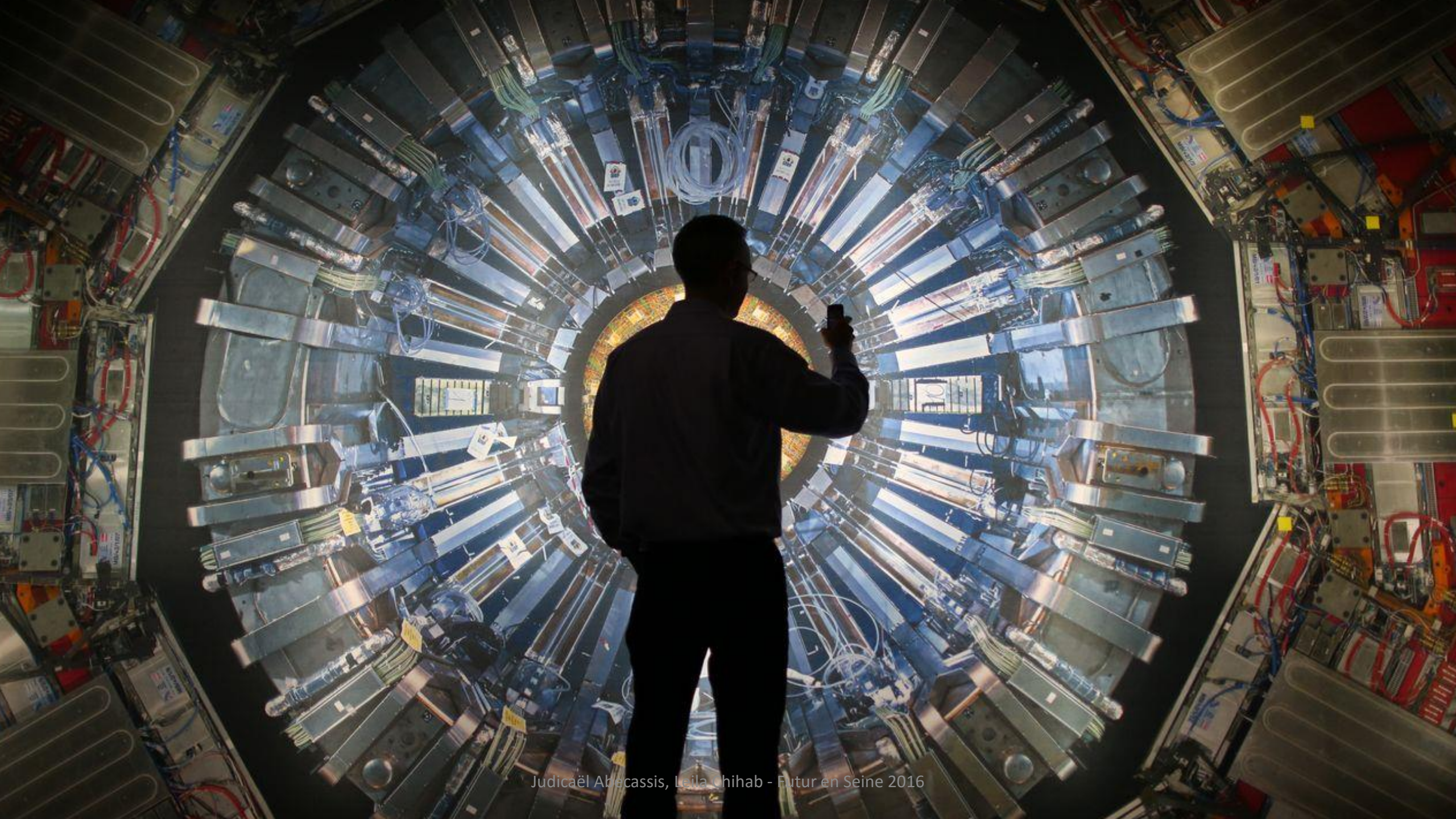




Histoire d'un projet particulier





QUARK CLASH

Type : Jeu de réflexion / Jeu de cartes

Nombre de joueurs : 1 à 2

Plateforme : PC, Mobile (Android, iOS)



