

TEORIA E FENOMENOLOGIA DEI NUCLEI E DEGLI ADRONI

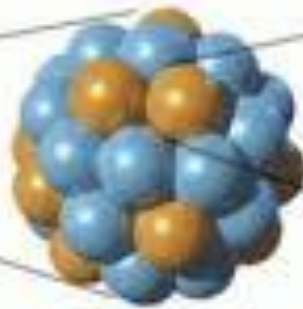
TEORIA E FENOMENOLOGIA DEI NUCLEI E DEGLI ADRONI

Atom



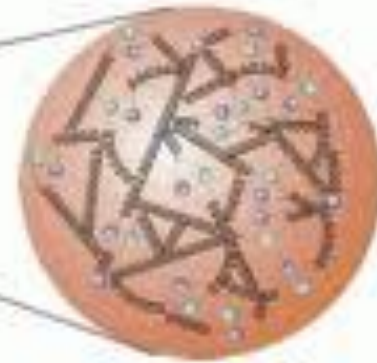
10^{-10} m

Nucleus



10^{-14} m

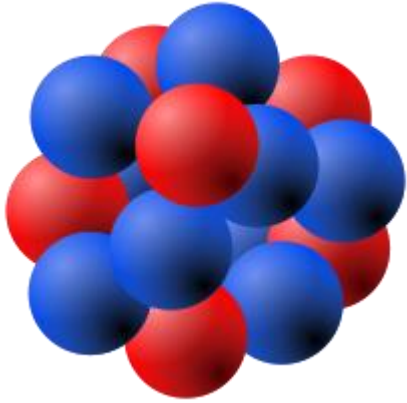
Nucleon



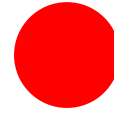
**Quarks and
Gluons**

10^{-15} m

nucleo



neutrone

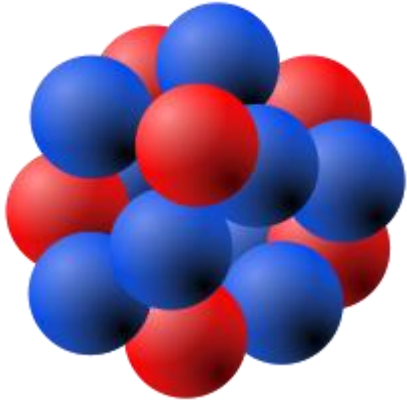


protone

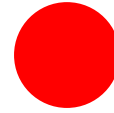


nucleoni

nucleo



neutrone



protone



pione

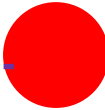
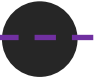
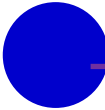
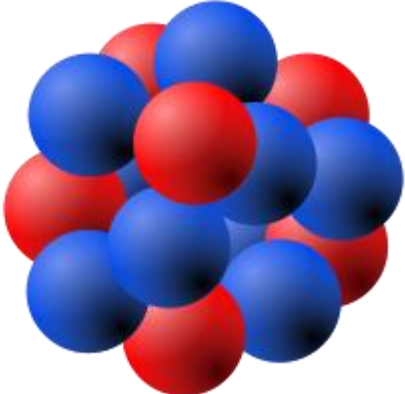


nucleoni



adroni

nucleo



neutrone

protone

pione

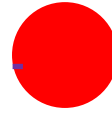
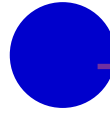
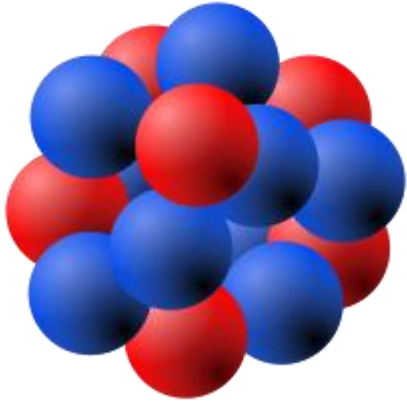


nucleoni



adroni

nucleo



neutrone

protone

pione

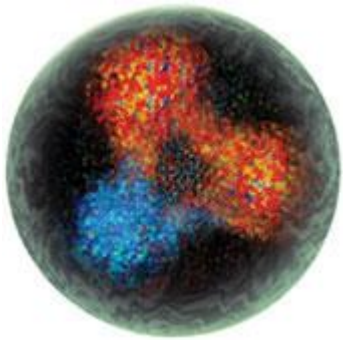


nucleoni



adroni

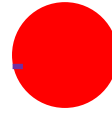
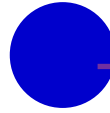
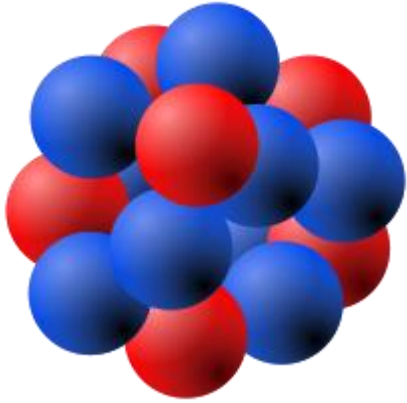
nucleone



quark

quark

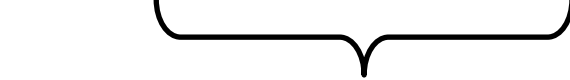
nucleo



neutrone

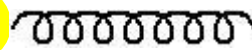
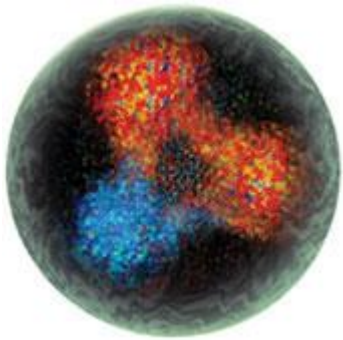
protone

pione



adroni

nucleone



quark

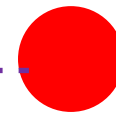
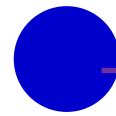
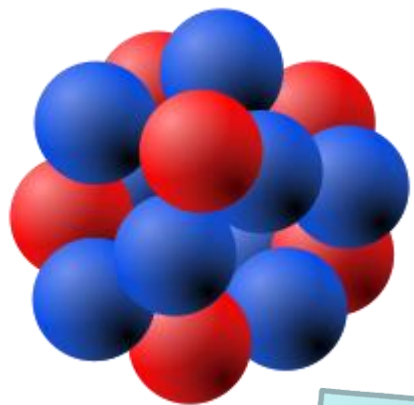
gluone

quark



partoni

nucleo



neutrone

protone

pione

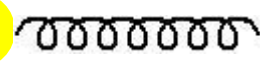
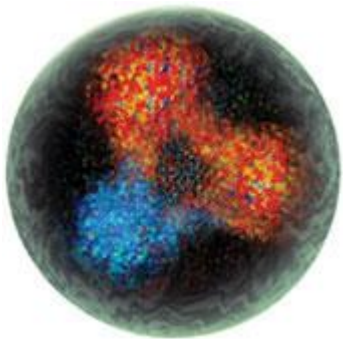


nucleoni



adroni

nucleone



quark

gluone

quark



partoni

Chi siamo?

FISICA NUCLEARE

Carlotta Giusti
Matteo Vorabbi
Andrea Meucci

FISICA ADRONICA

Marco Radici
Barbara Pasquini
Marco Guagnelli
Alessandro Bacchetta
Xiaonu Xiong
Barbara De Palma
Luca Mantovani



Chi siamo?

