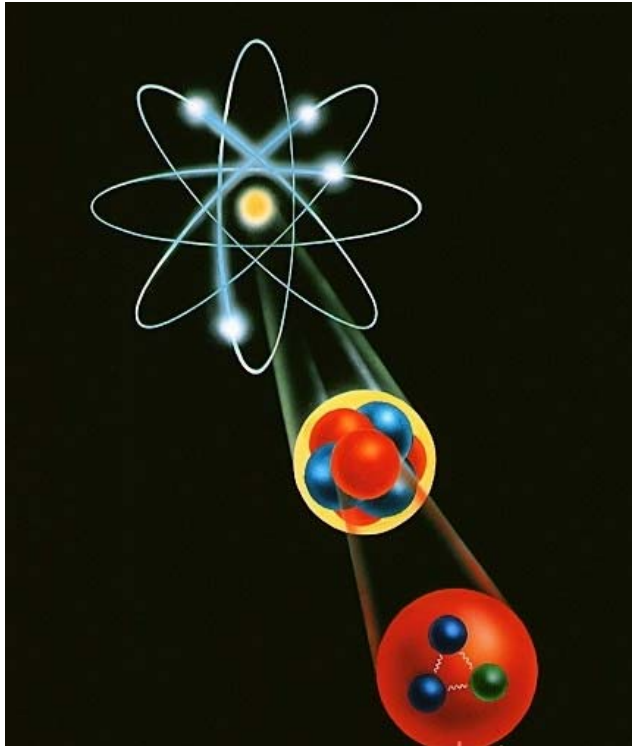


Cards games with particules



November 2011

<http://elementaire.lal.in2p3.fr/>

New project initiated by the people who created



Two versions:

◆ **64 cards**, it contains:

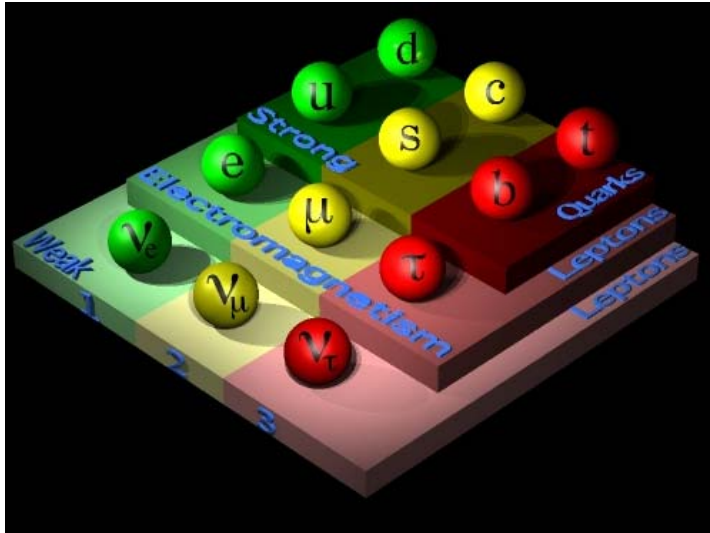
- **all** elementary particles and
- the **3 forces**

◆ **32 cards**: the strong force is removed

Several games for each version:

- **7 families** (to become familiar)
- **quark poker** (poker-like)
- **collision** (dominos-like)

