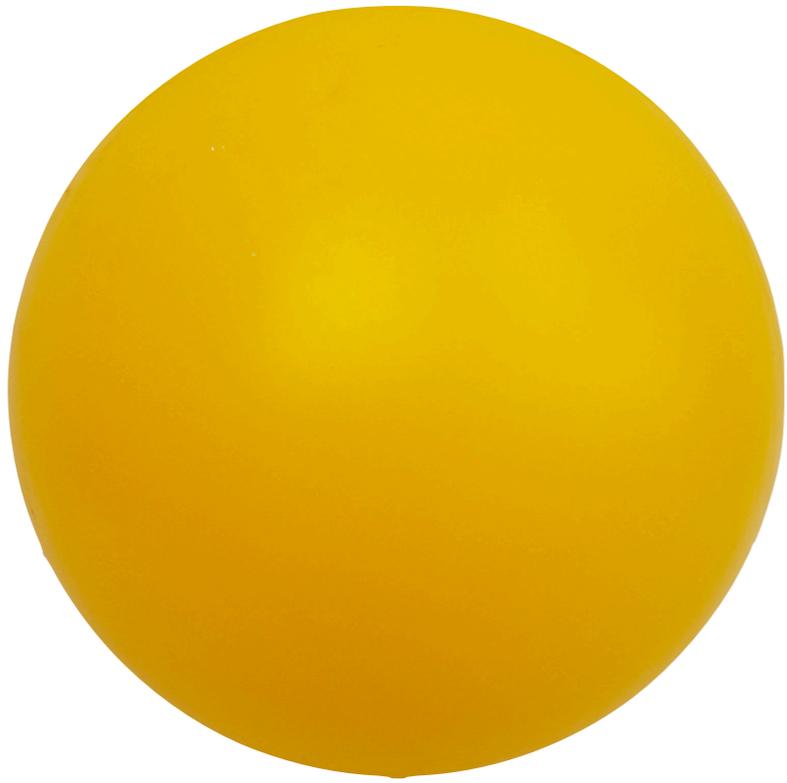


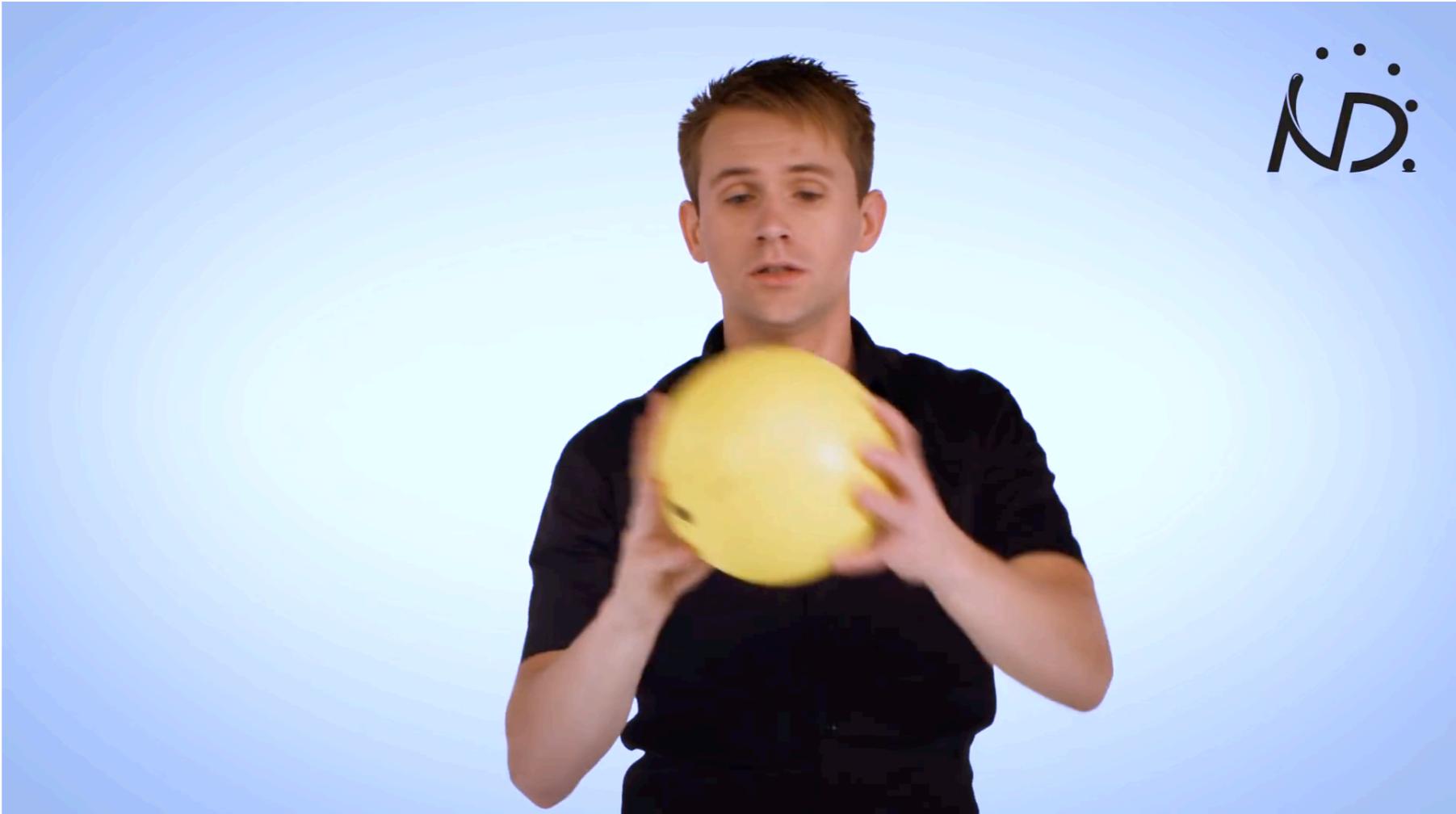


# Invarianza per traslazione

Conservazione della  
quantità di moto:  $mv$



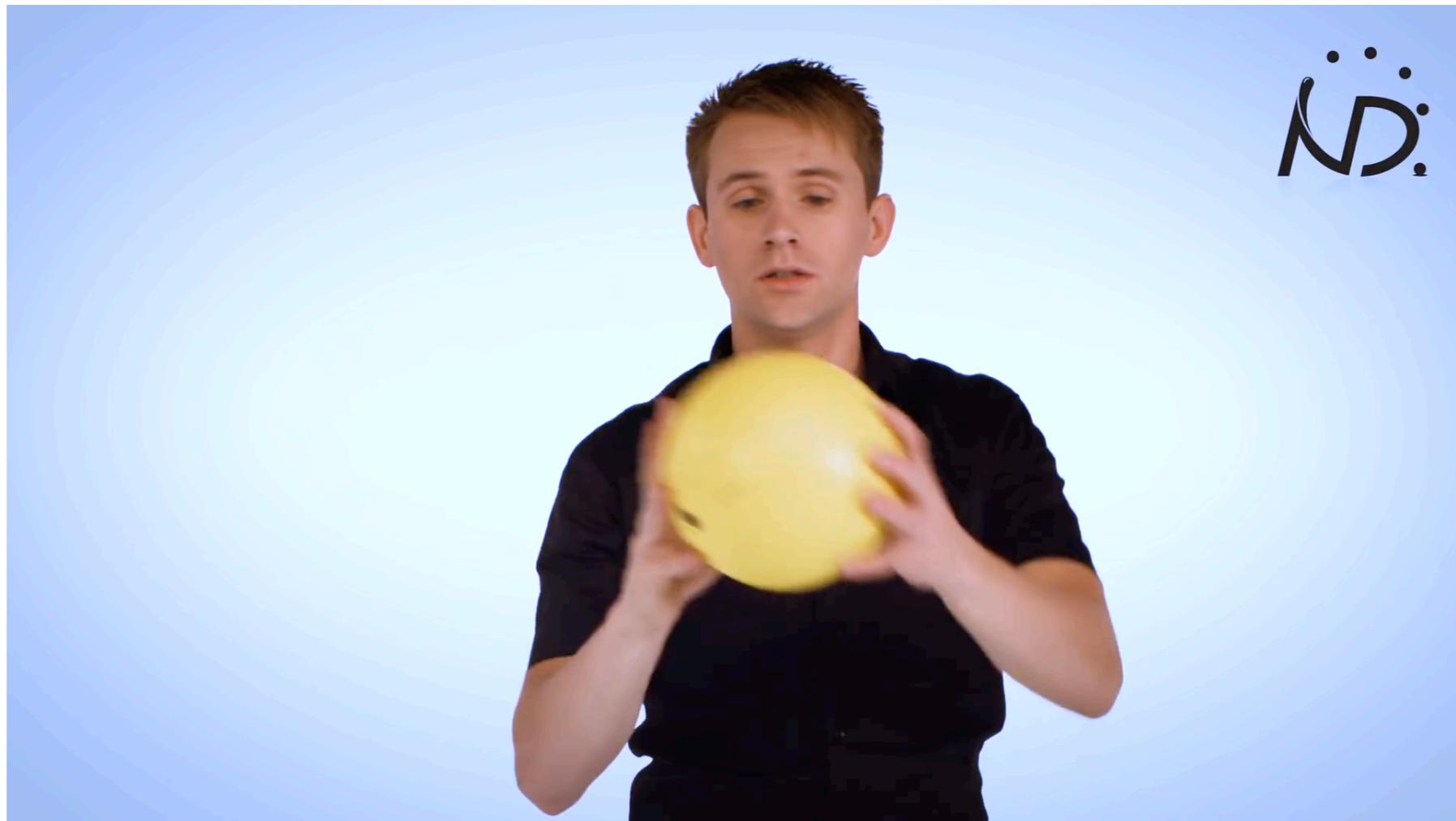




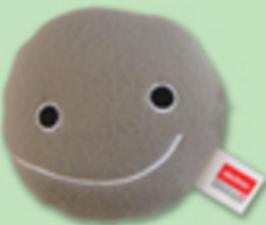
# Invarianza per rotazione

Conservazione del  
momento angolare:

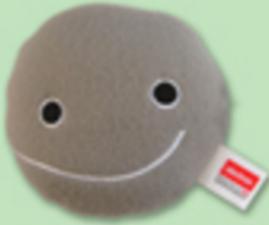
$$\vec{L} = \vec{r} \times m\vec{v}$$



# Una questione di principio (di conservazione): la scoperta dei neutrini

	I	II	III	
QUARKS	 $u$ UP QUARK	 $c$ CHARM QUARK	 $t$ TOP QUARK	
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FERMIONS

