

# Ciencia & Belleza



SIMPOSIO LATORRE

**Pedro M. Etxenke Landiribar**

LatorreFest Symposium

Barcelona, 31 de mayo de 2019

**Mrs Heisenberg about W Heisenberg:**

**“... he talks about the miracle of symmetry as the original archetype of creation, about harmony, about the beauty of simplicity and its inner truth”**

$$\vec{\nabla} \cdot \vec{D} = \rho$$

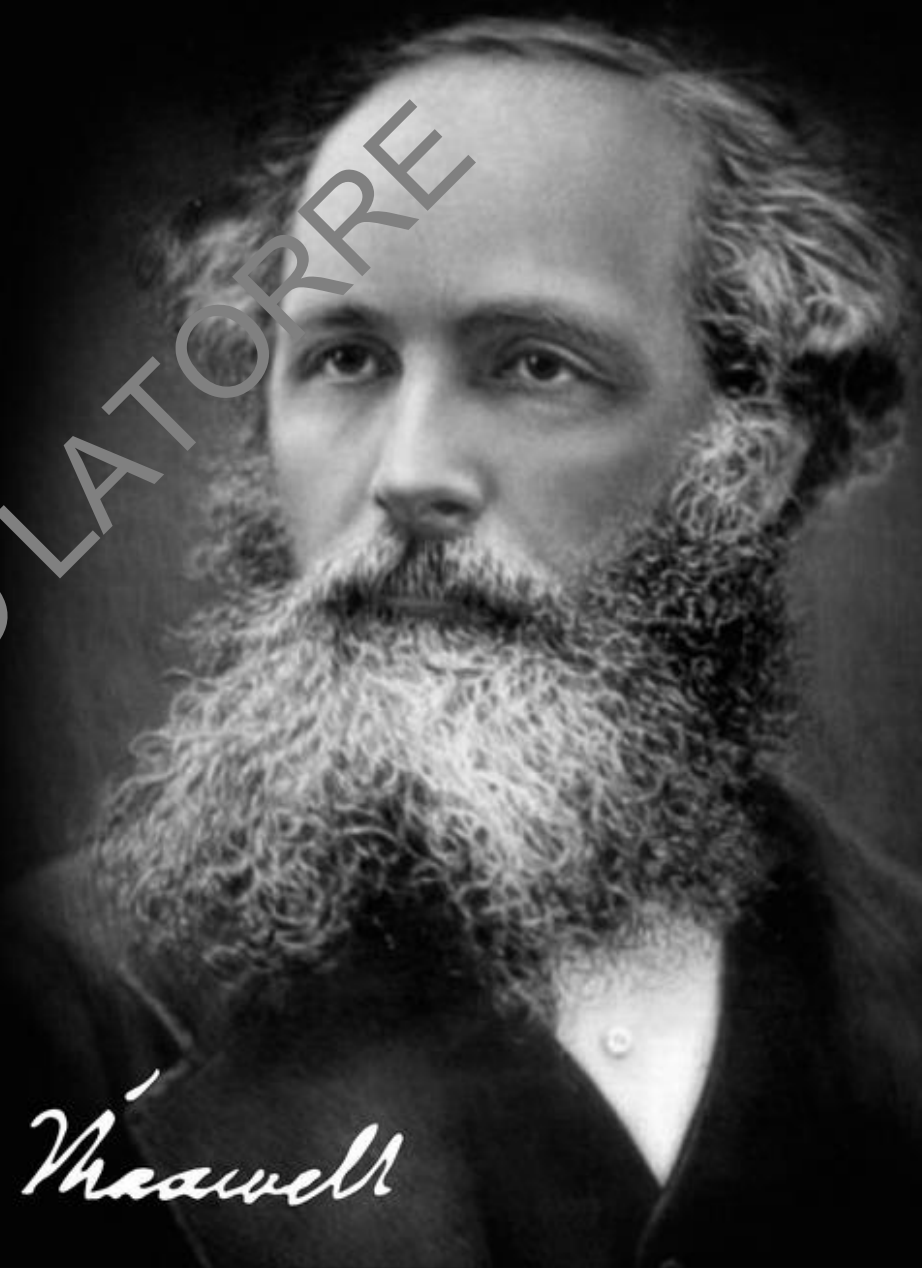
$$\vec{\nabla} \cdot \vec{B} = 0$$

$$\vec{\nabla} \times \vec{H} = \vec{j} + \frac{\partial \vec{D}}{\partial t}$$

$$\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$$

*J. Clerk Maxwell*

SIMBOSIO LATORRE

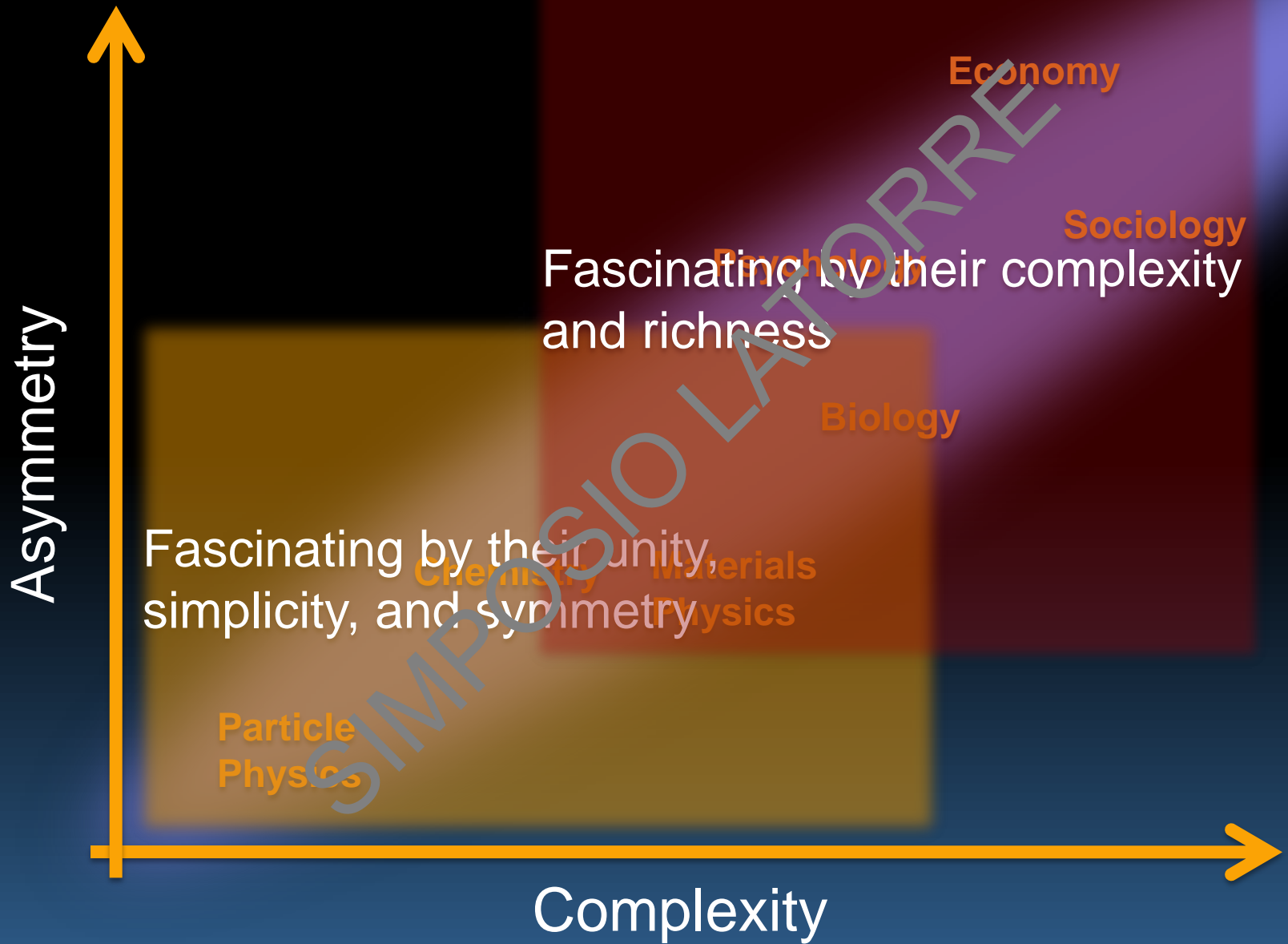


$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R = \frac{8\pi G_N}{c^4} T_{\mu\nu}$$