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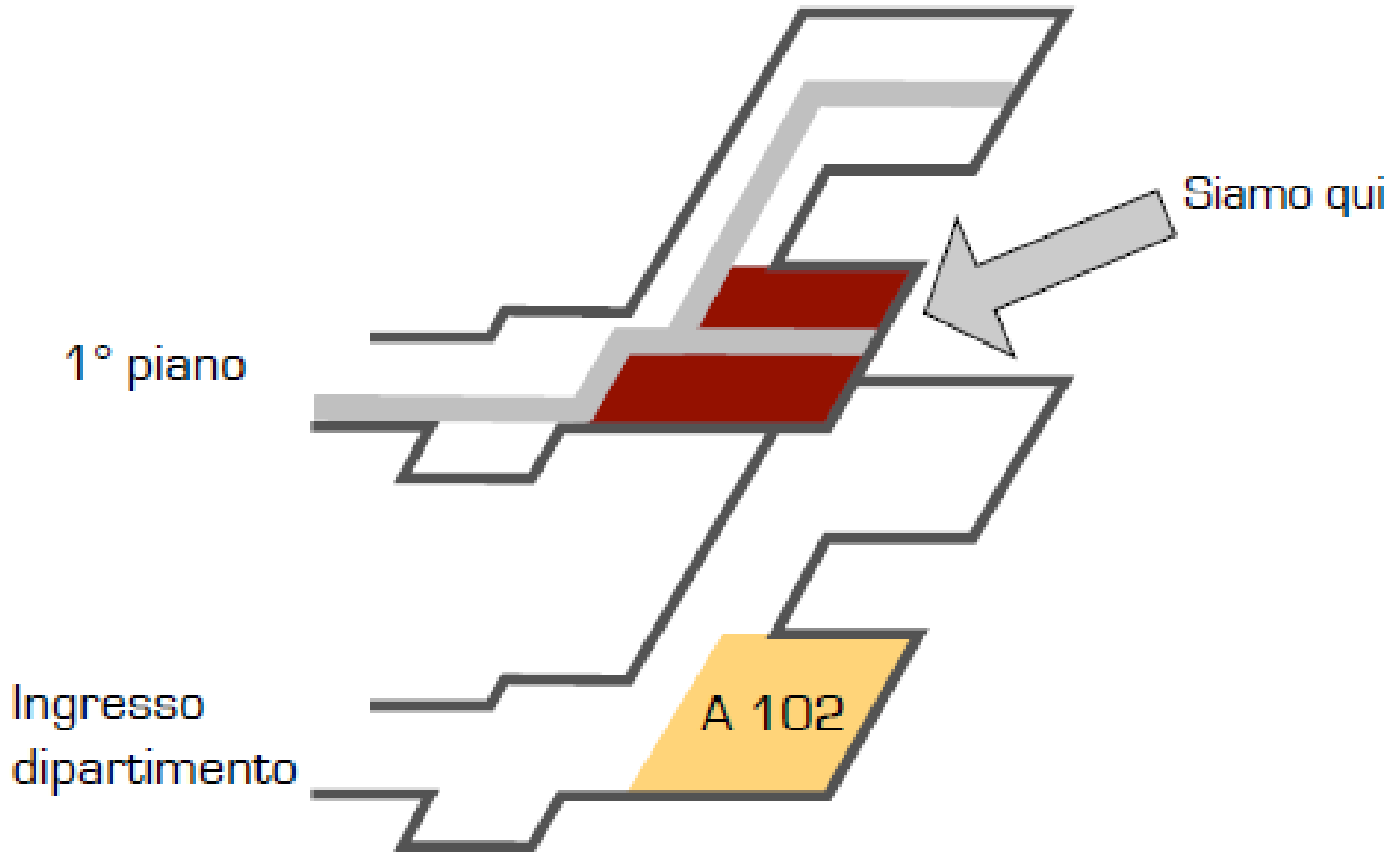
FISICA ADRONICA

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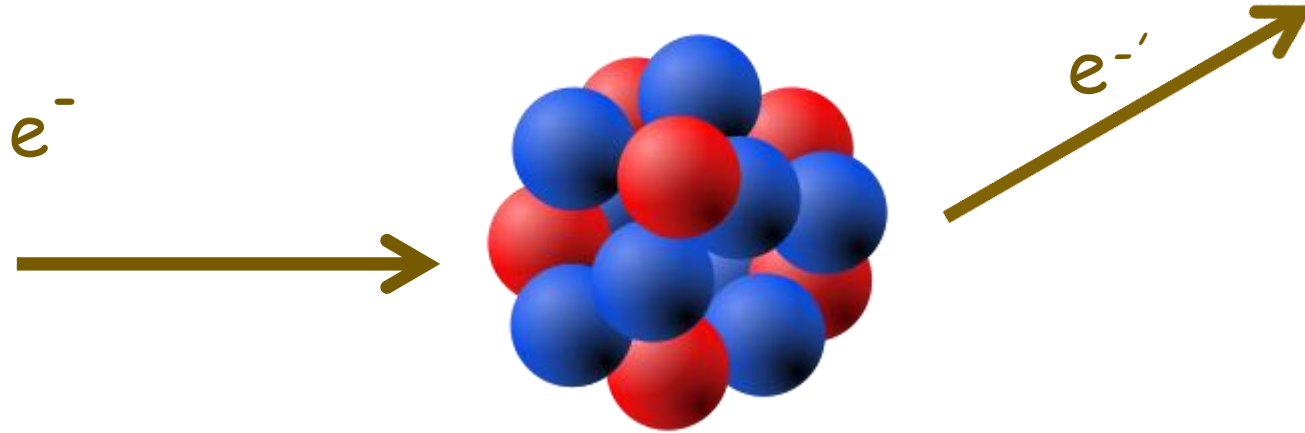
chi vuole
unirsi...
è benvenuto!

Dove ci trovate?

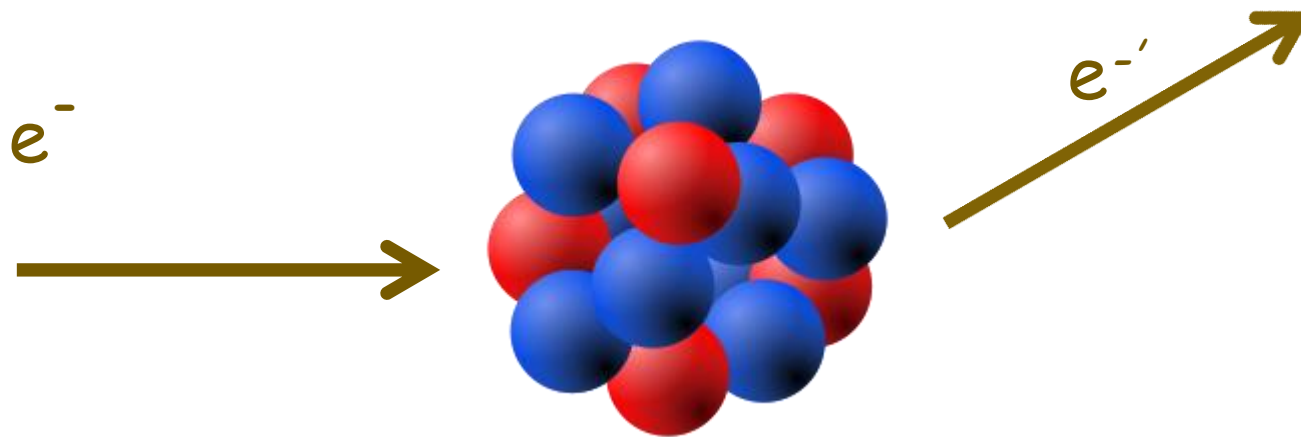


ESPLORIAMO NUCLEI CON SONDE LEPTONICHE

SONDA LEPTONICA: ELETTRONE



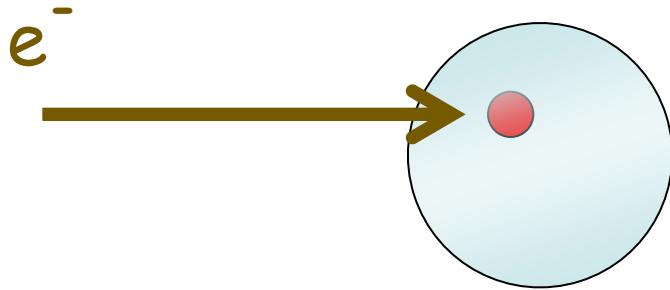
SONDA LEPTONICA: ELETTRONE



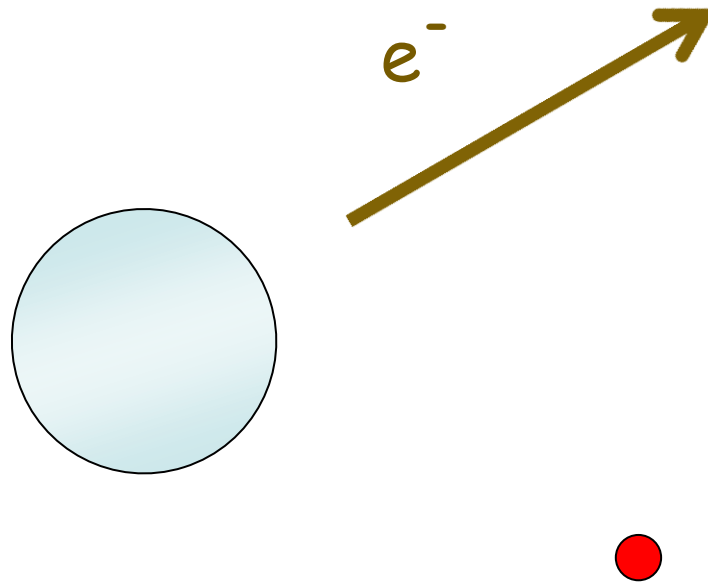
Interazione elettromagnetica meglio conosciuta e meno forte dell'interazione tra gli adroni

