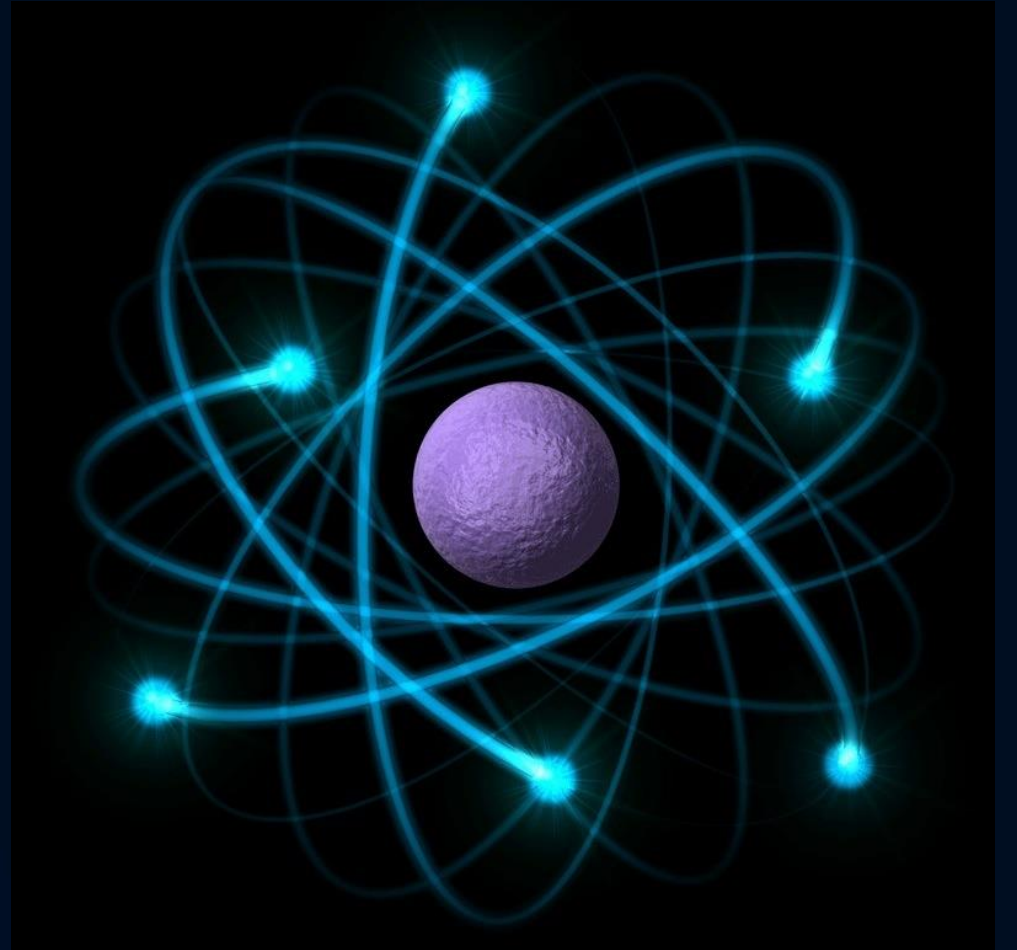
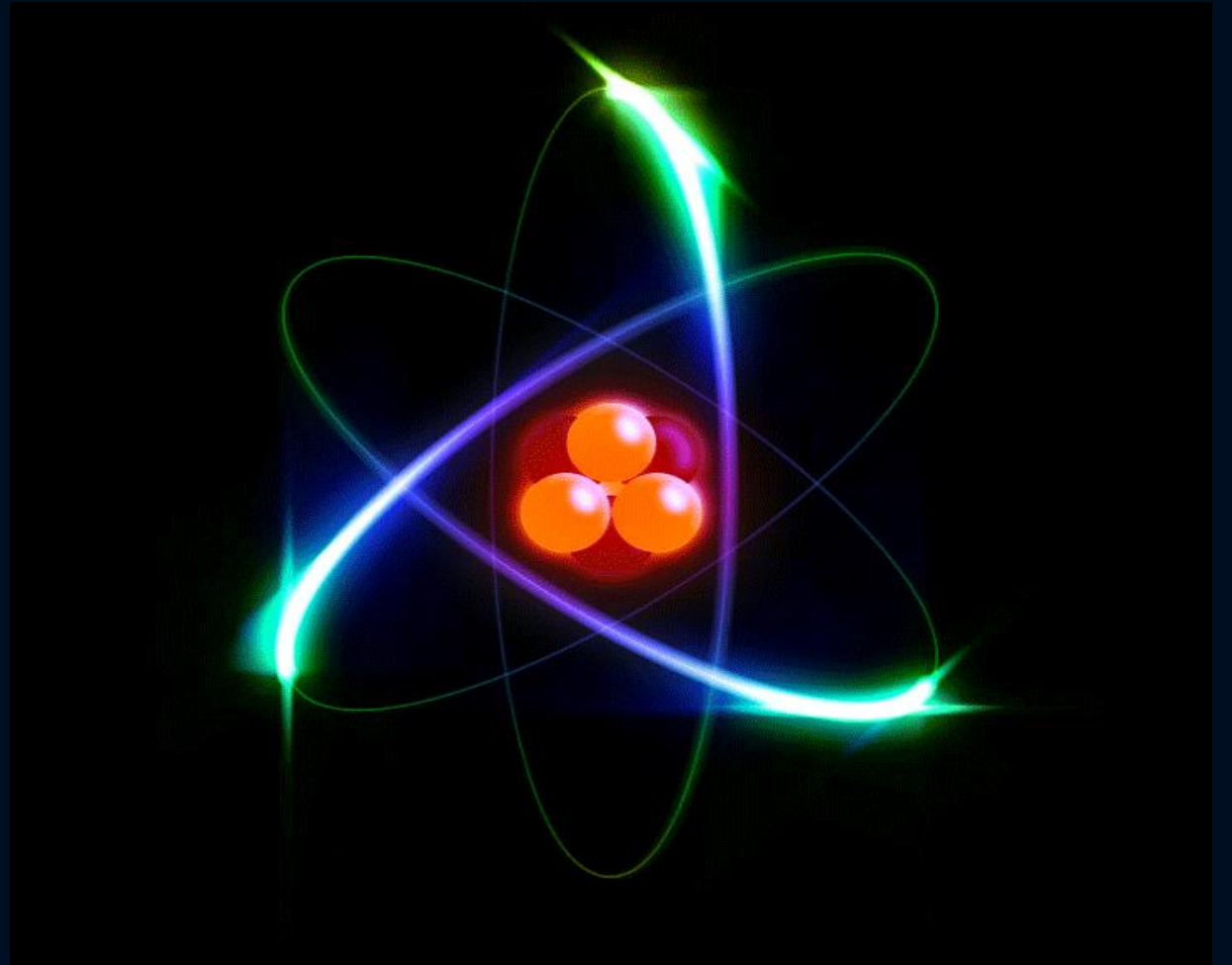
