Matematikens mysterier
- från svarta hål till artificiell intelligens -

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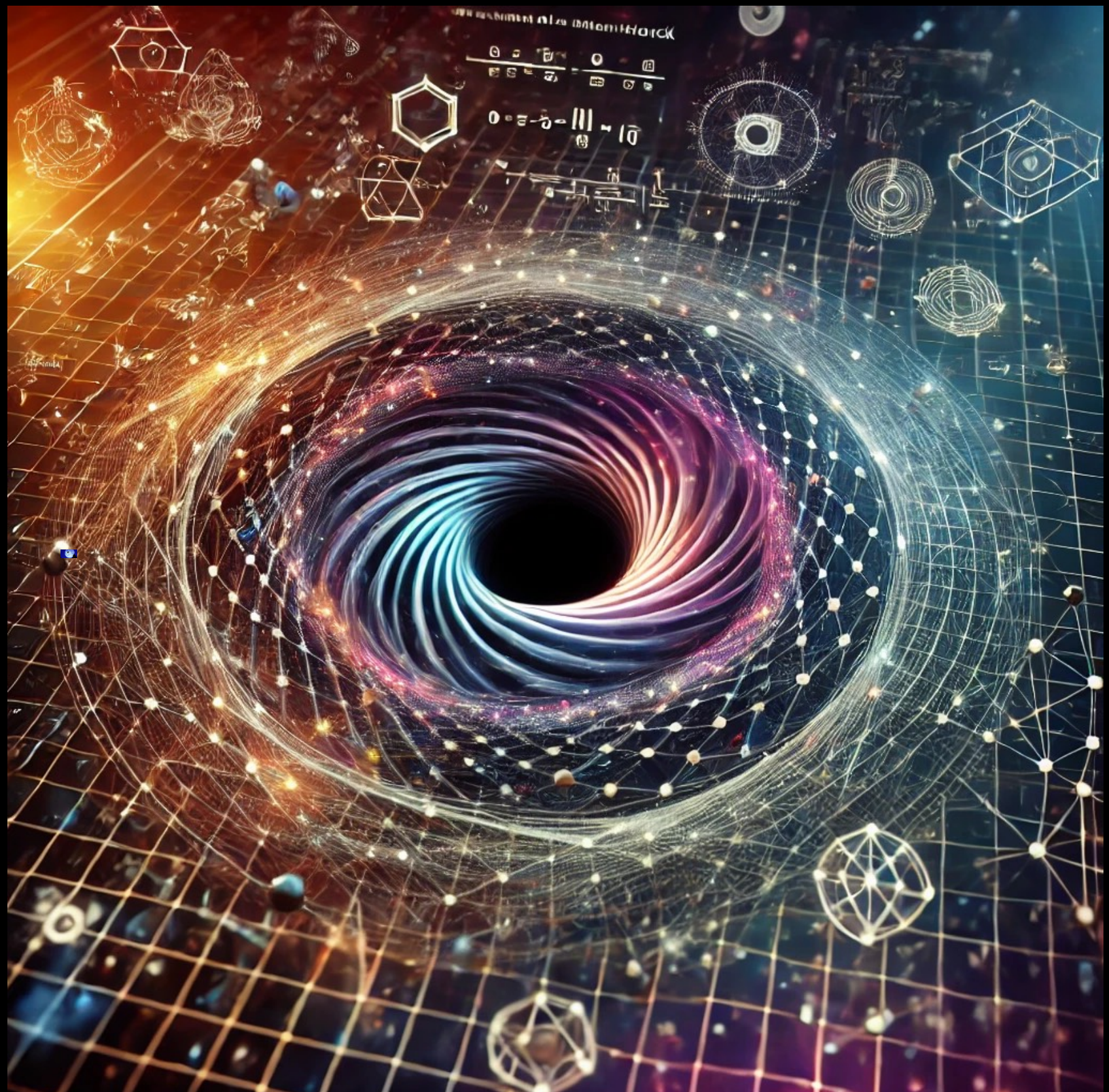
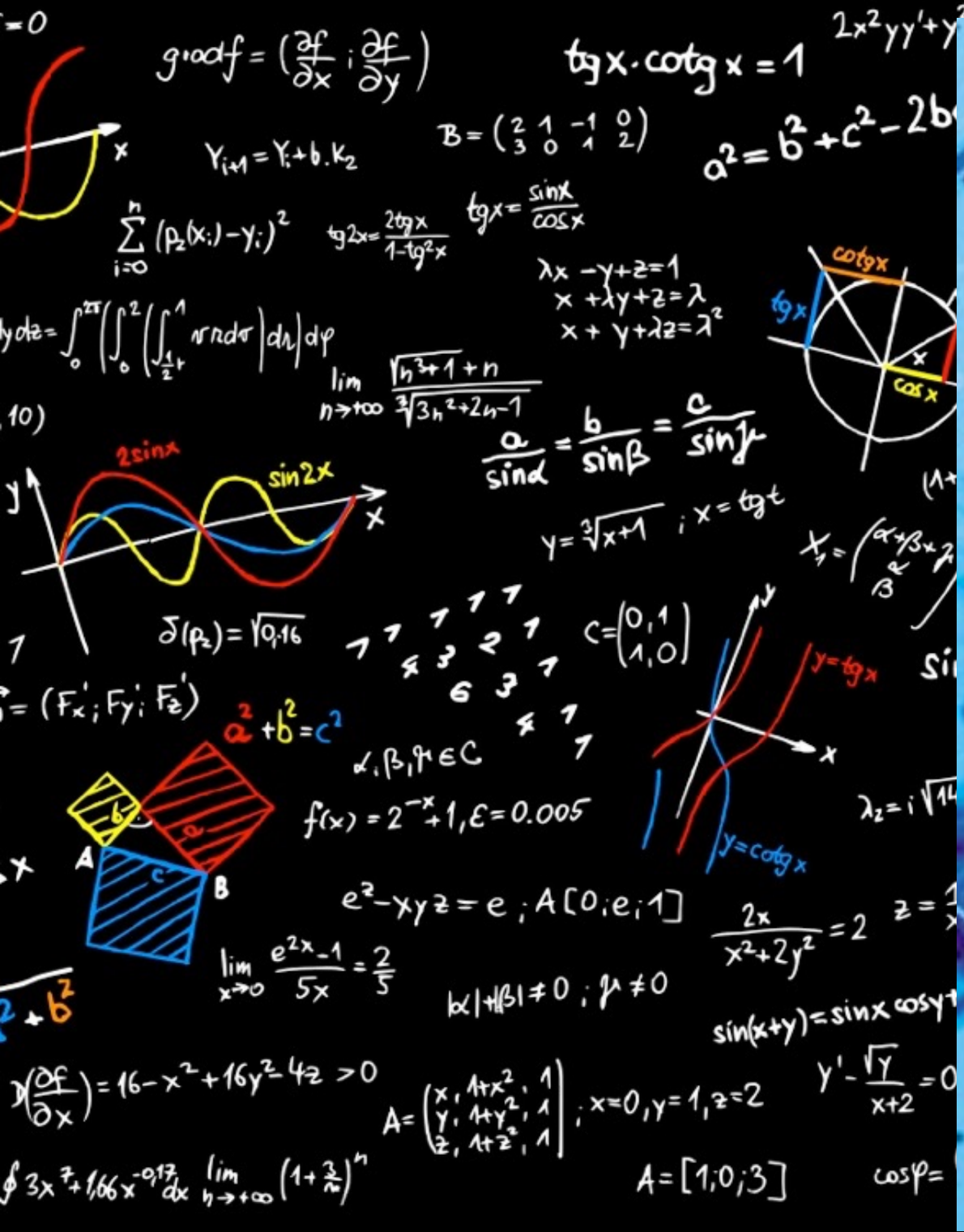
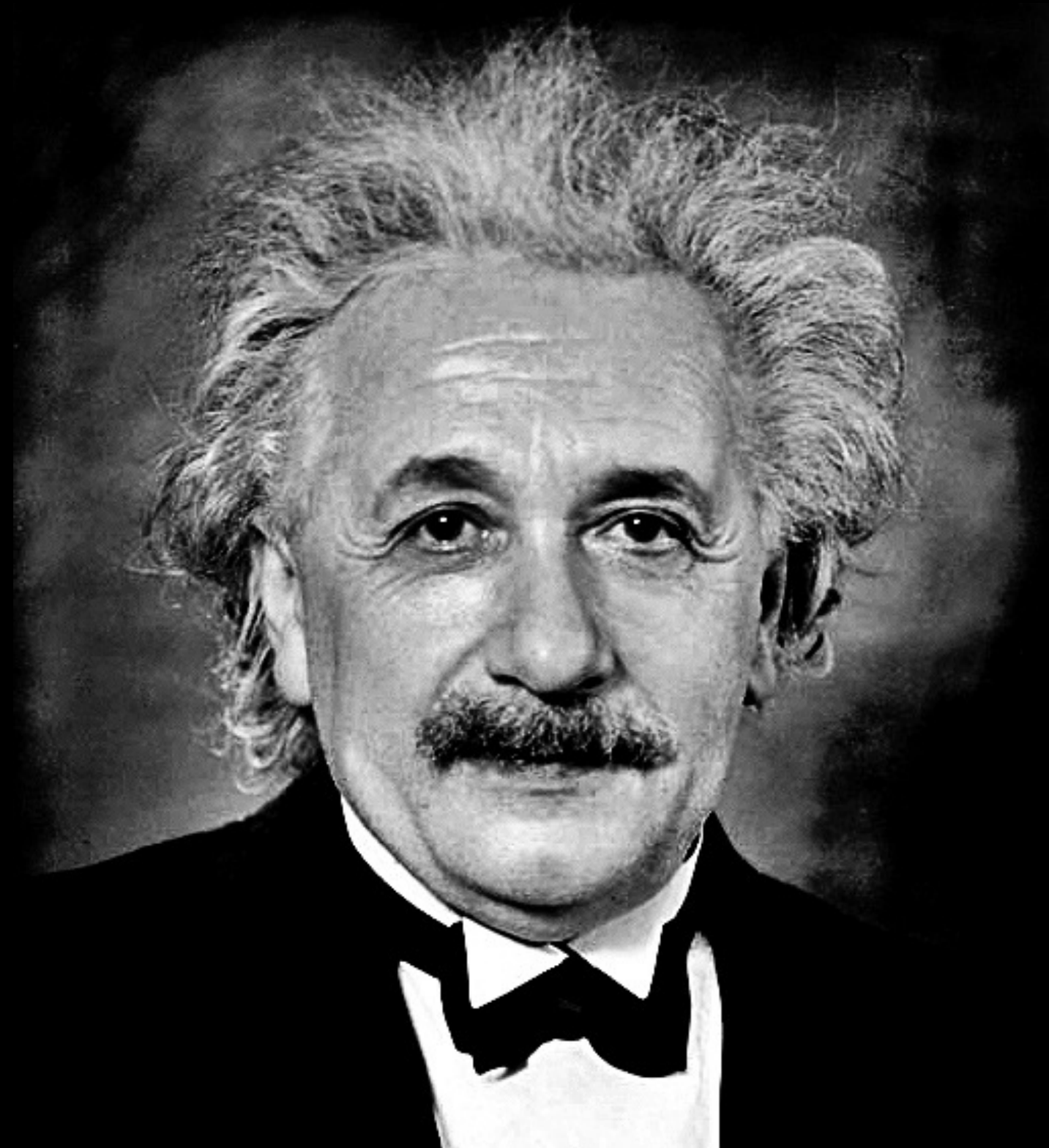
Tisdag 28 okt
2025




grad f = (∂f/∂x ; ∂f/∂y)
tgx · cotgx = 1
B = (2 1 -1 0 / 3 0 1 2)
a² = b² + c² - 2b
Y_{i+1} = Y_i + b.K_2
tgx = sinx/cosx
tg2x = 2tgx/(1-tg²x)
λx - y + z = 1
x + λy + z = λ
x + y + λz = λ²
lim n→+∞ (√(n³+1) + n)/(∛(3n²+2n-1))
a/sinα = b/sinβ = c/sinγ
y = ∛(x+1) ; x = tgt
δ(p_2) = √0,16
C = (0,1 / 1,0)
a² + b² = c²
α, β, γ ∈ C
f(x) = 2^{-x} + 1, ε = 0.005
e² - xyz = e ; A[0;e;1]
lim x→0 (e^{2x} - 1)/5x = 2/5
|α| + |β| ≠ 0 ; γ ≠ 0
2x/(x² + 2y²) = 2
sin(x+y) = sinx cosy
A = (x, 1+x², 1 / y, 1+y², 1 / z, 1+z², 1) ; x=0, y=1, z=2
A = [1;0;3]
y' - √y/(x+2) = 0
cosφ =
∫ 3x^{7,1} + 1,66x^{-0,17} dx
lim n→+∞ (1 + 3/n)^n
2sinx
sin2x
cotgx
tgx
y=tgx
y=cotgx

How can it be that mathematics, being after all a product of human thought which is independent of experience, is so admirably appropriate to the objects of reality?