INTERACTION FORTE

ÉLECTROMAGNÉTIQUE

INTERACTION FAIBLE

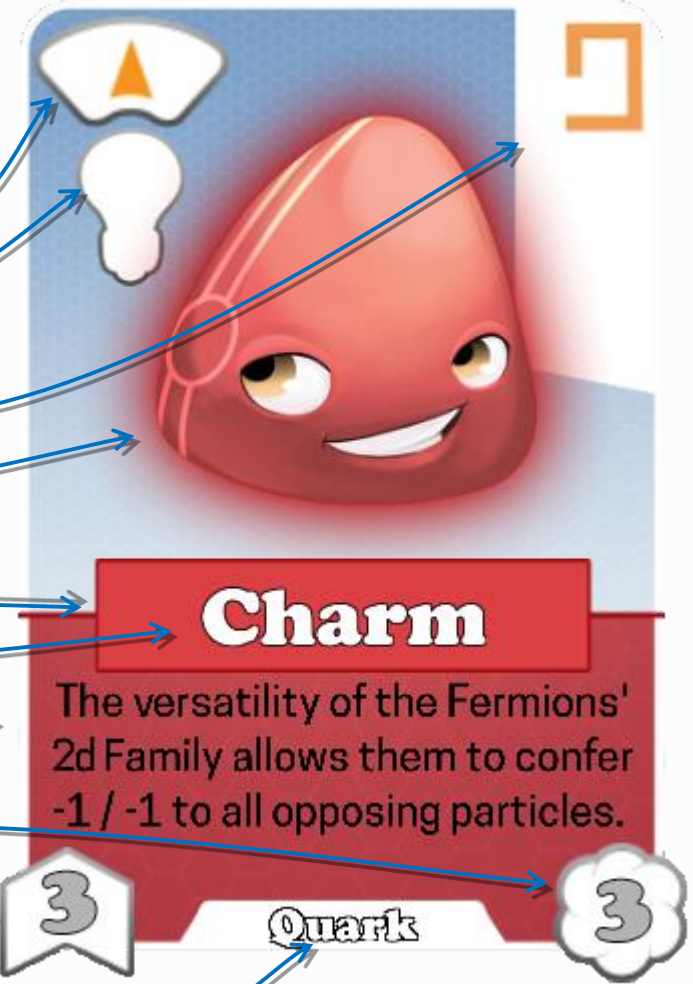
GRAVITATION



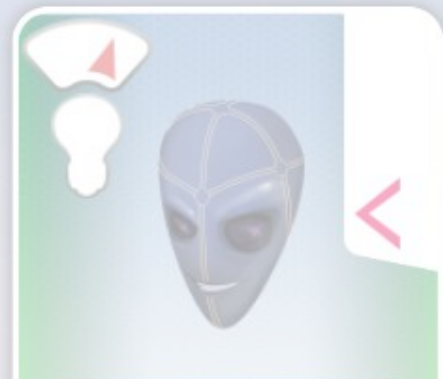


INSPIRATIONS

- Famille
- Charge électrique
- Symbole d'interaction electro-faible
- Illustration
- Couleur d'interaction forte
- Nom de la particule
- Capacité spéciale
- Points de défense
- Points d'attaque
- Type de la particule



Carte



Beauty

The mass of the Fermions' 3rd antifamily allows them to reduce the defence of opposing Particles by half.

4

Antiquark

2

Member of the third anti-family, the anti-beauty quark is discovered in 1977 at Fermilab in proton-proton collisions in which a particle which is a bound state of beauty and anti-beauty is emitted. It has been particularly studied to understand the subtle differences between quarks and anti-quarks when they interact through the weak interaction, leading to an asymmetry between matter and antimatter.

Lifetime : $\sim 1.5 \times 10^{-12}$ s

Mass : 4.2 GeV/c²

Spin : 1/2

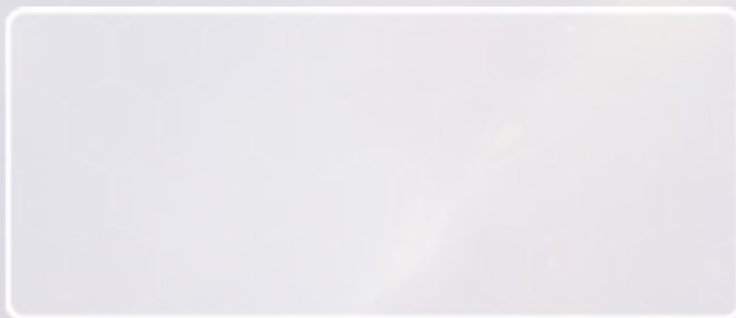
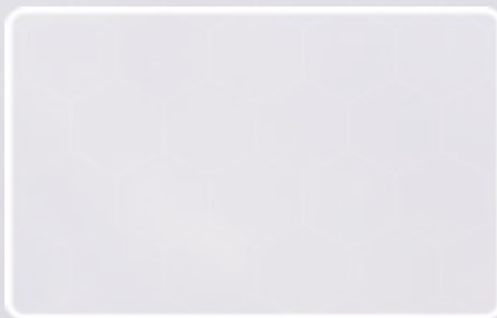
Electric charge : +1/3

Weak charge : yes

Colour : 1 (anti-)colour

Judicael





PLAY

PASS

RULES

QUIT

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Beauty

The mass of the Fermions' 3rd antifamily allows them to reduce the defence of opposing Particles by half.