SIMPOSIO LATOPORRE



SIMPÓSIO LA TORRE



# The Elements

<b>H</b> 1 Hydrogen	<b>He</b> 2 Helium																
<b>Li</b> 3 Lithium	<b>Be</b> 4 Beryllium	<b>B</b> 5 Boron	<b>C</b> 6 Carbon	<b>N</b> 7 Nitrogen	<b>O</b> 8 Oxygen	<b>F</b> 9 Fluorine	<b>Ne</b> 10 Neon										
<b>Na</b> 11 Sodium	<b>Mg</b> 12 Magnesium	<b>Al</b> 13 Aluminum	<b>Si</b> 14 Silicon	<b>P</b> 15 Phosphorus	<b>S</b> 16 Sulfur	<b>Cl</b> 17 Chlorine	<b>Ar</b> 18 Argon										
<b>K</b> 19 Potassium	<b>Ca</b> 20 Calcium	<b>Sc</b> 21 Scandium	<b>Ti</b> 22 Titanium	<b>V</b> 23 Vanadium	<b>Cr</b> 24 Chromium	<b>Mn</b> 25 Manganese	<b>Fe</b> 26 Iron	<b>Co</b> 27 Cobalt	<b>Ni</b> 28 Nickel	<b>Cu</b> 29 Copper	<b>Zn</b> 30 Zinc	<b>Ga</b> 31 Gallium	<b>Ge</b> 32 Germanium	<b>As</b> 33 Arsenic	<b>Se</b> 34 Selenium	<b>Br</b> 35 Bromine	<b>Kr</b> 36 Krypton
<b>Rb</b> 37 Rubidium	<b>Sr</b> 38 Strontium	<b>Y</b> 39 Yttrium	<b>Zr</b> 40 Zirconium	<b>Nb</b> 41 Niobium	<b>Mo</b> 42 Molybdenum	<b>Tc</b> 43 Technetium	<b>Ru</b> 44 Ruthenium	<b>Rh</b> 45 Rhodium	<b>Pd</b> 46 Palladium	<b>Ag</b> 47 Silver	<b>Cd</b> 48 Cadmium	<b>In</b> 49 Indium	<b>Sn</b> 50 Tin	<b>Sb</b> 51 Antimony	<b>Te</b> 52 Tellurium	<b>I</b> 53 Iodine	<b>Xe</b> 54 Xenon
<b>Cs</b> 55 Cesium	<b>Ba</b> 56 Barium	<b>Hf</b> 72 Hafnium	<b>Ta</b> 73 Tantalum	<b>W</b> 74 Tungsten	<b>Re</b> 75 Rhenium	<b>Os</b> 76 Osmium	<b>Ir</b> 77 Iridium	<b>Pt</b> 78 Platinum	<b>Au</b> 79 Gold	<b>Hg</b> 80 Mercury	<b>Tl</b> 81 Thallium	<b>Pb</b> 82 Lead	<b>Bi</b> 83 Bismuth	<b>Po</b> 84 Polonium	<b>At</b> 85 Astatine	<b>Rn</b> 86 Radon	
<b>Fr</b> 87 Francium	<b>Ra</b> 88 Radium	<b>Rf</b> 104 Rutherfordium	<b>Db</b> 105 Dubnium	<b>Sg</b> 106 Seaborgium	<b>Bh</b> 107 Bohrium	<b>Hs</b> 108 Hassium	<b>Mt</b> 109 Meitnerium	<b>Ds</b> 110 Darmstadtium	<b>Rg</b> 111 Roentgenium	<b>Uub</b> 112 Ununbium	<b>Uut</b> 113 Ununtrium	<b>Uuq</b> 114 Ununquadium	<b>Uup</b> 115 Ununpentium	<b>Uuh</b> 116 Ununhexium	<b>Uus</b> 117 Ununseptium	<b>Uuo</b> 118 Ununoctium	
<b>La</b> 57 Lanthanum	<b>Ce</b> 58 Cerium	<b>Pr</b> 59 Praseodymium	<b>Nd</b> 60 Neodymium	<b>Pm</b> 61 Promethium	<b>Sm</b> 62 Samarium	<b>Eu</b> 63 Europium	<b>Gd</b> 64 Gadolinium	<b>Tb</b> 65 Terbium	<b>Dy</b> 66 Dysprosium	<b>Ho</b> 67 Holmium	<b>Er</b> 68 Erbium	<b>Tm</b> 69 Thulium	<b>Yb</b> 70 Ytterbium	<b>Lu</b> 71 Lutetium			
<b>Ac</b> 89 Actinium	<b>Th</b> 90 Thorium	<b>Pa</b> 91 Protactinium	<b>U</b> 92 Uranium	<b>Np</b> 93 Neptunium	<b>Pu</b> 94 Plutonium	<b>Am</b> 95 Americium	<b>Cm</b> 96 Curium	<b>Bk</b> 97 Berkelium	<b>Cf</b> 98 Californium	<b>Es</b> 99 Einsteinium	<b>Fm</b> 100 Fermium	<b>Md</b> 101 Mendelevium	<b>No</b> 102 Nobelium	<b>Lr</b> 103 Lawrencium			