- A. Einstein



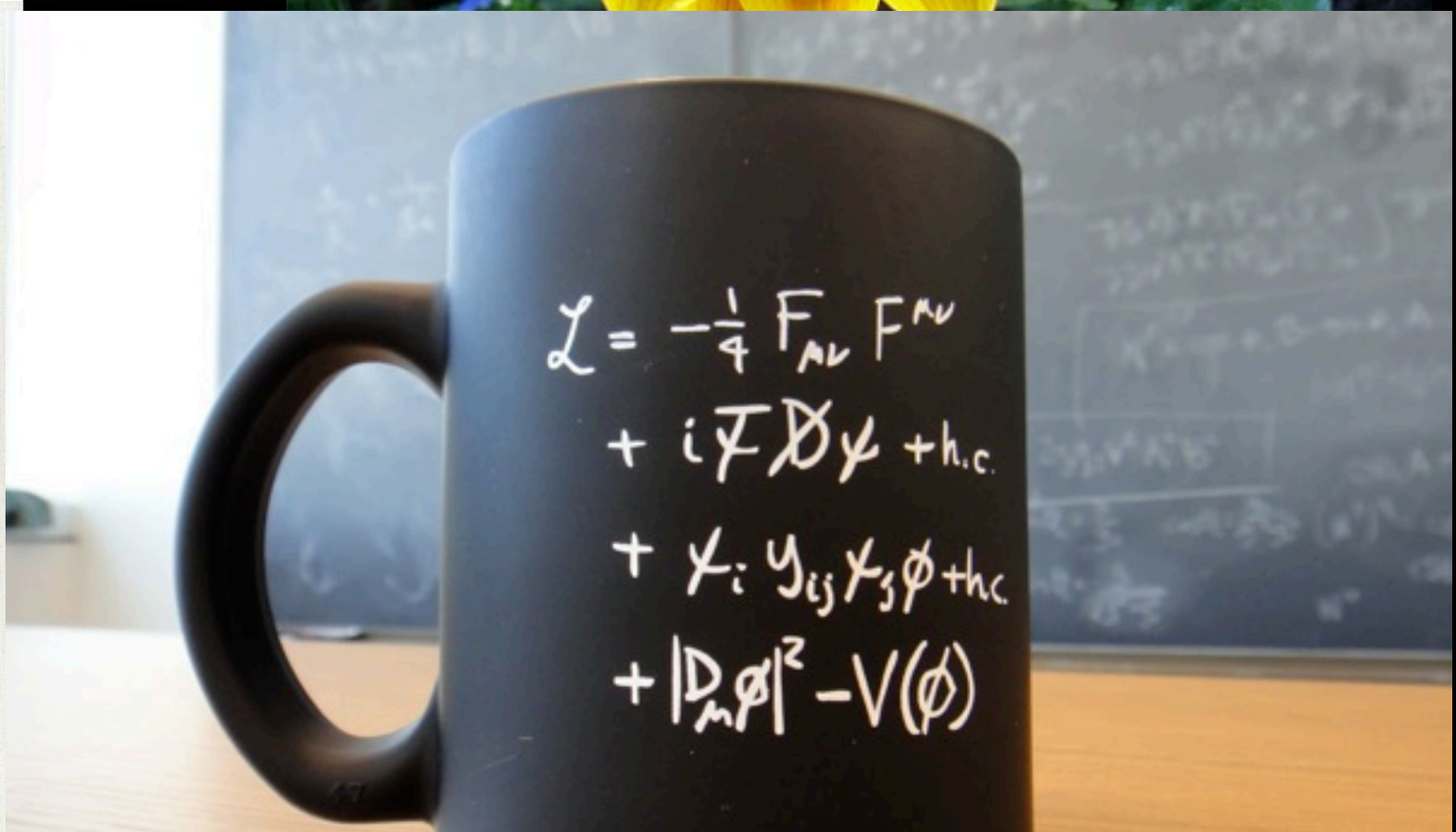

WORKING
CLASS

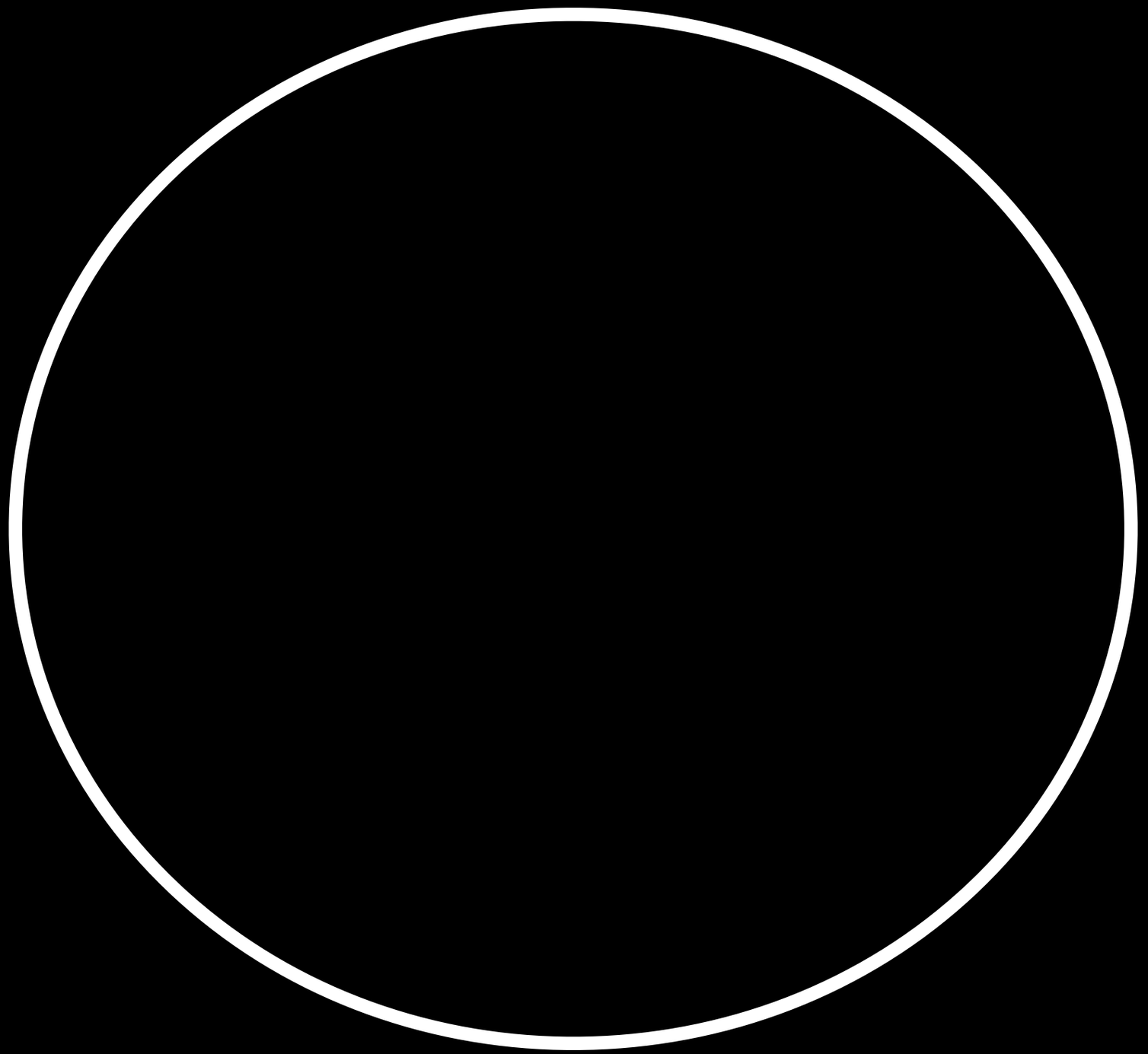
$$\Psi_{g,h}(\sigma,\tau,z) := \exp\left[\sum_{L=1}^{\infty} p^L \mathcal{T}_L^{\alpha} \phi_{g,h}(\tau,z)\right]$$

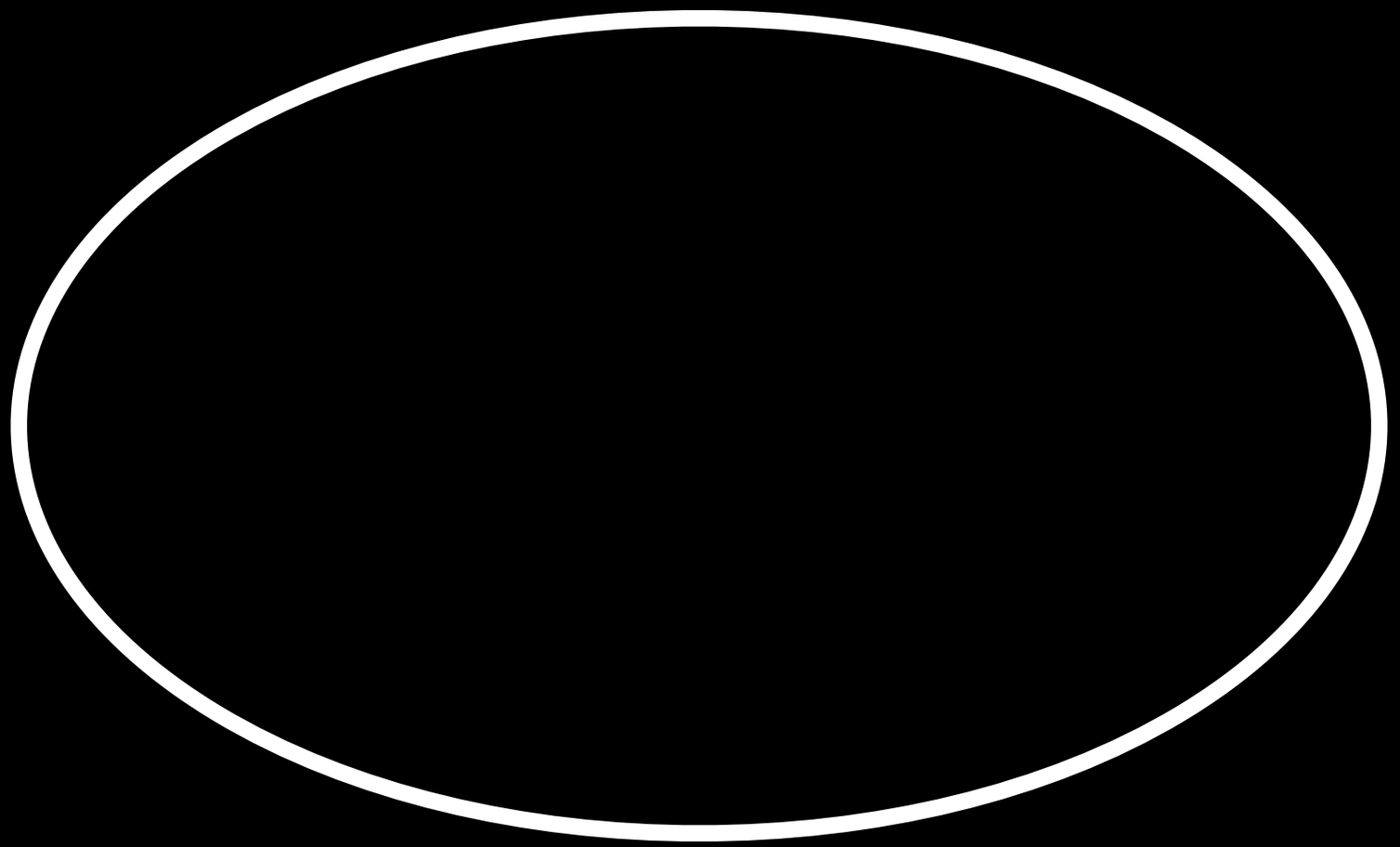
$$\chi(K3;\tau,z) = \frac{\vartheta_1(\tau,z)^2}{\eta(\tau)^3}\left(24\mu(\tau,z) + q^{-1/8}(-2+\sum_{n=1}^{\infty} A_n q^n)\right)$$

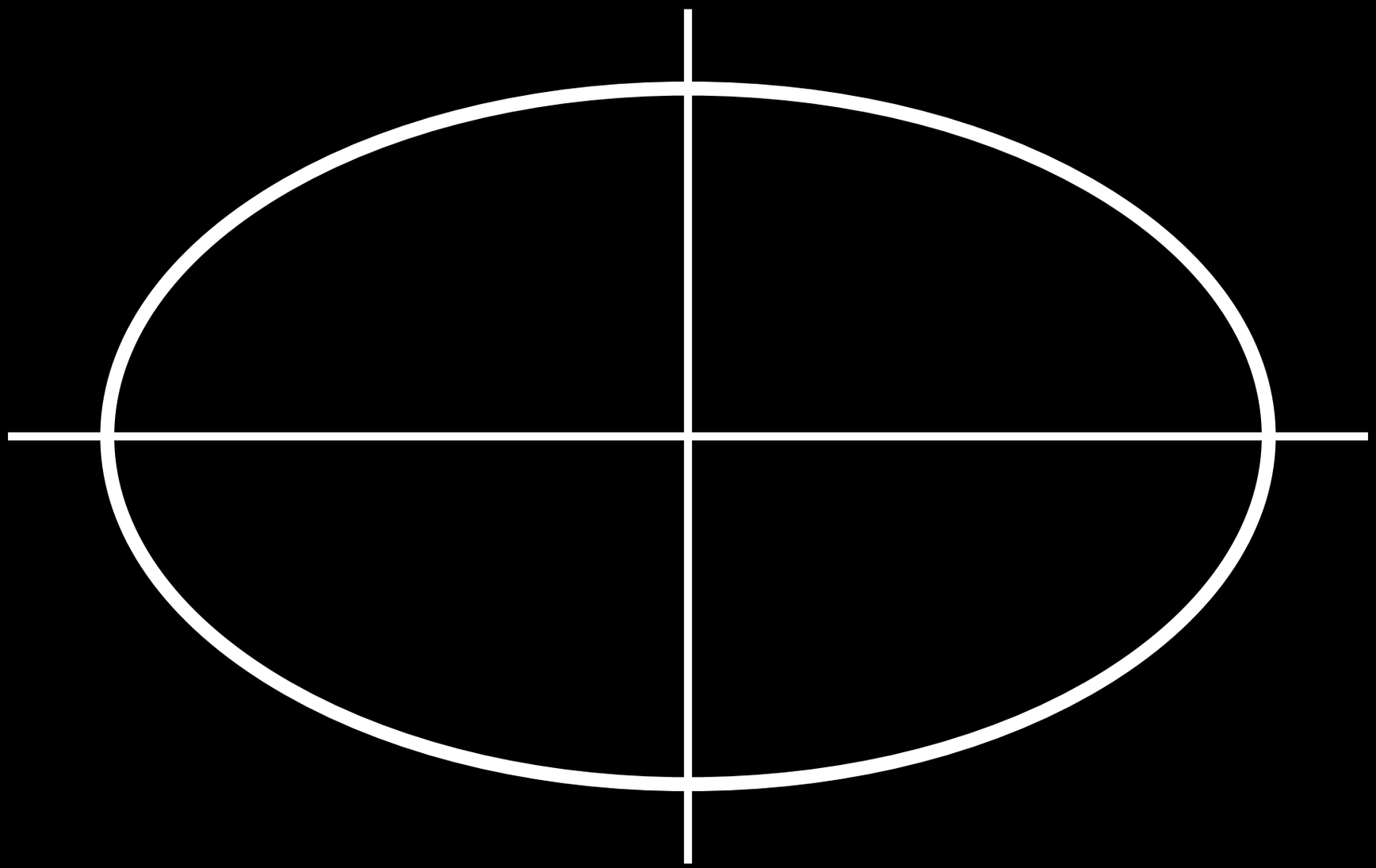
$$\mathrm{gdim}\, V^{\natural} = \sum_{n=-1}^{\infty} (\dim V_n^{\natural}) q^n = q^{-1} + 196884q + \cdots = J(\tau)$$