I

II

III

QUARKS



$u$   
UP QUARK



$c$   
CHARM QUARK



$t$   
TOP QUARK



$d$   
DOWN QUARK



$s$   
STRANGE QUARK



$b$   
BOTTOM QUARK

LEPTONS



$\nu_e$   
ELECTRON-NEUTRINO



$\nu_\mu$   
MUON-NEUTRINO



$\nu_\tau$   
TAU-NEUTRINO



$e^-$   
ELECTRON

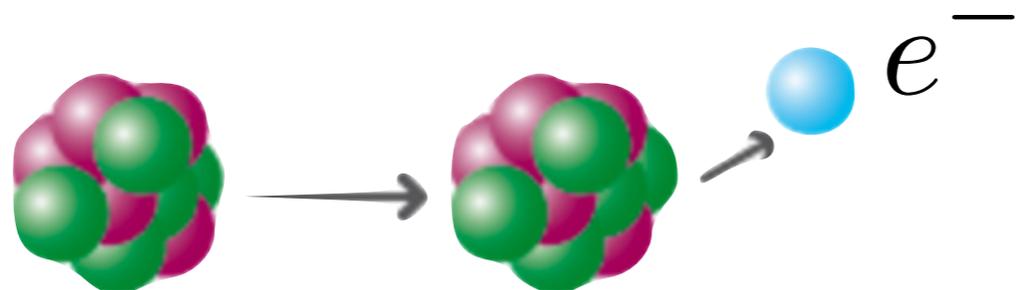


$\mu$   
MUON



$\tau$   
TAU

Una questione di principio  
(di conservazione):  
la scoperta dei neutrini



FERMIONS

I

II

III

QUARKS



$u$   
UP QUARK



$c$   
CHARM QUARK



$t$   
TOP QUARK



$d$   
DOWN QUARK



$s$   
STRANGE QUARK



$b$   
BOTTOM QUARK

LEPTONS



$\nu_e$   
ELECTRON-NEUTRINO



$\nu_\mu$   
MUON-NEUTRINO



$\nu_\tau$   
TAU-NEUTRINO



$e^-$   
ELECTRON

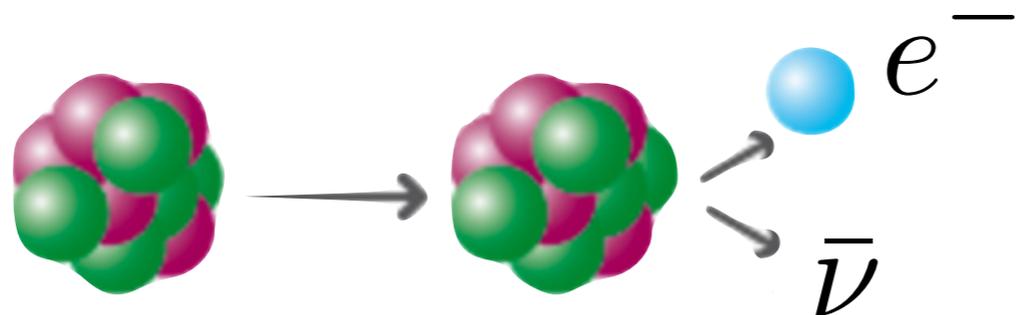


$\mu$   
MUON

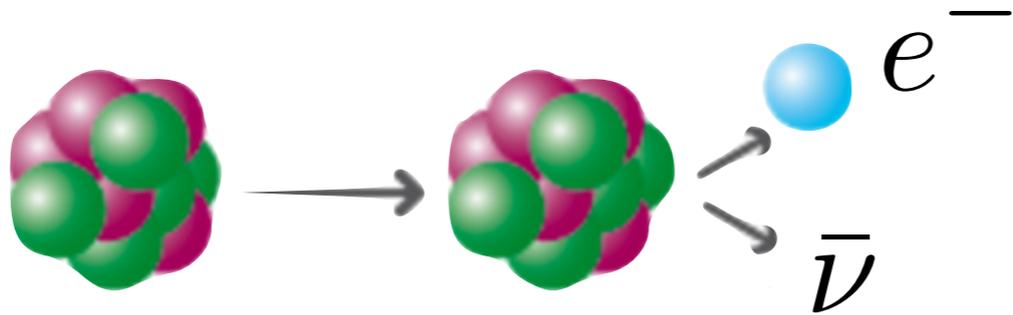


$\tau$   
TAU

Una questione di principio  
(di conservazione):  
la scoperta dei neutrini

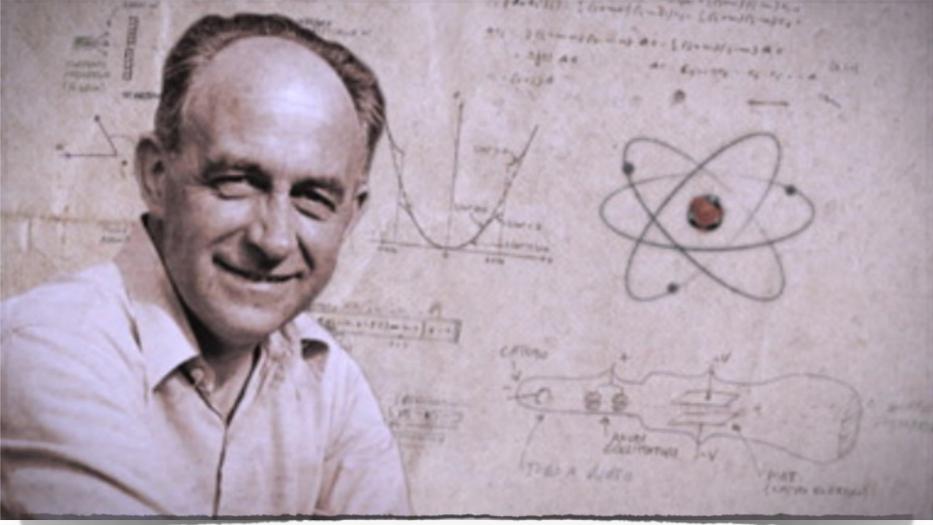
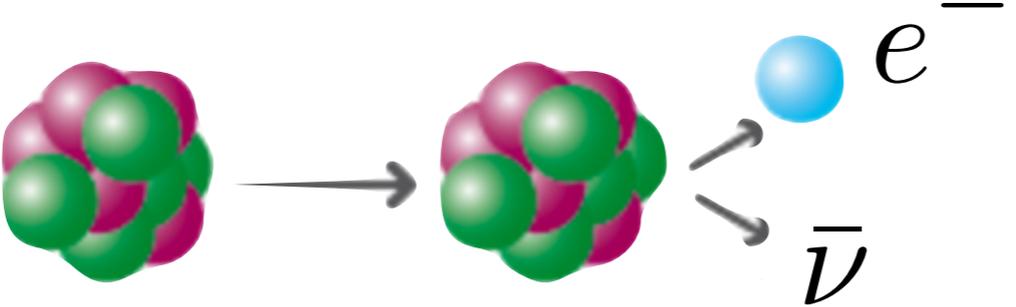


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	 $e^-$ ELECTRON	 $\mu$ MUON	 $\tau$ TAU

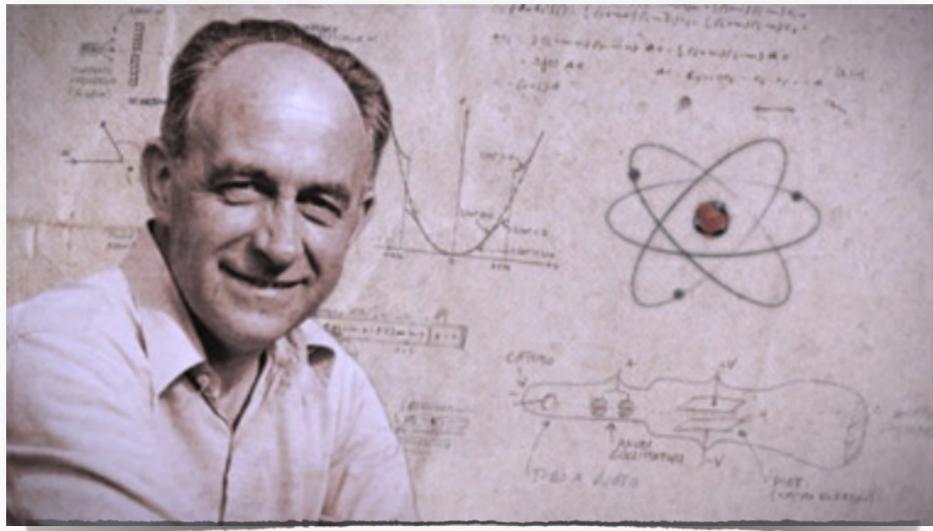
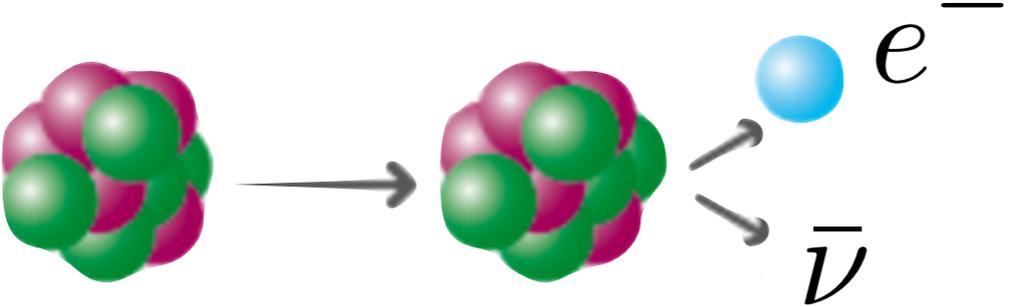
# Una questione di principio (di conservazione): la scoperta dei neutrini



ELEMENTARY PARTICLES of THE STANDARD MODEL:

	I	II	III
<b>QUARKS</b>	 $u$ UP QUARK	 $c$ CHARM QUARK	 $t$ TOP QUARK
	 $d$ DOWN QUARK	 $s$ STRANGE QUARK	 $b$ BOTTOM QUARK
<b>LEPTONS</b>	 $\nu_e$ ELECTRON-NEUTRINO	 $\nu_\mu$ MUON-NEUTRINO	 $\nu_\tau$ TAU-NEUTRINO
	 $e^-$ ELECTRON	 $\mu$ MUON	 $\tau$ TAU

# Una questione di principio (di conservazione): la scoperta dei neutrini



ELEMENTARY PARTICLES of THE STANDARD MODEL:

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	 $e^-$ ELECTRON	 $\mu$ MUON	 $\tau$ TAU

---

# Come fare il fisico?

---



# Come fare il fisico?

$$1+1=3$$

I conti non tornano?