Elettrone trasferisce al nucleo energia e momento che possono essere variati indipendentemente: informazione completa sulla risposta del nucleo

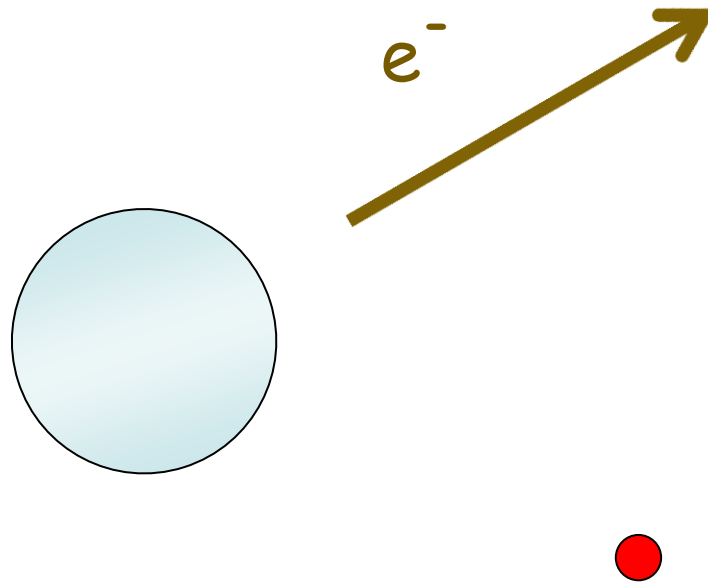
sonda: elettrone



emissione di un nucleone



emissione di un nucleone

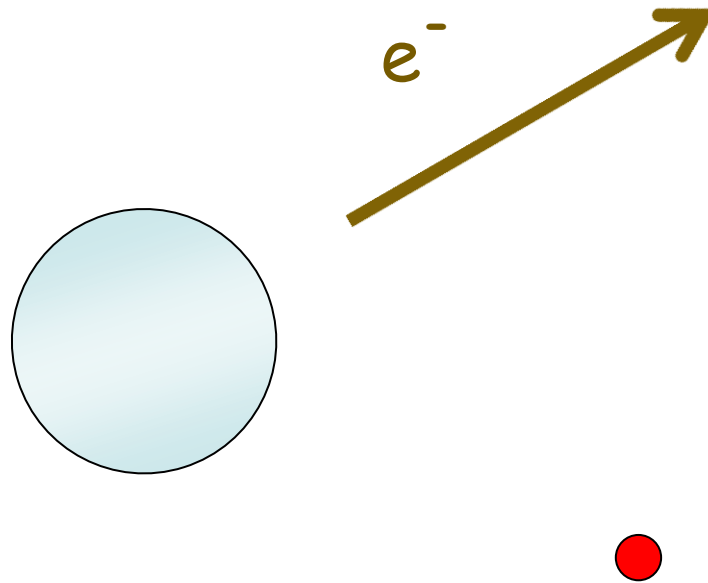


Emissione diretta di un nucleone

Elettrone e nucleone emesso rivelati in coincidenza, stato nucleare finale determinato: **processo esclusivo**

Solo elettrone rivelato somma su possibili stati finali: **processo inclusivo**

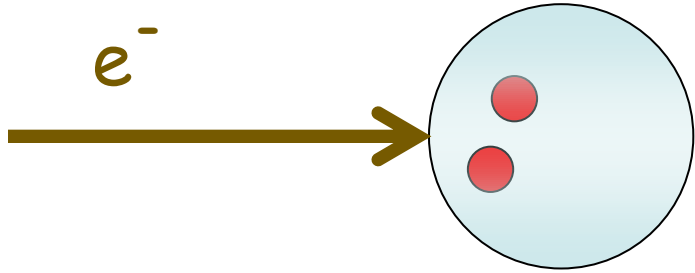
emissione di un nucleone



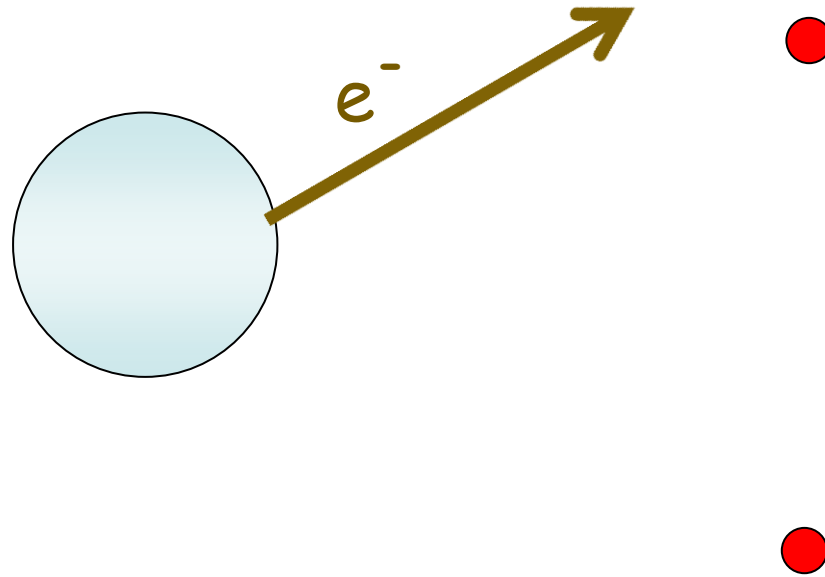
esclusivo: informazione su proprietà singoli nucleoni
inclusivo: informazione meno specifica ma più globale

informazione su validità e limiti modello particella
indipendente **CORRELAZIONI TRA NUCLEONI**
Correlazioni dovute alla interazione tra nucleoni

Per studiare correlazioni: emissione di due nucleoni



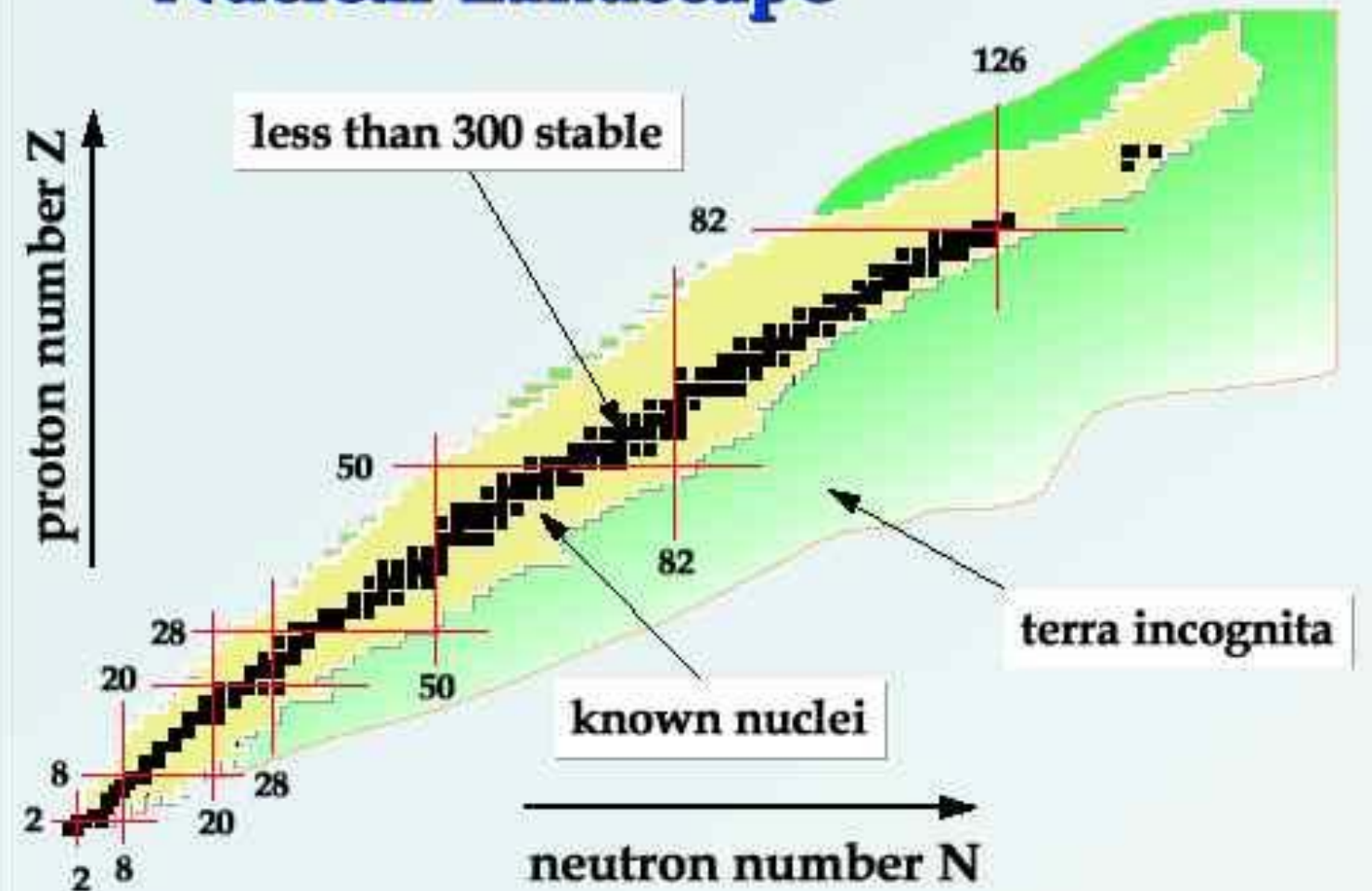
Per studiare correlazioni: emissione di due nucleoni