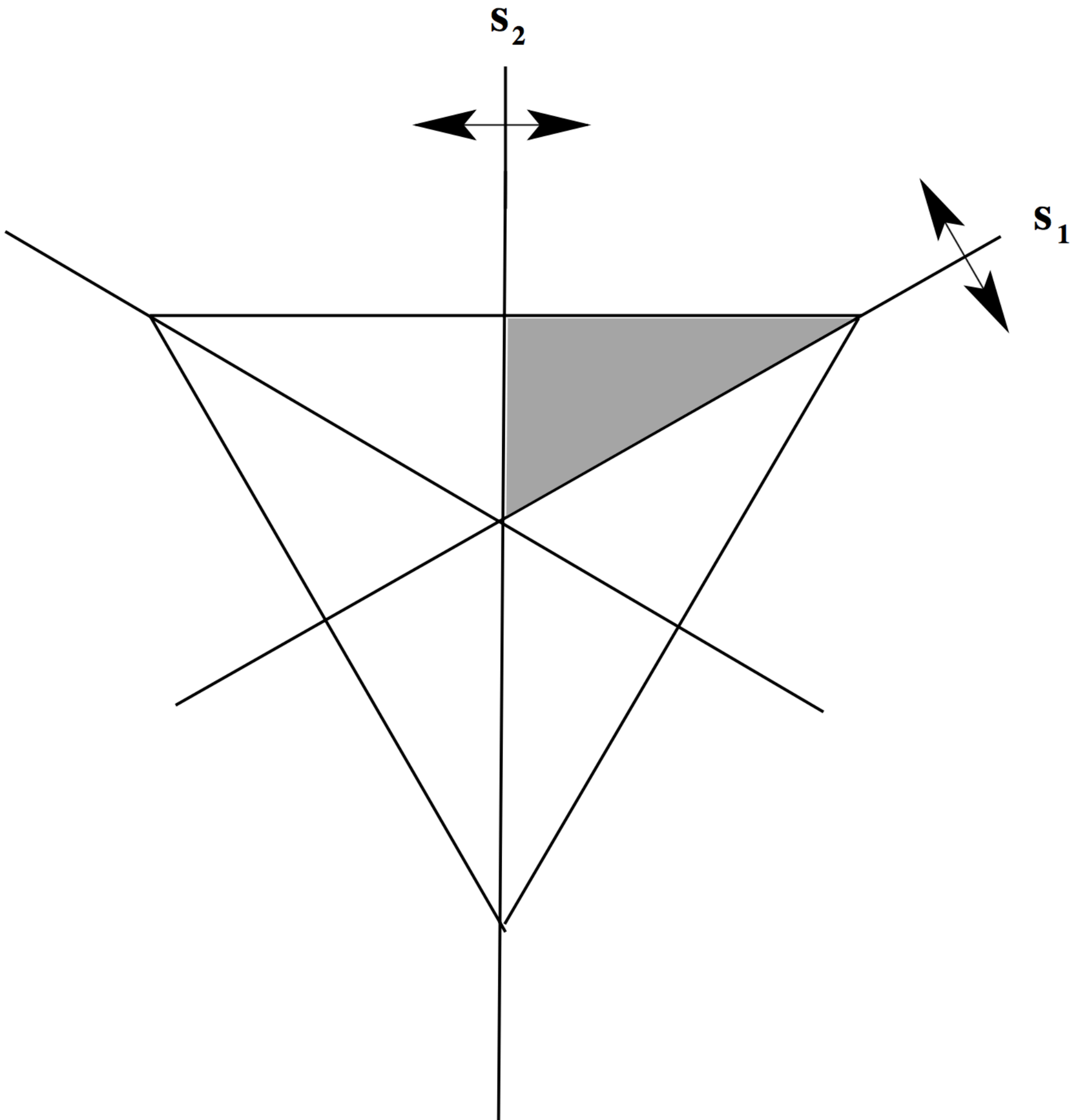
Naturen har inbyggda symmetrier

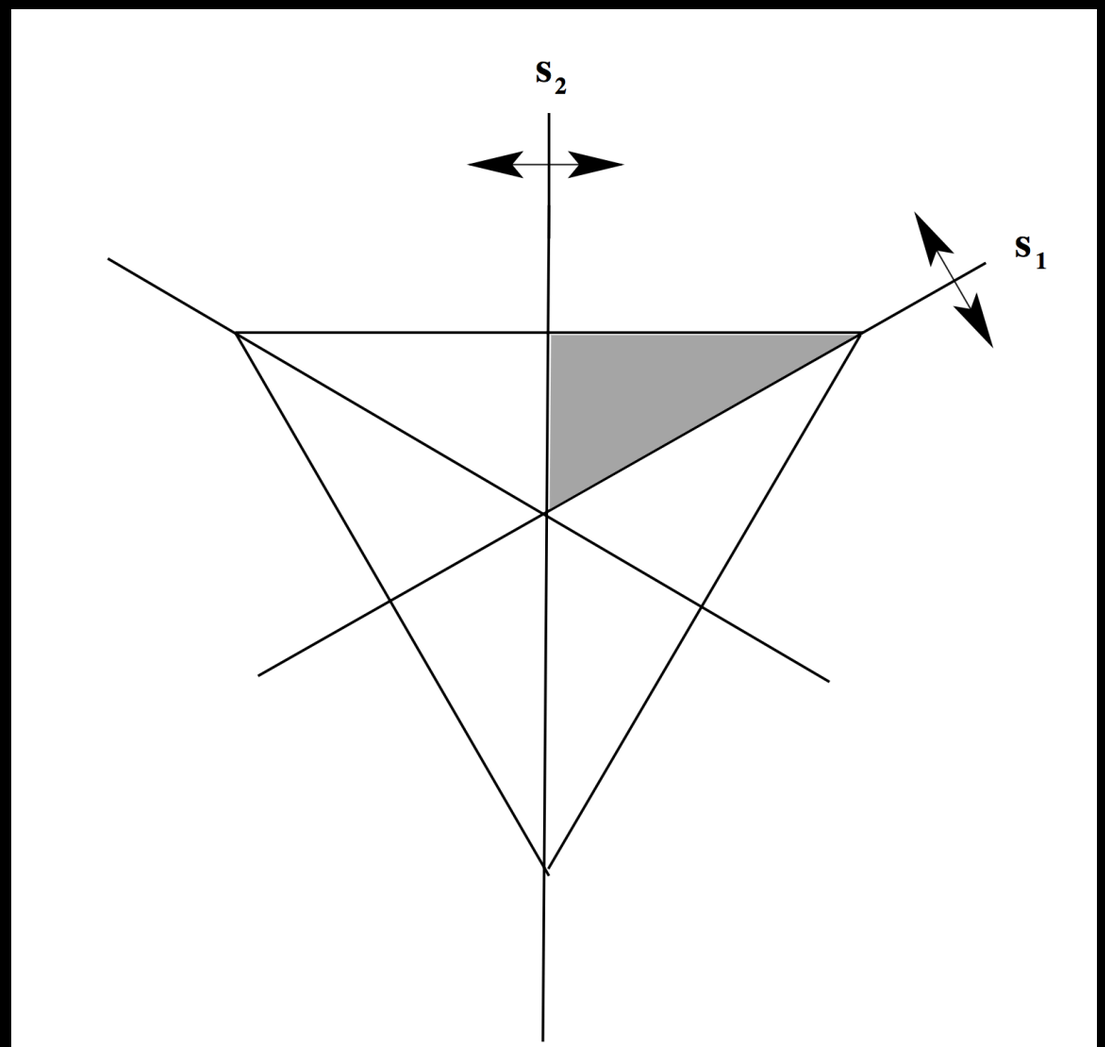









S2
S1



Symmetritransformationer bildar
ett matematisk objekt
som kallas ***grupp***

Kombination av två transformationer
måste också vara en symmetri

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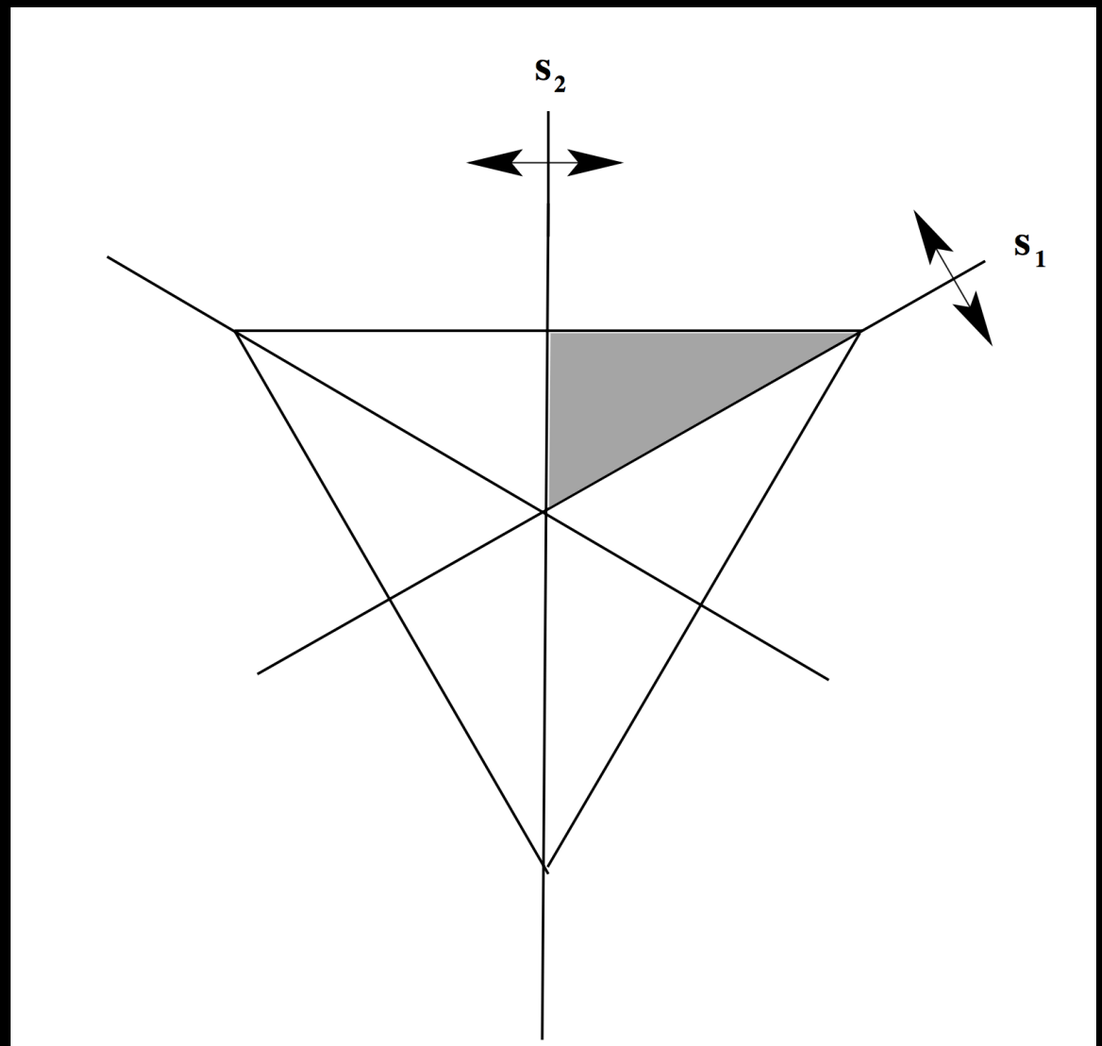
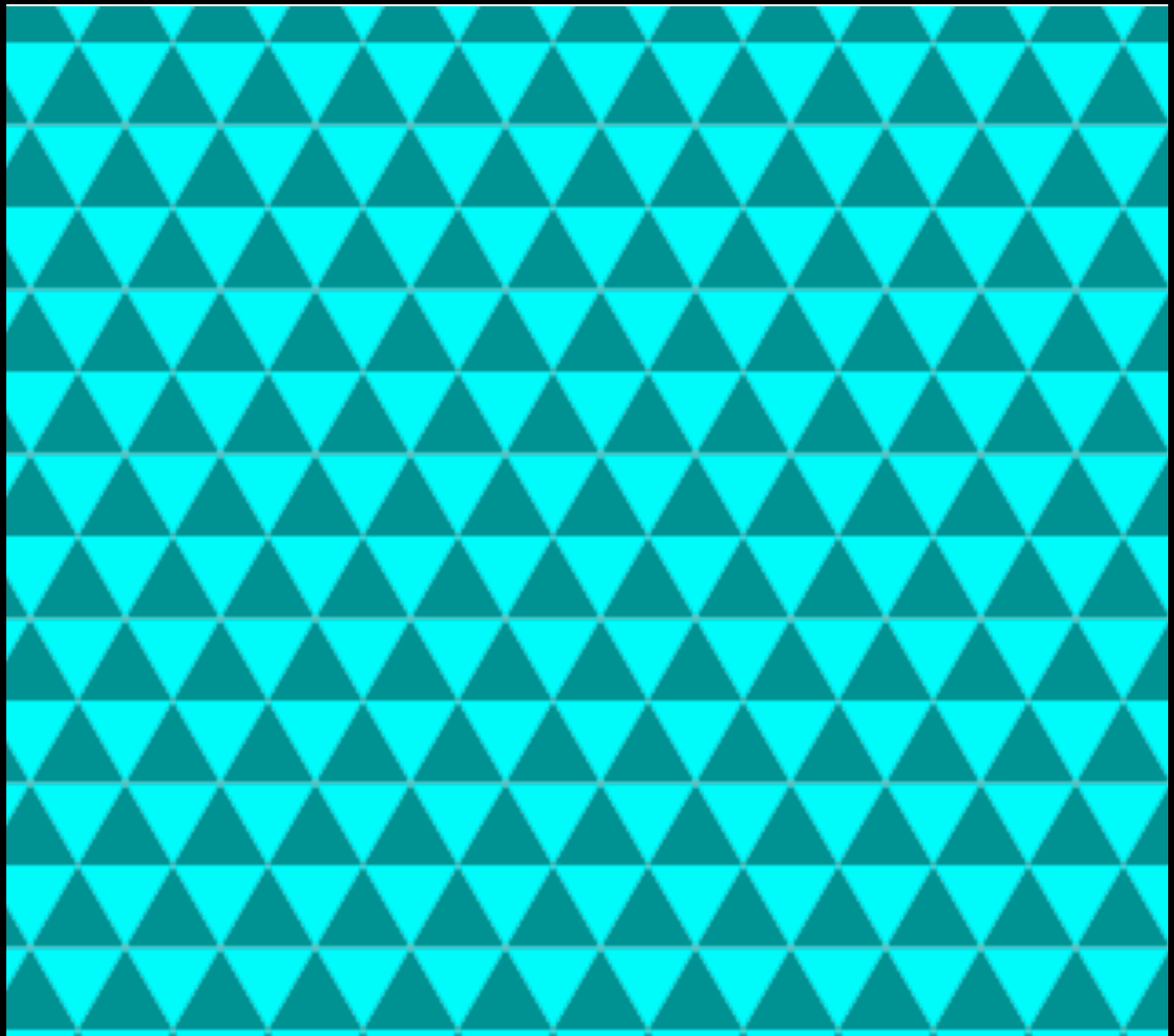
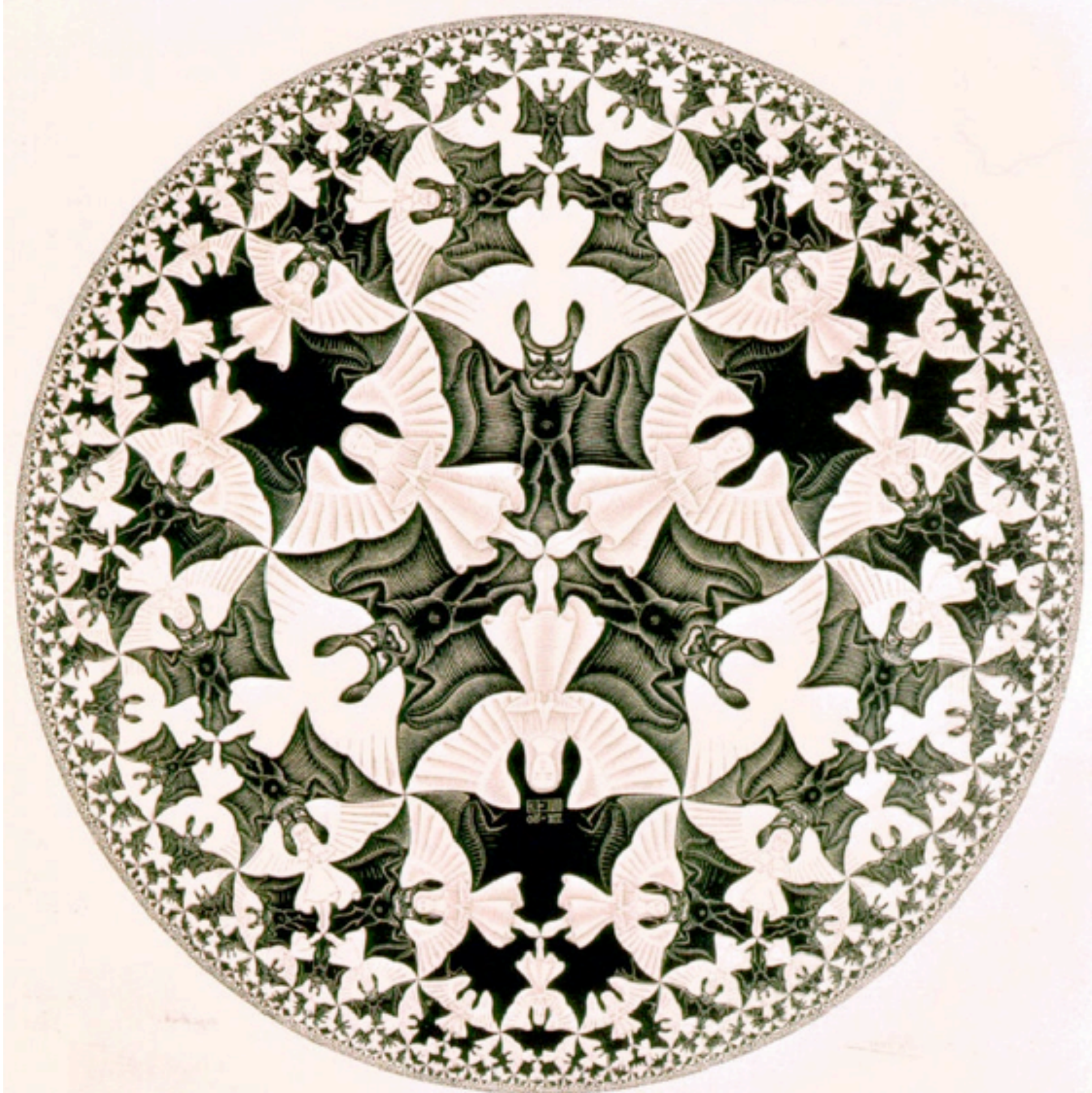