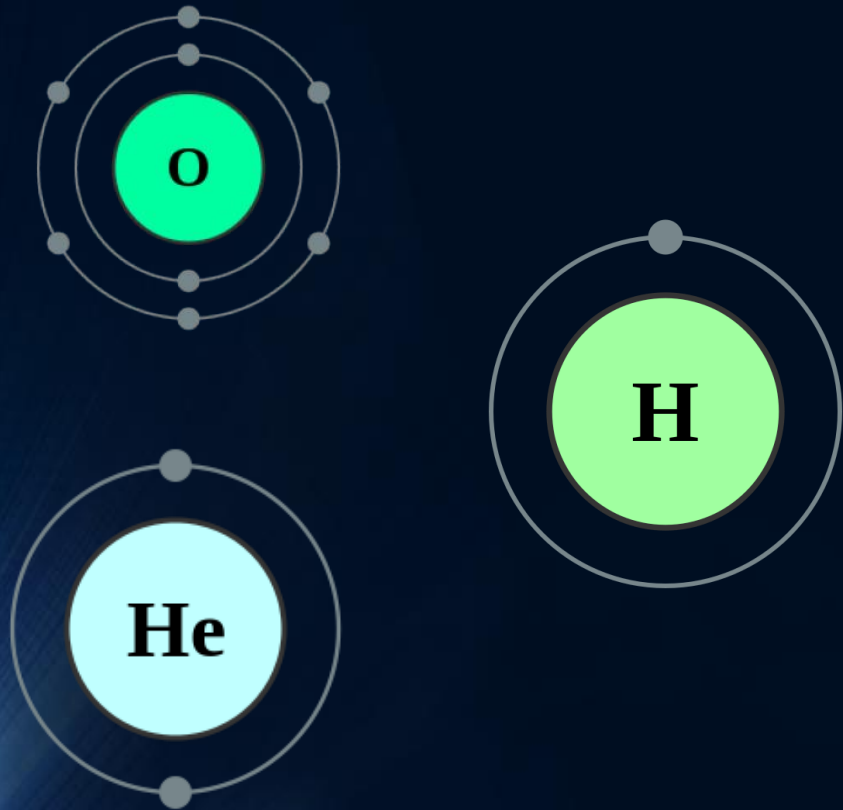