Interazione su coppia di nucleoni correlati che vengono emessi da **CORRELAZIONI TRA NUCLEONI**

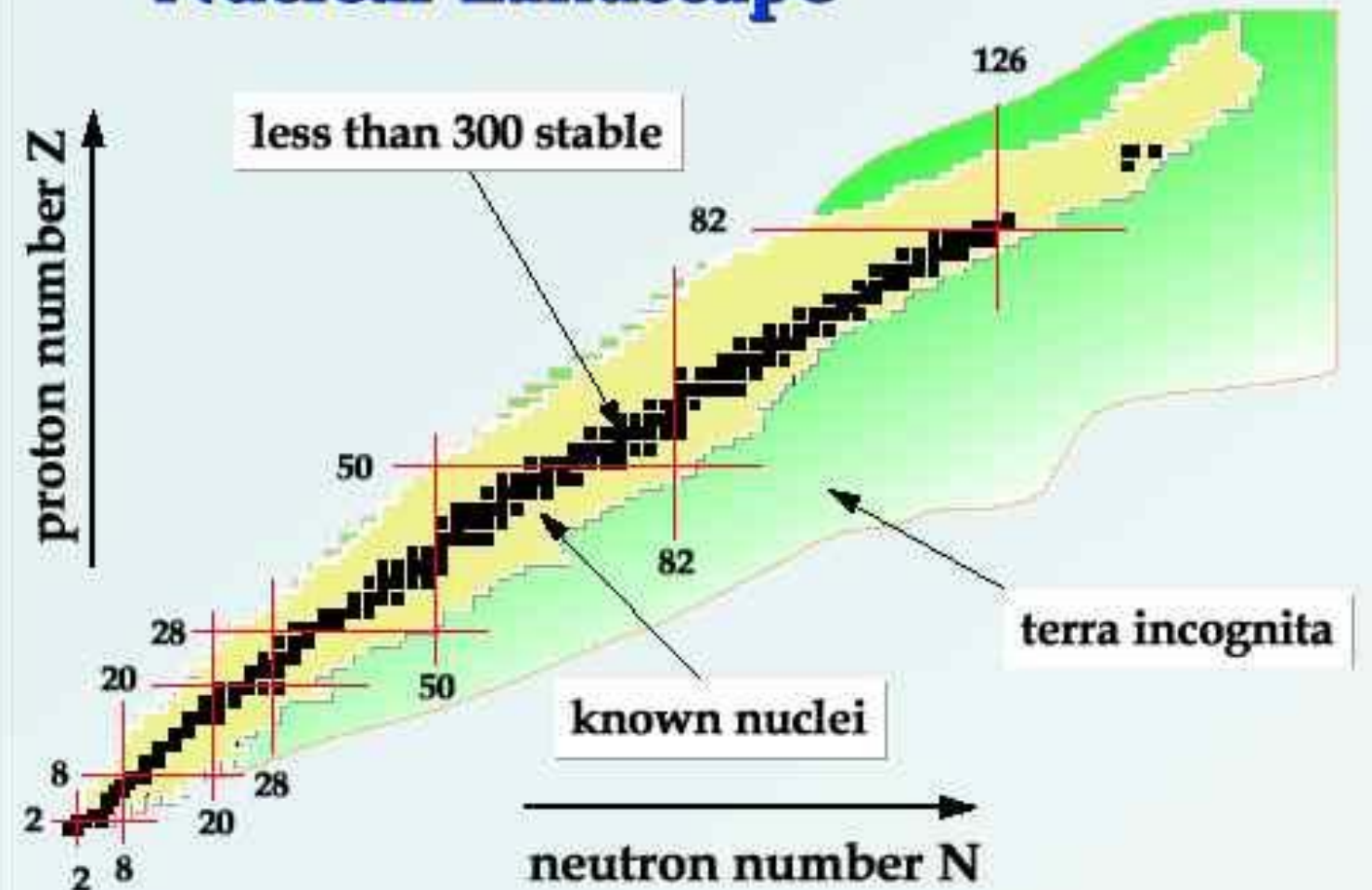
NUCLEI STABILI ED ESOTICI

Nuclear Landscape

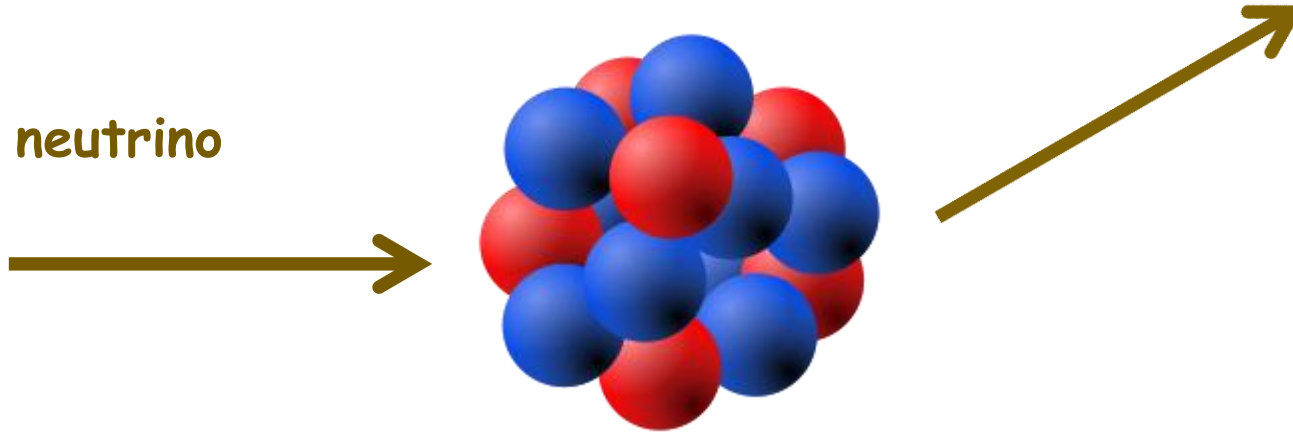


Nuclei stabili ed esotici per esplorare l'evoluzione delle proprietà nucleari al variare del rapporto N/Z
comprendere l'origine e i limiti di stabilità della materia