Men vad händer om vi flyttar triangeln?

Men en “tesselering” av planet med trianglar har oändlig symmetri!





Naturens fundamentala lagar bestäms av symmetrier!

starka kärnkraften

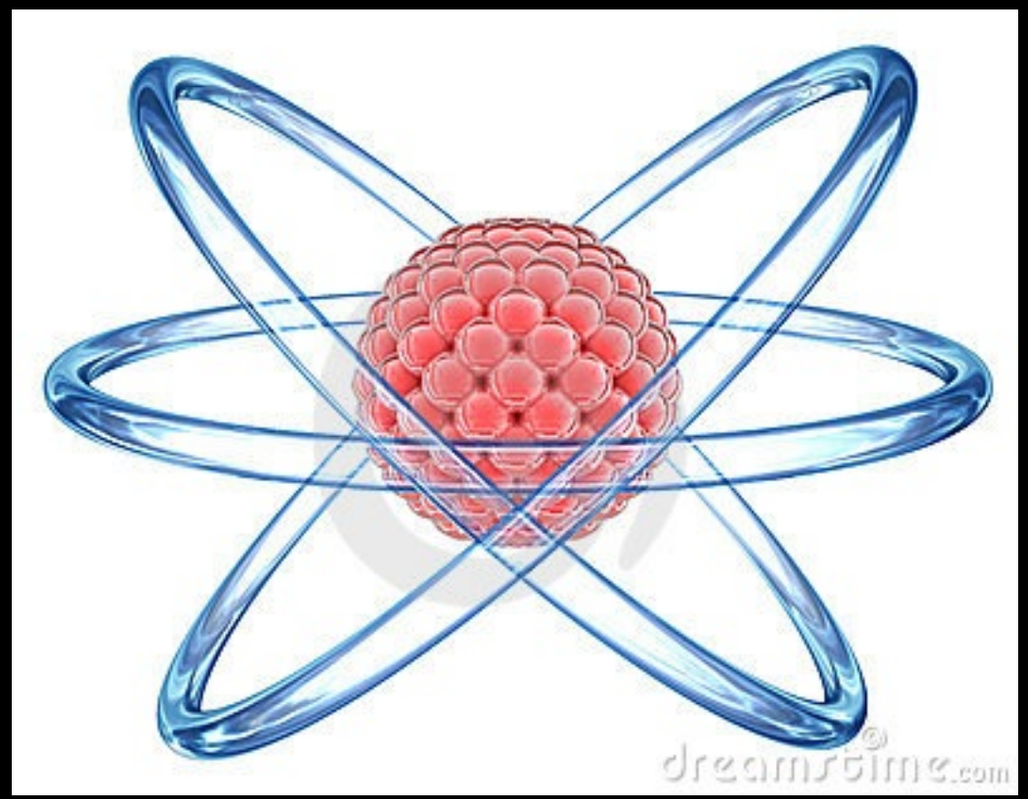
gravitation

elektromagnetism

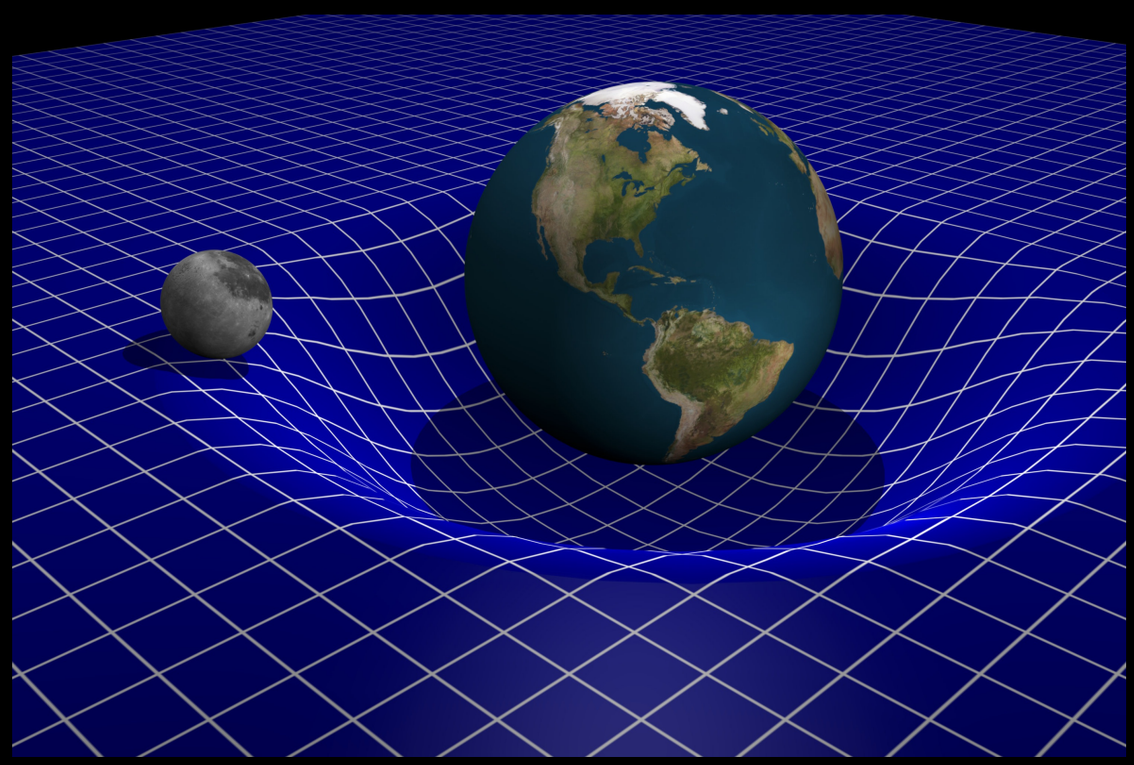
svaga kärnkraften


Svag is


PlONK
©Lana

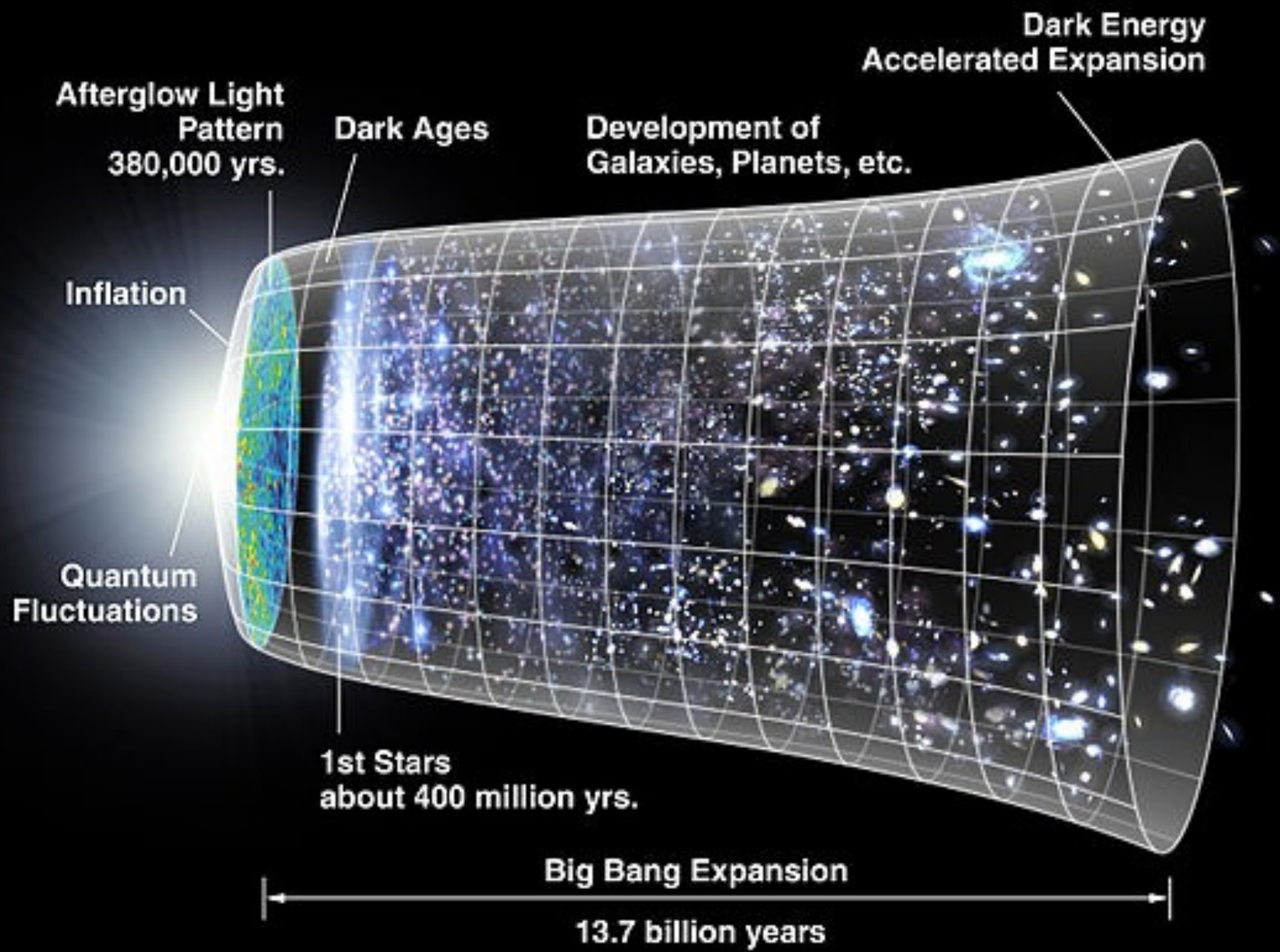


kvantmekanik



allmän relativitetsteori

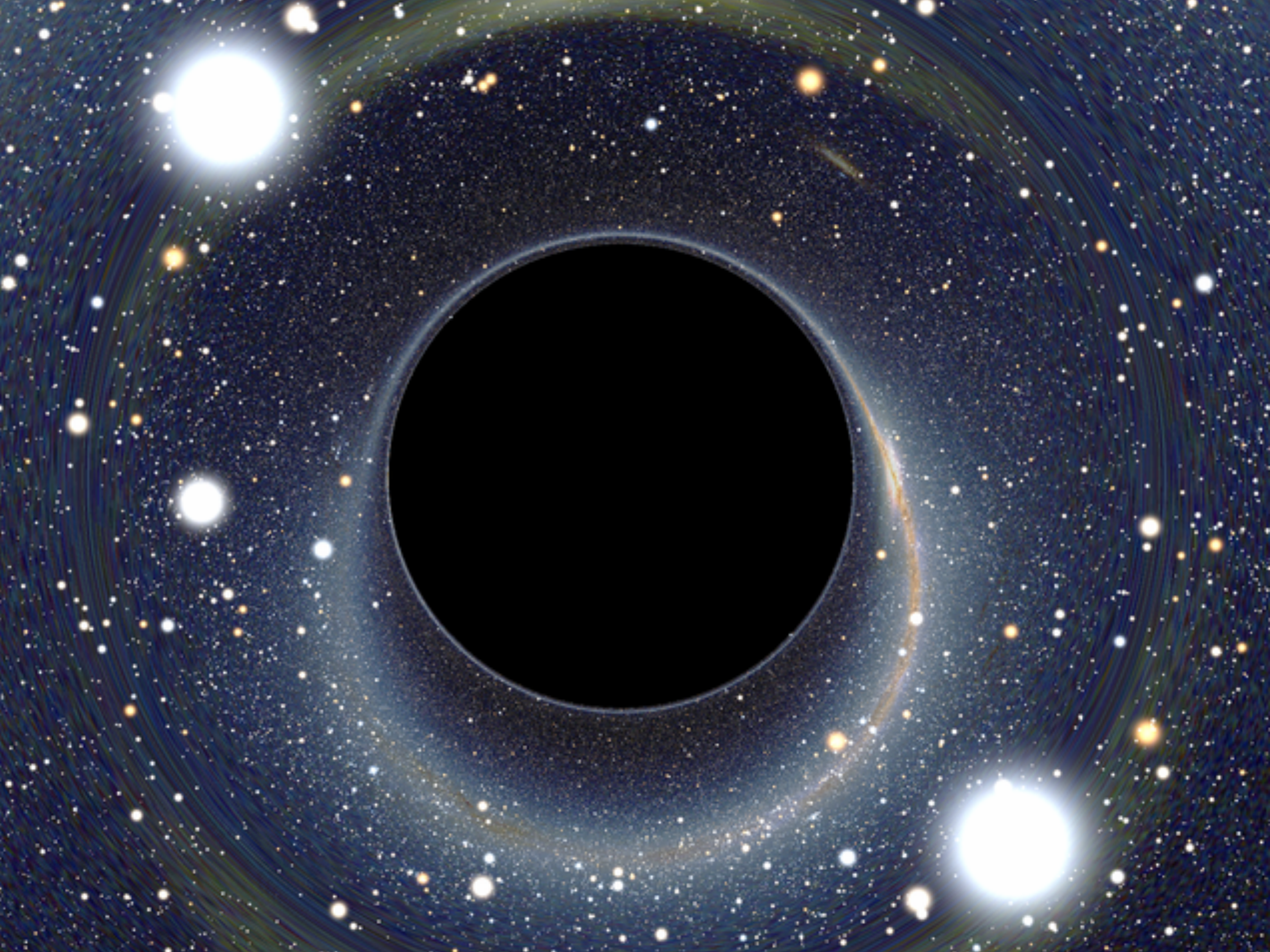
Det finns regioner i universum där kvantmekanik och allmän relativitetsteori måste kombineras