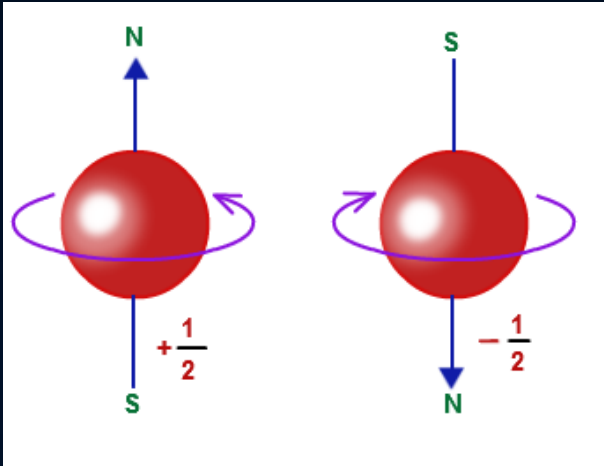
# ΔΟΜΗ ΤΗΣ ΥΛΗΣ

The background features a dark blue gradient on the left, transitioning into a complex, glowing blue structure on the right. This structure consists of numerous thin, parallel lines that curve and spiral inward, creating a sense of depth and movement, reminiscent of a tunnel or a futuristic architectural element. The lines are more densely packed and brighter in the center-right area, fading into the dark background on the left.