# Come fare il fisico?

$$1+1=3$$

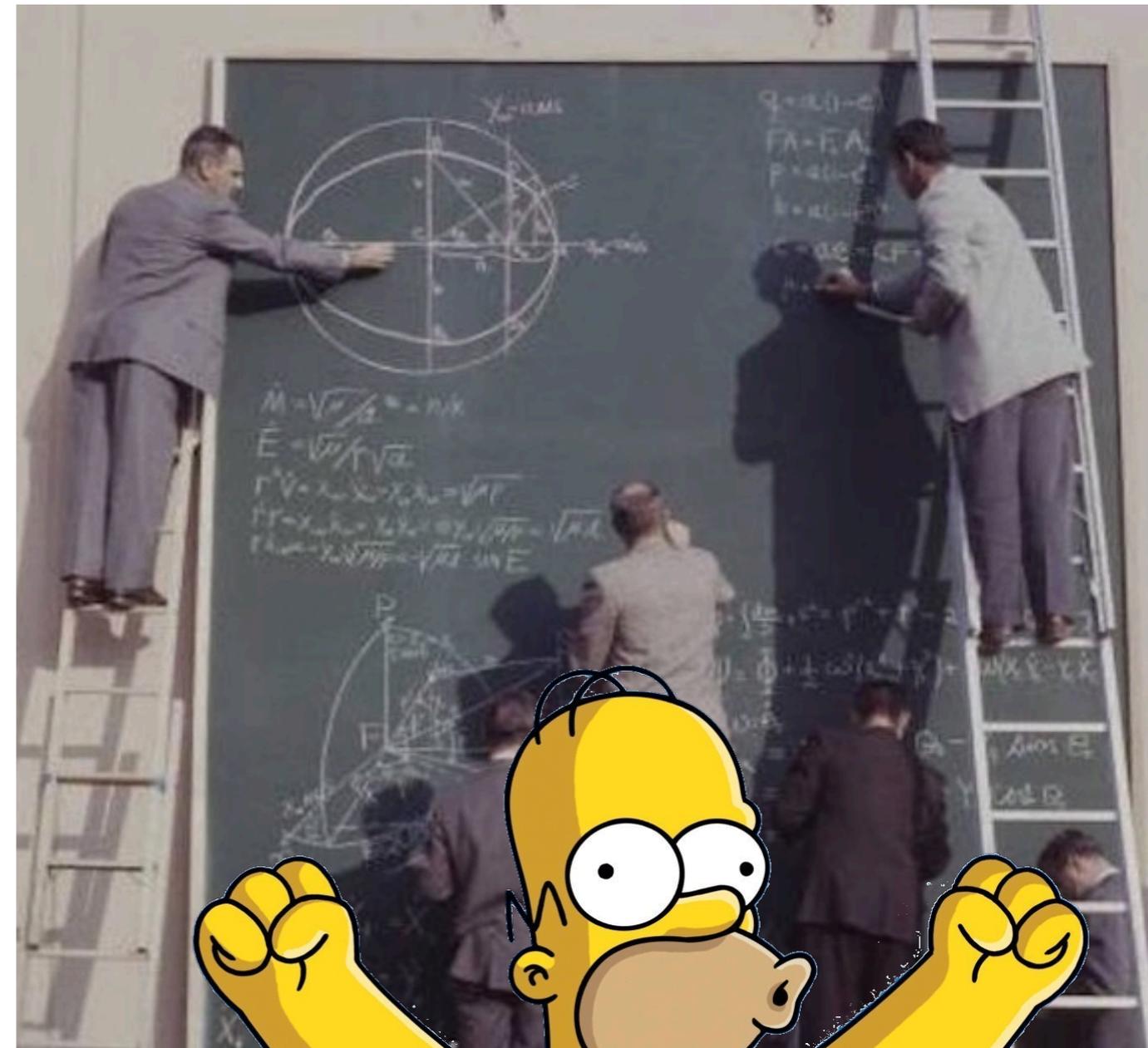
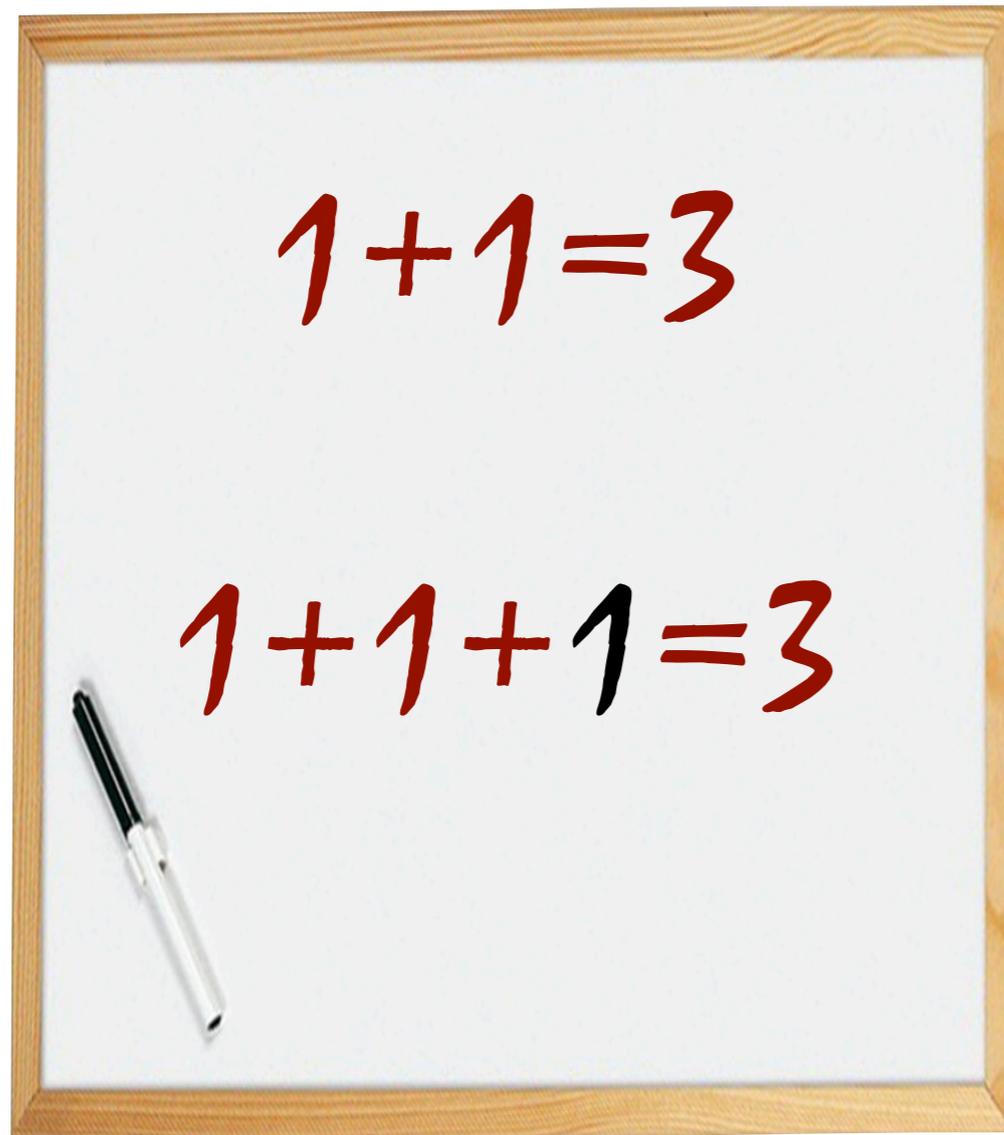
$$1+1+1=3$$

I conti non tornano?

Aggiungi un ipotetico  
numero invisibile



# Come fare il fisico?



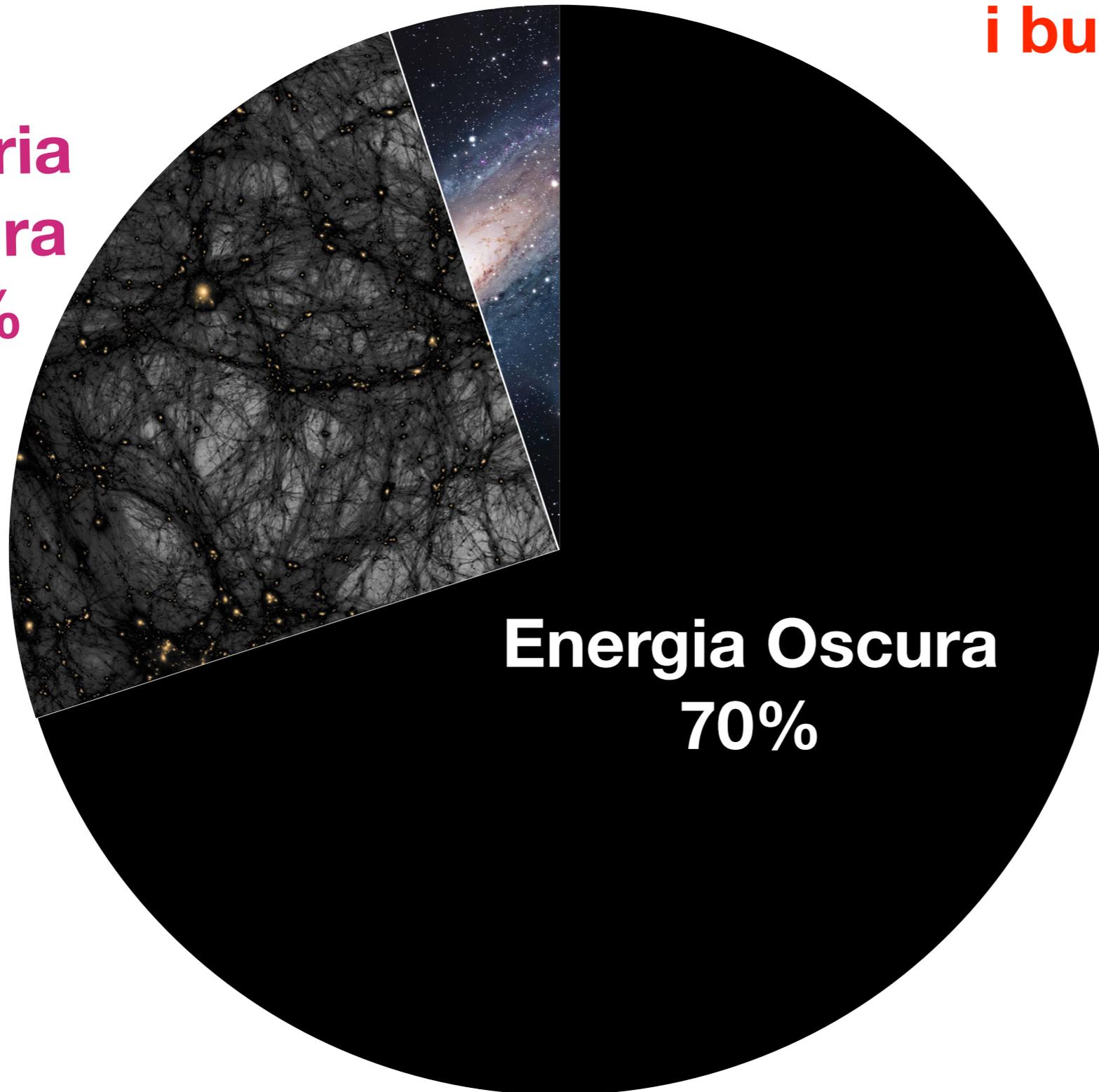
**Ora stai ragionando  
come un fisico!**