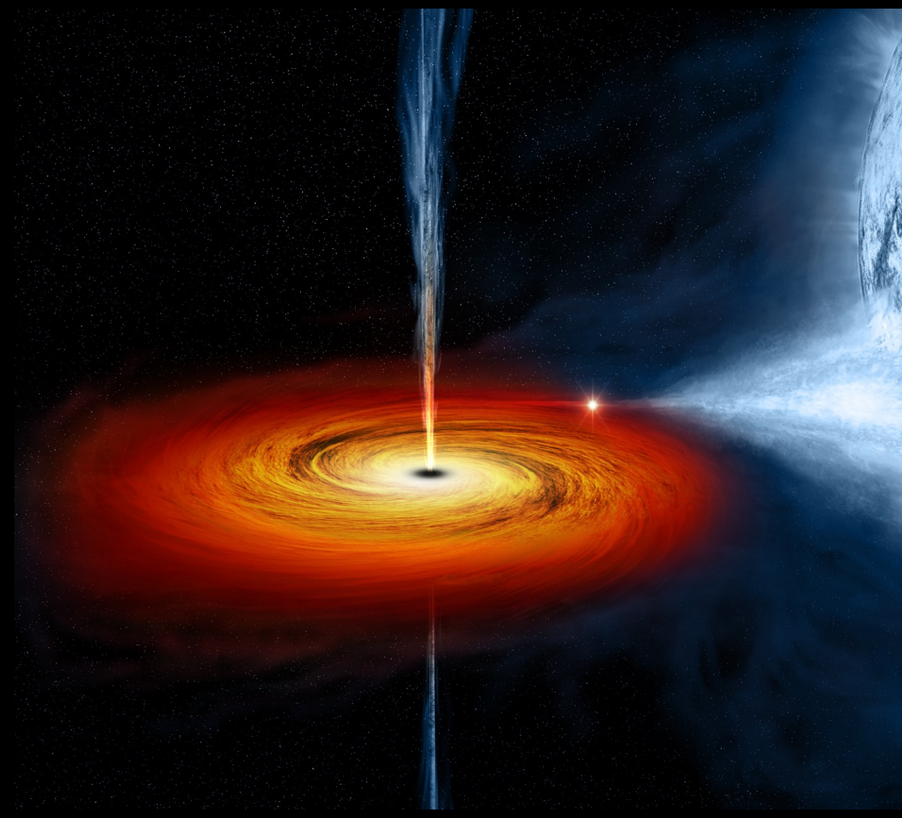
The Milky Way

DIGITAL IMAGE OF THE MILKY WAY BY PIKAIA IMAGING (WWW.PIKAIA-IMAGING.CO.UK)

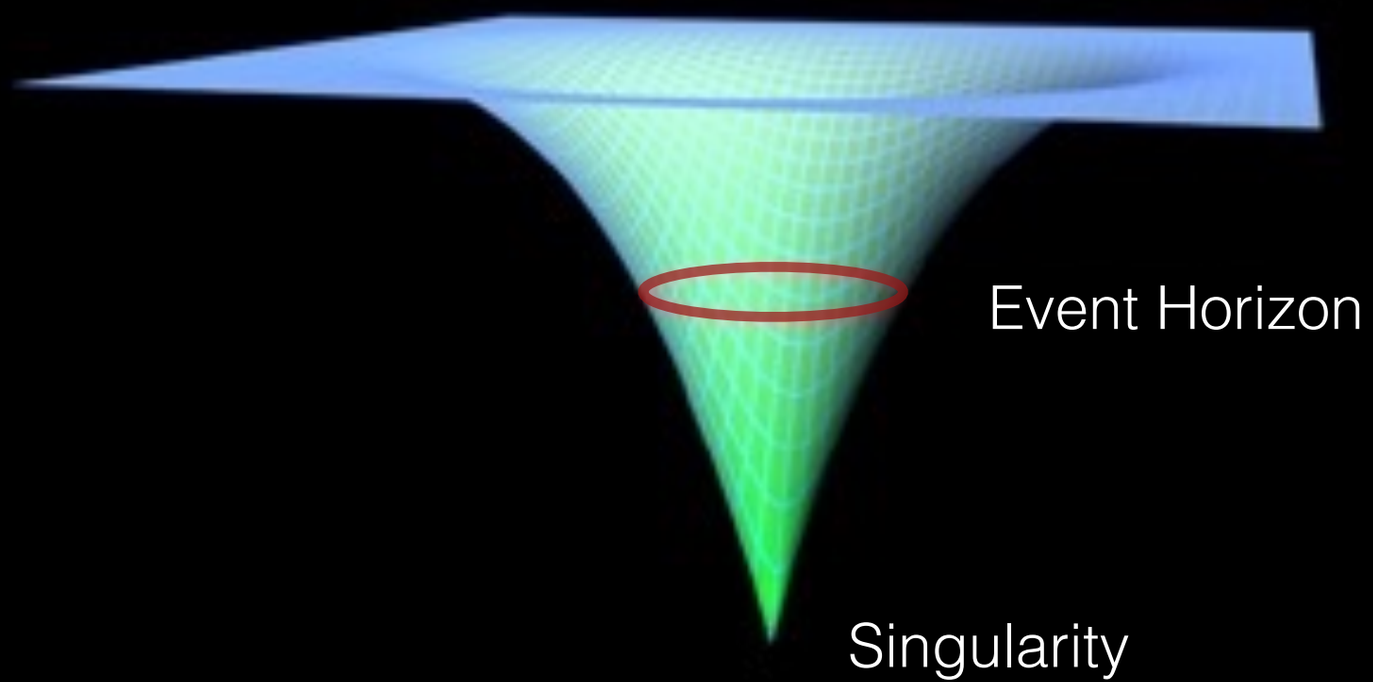
NewScientist



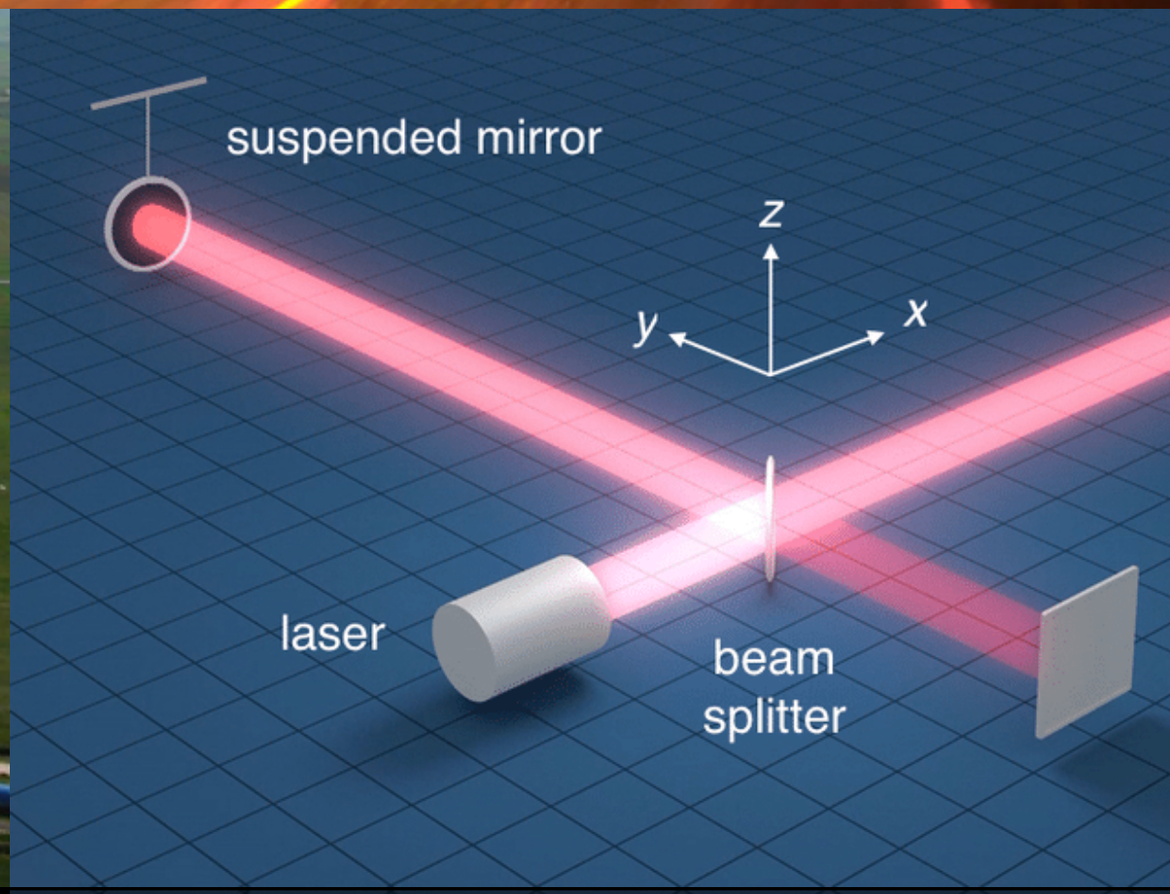
Ett svart hål bildas när en tillräckligt stor stjärna kollapsar och dör



I mitten av ett svart hål bryts rumtiden sönder



Vad händer inuti ett svart hål?


suspended mirror
z
y
x
laser
beam
splitter

Vad har allt detta med AI att göra?