4 Antiquark 2

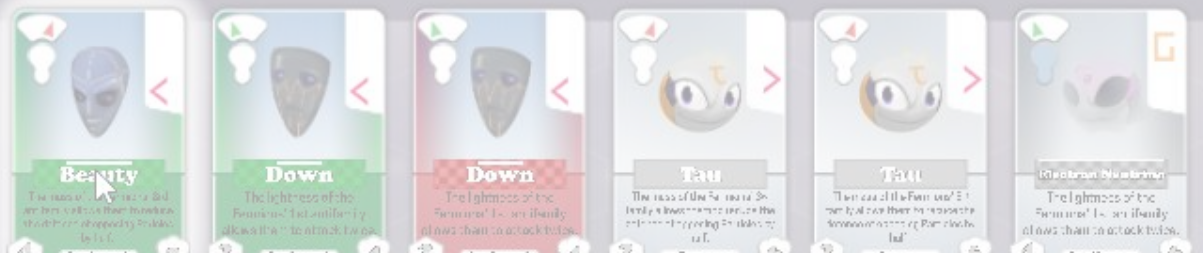
Member of the third anti-family, the anti-beauty quark is discovered in 1977 at Fermilab in proton-proton collisions in which a particle which is a bound state of beauty and anti-beauty is emitted. It has been particularly studied to understand the subtle differences between quarks and anti-quarks when they interact through the weak interaction, leading to an asymmetry between matter and antimatter.

Lifetime : $\sim 1.5 \times 10^{-12}$ s
 Mass : $4.2 \text{ GeV}/c^2$
 Spin : $1/2$
 Electric charge : $+1/3$
 Weak charge : yes
 Colour : 1 (anti-)colour

Judicael



The main game board contains 14 cards arranged in two rows. The top row has 5 cards: Down, Gluon, Up, Strange, and Down. The bottom row has 9 cards: Strange, Strange, Up, Charm, Gluon, Gluon, and Up. The Gluon cards in the top row and the Gluon cards in the bottom row are highlighted with a yellow border.

The bottom row of cards includes Beauty, Down, Down, Tau, Tau, and Gluon. The Beauty card is highlighted with a yellow border.

PLAY

PASS

RULES

QUIT



Beauty

The mass of the Fermions' 3rd antifamily allows them to reduce the defence of opposing Particles by half.

4 Antiquark 2

Member of the third anti-family, the anti-beauty quark is discovered in 1977 at Fermilab in proton-proton collisions in which a particle which is a bound state of beauty and anti-beauty is emitted. It has been particularly studied to understand the subtle differences between quarks and anti-quarks when they interact through the weak interaction, leading to an asymmetry between matter and antimatter.

Lifetime : $\sim 1.5 \times 10^{-12}$ s
 Mass : $4.2 \text{ GeV}/c^2$
 Spin : $1/2$
 Electric charge : $+1/3$
 Weak charge : yes
 Colour : 1 (anti-)colour

Judicael




Down: The lightness of the Fermions' 3rd family allows them to attack twice.

Gluon: Gluons are the particles that hold quarks of the same colour together.

Up: The lightness of the Fermions' 1st family allows them to attack twice.

Strange: The second lightest of the Fermions' 3rd family allows them to attack twice.

Down: The lightness of the Fermions' 1st family allows them to attack twice.

Strange: The mass of the Fermions' 2nd family allows them to attack twice.

Strange: The mass of the Fermions' 2nd family allows them to attack twice.

Up: The lightness of the Fermions' 1st family allows them to attack twice.

Charm: The mass of the Fermions' 2nd family allows them to attack twice.

Gluon: Gluons are the particles that hold quarks of the same colour together.

Gluon: Gluons are the particles that hold quarks of the same colour together.

Up: The lightness of the Fermions' 1st family allows them to attack twice.




Beauty: The mass of the Fermions' 3rd family allows them to reduce the defence of opposing Particles by half.

Down: The lightness of the Fermions' 1st family allows them to attack twice.

Down: The lightness of the Fermions' 1st family allows them to attack twice.

Tau: The mass of the Fermions' 3rd family allows them to reduce the defence of opposing Particles by half.

Tau: The mass of the Fermions' 3rd family allows them to reduce the defence of opposing Particles by half.