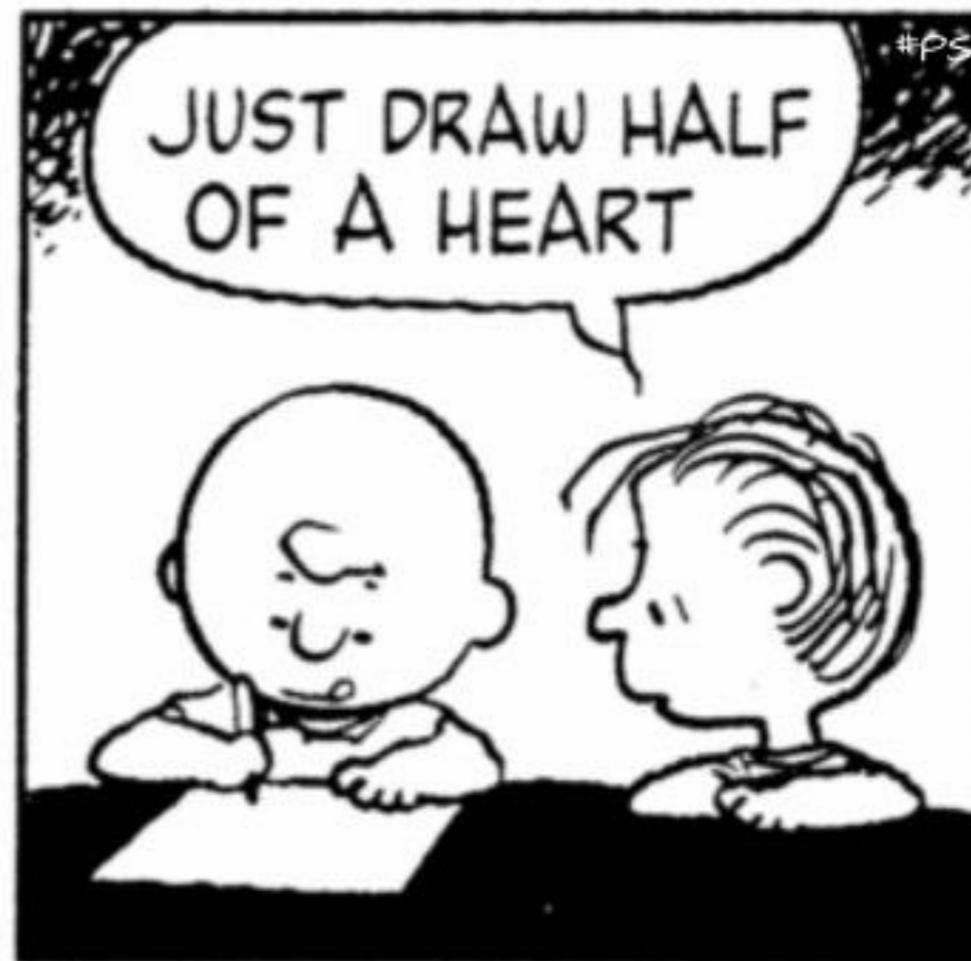


**Materia Ordinaria** **5%** → **La materia che conosciamo:**  
**tutti i pianeti, le comete,**  
**le stelle, le galassie,**  
**i buchi neri...**

