

Find Your Own Odderon!

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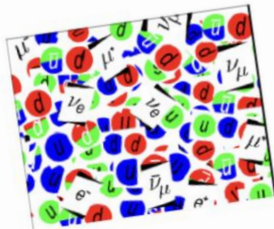
Tamás Csörgő, Member of Academia Europea

(Berze Science Club, scientist patron, MATE KRC Gyöngyös and Wigner RCP Budapest, Hungary)

52nd International Symposium on Multiparticle Dynamics
26th August 2023

RÉSZECSKÉS KÁRTYAJÁTÉK

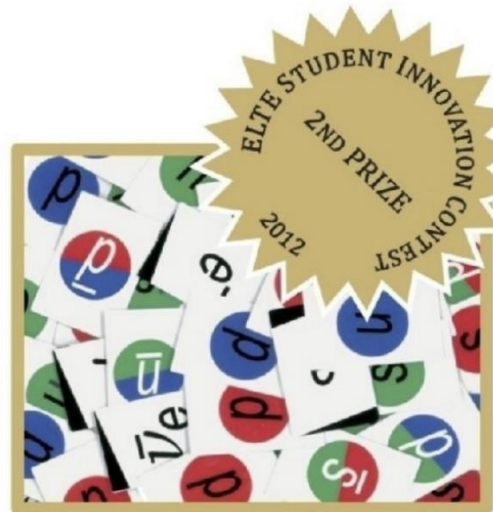
ELEMI RÉSZECSKÉK JÁTÉKOSAN



Csörgő Judit
Török Csaba
Csörgő Tamás

QUARK MATTER CARD GAME

Find Your Own Higgs Boson



Judit Csörgő, Csaba Török, Tamás Csörgő

RÉSZECSKÉS KÁRTYAJÁTÉK

ELEMI RÉSZECSKÉK - JÁTÉKOSAN
2. KIADÁS, KÁRTYA MELLÉKLETTEL

CSÖRGŐ JUDIT
TÖRÖK CSABA
CSÖRGŐ TAMÁS



QUARK MATTER CARD GAME

**Let's explore the
deck!**

Standard Model

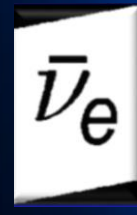
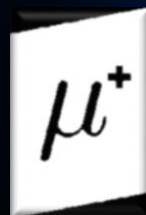
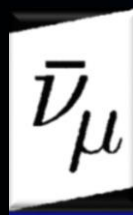
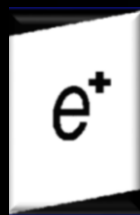
Antiparticles

Three generations of matter (fermions)

	I	II	III		
mass		1.27 GeV/c ²	171.2 GeV/c ²	0	? GeV/c ²
charge		$\frac{2}{3}$	$\frac{2}{3}$	0	0
spin		$\frac{1}{2}$	$\frac{1}{2}$	1	0
name	u	c charm	t top	γ photon	H Higgs boson
Quarks	d	s	b 4.2 GeV/c ² $-\frac{1}{3}$ $\frac{1}{2}$ bottom	g gluon	
	ν_e	ν_μ	ν_τ <15.5 MeV/c ² 0 $\frac{1}{2}$ tau neutrino	Z⁰ Z boson	
	e⁻	μ⁻	τ 1.777 GeV/c ² -1 $\frac{1}{2}$ tau	W[±] W boson	
Leptons					Gauge bosons

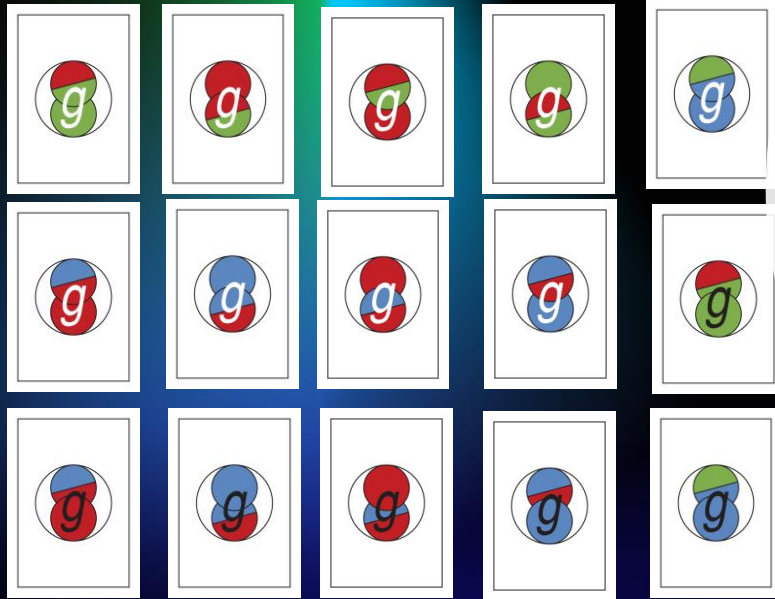


antiquarks



antileptons

Gluon cards



Gluons:

Mediate interactions between quarks
Force carriers for the strong nuclear force
8 distinct types due to color charge combinations
 $3 \times 3 = 8 + 1$
Massless and travel at the speed of light

Gamification:

Introduced to change colors or anticolors
to color, add anti-color and a new color
 $3 \text{ anti-color} \times 2 \text{ new color} \times 2 \text{ ordering} = 6 \times 2 = 12$
to anti-color, add color and a new anti-color
 $3 \text{ color} \times 2 \text{ new anti-color} \times 2 \text{ ordering} = 6 \times 2 = 12$
 $24 = 2 \times 12$

<https://en.wikipedia.org/wiki/Gluon>

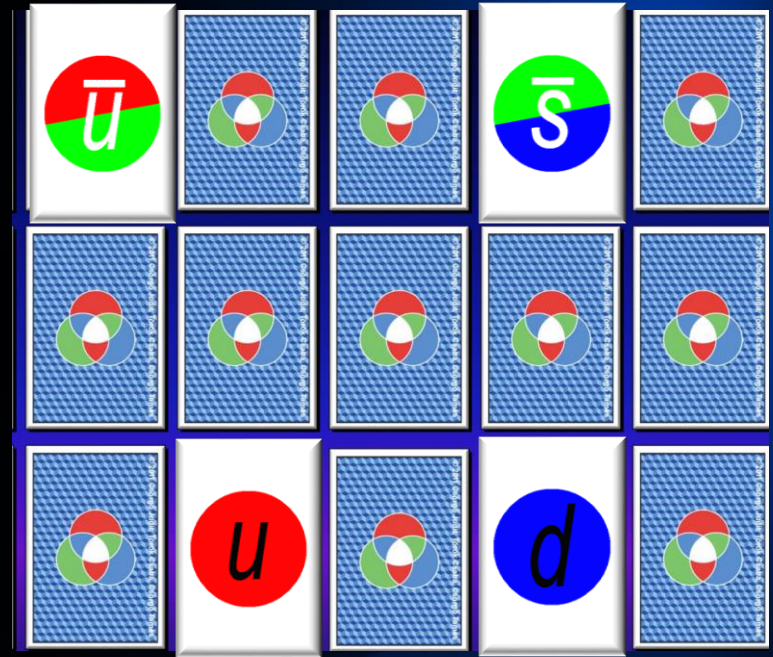
Memory card game – Find “pairs”!

Mesons

Composite particles made of quarks and antiquarks

Mediators of the strong force between nucleons in the nucleus

<https://en.wikipedia.org/wiki/Meson>

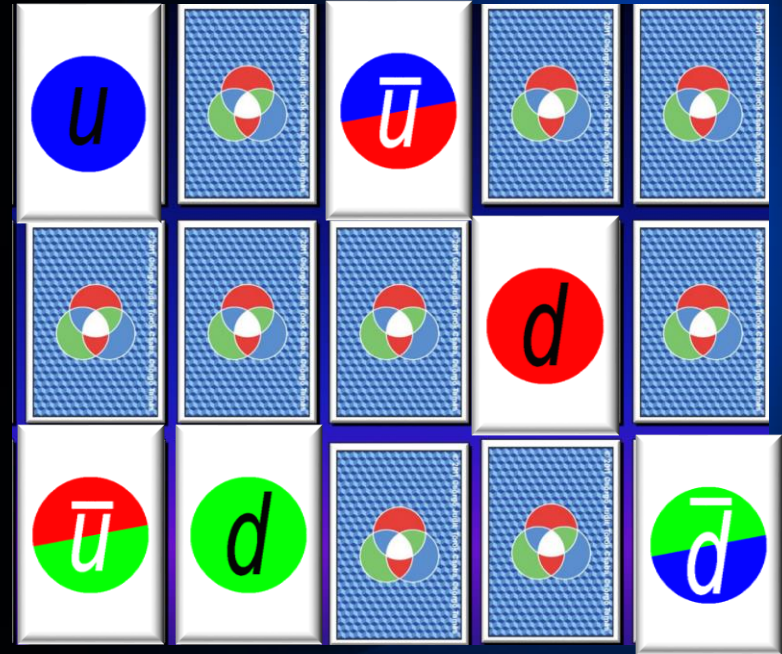


Memory card game – Find "pairs"!

Baryons

Composite particles
consisting of three quarks

Subject to the strong nuclear
force



<https://en.wikipedia.org/wiki/Baryon>

Memory card game – Find "pairs"!

Pomeron

Describes the exchange of gluons between particles during certain high-energy scattering processes .

<https://en.wikipedia.org/wiki/Pomeron>



Memory card game – Find "pairs"!

Odderon

In high-energy elastic scattering the odderon can contribute to the difference in scattering between particle-particle and particle-antiparticle interactions.

<https://en.wikipedia.org/wiki/Odderon>



**Thank you for your
attention!**

Further links

- <https://en.wikipedia.org/wiki/Odderon>
- <https://hu.wikipedia.org/wiki/Odderon>
- <https://medium.com/@georgina.zsori/interview-with-the-research-group-that-discovered-odderon-2c02adbb7852>
- <https://medium.com/@georgina.zsori/an-odd-interview-about-the-odderon-4bd080402518>
- <https://medium.com/@georgina.zsori/interjú-az-odderont-felfedező-kutatócsoporttal-189f21526598>
- <https://medium.com/@georgina.zsori/egy-páratlan-interjú-az-odderonról-b56bd532740d>