Up: The lightness of the Fermions' 1st family allows them to attack twice.

PLAY

PASS

RULES

QUIT

Computer



Top row of cards:

- Photon**: Photon's luminous power gives -2, -2 to charged opposing particles.
- W⁺**: The speedy, red, triphasic W⁺ is the most powerful of the W bosons. It has a mass 80 times that of the electron.
- W⁻**: The speedy, red, triphasic W⁻ is the most powerful of the W bosons. It has a mass 80 times that of the electron.

Bottom row of cards:

- Strange**: The mass of the Strange quark is 1/3 that of the proton.
- Strange**: The mass of the Strange quark is 1/3 that of the proton.
- Charm**: The mass of the Charm quark is 1/3 that of the proton.
- Top**: The mass of the Top quark is 173 times that of the proton.
- Electron**: The lightness of the Electron's family allows them to attach twice.
- Charm**: The mass of the Charm quark is 1/3 that of the proton.
- Gluon**: Quarks are connected to each other by gluons. They are the carriers of the strong force.

PLAY

PASS

Transformation: STRONG

Left card: **Up** (Lightness of the charm quark's family allows them to attach twice).

Right cards: **Gluon** (Quarks are connected to each other by gluons. They are the carriers of the strong force.) and **Up** (The lightness of the charm quark's family allows them to attach twice).

RULES

QUIT

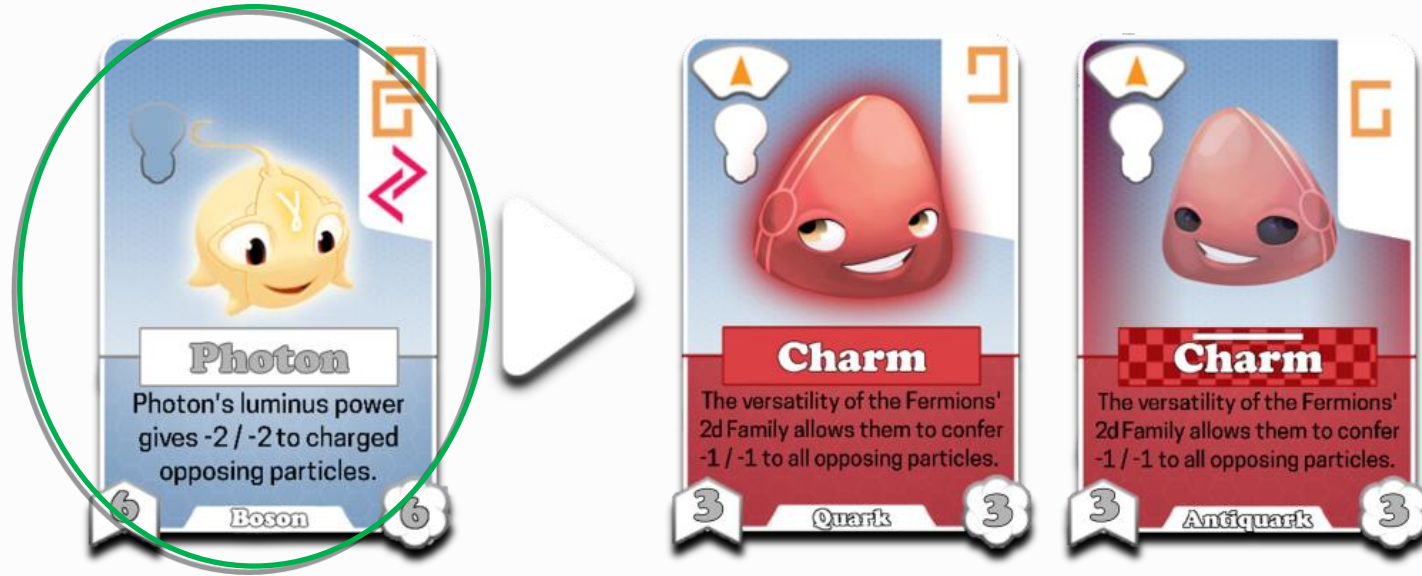
Judicael



Bottom row of cards:

- Down**: The lightness of the charm quark's family allows them to attach twice.
- Down**: The lightness of the charm quark's family allows them to attach twice.
- Top**: The mass of the Top quark is 173 times that of the proton.
- Top**: The mass of the Top quark is 173 times that of the proton.
- Electron**: The lightness of the Electron's family allows them to attach twice.