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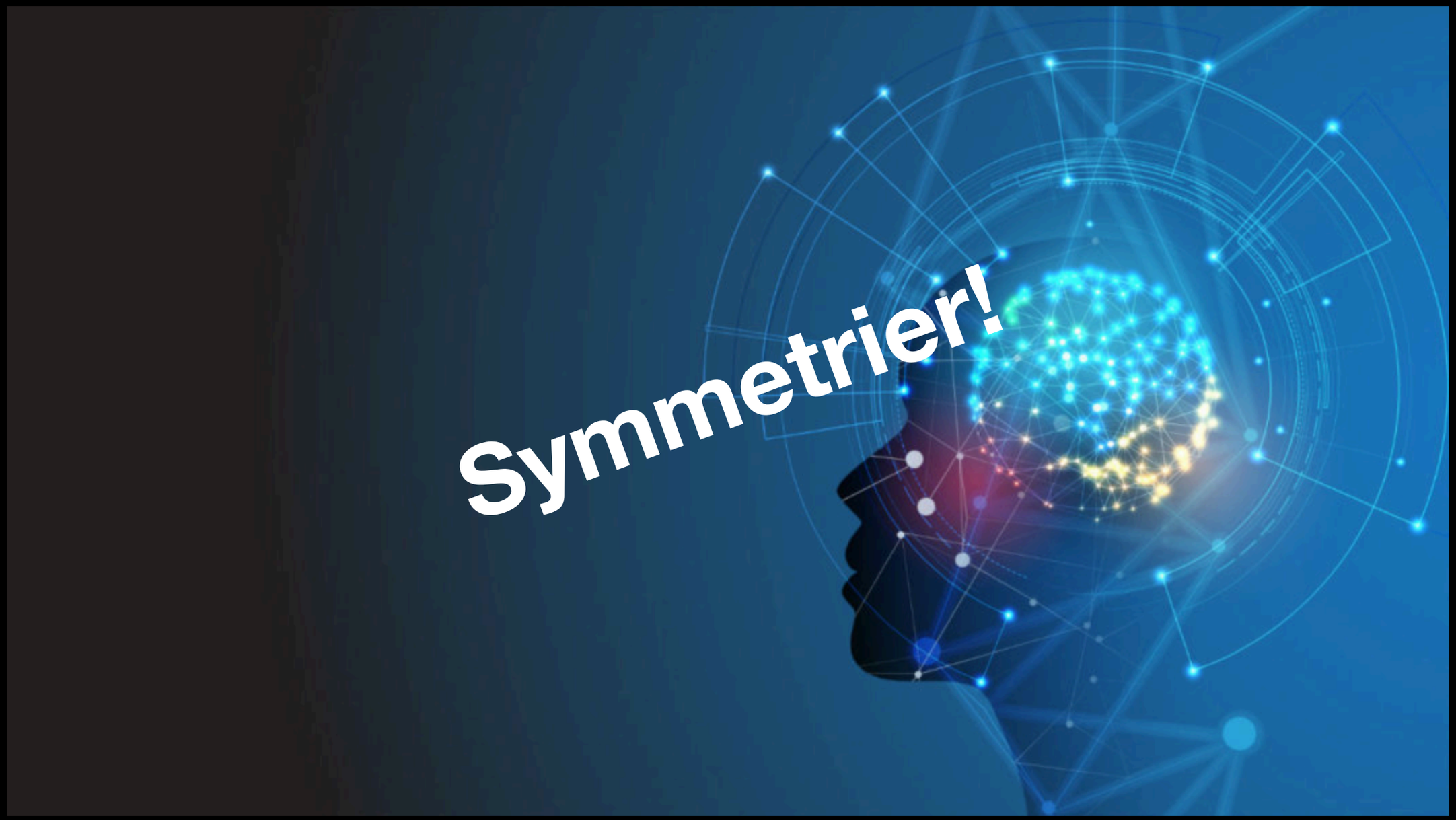
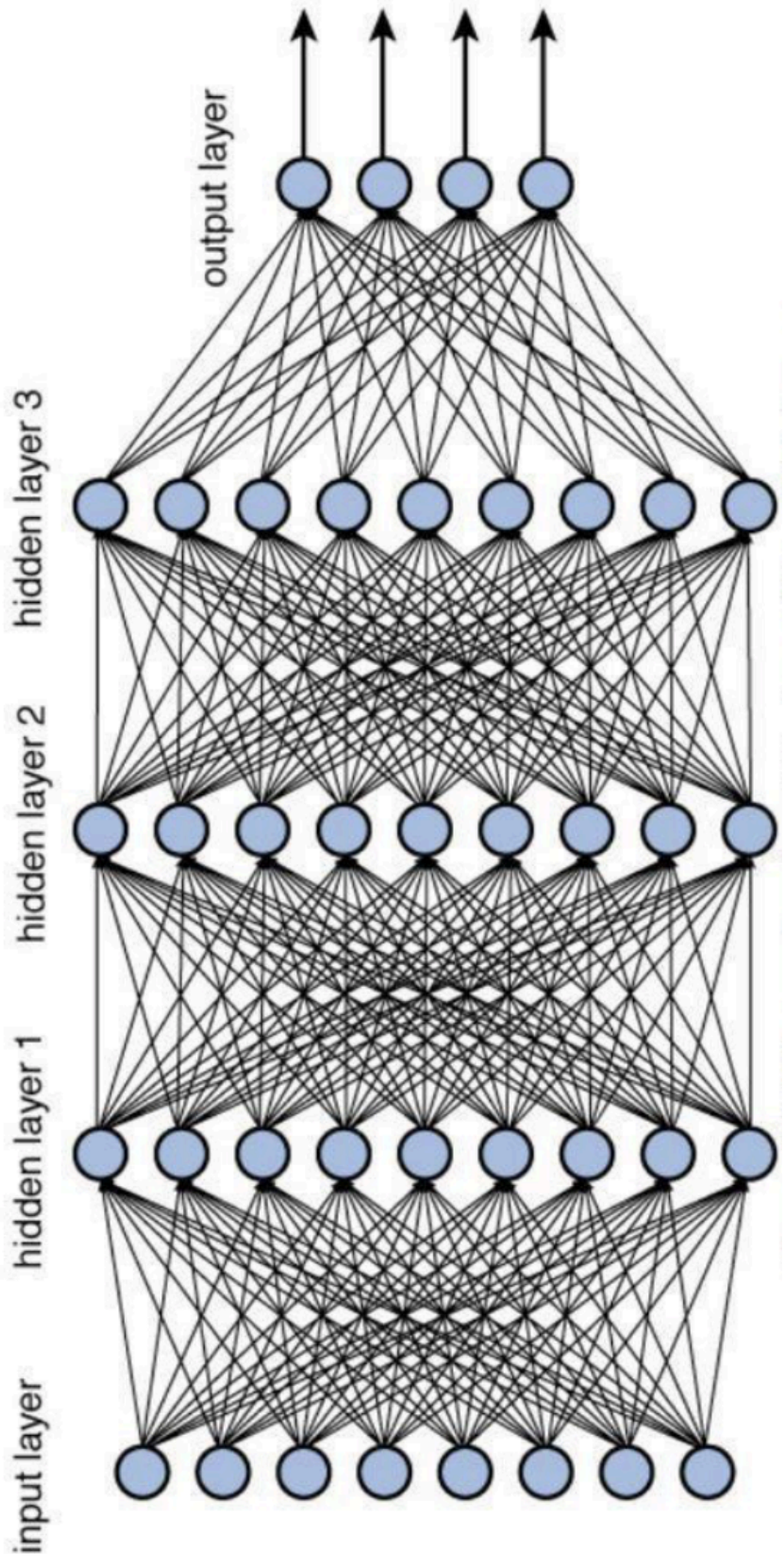
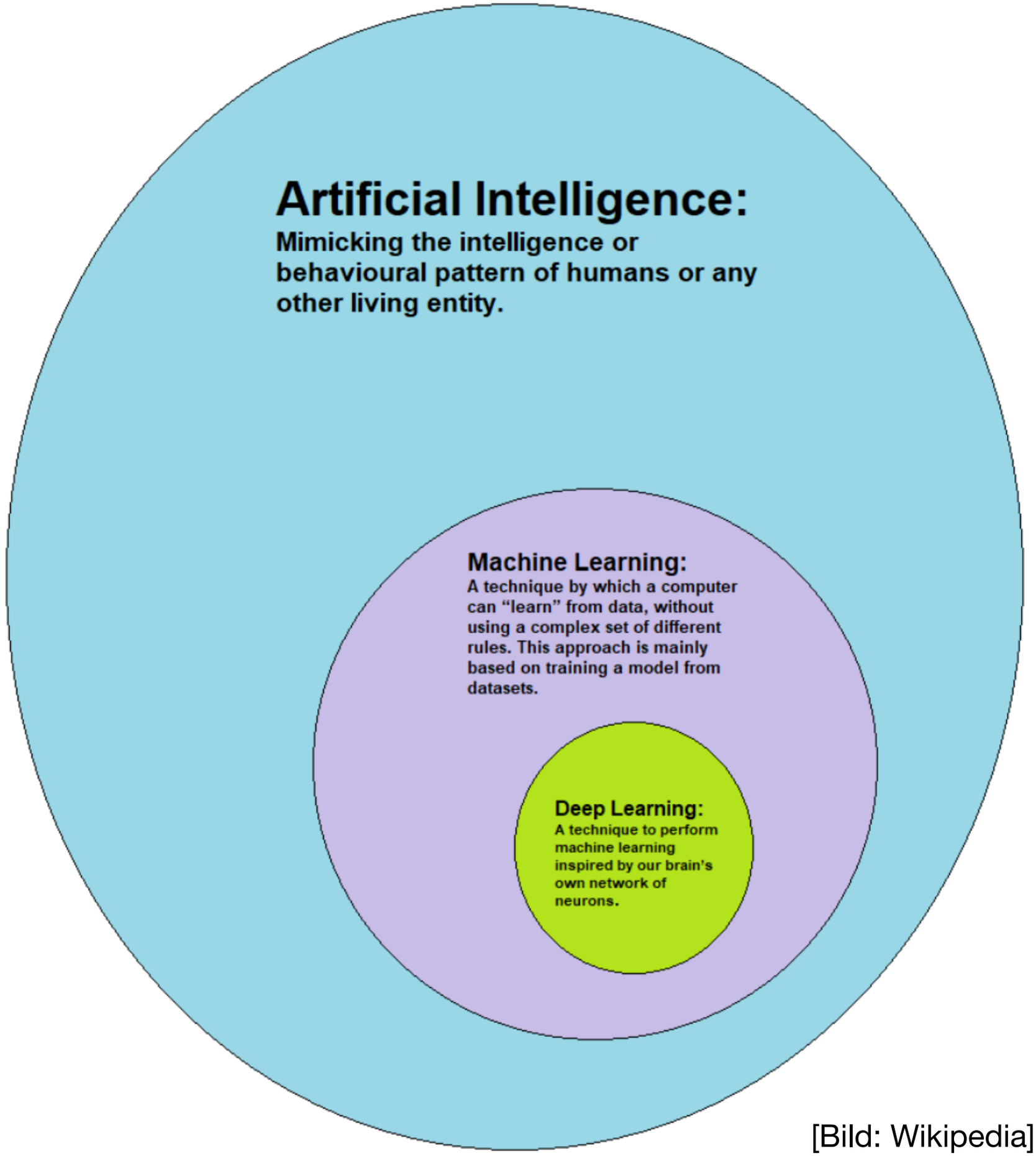
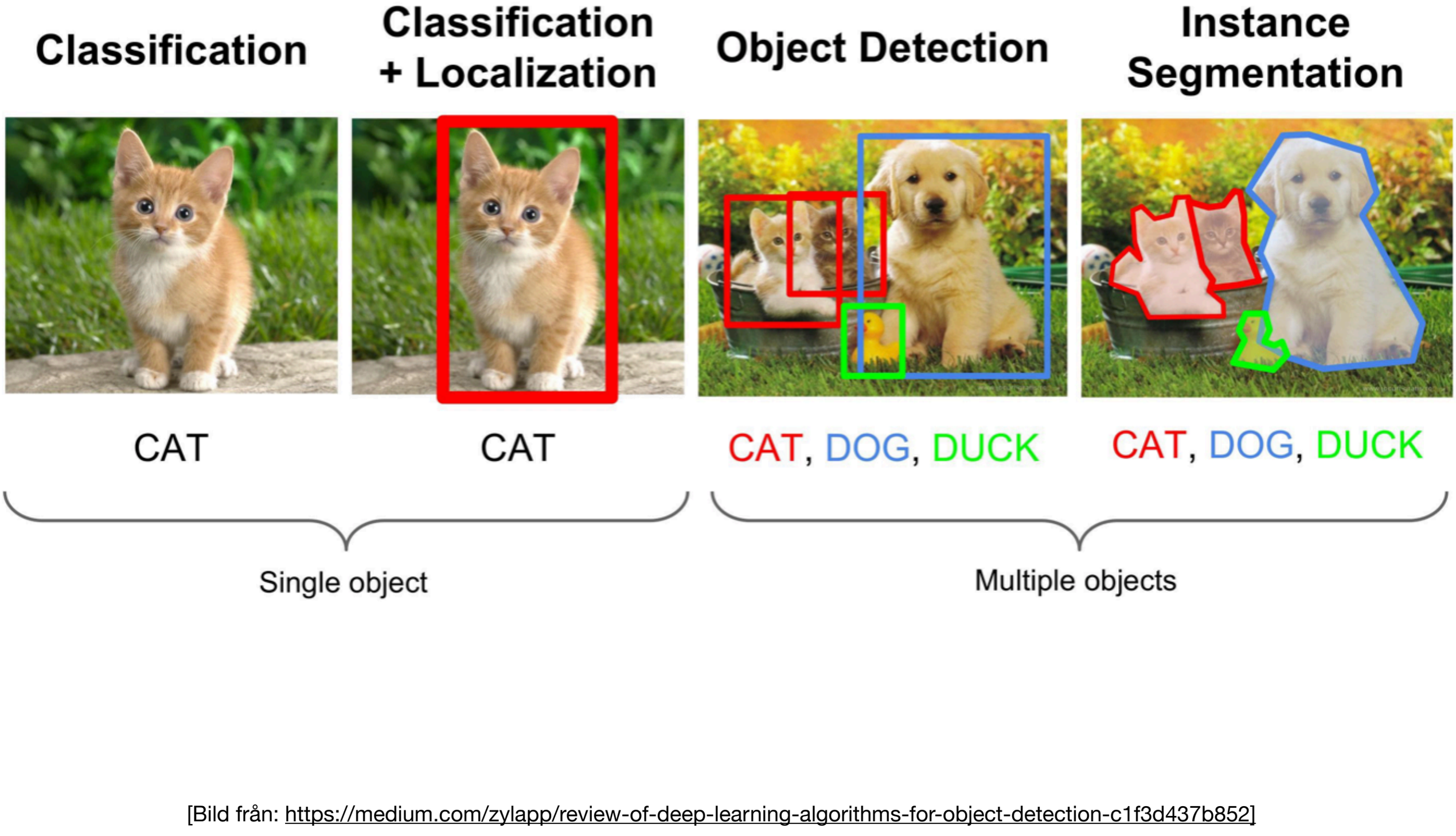