☛ Radioactive elements

Photographs show samples of the pure or nearly pure element, except for Francium, Actinium, Protactinium, and the actinides containing multiple valence states of the element (Pa, Ra, Th, Po, and the lanthanides). Some elements are shown as they appear in nature, while others are shown as they appear in the laboratory. The elements are arranged in order of increasing atomic number.

Photos and photographs by Theodore G. Gray, 2008. Research 116.

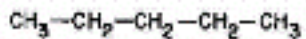
See <http://www.chemeddl.org> for more information on the periodic table of elements.

Photos: Copyright © 2008, Theoretical 10. Gray: All rights reserved.

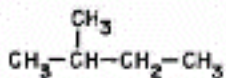
View some of this poster: [periodictable.com](http://periodictable.com).

Have samples like these: [element-collectors.com](http://element-collectors.com)

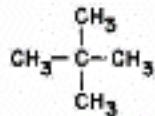
Toda la materia  
habida y por haber



*n*-Pentane  
(bp = 36°C)



Isopentane  
(bp = 28°C)



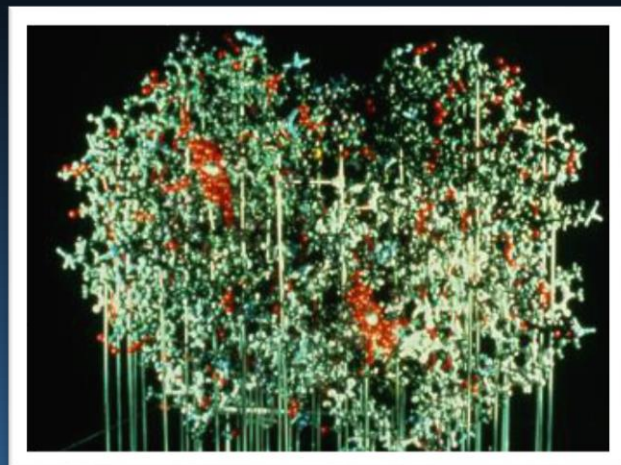
Neopentane  
(bp = 10°C)



$\text{C}_5 \text{H}_{12}$  three isomers of pentane

$\text{C}_{30} \text{H}_{62} \approx 4000$  million isomers

Think of Hemoglobin  $\text{C}_{2954} \text{H}_{4516} \text{N}_{780} \text{O}_{806} \text{S}_{12} \text{Fe}_4$ !!





**“He who binds to himself a joy  
Does the winged life destroy  
But he who kisses the joy as it flies  
Lives in eternity’s sun rise!”**

**“Eternity”, William Blake**

## Criterios de belleza

- ¿Cuán amplias y de largo alcance son las implicaciones?
- ¿Cuán sutiles e inesperadas son las conexiones?
- ¿Cuán profundamente penetra en el secreto de la naturaleza?