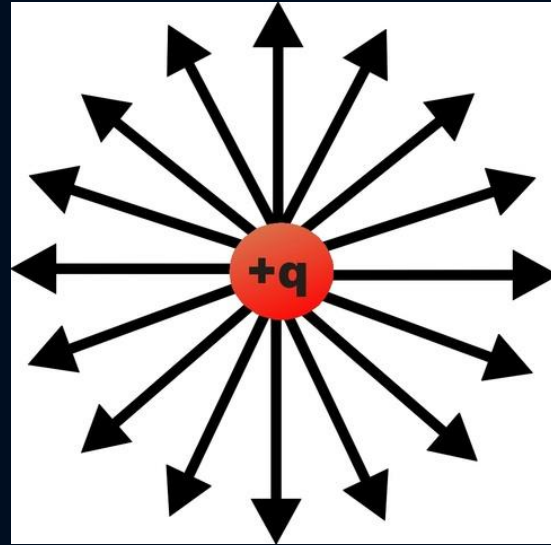
# H APXH





- Ιδιοπεριστροφική κίνηση

**MASS**



- Ηλεκτρικό Φορτίο

**LIFETIME**

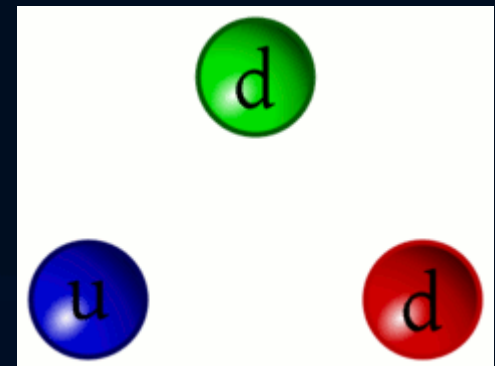
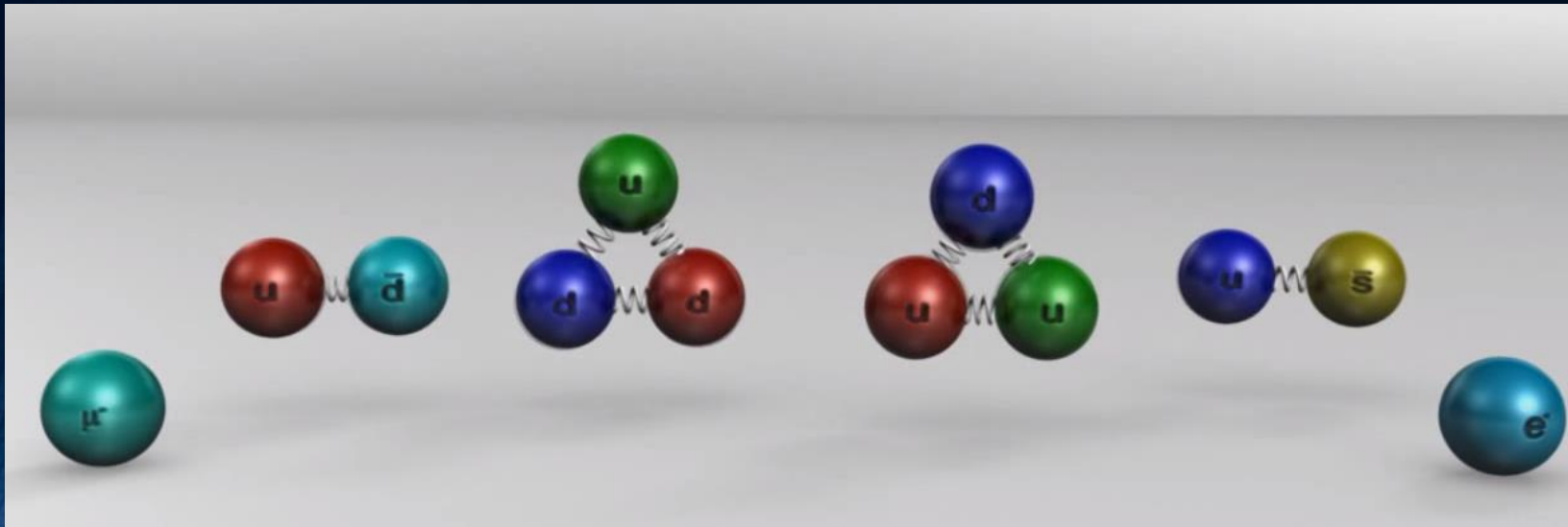
# STANDARD MODEL

## FERMIONS

matter constituents  
spin = 1/2, 3/2, 5/2, ...

Leptons spin = 1/2			Quarks spin = 1/2		
Flavor	Mass GeV/c <sup>2</sup>	Electric charge	Flavor	Approx. Mass GeV/c <sup>2</sup>	Electric charge
$\nu_e$ electron neutrino	$<1 \times 10^{-8}$	0	<b>u</b> up	0.003	2/3
<b>e</b> electron	0.000511	-1	<b>d</b> down	0.006	-1/3
$\nu_\mu$ muon neutrino	$<0.0002$	0	<b>c</b> charm	1.3	2/3
<b><math>\mu</math></b> muon	0.106	-1	<b>s</b> strange	0.1	-1/3
$\nu_\tau$ tau neutrino	$<0.02$	0	<b>t</b> top	175	2/3
<b><math>\tau</math></b> tau	1.7771	-1	<b>b</b> bottom	4.3	-1/3