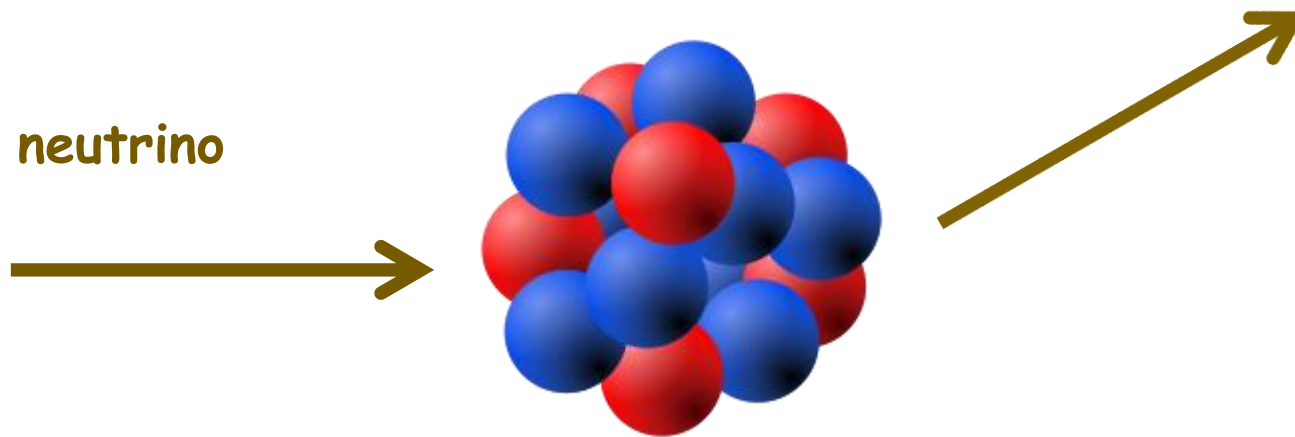
Nuclear Landscape



SONDA LEPTONICA: NEUTRINO



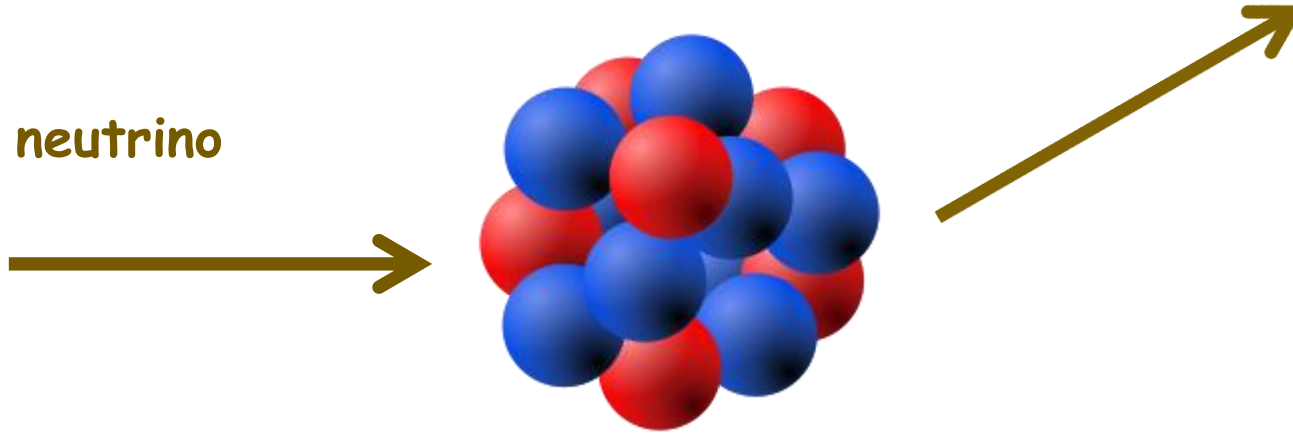
SONDA LEPTONICA: NEUTRINO



Interazione debole

Informazione aggiuntiva sulle proprietà dei nuclei e del nucleone ma...

SONDA LEPTONICA: NEUTRINO

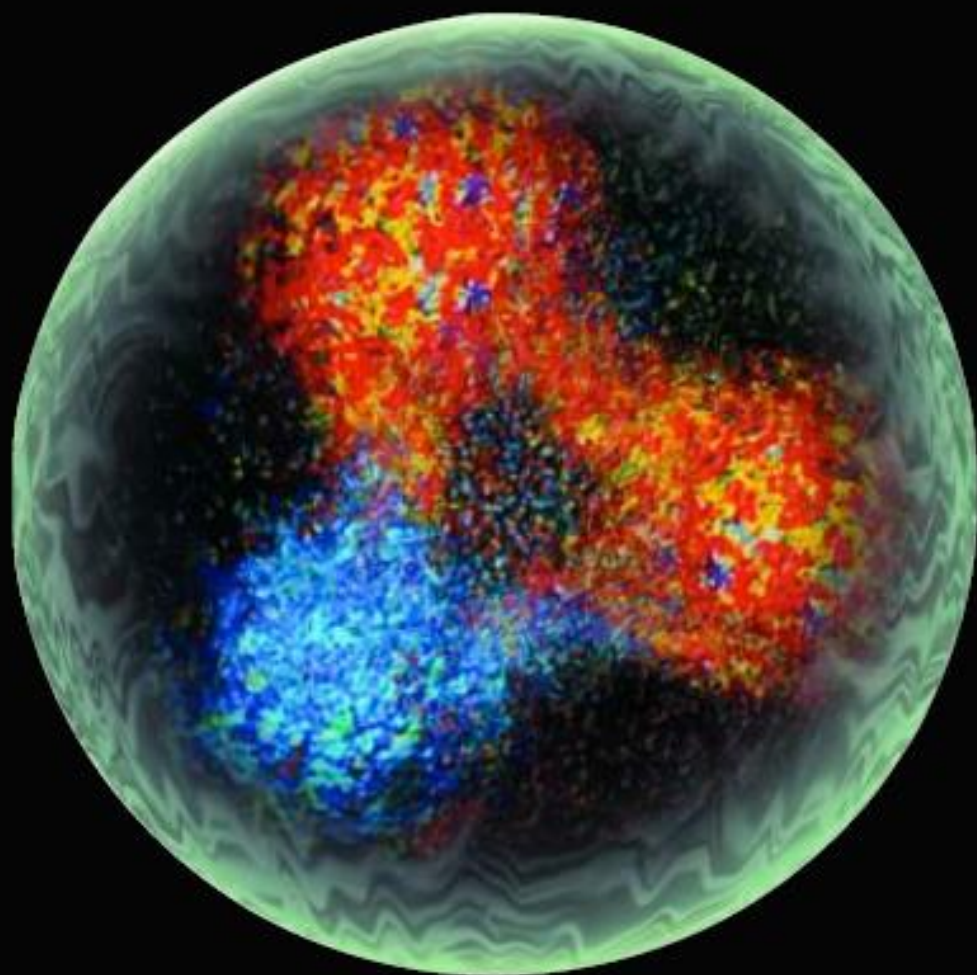


ma...

esperimenti fatti per determinare proprietà dei neutrini
(oscillazioni di neutrini)

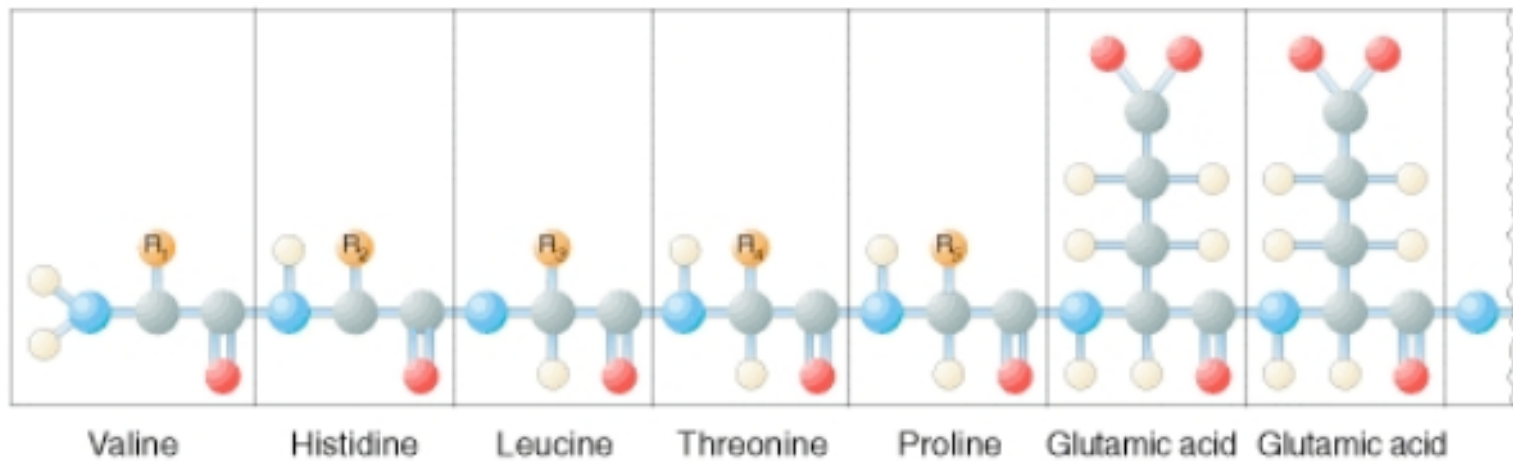
nuclei usati per rivelare neutrini: esperimenti richiedono una precisa
conoscenza interazioni neutrino-nucleo