Objectives

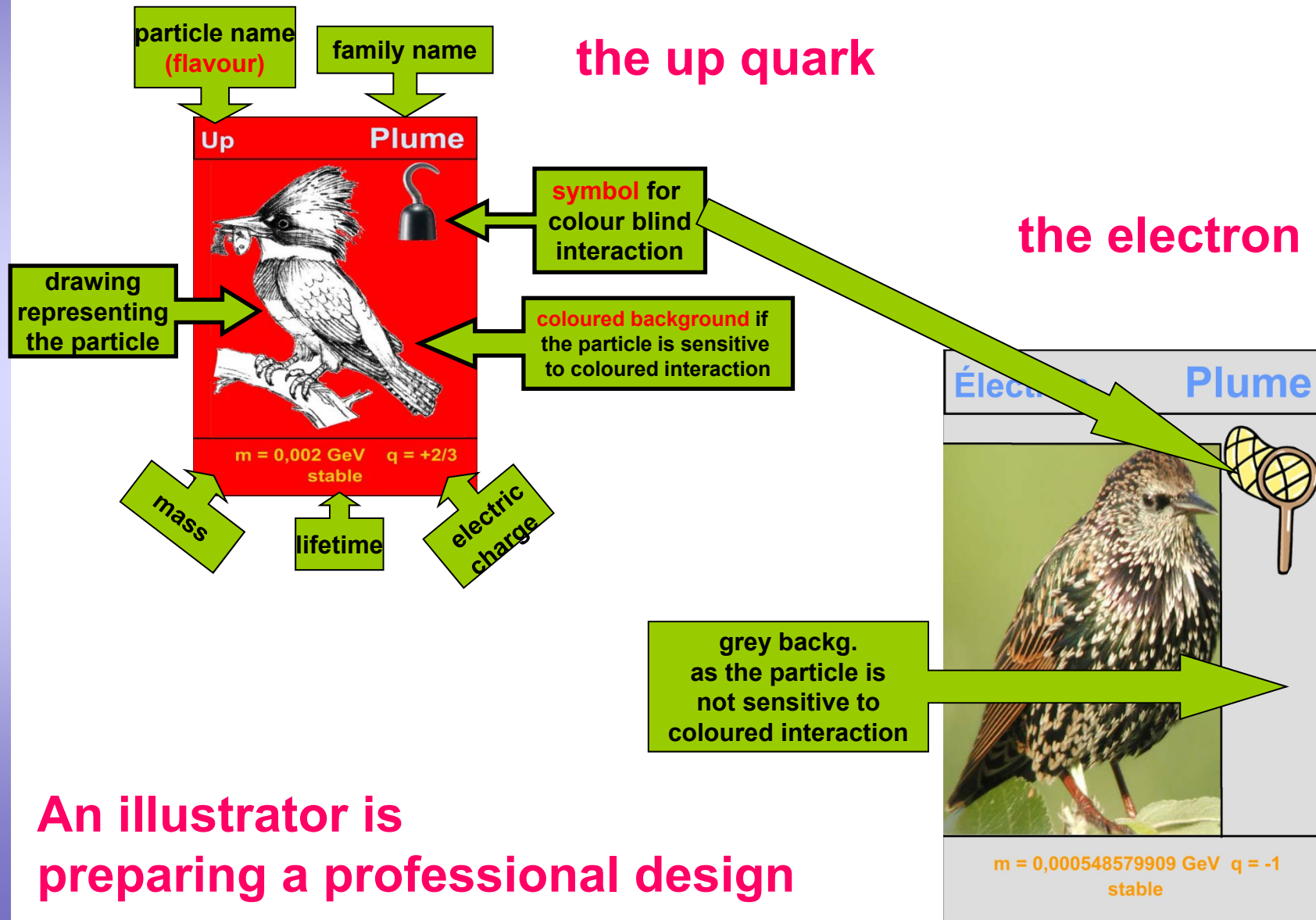


- Identify fundamental constituents of matter: names, masses, lifetimes;
- Illustrate their organization into families;
- Matter / antimatter symmetry;
- Discover the fundamental interactions: how they are transmitted, how they apply;
- Understand dynamics and few conservation principles (charge conservation as an example)

The games reproduce processes present in Nature.