[Bild: Wikipedia]



[Bild från: https://medium.com/zylapp/review-of-deep-learning-algorithms-for-object-detection-c1f3d437b852]

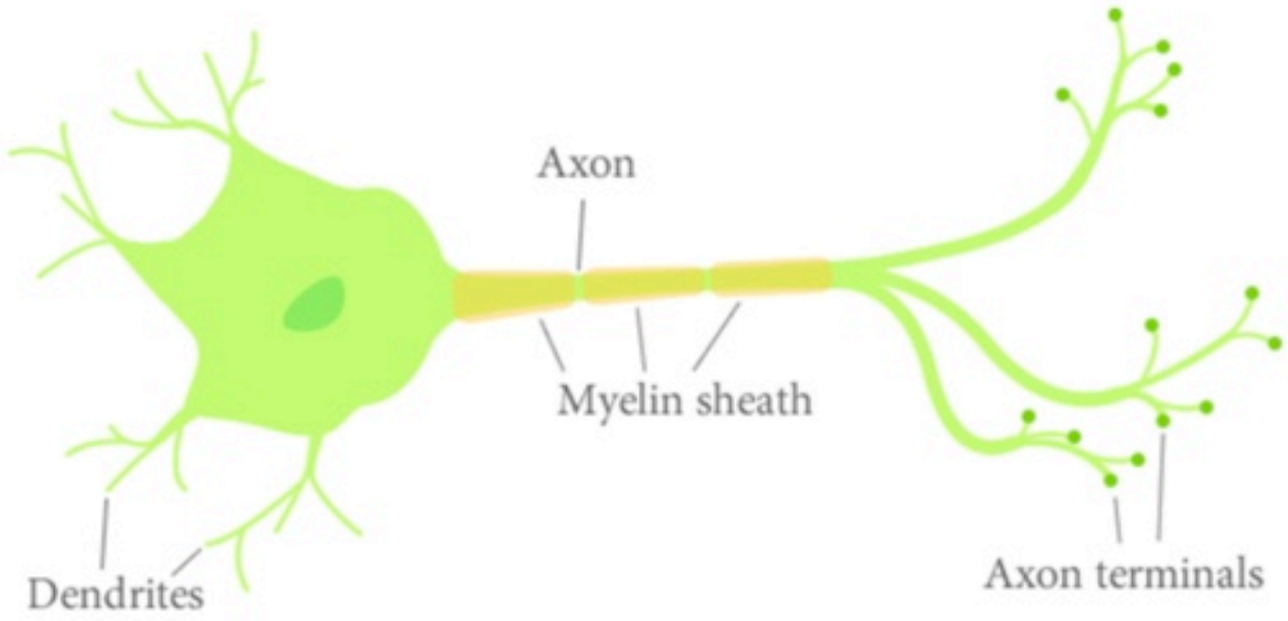
[Bild från thispersondoesnotexist.com]

What can I help with?

Ask anything

+ Search Deep research ···

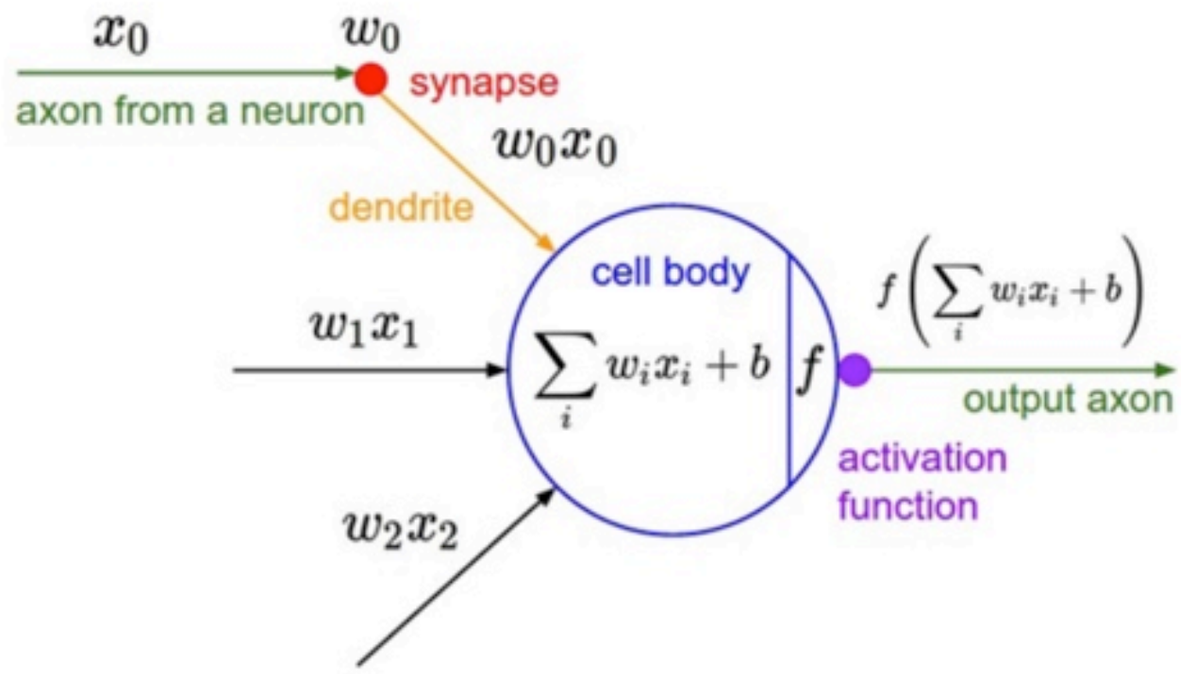
Real Neuron



Artificiell neuron:

1. Input lager
2. Dolda lager
3. Output lager

Artificial Neuron



Att känna igen bilder

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“skateboard”

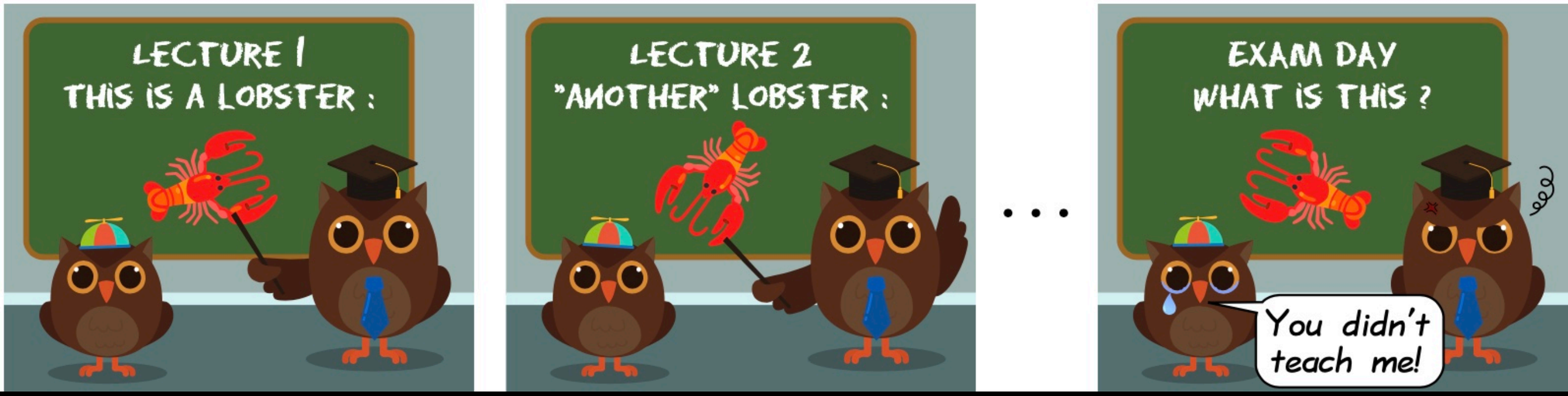
“capybara”

“boxhandskar”

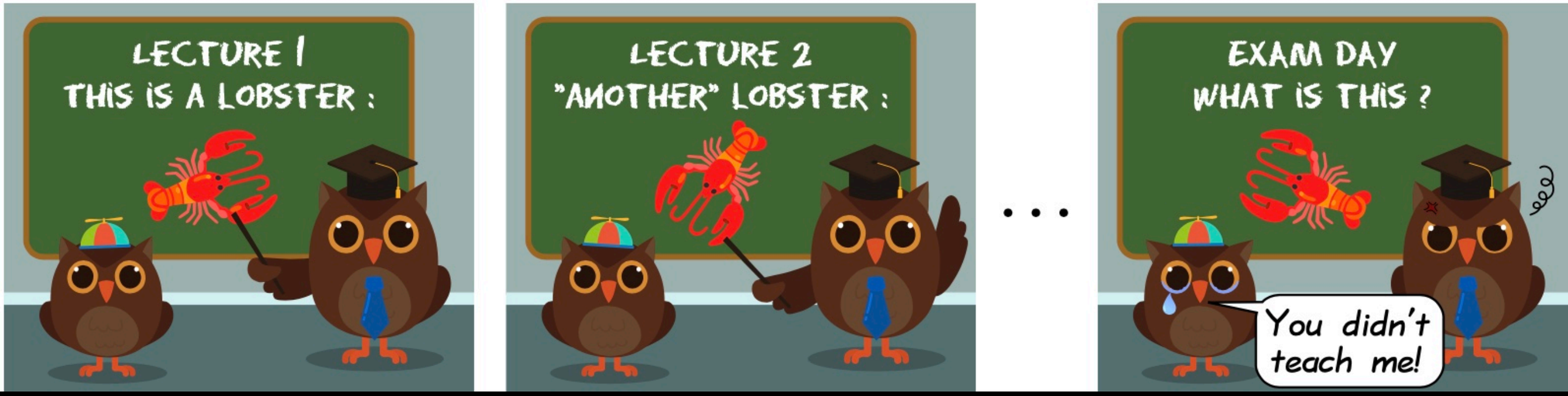
Reflektionssymmetri

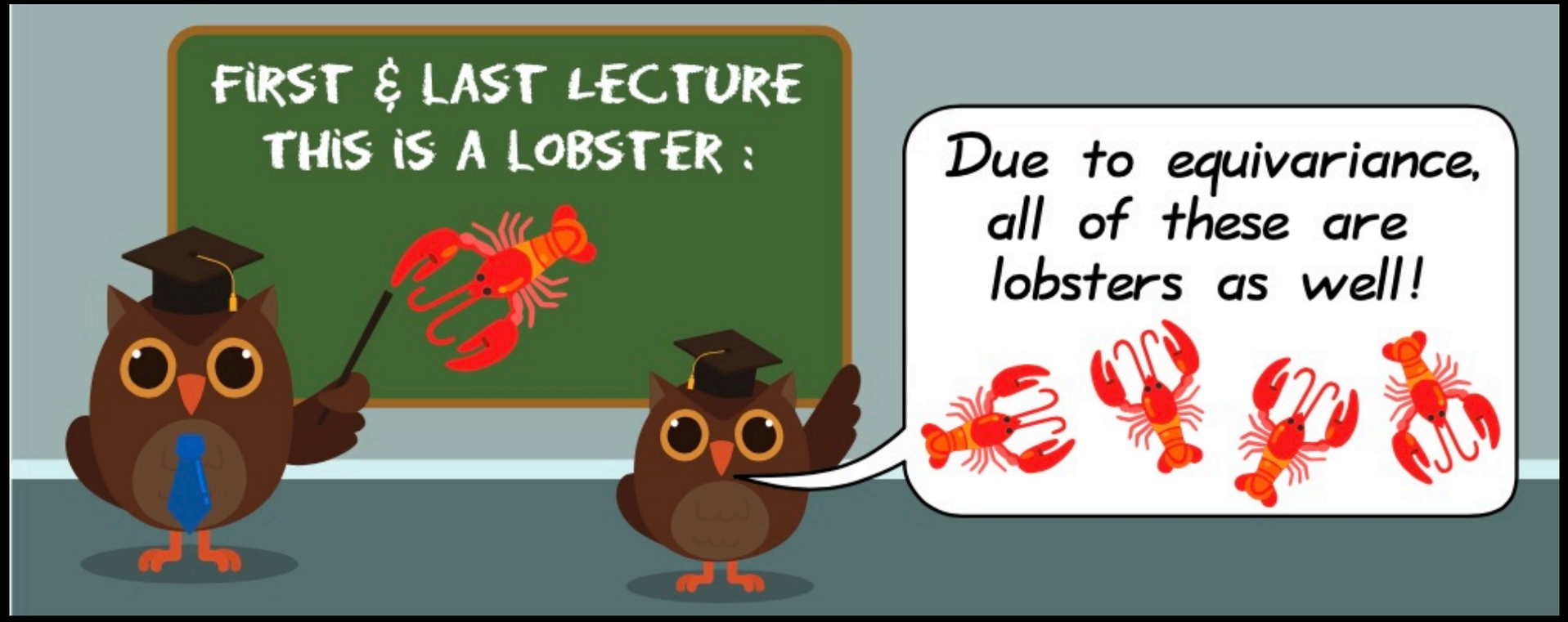
reflektera

“boxhandske”



[Bilder från: Weiler, Forré, Verlinde, Welling (2023)]