La struttura del nucleone



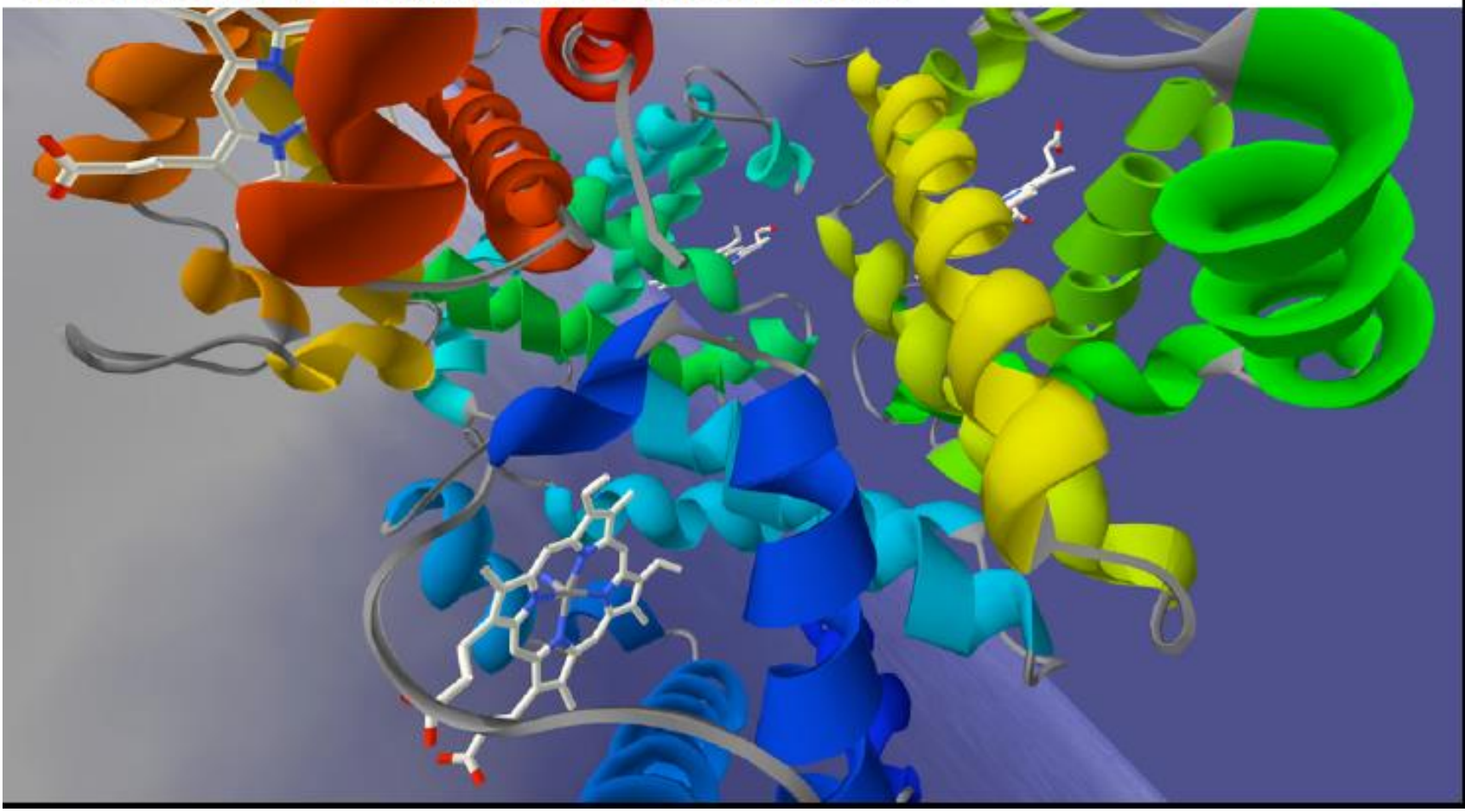
Attuale conoscenza del protone

Monodimensionale, simile alla sequenza degli aminoacidi di una proteina

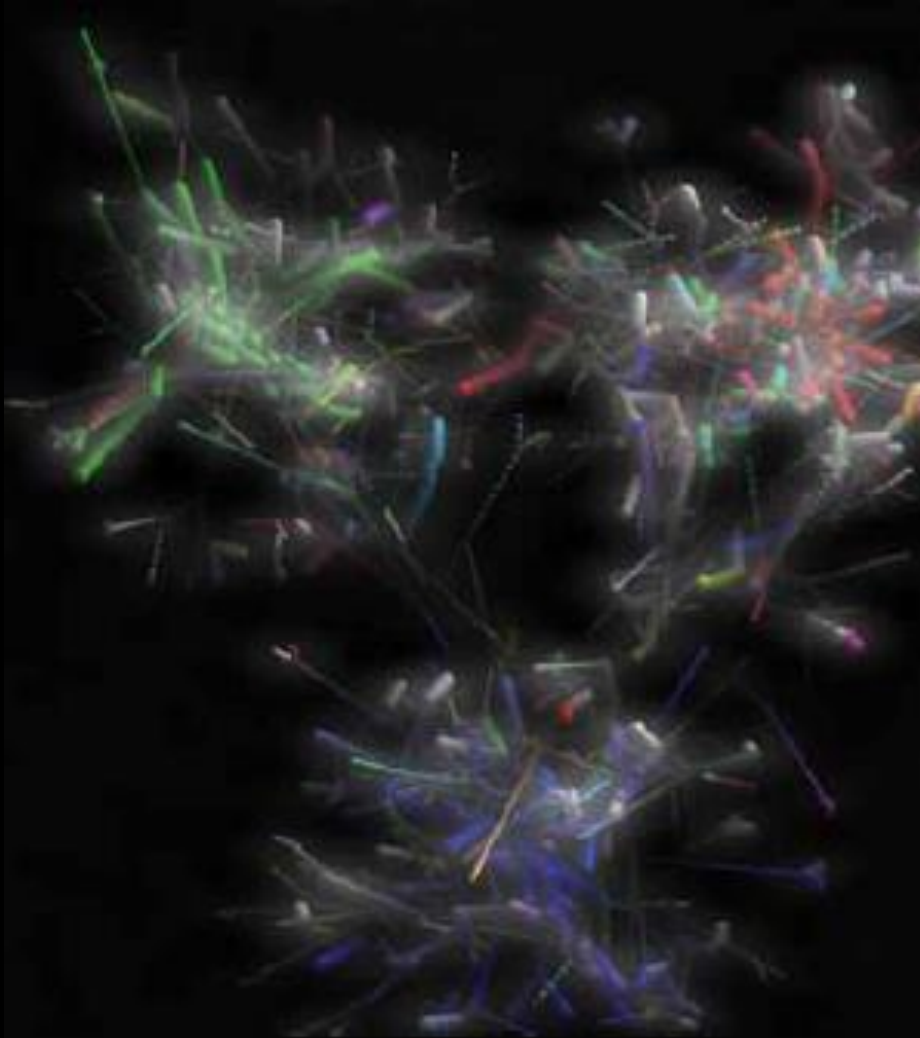


La nuova frontiera:

Struttura multidimensionale



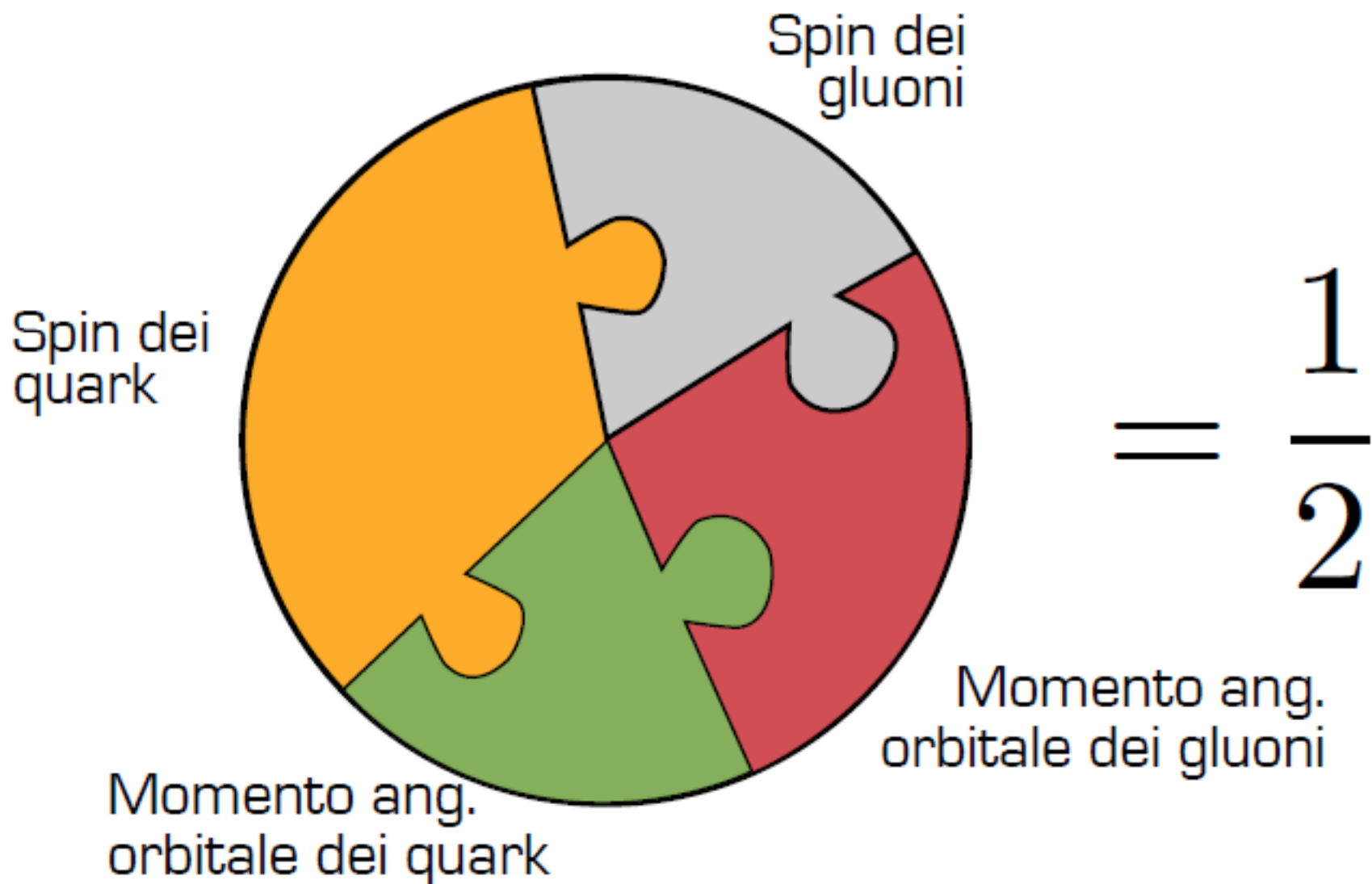
Protone in 3D



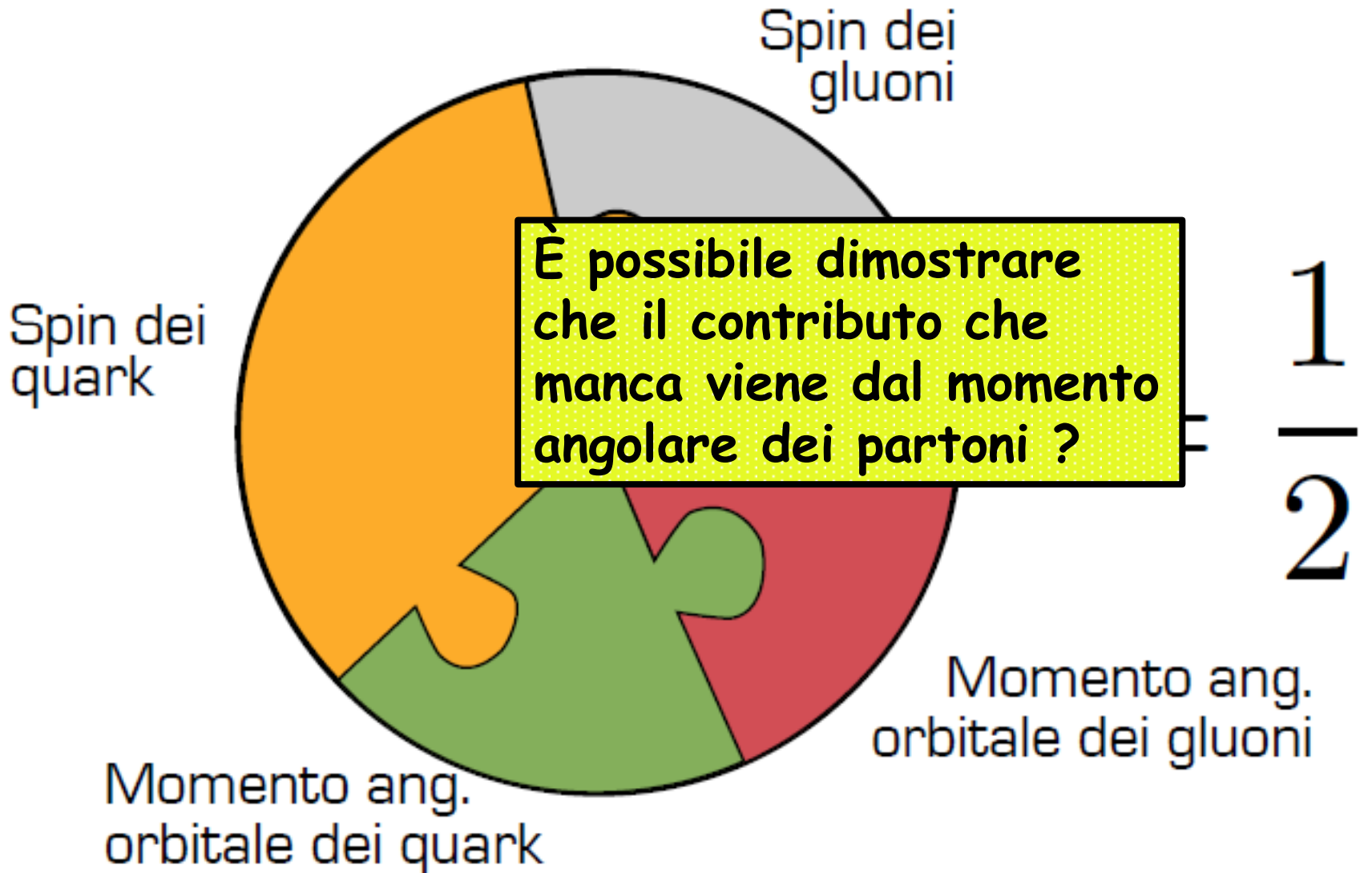
La conoscenza della struttura multidimensionale permette l'analisi di proprietà altrimenti inaccessibili come correlazioni quark-gluoni, interazioni di stato finale, correlazioni spin-orbita e spin-spin.....

e molto altro.....