**Materia  
Oscura  
25%**

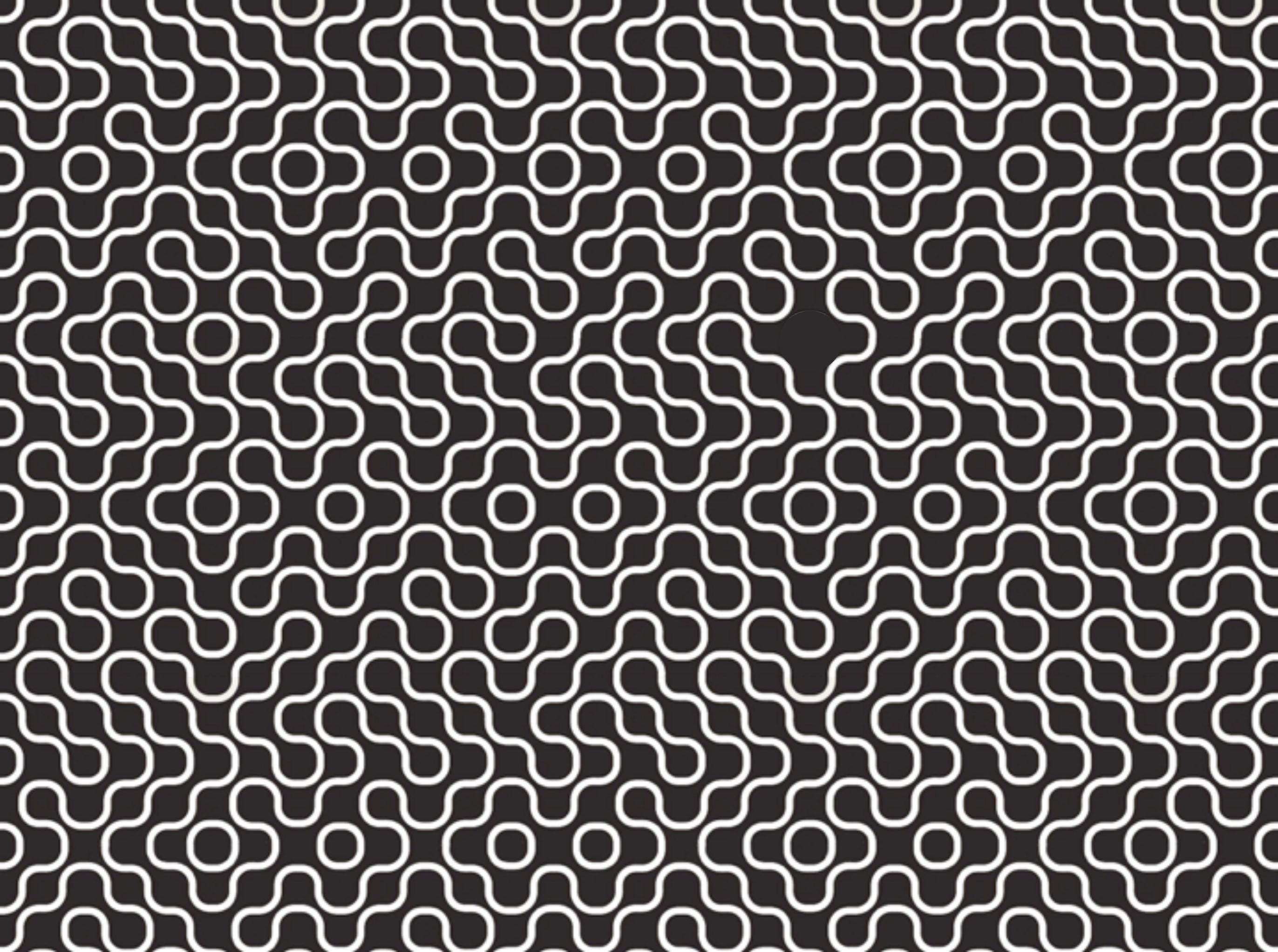


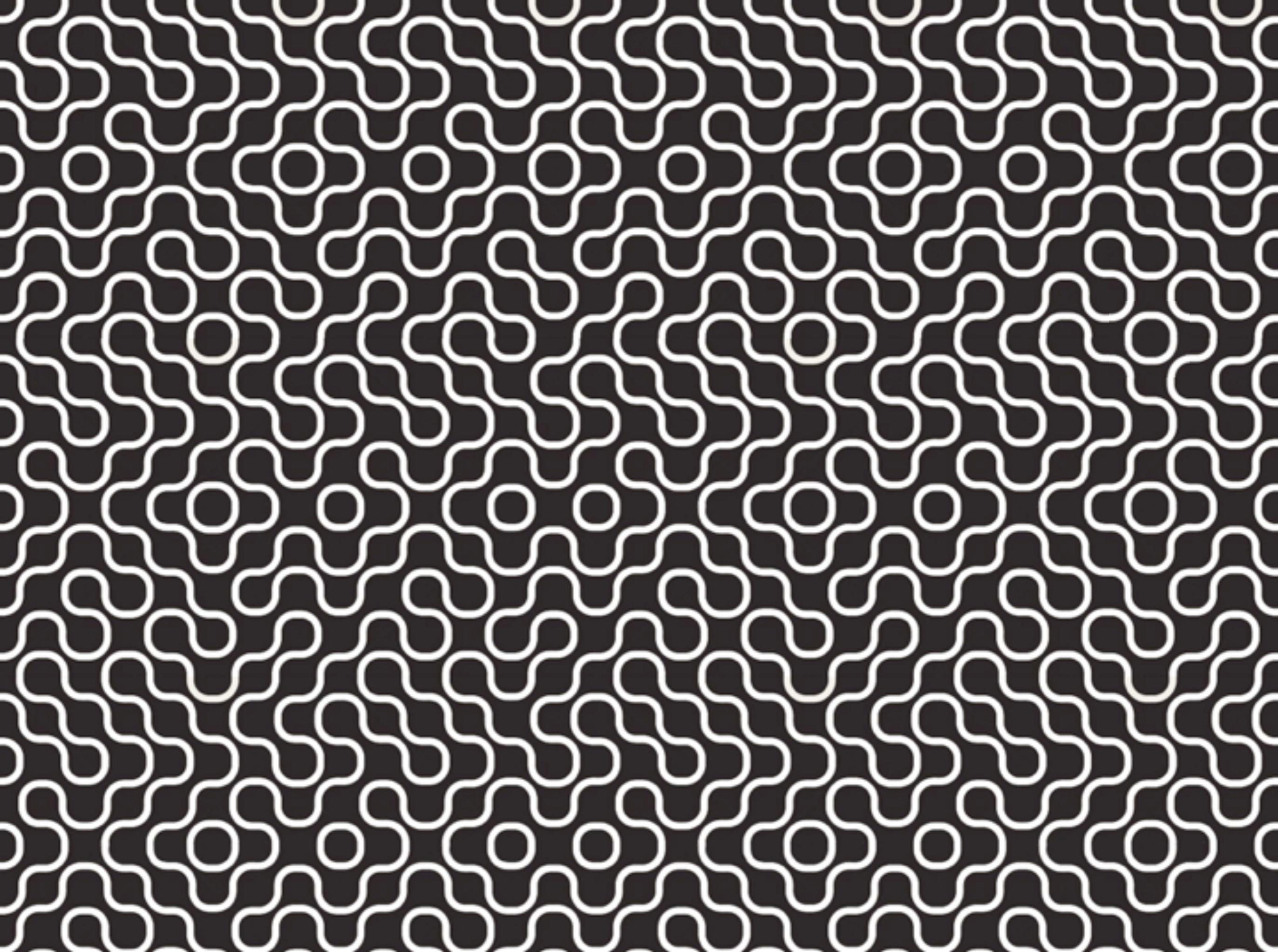
**Energia Oscura  
70%**



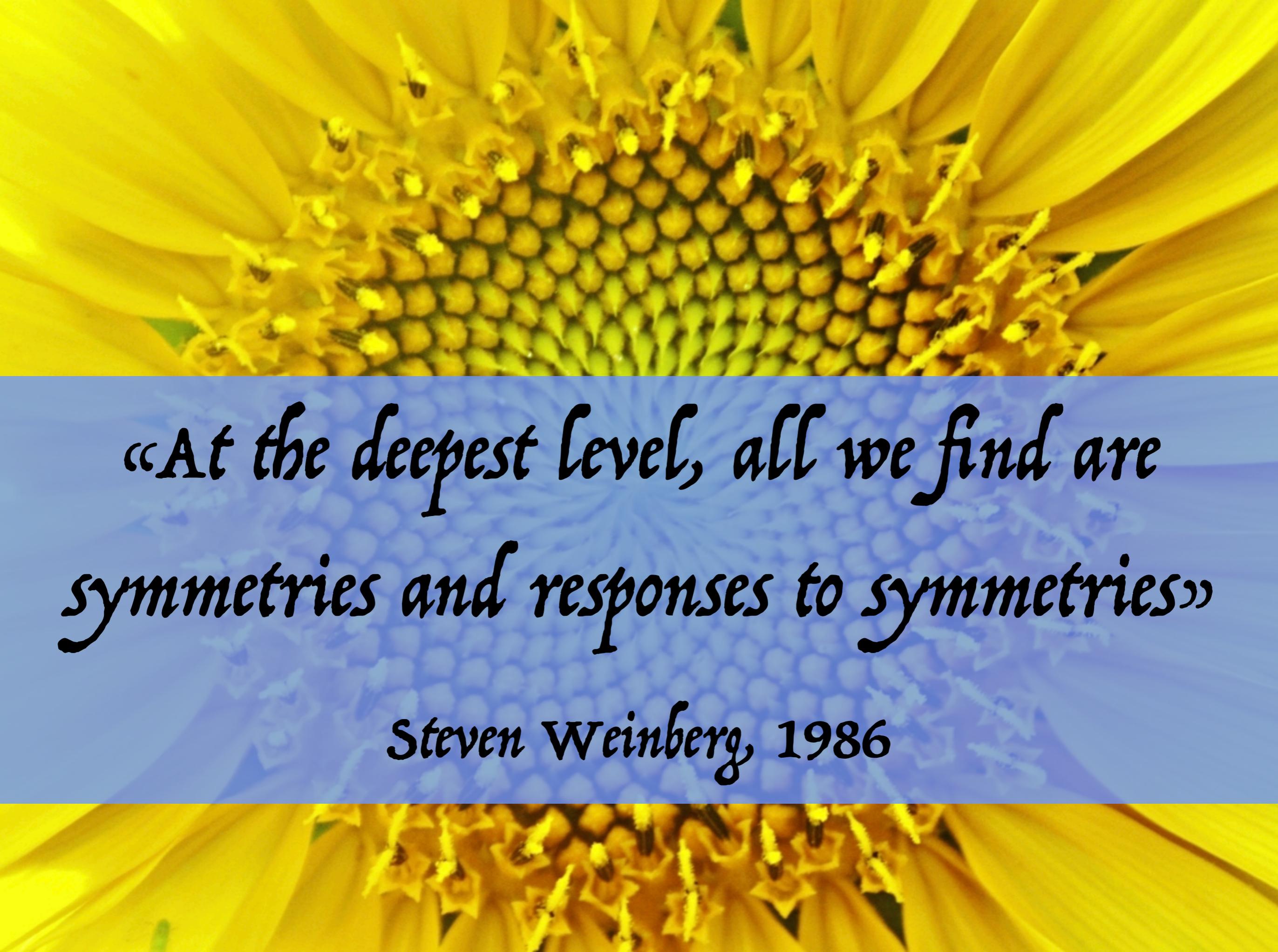
©PEANUTSSPECIALS





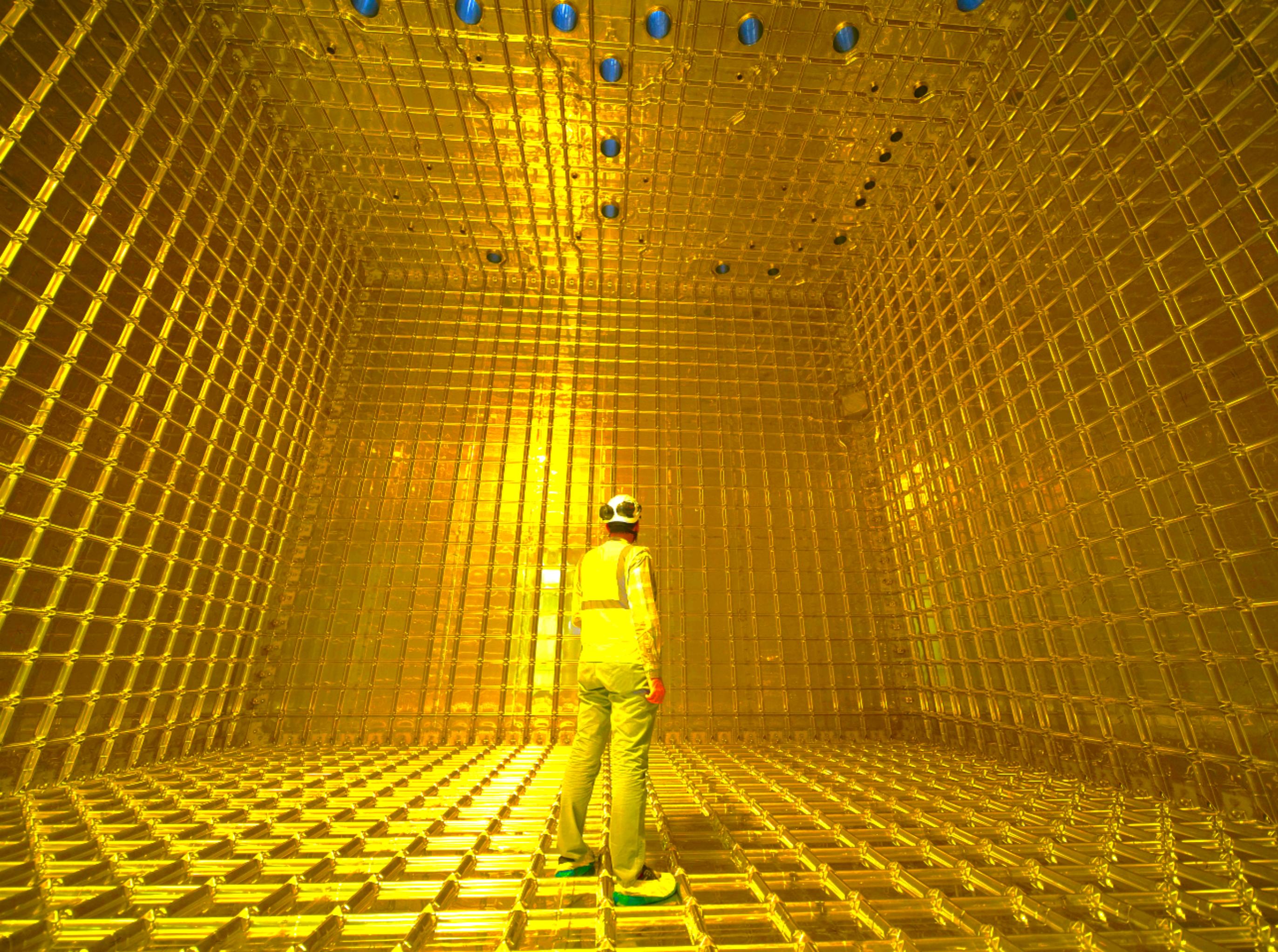






*«At the deepest level, all we find are symmetries and responses to symmetries»*