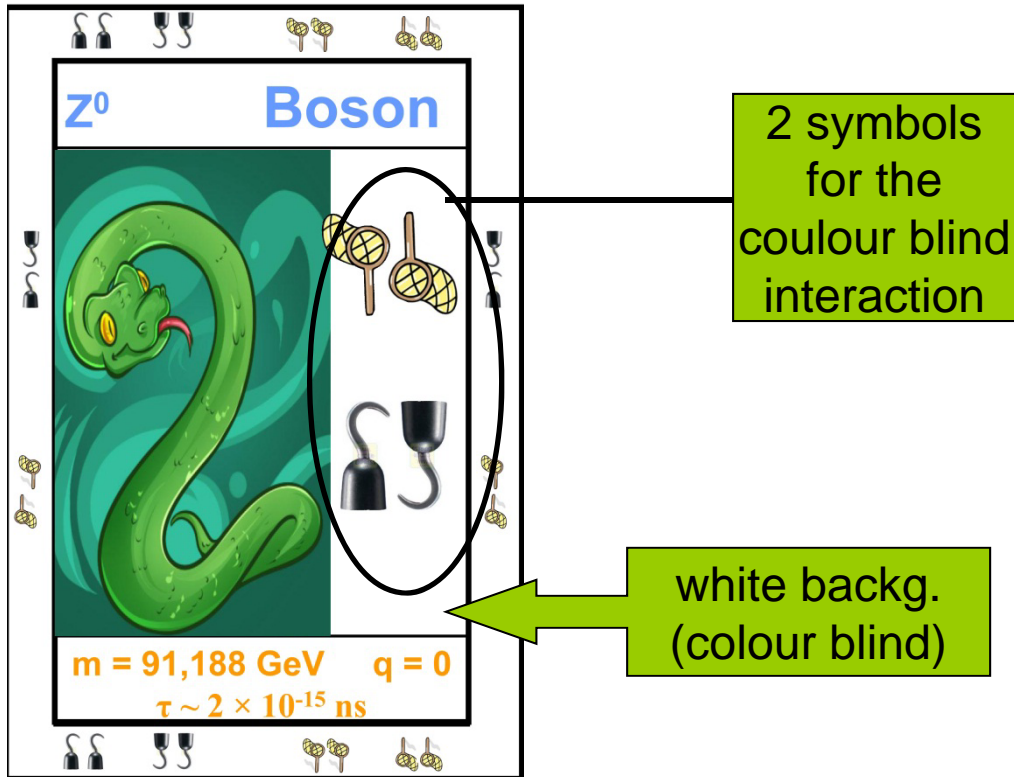
As the games are for non-specialists, the card's design is important

Examples of constituent cards



An illustrator is preparing a professional design

Example of a colour blind interaction card



the Z⁰ boson

Transformation = 3 cards combination

The basic process.