## Criterios de belleza

- **Máxima sencillez**
- **Obra colectiva**
- **Inexhaustible. Cita Faraday**

SIMPOSIO LATORRE

MISTERIO

MISTERIO

MISTERIO

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MISTERIO

MISTERIO

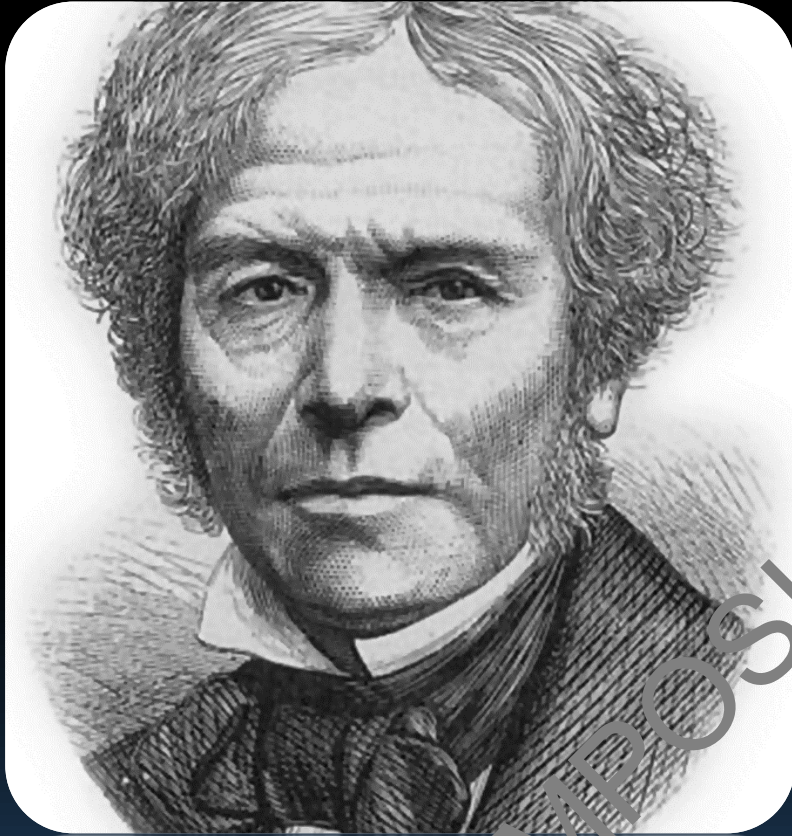
MISTERIO

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MISTERIO

MISTERIO

La expansión de las fronteras del  
conocimiento nos pone en contacto con lo  
desconocido\*



“La gran belleza de nuestra ciencia es que su avance, lejos de agotar el campo de investigación, en algún grado abre las puertas a un conocimiento más vasto y diverso, desbordante de **hermosura y utilidad**”