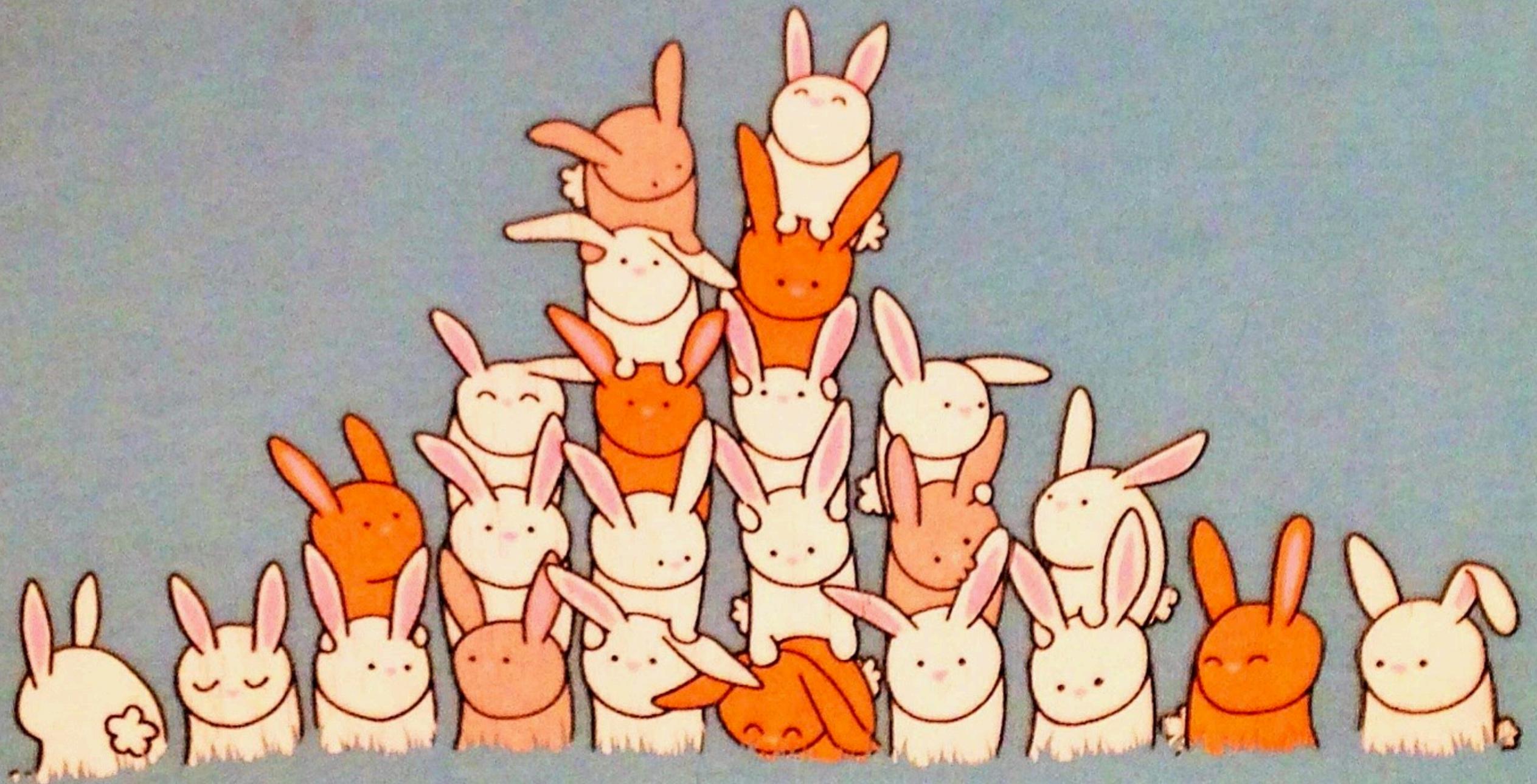
*Steven Weinberg, 1986*





# Sezione Aurea







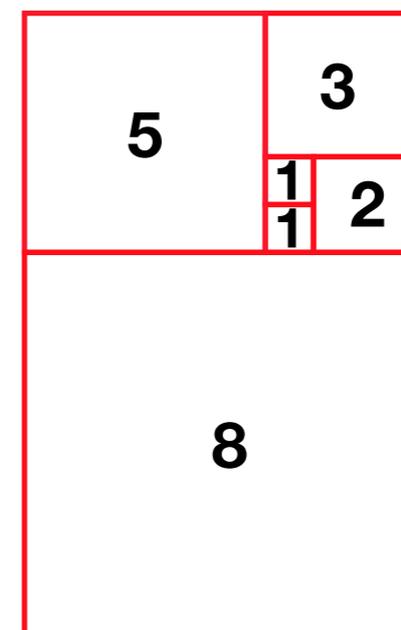
**1**

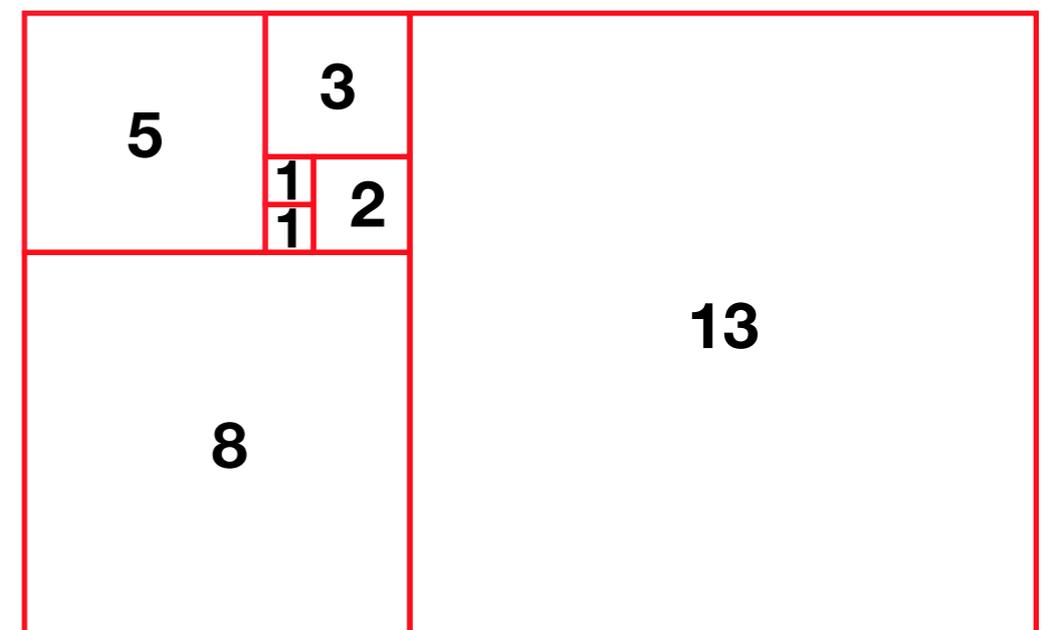
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1

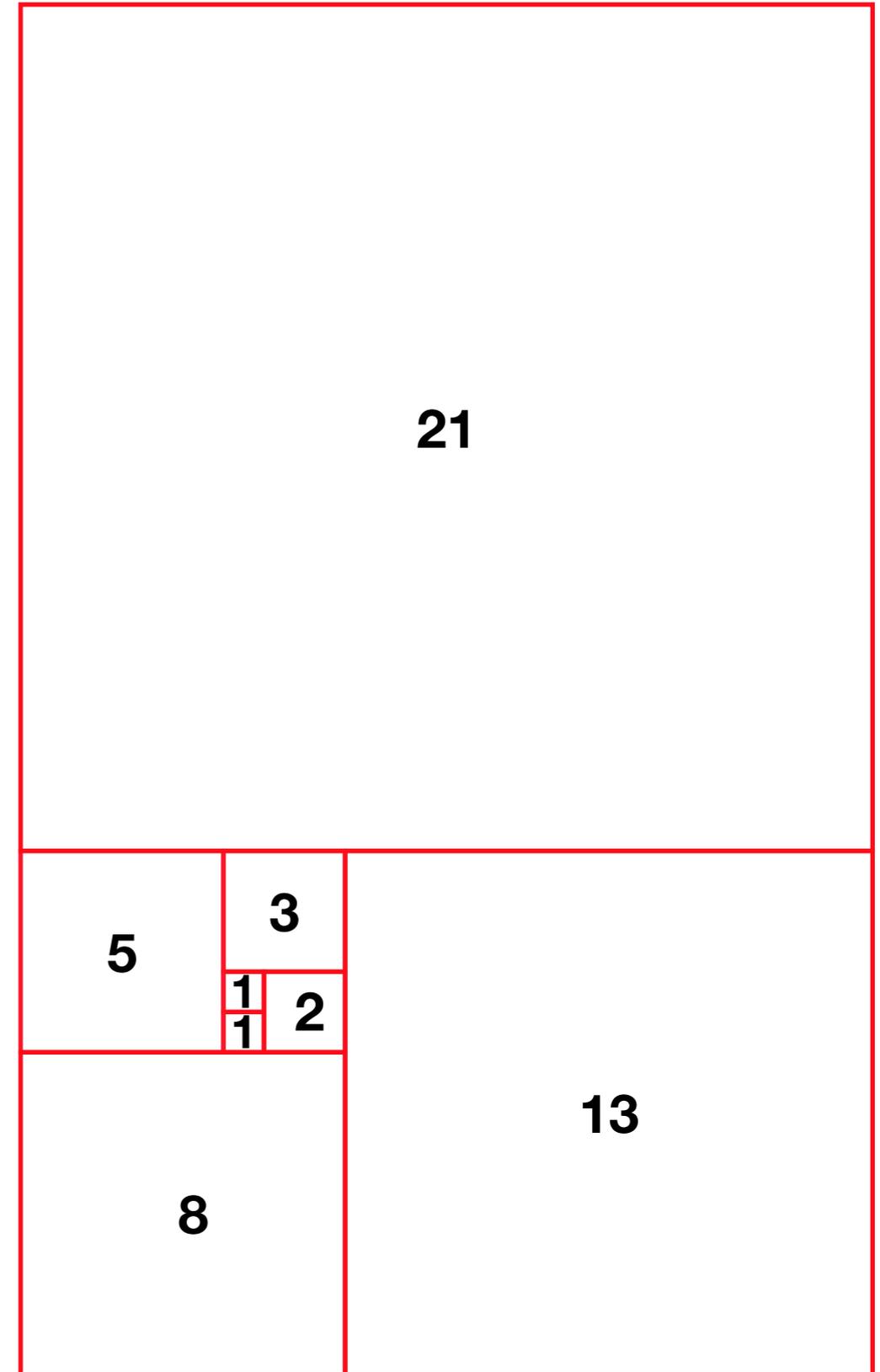
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1	