Force



Familles



Première famille



Seconde famille



Troisième famille

Interaction Faible



$$\square = \overbrace{\langle \quad \rangle}^{=0} + \square$$

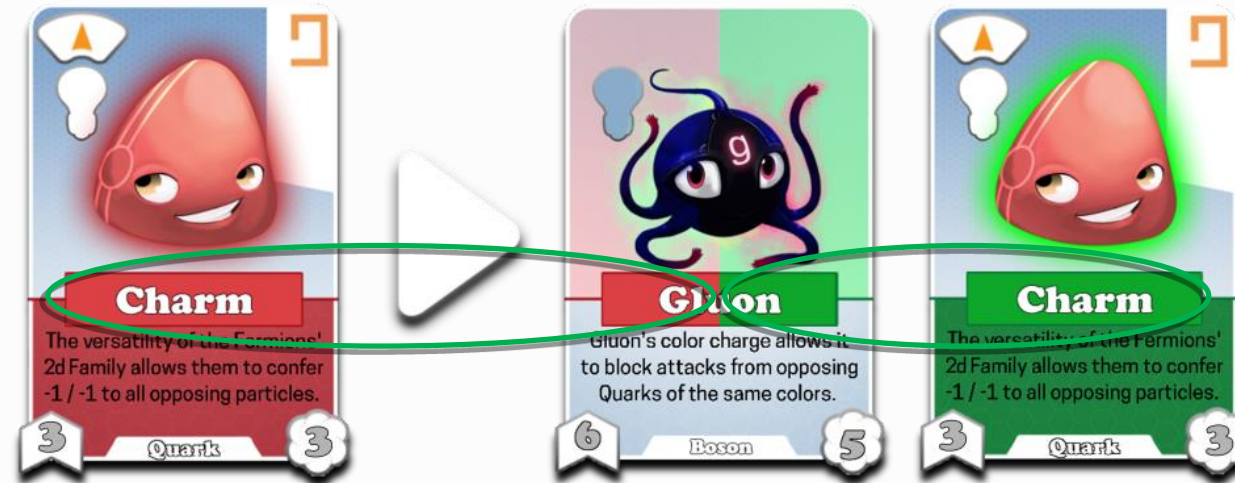
Interaction Forte



$$\text{Red Square} = \text{Red Square} + \text{White Square}$$

$$\text{White Square} = \text{Red Square} + \text{Red and White Checkered Square}$$

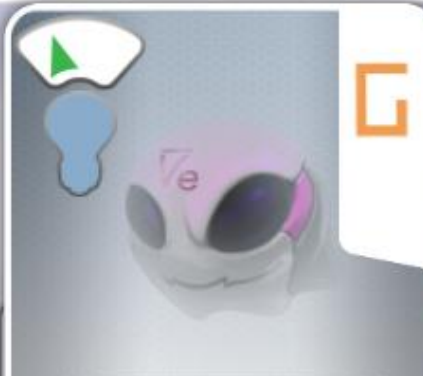
Gluons



Higgs



Computer

Electron Neutrino
The lightness of the Fermions' 1st antifamily allows them to attack twice.

Antilepton 6



Up
The lightness of the Fermions' 1st family allows them to attack twice.

Quark 2



Electron Neutrino attacks Up...
Up loses 4 health points!



Down
The heaviness of the Fermions' 1st family allows them to attack twice.



Down
The heaviness of the Fermions' 1st family allows them to attack twice.



Tau
The heaviness of the Fermions' 1st family allows them to attack twice.



Tau
The heaviness of the Fermions' 1st family allows them to attack twice.



Up
The lightness of the Fermions' 1st family allows them to attack twice.