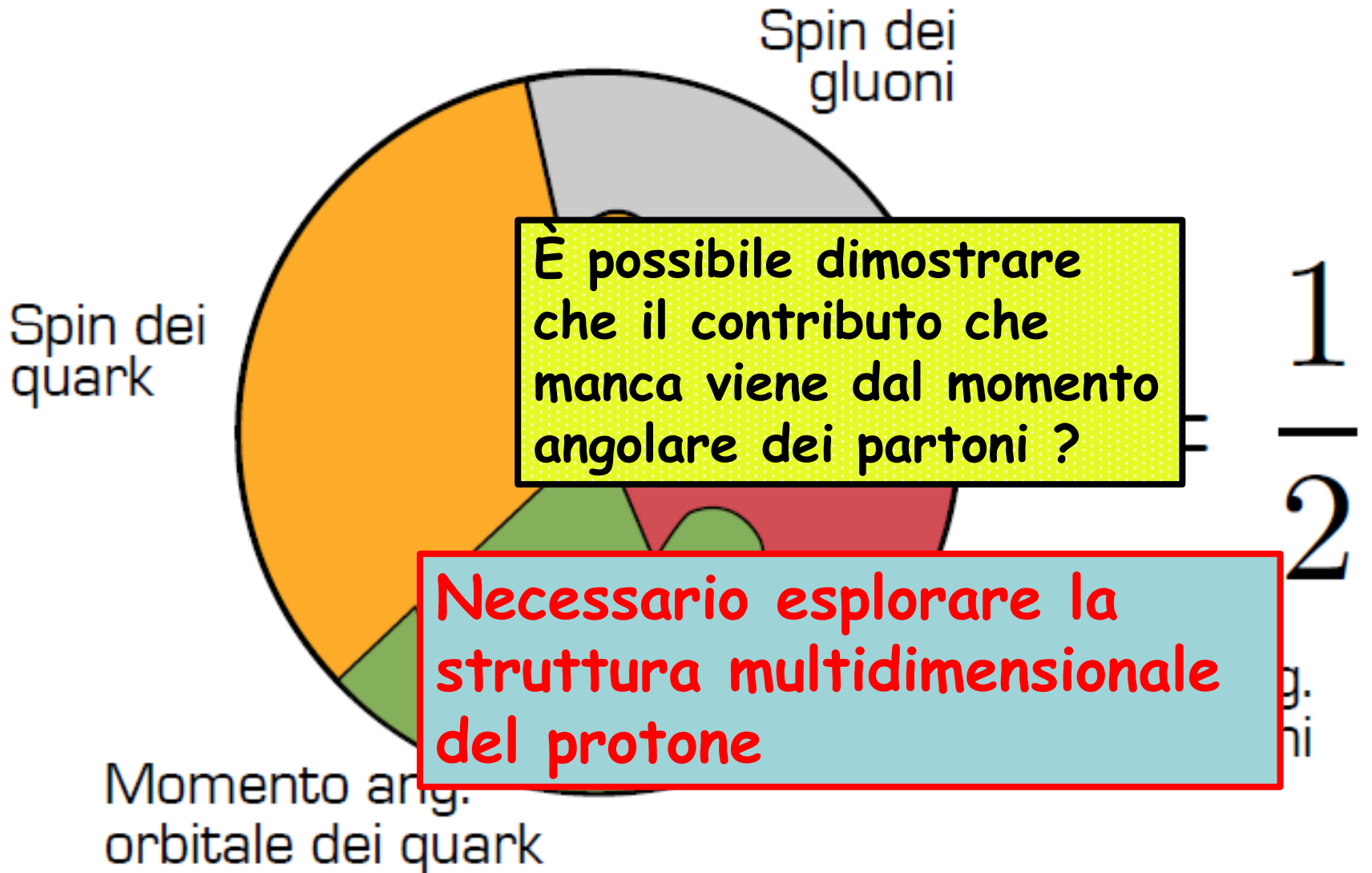
Il puzzle dello spin del protone



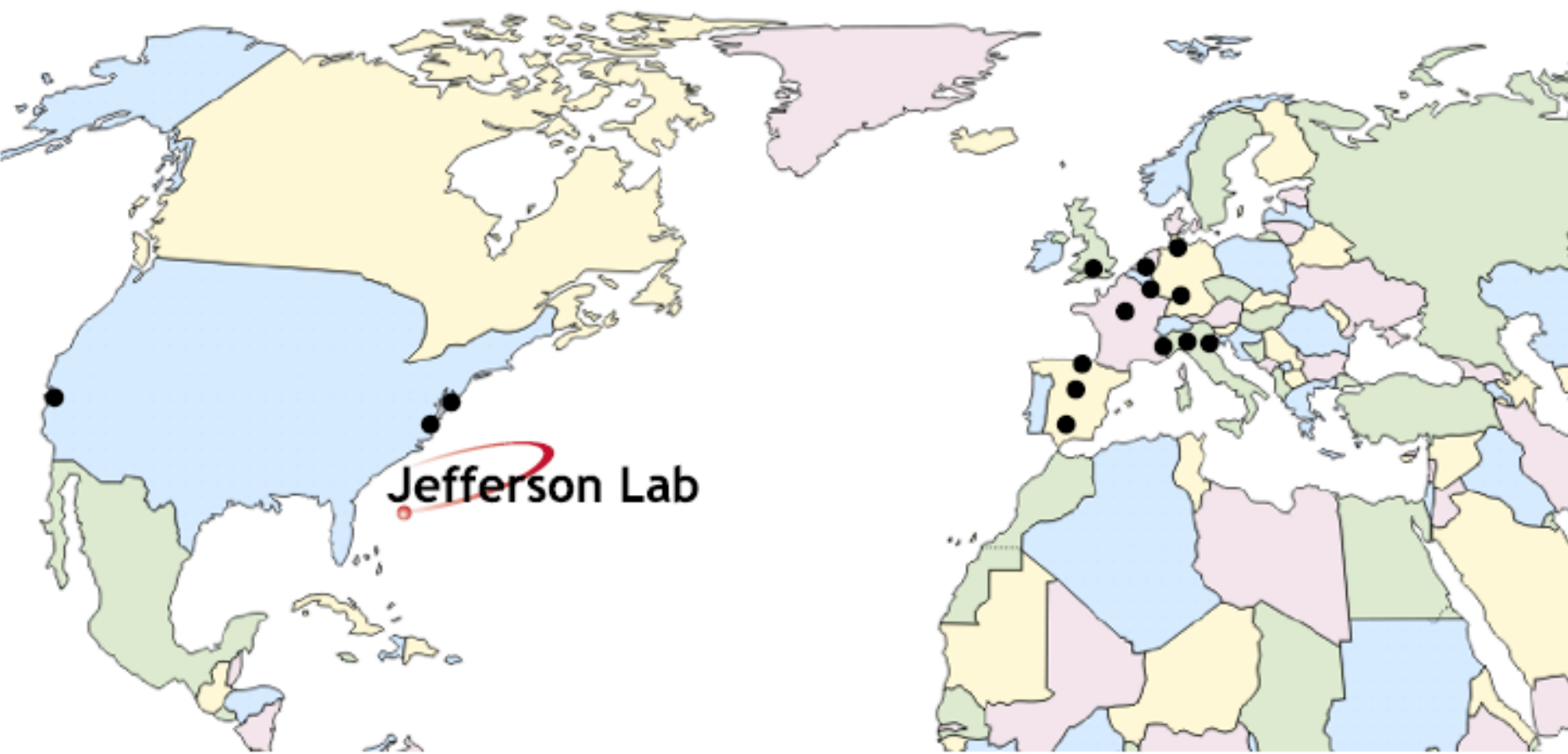
Il puzzle dello spin del protone



Il puzzle dello spin del protone



Contatti nazionali e internazionali



Per chi ne vuole sapere di più

<http://www.sif.it/attivita/saggiatore/econtents>

SCIENZA IN PRIMO PIANO

THE PROTON IN 3D

ALESSANDRO BACCHETTA^{1*}, MARCO CONTALBRIGO^{2}**

¹ *Università di Pavia and INFN Pavia, Italy*
² *INFN Ferrara, Italy*

Protons and neutrons constitute the building blocks of normal matter, accounting for almost all the mass of our world. We are still far from understanding the intricacies and mysteries of their inner structure. In the course of several decades of successful studies, we dedicated our efforts to delving deeper and deeper into them. A few years ago, the advent of high energy

1 Introduction
Atoms are made of protons, neutrons, and electrons, approximately in equal numbers. Electrons weigh about 0.5 MeV, protons and neutrons about 1000 MeV. It follows that nucleons (i.e., protons and neutrons) are responsible for about 99.97% of the mass of matter around us. When we study nucleons, we are embarked on the quest to understand the constituents of matter, one of the most fascinating adventures of the

... of the order of

LA RICERCA RICHIEDE

conoscenze teoriche per affrontare e risolvere problemi

sviluppo e formulazione di modelli

aspetti formali

metodi analitici

calcoli numerici

risultati numerici da confrontare con dati sperimentali

PROSPETTIVE

- CARLO BARBIERI senior lecturer University Surrey
- ANDREA MEUCCI docente di ruolo scuola media
- FRANCESCO CONTI finanza
- CHIARA FORNAROLA finanza
- ILARIA JEMOS finanza
- SOFIA CAZZANIGA finanza
- MANUEL PINCETTI consulenza
- MARINA DORATI industria
- ANDREA SIGNORI dottorando Amsterdam
- SABRINA COTOGNO dottoranda Amsterdam