**Michael Faraday**

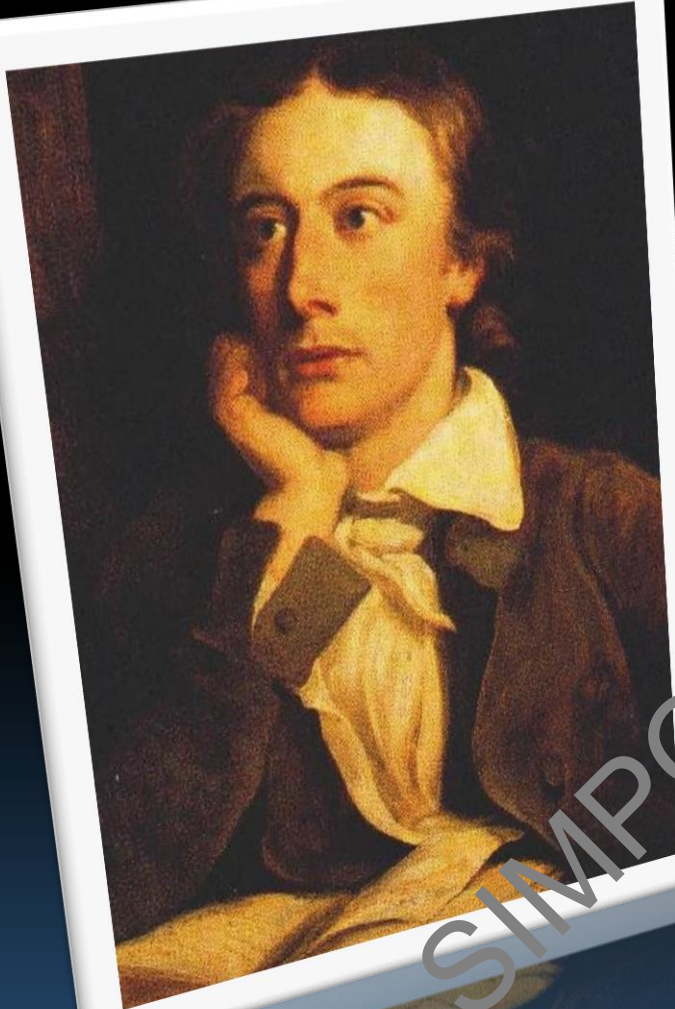


**“El sutil mundo de lo cuántico me tiene robado el corazón”**

***Simplex sigillum veri***

***Pulcritudo splendor veritatis***

SIMPOSIUM LATORRE



“Beauty is truth, truth is beauty,  
- that is all

Ye know on earth, and all ye  
need to know”

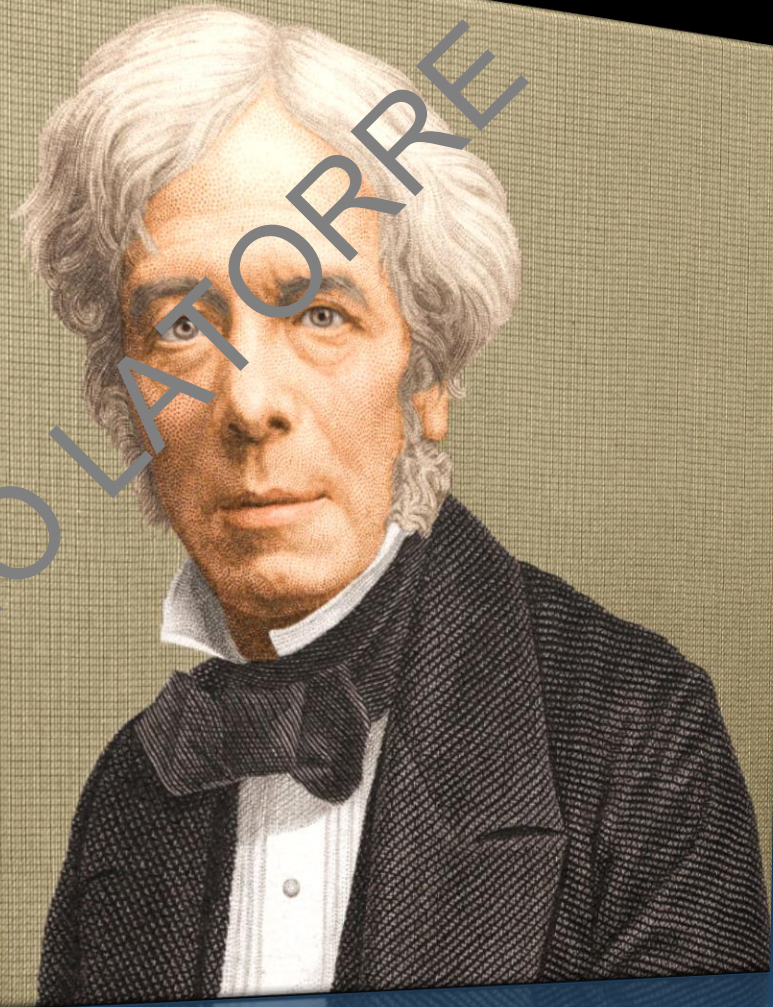
**John Keats**

“Ode to a Grecian urn”



**“Nothing is too wonderful to be true,**  
if it be consistent with  
the laws of nature;  
and in such thing as  
these, experiment is  
the best test of such  
consistency”

**Faraday**  
Laboratory Journal  
March 18, 1849



## **William Blake's longing:**

**“To see a world in a Grain of Sand  
And a Heaven in a Wild Flower  
Hold Infinity in the palm of your hand  
And Eternity in an hour”**