PLAYER 2 TURN

PASS

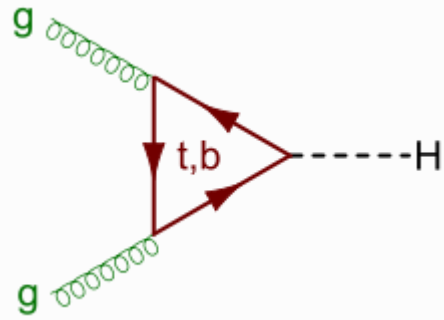
RULES

QUIT

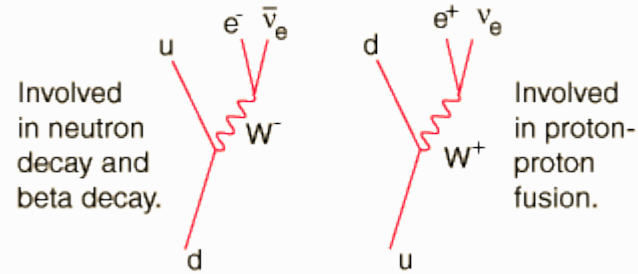
Judicael



Science



Weak interaction transformations of u and d quarks

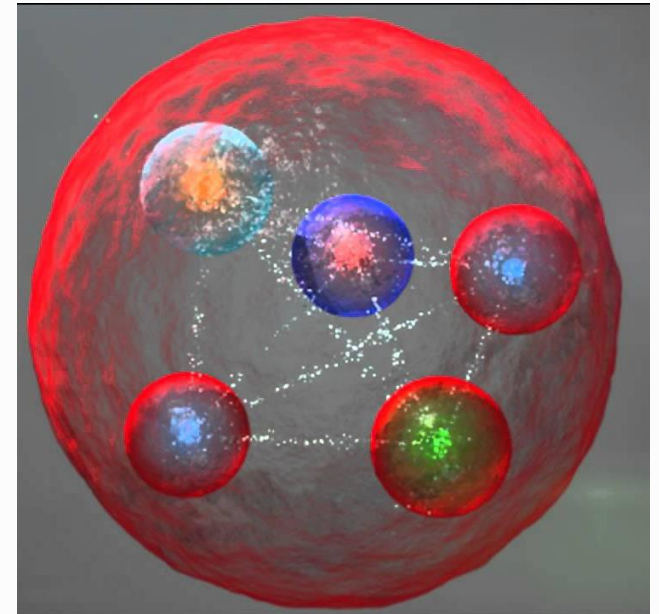


Involved in neutron decay and beta decay.

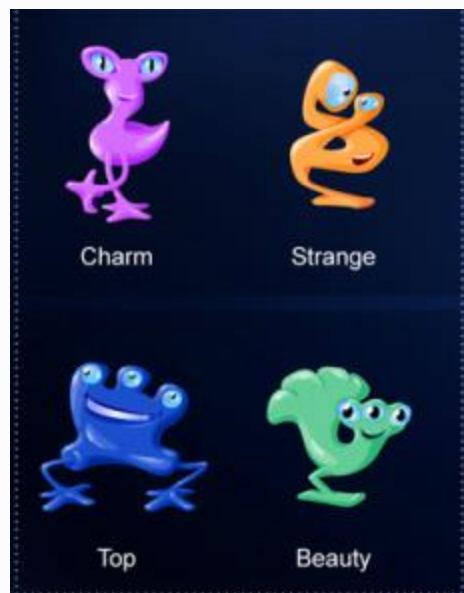
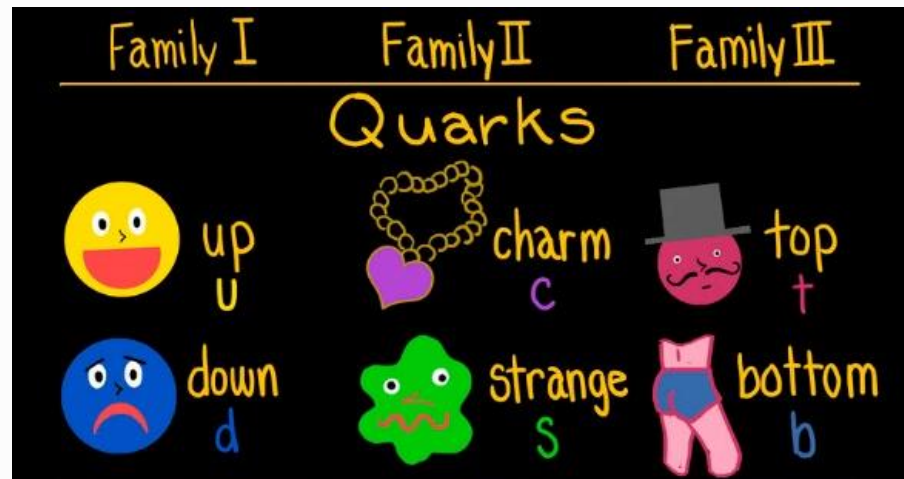
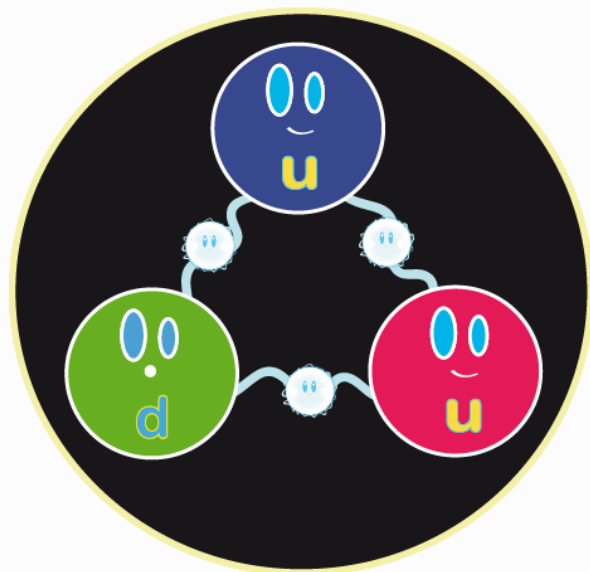
Involved in proton-proton fusion.