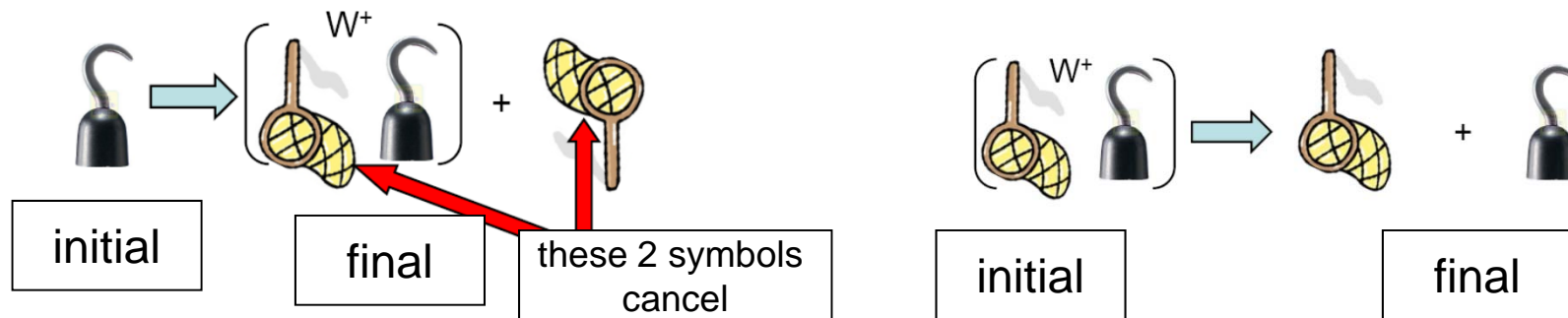
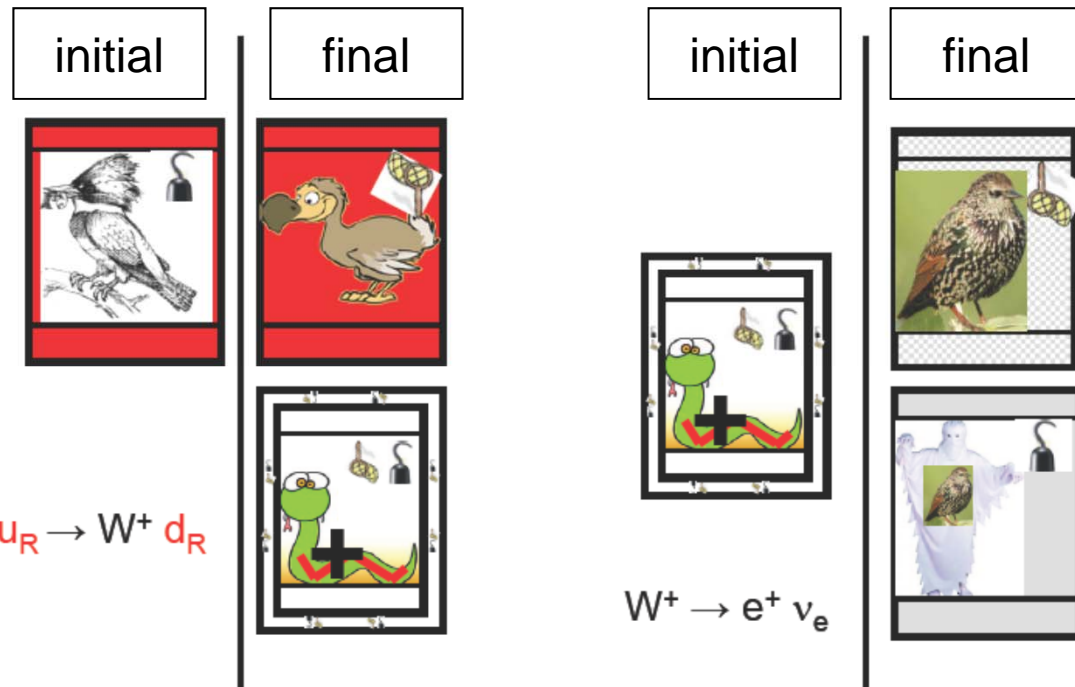
3 cards,

At least one "force"

One of them is the initial state, the other 2 are the final state.

You have to conserve:

- colour
- symbols



7 families

Plume	u_V up	d_V down	u_B up	d_B down	e^- électron	ν_e neutrino-électron
Adams	c_V charm	s_V étrange	c_B charm	s_B étrange	μ^- muon	ν_μ neutrino-mu
Sumo	t_V top	b_V beauté	t_B top	b_B beauté	τ^- tau	ν_τ neutrino-tau
Boson	W^+ W-plus	Z^0 Z-zéro	W^- W-moins	γ photon	H^0 boson de Higgs	g_{VB} gluon
Méplu	$-u_V$ antiup	$-d_V$ antidown	$-u_B$ antiup	$-d_B$ antidown	e^+ antiélectron	$-\nu_e$ antineutrino-électron
Smada	$-c_V$ anticharm	$-s_V$ antiétrange	$-c_B$ anticharm	$-s_B$ antiétrange	μ^+ antimuon	$-\nu_\mu$ antineutrino-mu
Omus	$-t_V$ antitop	$-b_V$ antibeauté	$-t_B$ antitop	$-b_B$ antibeauté	τ^+ antitau	$-\nu_\tau$ antineutrino-tau

42 cards:

- **3 generations:** green, blue and grey
- **male/female :** the 2 symbols
- the “boson” family is different, you need to know each name