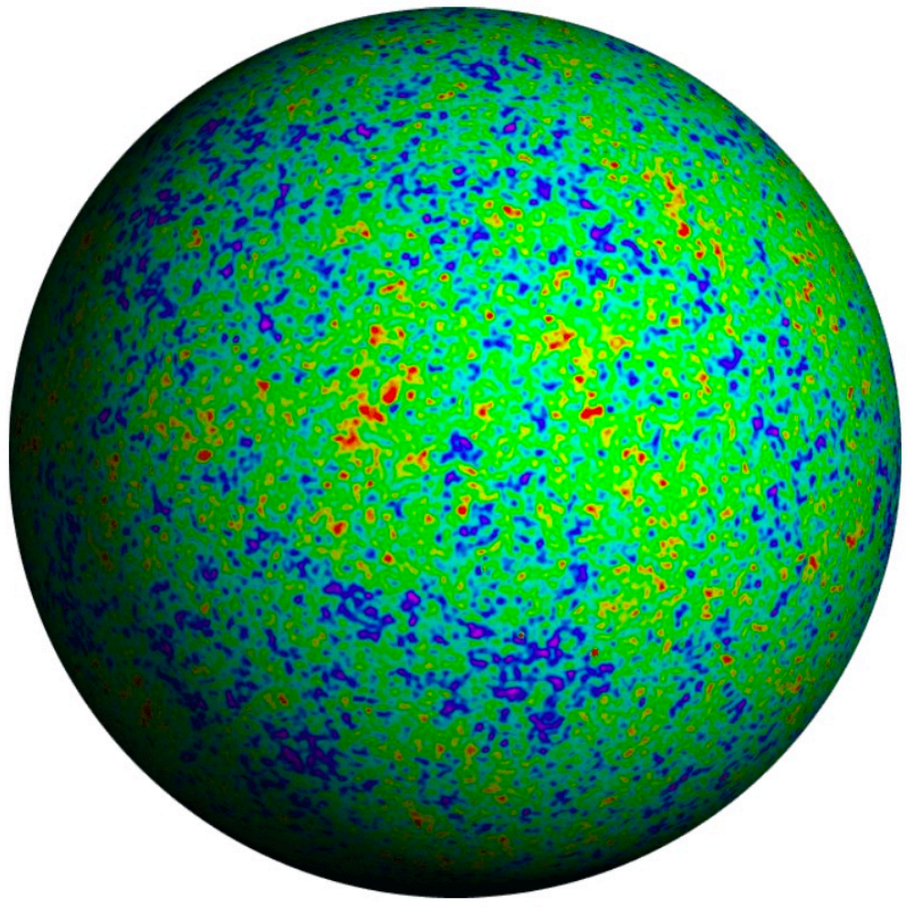




[Bilder från: Weiler, Forré, Verlinde, Welling (2023)]

Vad händer om datan är “krökt”?

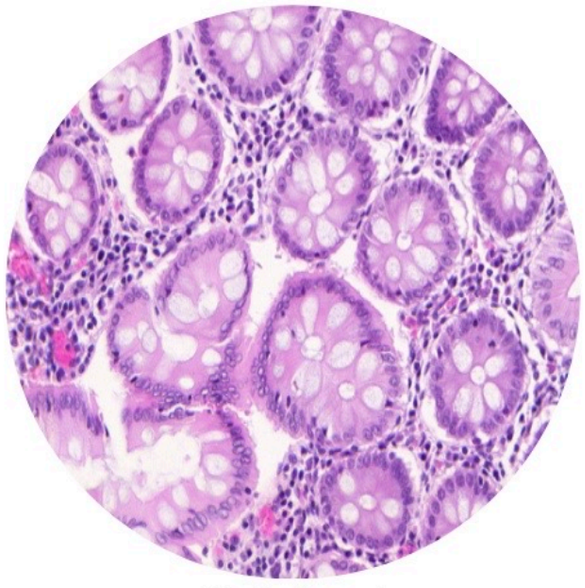
[Bild från Woodscape dataset, projected onto a sphere]



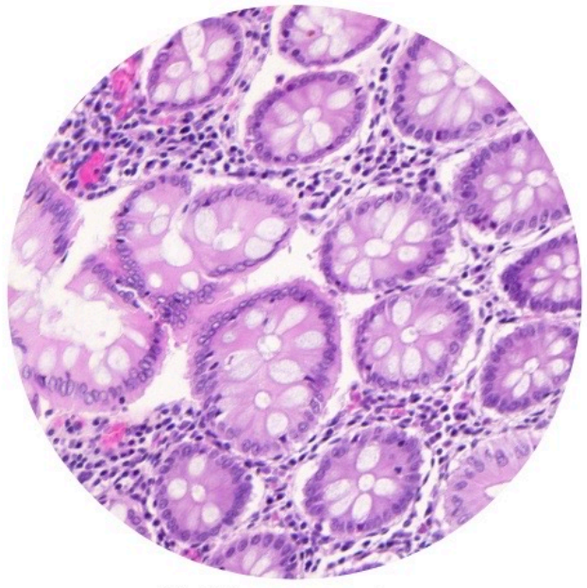
Kosmiska bakgrundsstrålningen

[Bild från Weiler et al]

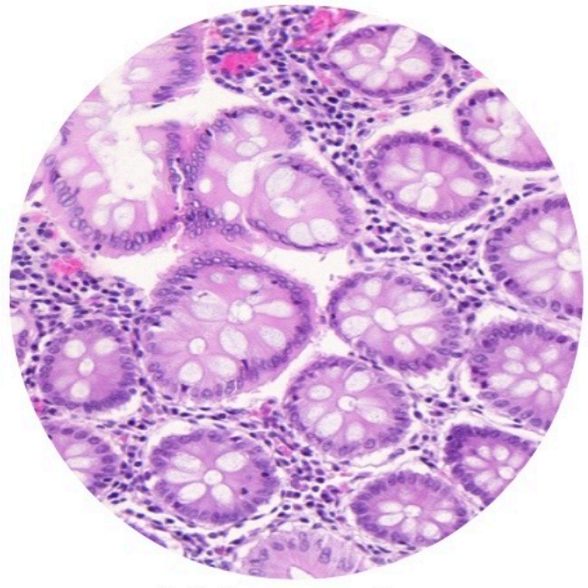
Medicinska bilder av tumörer



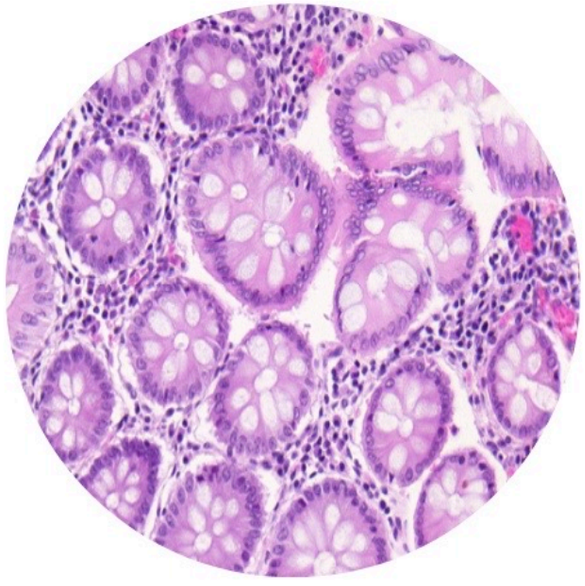
Original



45° rotation

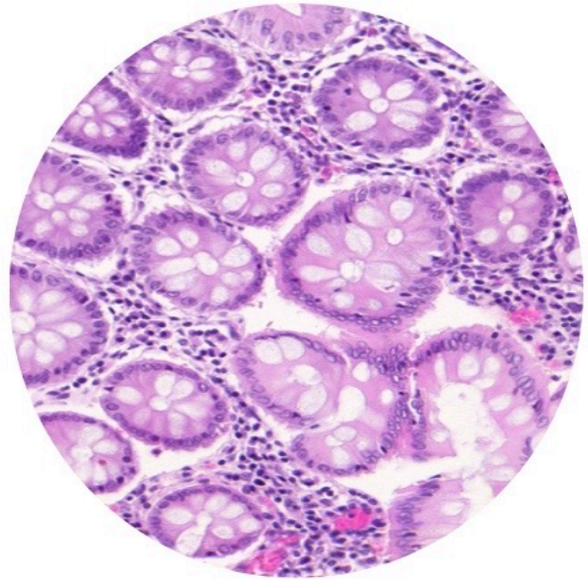


90° rotation



180° rotation

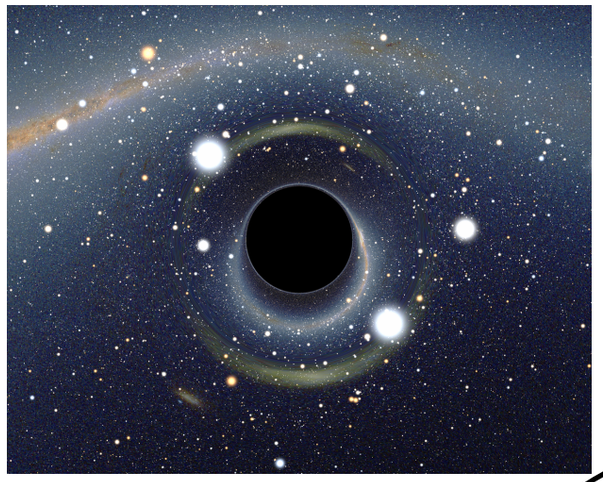
225° rotation



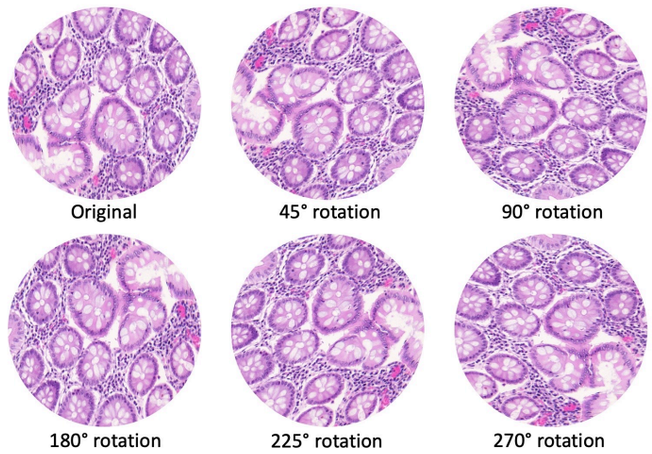
270° rotation

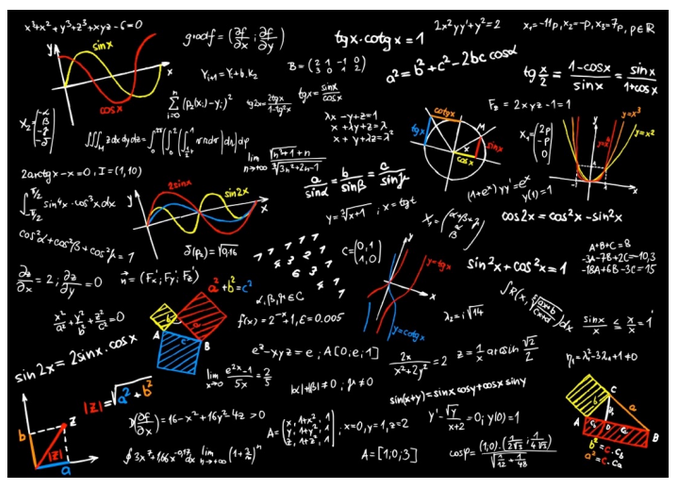
[Bild från Graham, Epstein, Rajpoot, 2020]

Fysik



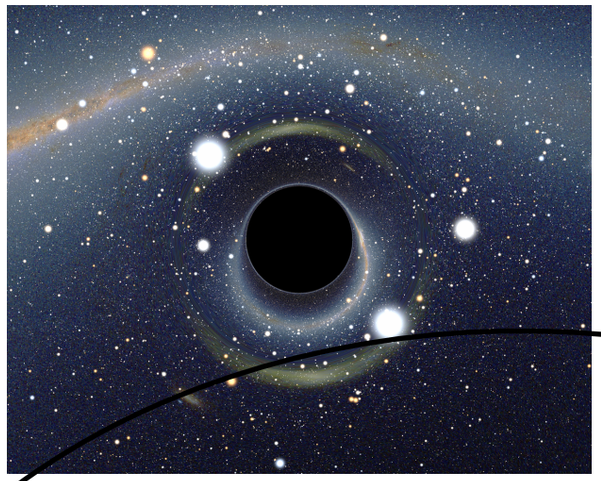
AI





Matematik

Fysik



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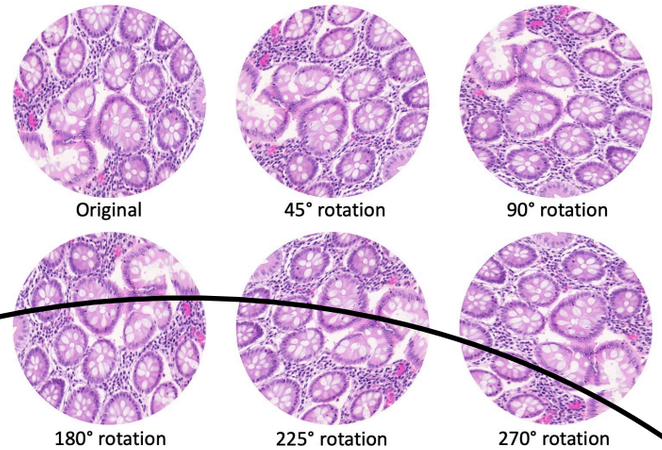

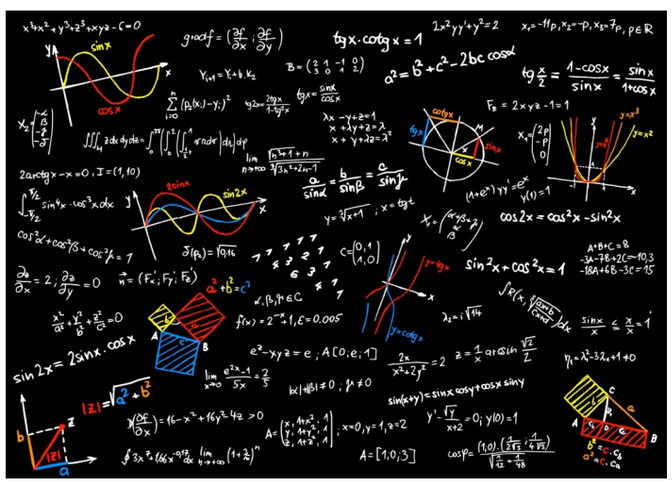

Matematik

Biologi/Kemi

TACK!