mass →	2.4 MeV	1.27 GeV	171.2 GeV
charge →	$\frac{2}{3}$	$\frac{2}{3}$	$\frac{2}{3}$
spin →	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
name →	u up	c charm	t top
Quarks	4.8 MeV	104 MeV	4.2 GeV
	$-\frac{1}{3}$	$-\frac{1}{3}$	$-\frac{1}{3}$
	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
	d down	s strange	b bottom



Art





Up & AntiUp



Charm & AntiCharm



Top & AntiTop



Down & AntiDown



Strange & AntiStrange



Bottom & AntiBottom

QUARKS



Gluon



Higgs



Photon



W+



W-



Z

BOSONS



Electron



Muon



Tau



Positron



Electron-Neutrino



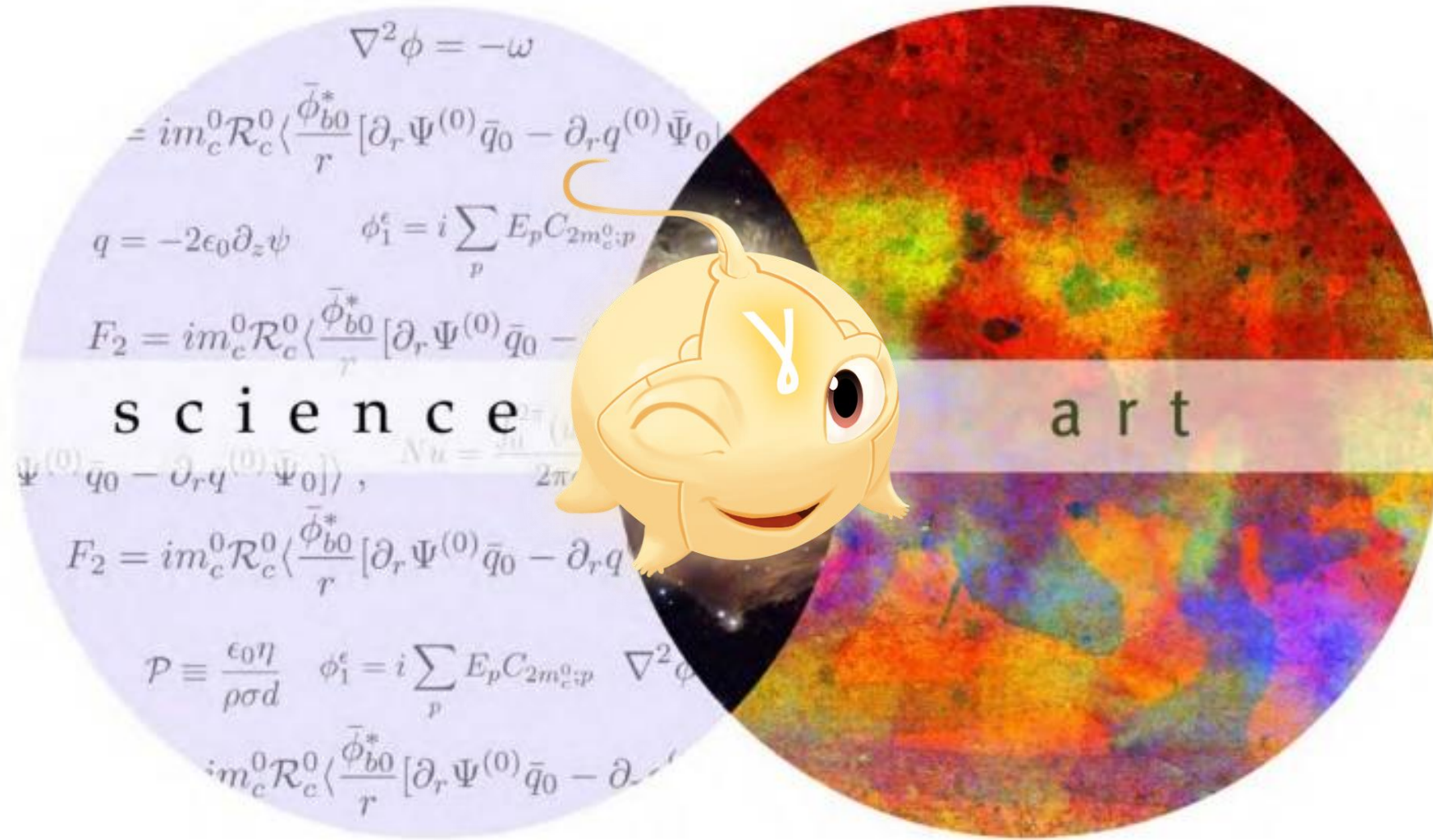
Muon-Neutrino



Tau-Neutrino

et les antileptons!