A quizz on physics

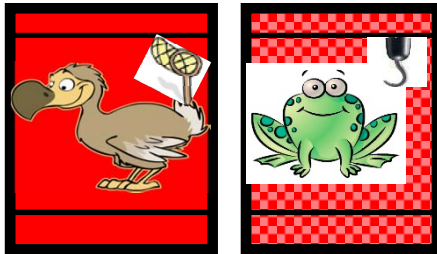
adapted to player's level is being prepared

**Rules are the same as in the original game.
To become familiar with particles names and how they are organized.**

Quark poker (32 cards)

As for the poker you have 2, 3, 4 and 5 cards combinations

2 cards: meson

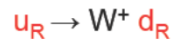


example: down-anticharm

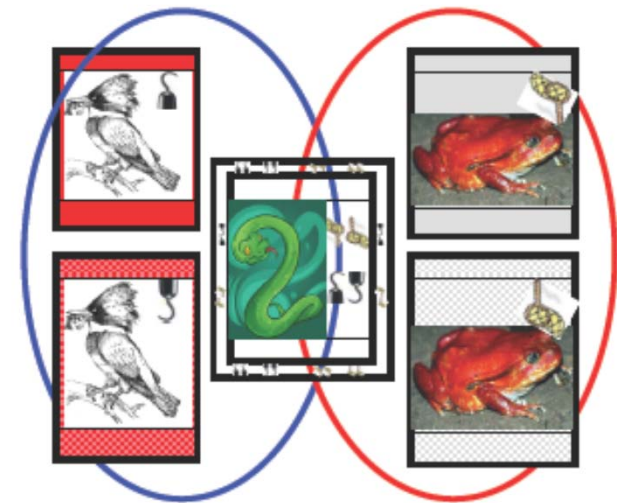
4 cards: families



3 cards: transformation



5 cards: reaction

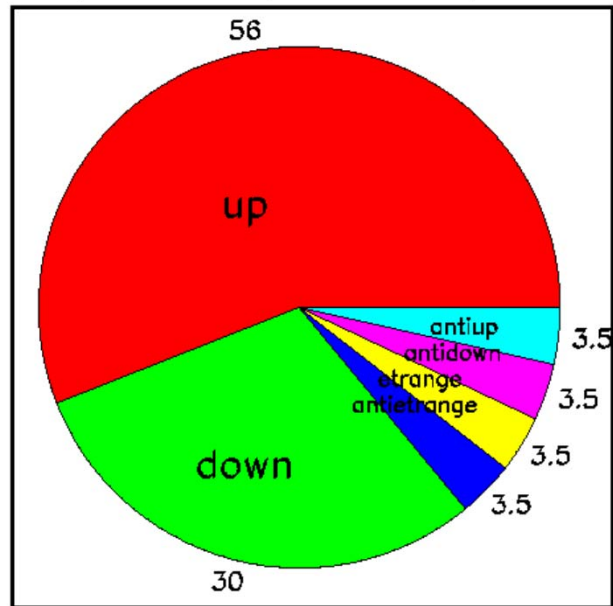


Apply twice the rules for 3 cards

Collision (32 cards)

Reproduce particle production at a collider (LHC for example).
Start the game by finding, randomly, the 2 constituents which collide.

quarks et antiquarks dans le proton



Apply successively the 3 cards
“transformation” rules



Plans

- Have a new drawing of the cards by a professional (by the end of the year)
- Write manuals for the different games (partly exist already)
- Write a text explaining the close connexion between the games and particle physics
- Develop contacts
- Evaluate the number of interested people to print the games (mid 2012)
- A public site will be available in the meantime where all material will be accessible and contacts with users can be established

Some requests to IPPOG

- Support to produce card versions in Foreign languages
- Distribute information about this activity
- Comments, feedback, advices, etc.
- To contact us: elementaire@lal.in2p3.fr
[Project leader: **Patrick Roudeau**, roudeau@lal.in2p3.fr]