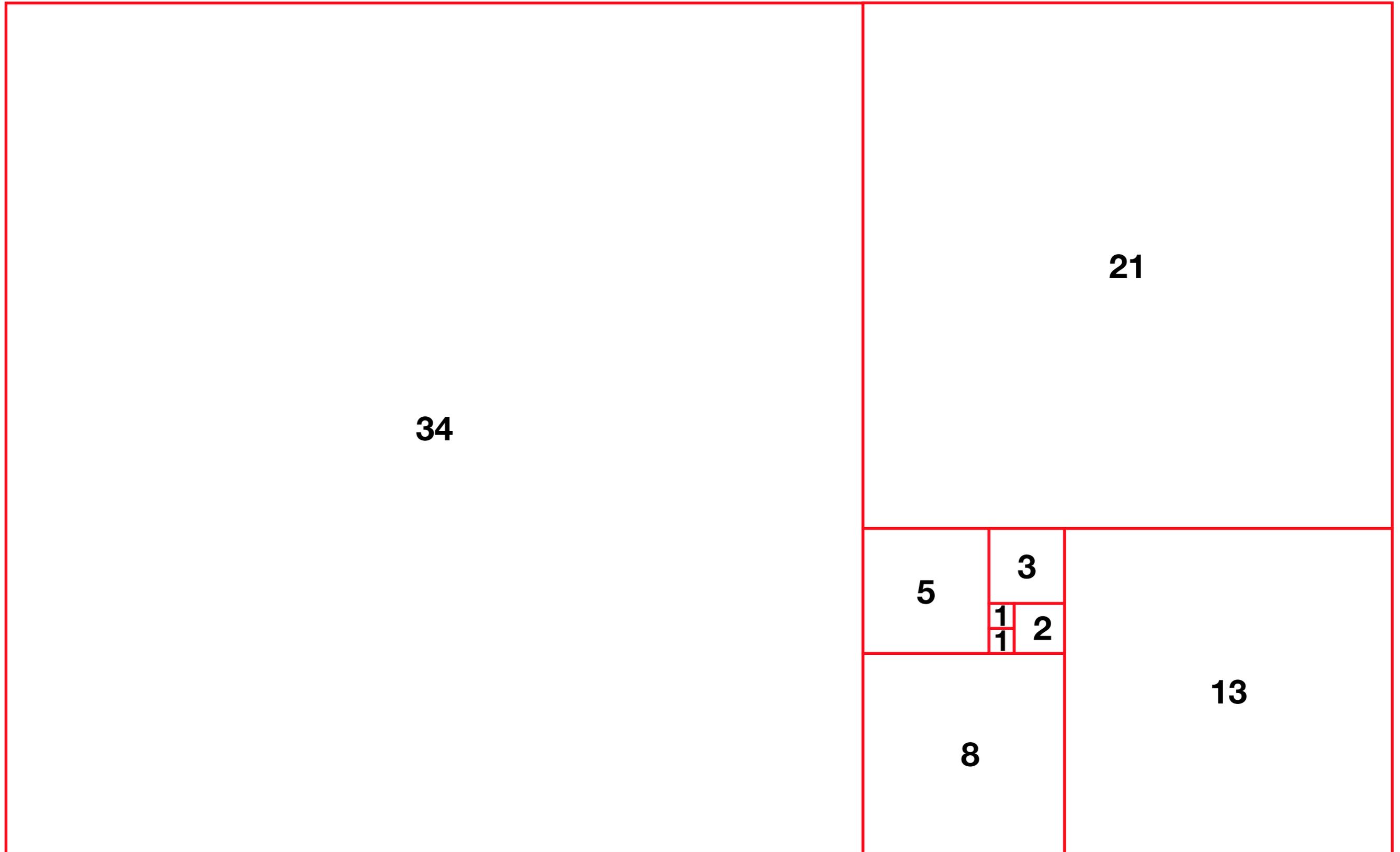
3	
1	2
1	

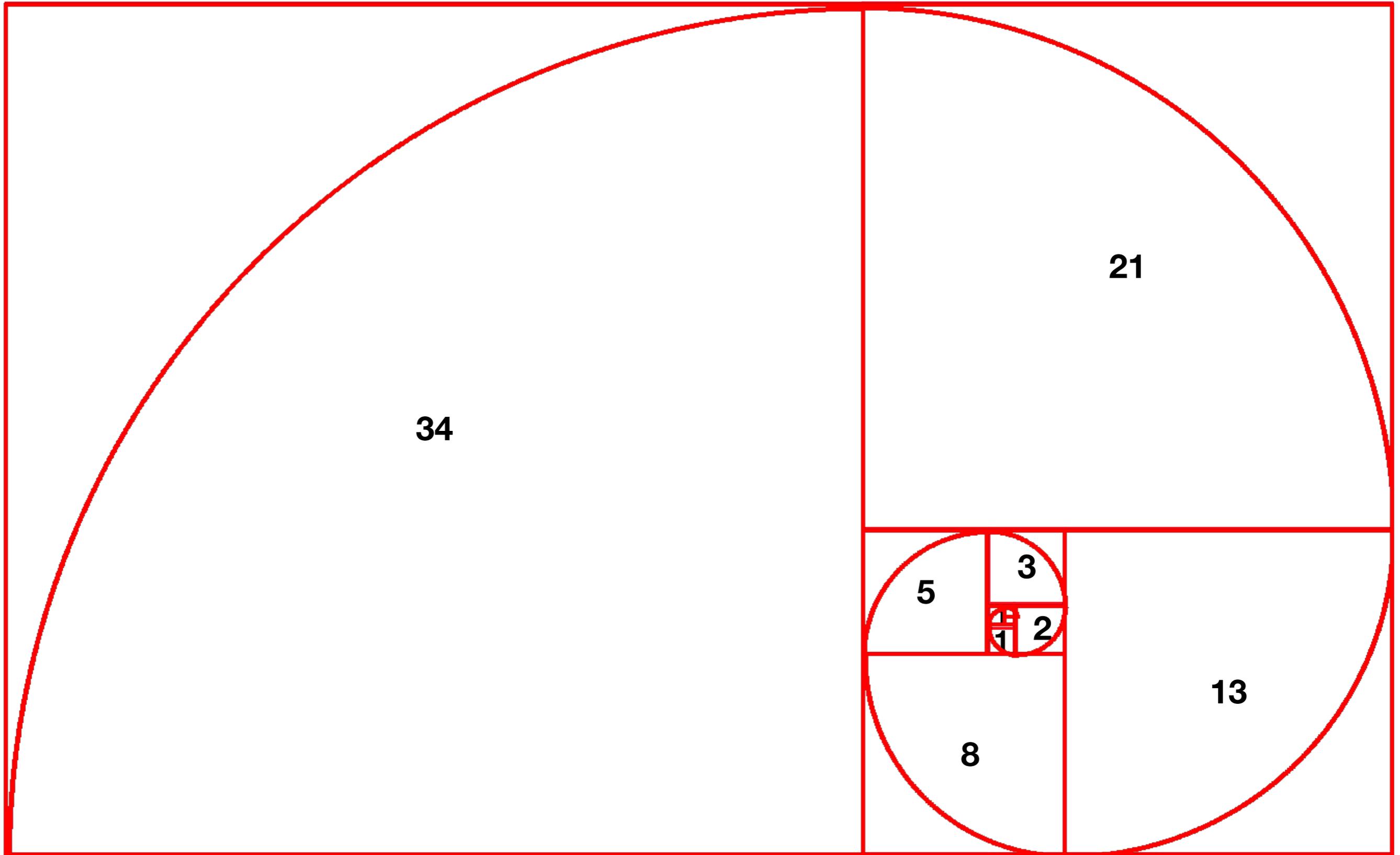
5	3
	1 2
	1

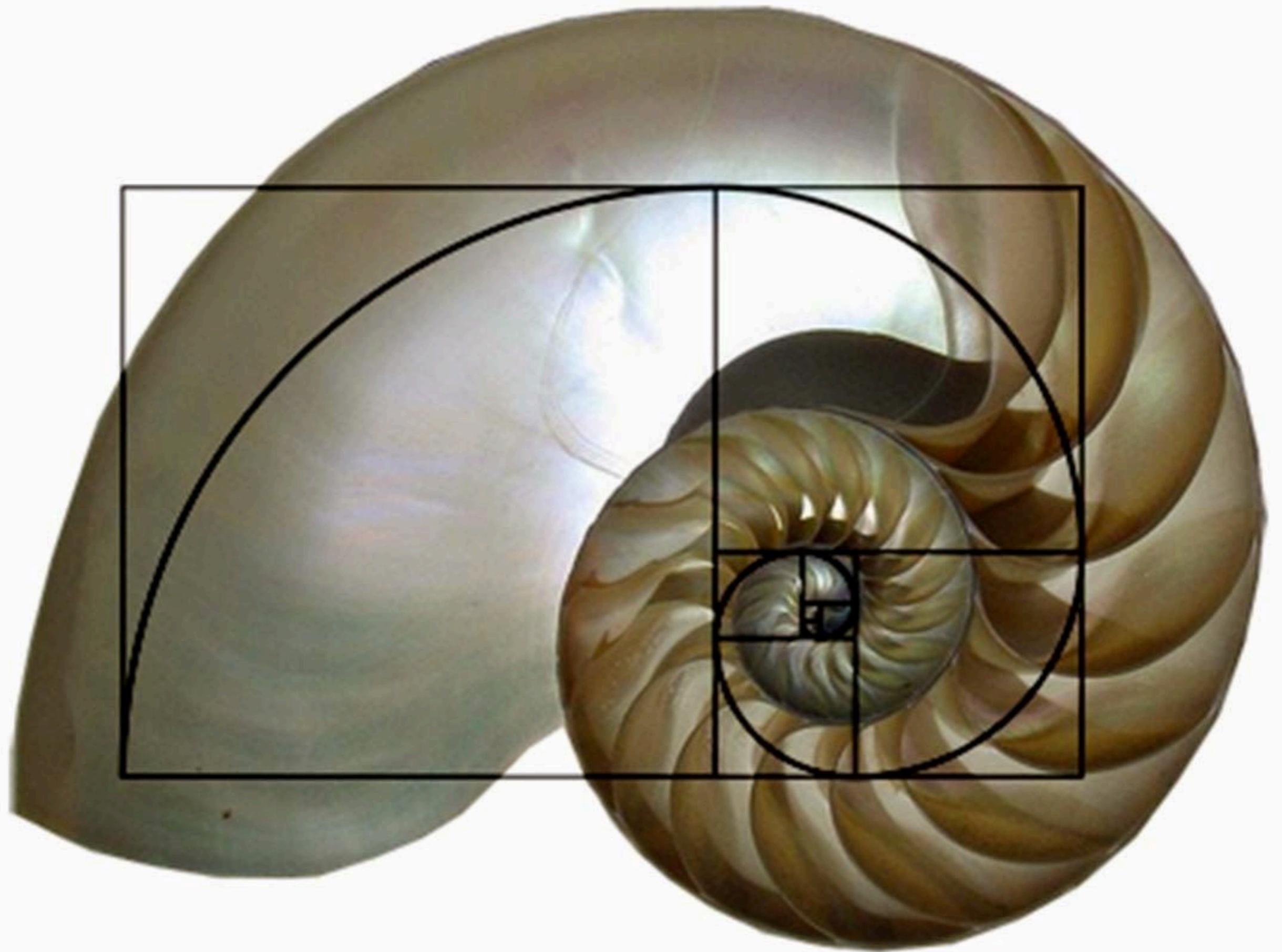








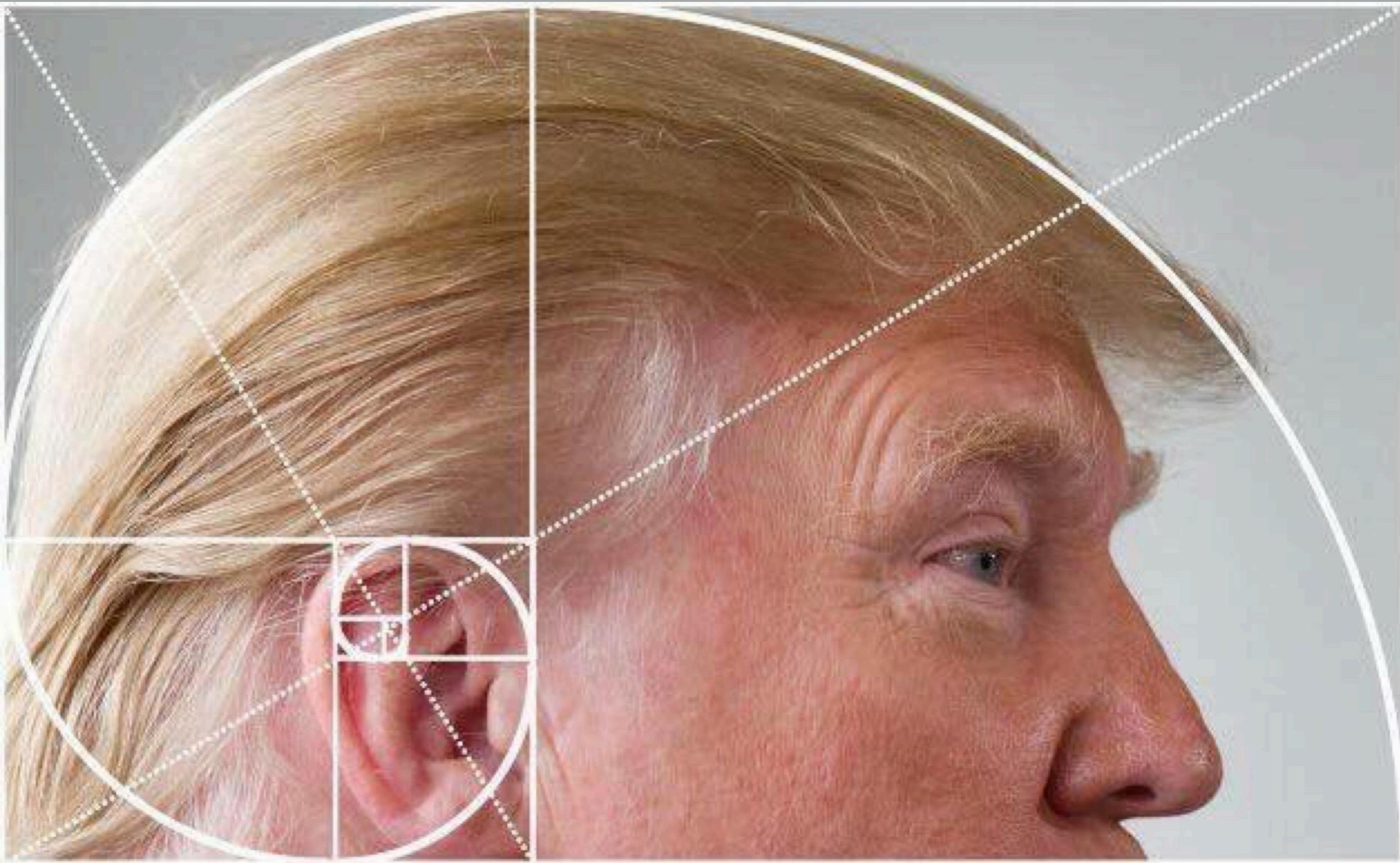