LEPTONS





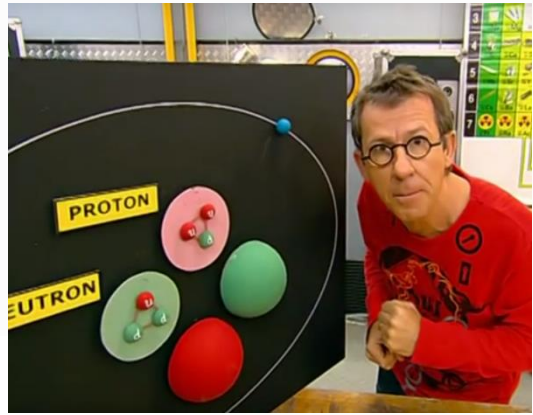
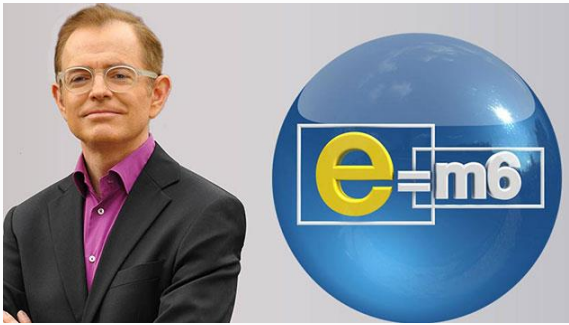


SCIENCE & VIE

**SCIENCES
ET
AVENIR**



SCIENCE & VIE




**SCIENCES
ET
AVENIR**

STRONG INTERACTION

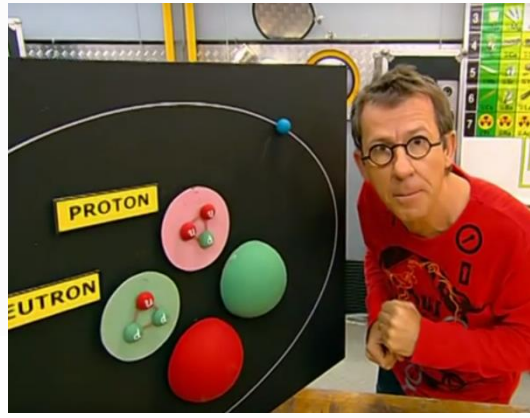
GRAVITY

ELECTROMAGNETISM

WEAK INTERACTION

Kurzgesagt – In a Nutshell 

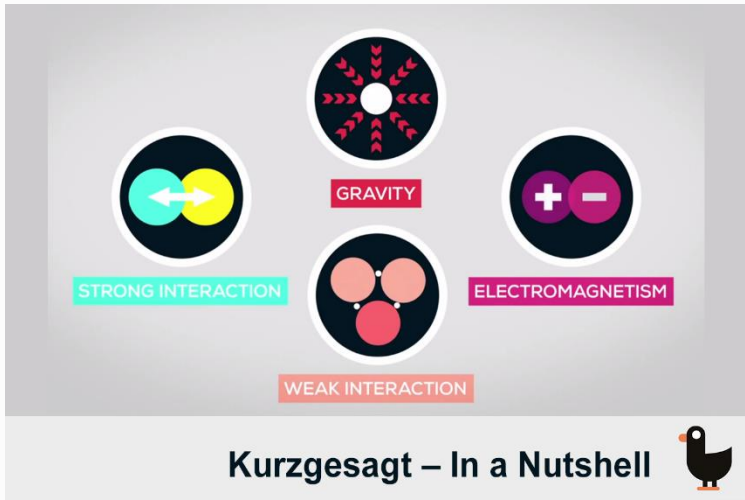
SCIENCE & VIE



**SCIENCES
ET
AVENIR**

**FUTUR
EN SEINE**

cité
des sciences &
de l'industrie



SCIENCE & VIE



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<http://elementaire.lal.in2p3.fr/quark-clash/>