# QUARKS



# BOSONS

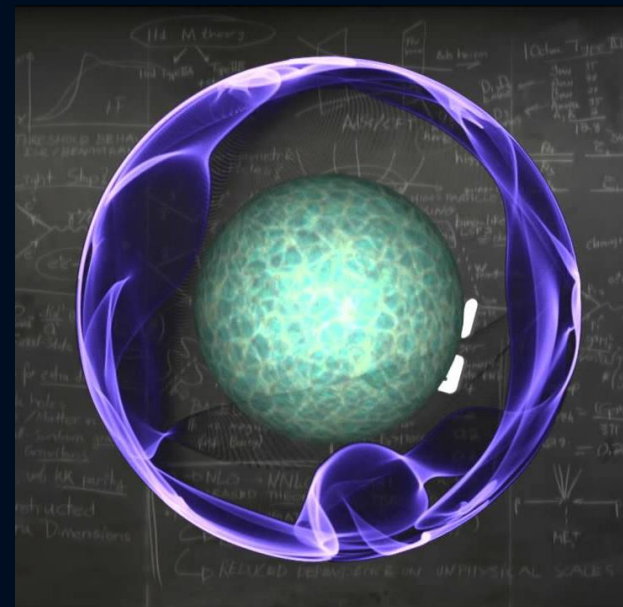
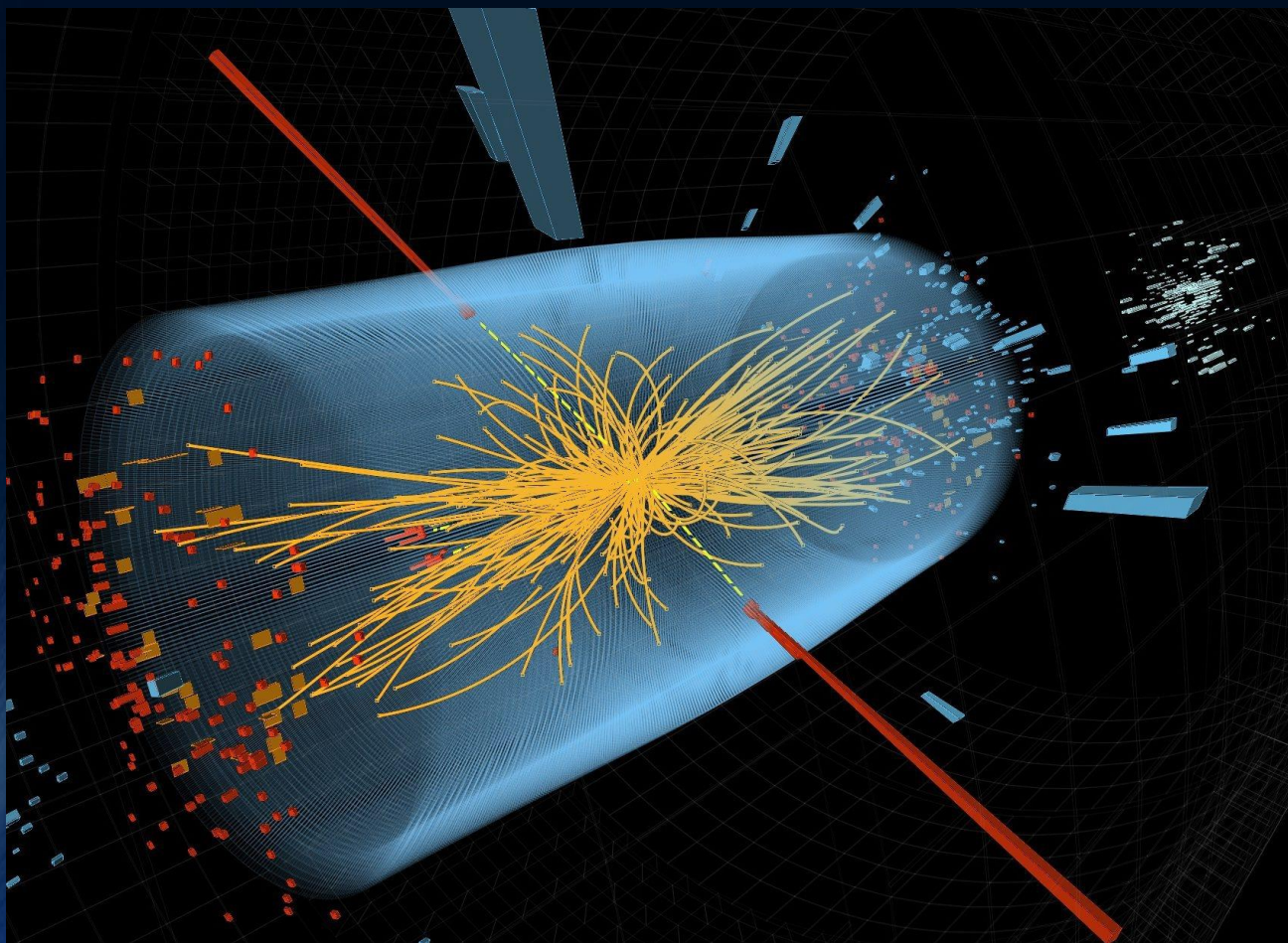
## Unified Electroweak spin = 1