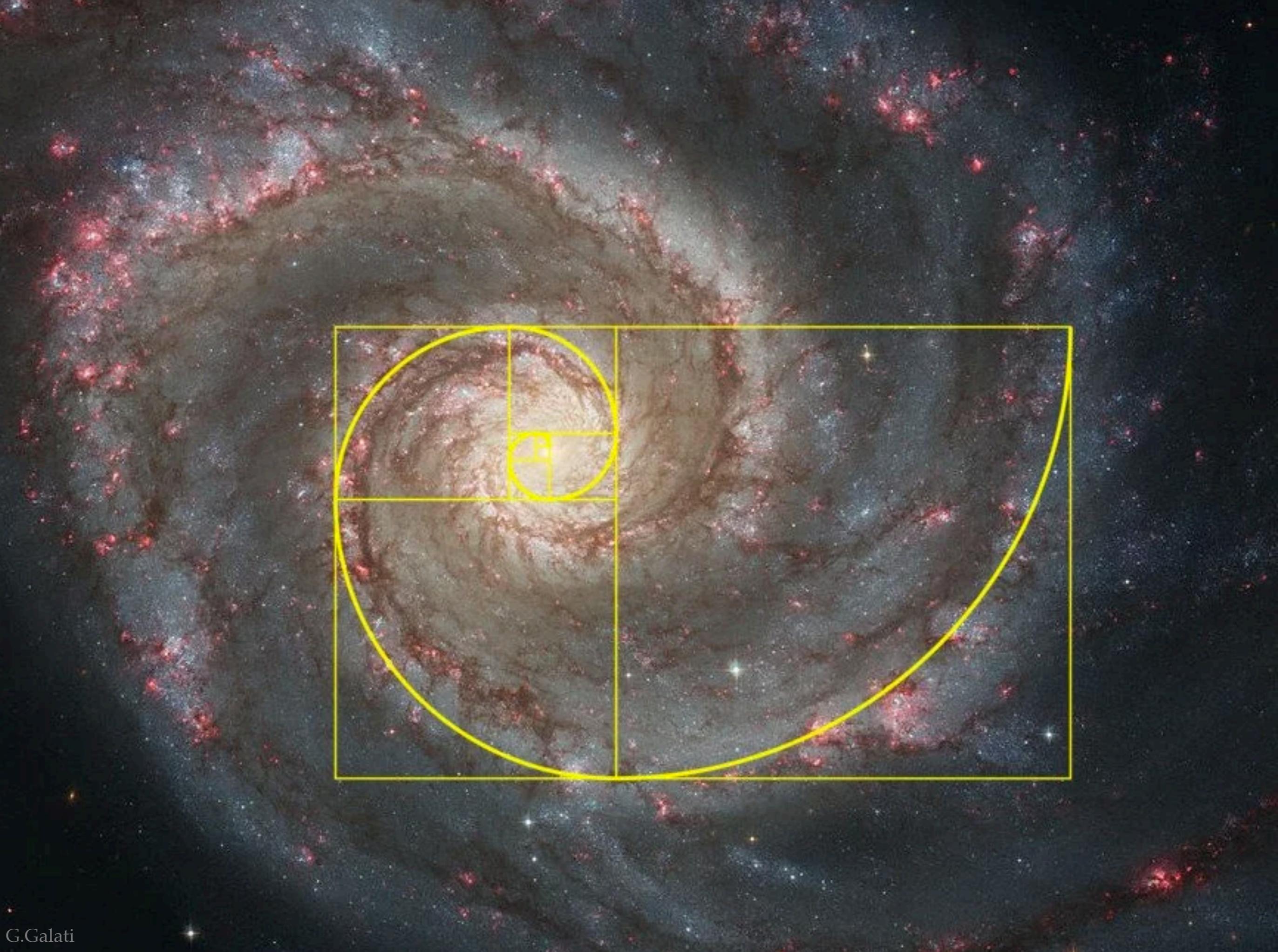




# Henri Cartier Bresson







富士三十六景

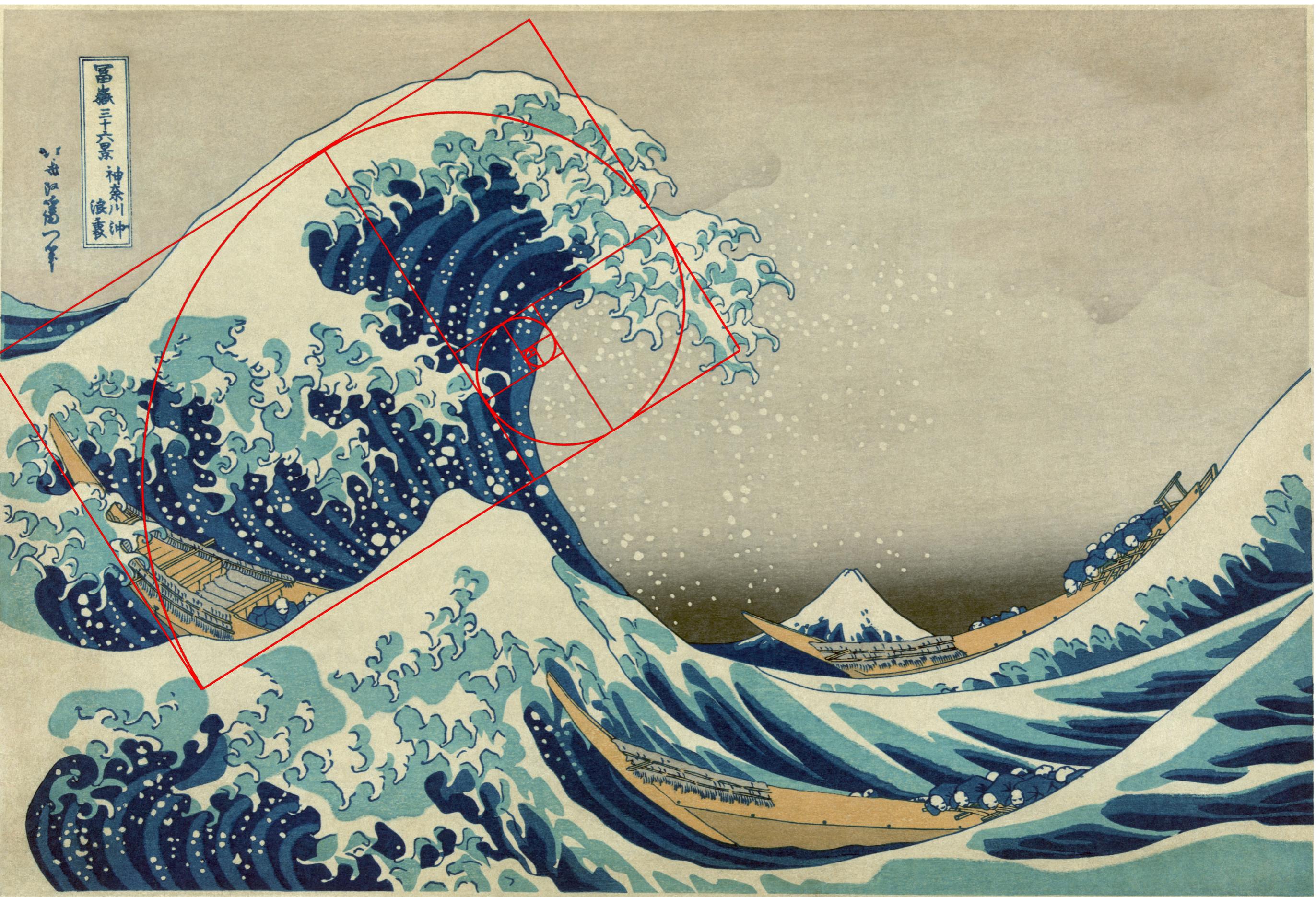
神奈川  
浪裏

葛飾画



富嶽三十六景 神奈川沖  
浪裏

葛飾画



La grande onda di Kanagawa (神奈川沖浪裏), Hokusai, 1830-1831