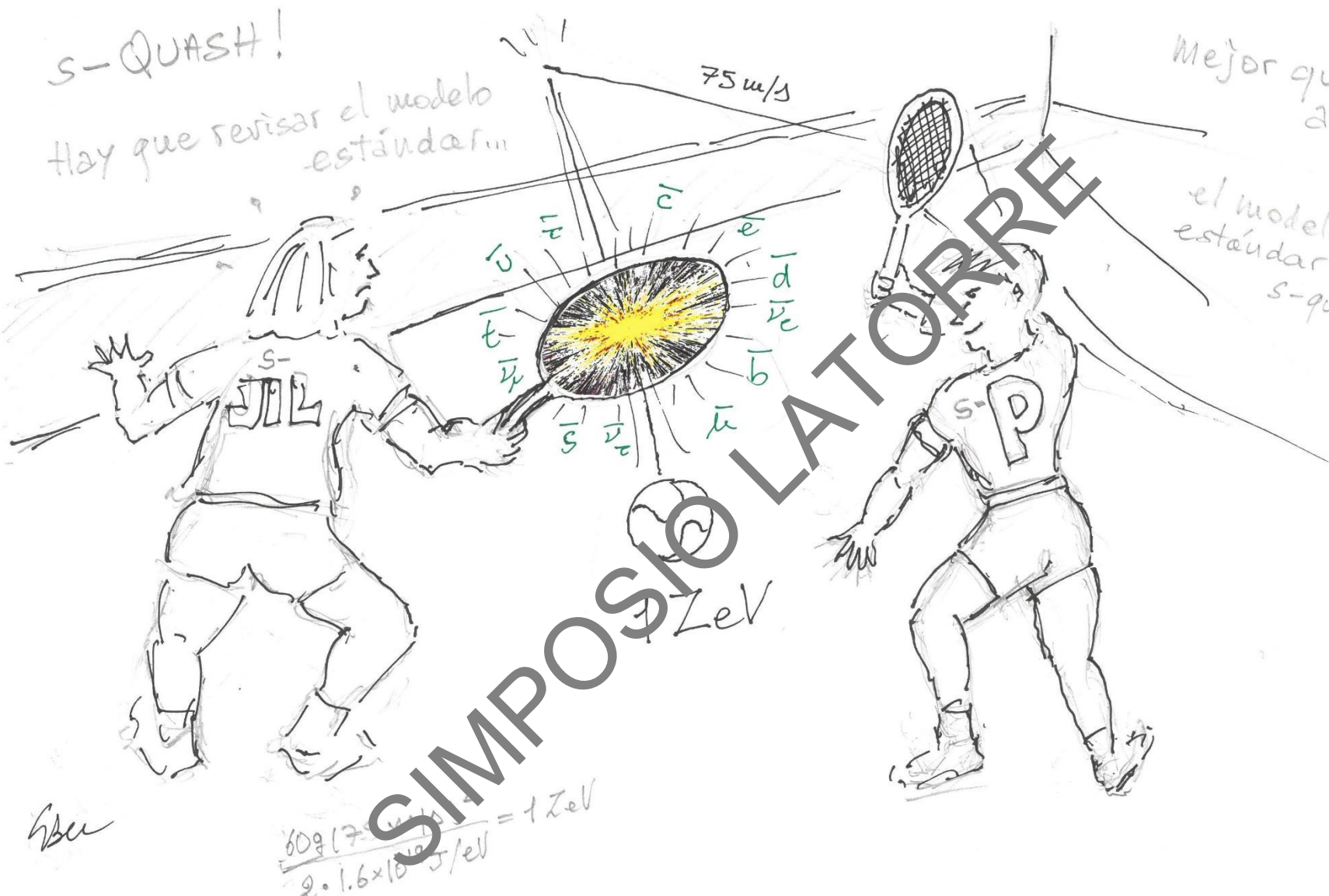


S-QUASH!

Hay que revisar el modelo estándar...

Mejor que al CERN!

el modelo estándar del s-quash



hbc

$$\frac{60g(7...)}{2 \cdot 1.6 \times 10^{-19} \text{ J/eV}} = 1 \text{ ZeV}$$

el QUASH super-simétrico



**¡Muchas gracias!**

An abstract painting featuring a white, stylized figure in the center, possibly representing a person or a creature. The background is a mix of dark, earthy tones (browns, greys) and vibrant colors (blues, reds, oranges). A bright, rainbow-like arc is visible in the upper right quadrant. The overall style is expressive and somewhat somber.

# Ya no sé nada

*Lo cierto es que una abstracta  
incertidumbre  
sale de cada caos que regresa  
cada vez a ser orden,  
y, qué curioso, todo  
comienza con palabras,  
nuevas palabras que se sientan solas  
a la mesa, ...*

*...  
hasta que son, hasta que comienza  
otra vez el comienzo por el verbo.*

**Neruda**