Name	Mass GeV/c <sup>2</sup>	Electric charge
$\gamma$ photon	0	0
$W^-$	80.4	-1
$W^+$	80.4	+1
$Z^0$	91.187	0

## Strong (color) spin = 1

Name	Mass GeV/c <sup>2</sup>	Electric charge
$g$ gluon	0	0

# HIGGS BOSSON





# Βαρυόνια και Αντι-Βαρυόνια

## Baryons $qqq$ and Antibaryons $\bar{q}\bar{q}\bar{q}$

Baryons are fermionic hadrons.  
There are about 120 types of baryons.

Symbol	Name	Quark content	Electric charge	Mass GeV/c <sup>2</sup>	Spin
<b>p</b>	proton	<b>uud</b>	1	0.938	1/2
<b><math>\bar{p}</math></b>	anti-proton	<b><math>\bar{u}\bar{u}\bar{d}</math></b>	-1	0.938	1/2
<b>n</b>	neutron	<b>udd</b>	0	0.940	1/2
<b><math>\Lambda</math></b>	lambda	<b>uds</b>	0	1.116	1/2
<b><math>\Omega^-</math></b>	omega	<b>sss</b>	-1	1.672	3/2

# ΥΛΗ ΚΑΙ ΑΝΤΙΥΛΗ



# ΜΕΙΩΝΙΑ

## Mesons $q\bar{q}$

Mesons are bosonic hadrons.  
There are about 140 types of mesons.

Symbol	Name	Quark content	Electric charge	Mass $\text{GeV}/c^2$	Spin
$\pi^+$	pion	$u\bar{d}$	+1	0.140	0
$K^-$	kaon	$s\bar{u}$	-1	0.494	0
$\rho^+$	rho	$u\bar{d}$	+1	0.770	1
$B^0$	B-zero	$d\bar{b}$	0	5.279	0
$\eta_c$	eta-c	$c\bar{c}$	0	2.980	0

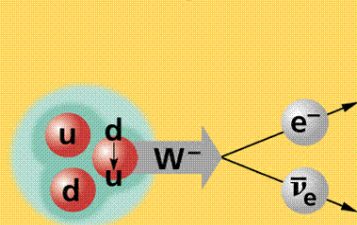
# ΟΙ ΔΥΝΑΜΕΙΣ

viewed as the exchange of meson

## PROPERTIES OF THE INTERACTIONS

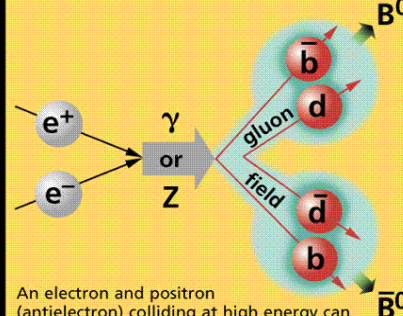
Property \ Interaction	Gravitational	Weak	Electromagnetic	Strong	
		(Electroweak)		Fundamental	Residual
Acts on:	Mass – Energy	Flavor	Electric Charge	Color Charge	See Residual Strong Interaction Note
Particles experiencing:	All	Quarks, Leptons	Electrically charged	Quarks, Gluons	Hadrons
Particles mediating:	Graviton (not yet observed)	$W^+$ $W^-$ $Z^0$	$\gamma$	Gluons	Mesons
Strength relative to electromag for two u quarks at:	$10^{-41}$	0.8	1	25	Not applicable to quarks
for two protons in nucleus	$10^{-41}$ $10^{-36}$	$10^{-4}$ $10^{-7}$	1	60 Not applicable to hadrons	20

$$n \rightarrow p e^- \bar{\nu}_e$$



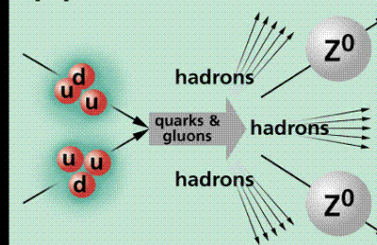
A neutron decays to a proton, an electron, and an antineutrino via a virtual (mediating) W boson. This is neutron  $\beta$  decay.

$$e^+e^- \rightarrow B^0 \bar{B}^0$$



An electron and positron (antielectron) colliding at high energy can annihilate to produce  $B^0$  and  $\bar{B}^0$  mesons via a virtual Z boson or a virtual photon.

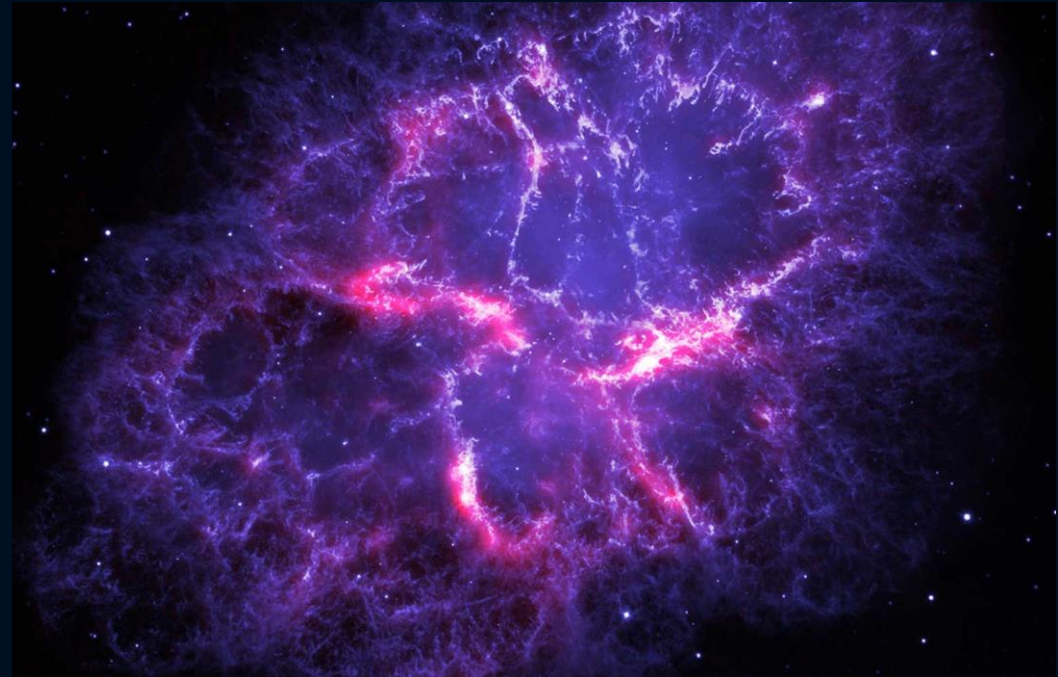
$$p p \rightarrow Z^0 Z^0 + \text{ assorted hadrons}$$



Two protons colliding at high energy can produce various hadrons plus very high mass particles such as Z bosons. Events such as this one are rare but can yield vital clues to the structure of matter.

# ΤΙ ΥΠΑΡΧΕΙ ΜΕΤΑ ΤΟ STANDARD MODEL ?

- ΥΠΕΡΣΥΜΜΕΤΡΙΑ
- ΜΑΥΡΗ ΥΛΗ
- ΆΛΛΕΣ ΔΙΑΣΤΑΣΕΙΣ



ΕΥΧΑΡΗΣΤΟΥΜΕ ΓΙΑ ΤΗΝ ΠΡΟΣΟΧΗ ΣΑΣ!!!!!!