The Structure of the Nucleus

Checker Board Model

by

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http://checkerboard.dnsalias.net/

Basic finding

The mass of the quarks in any generation and its associated lepton (-e) are related by the geometric mean:

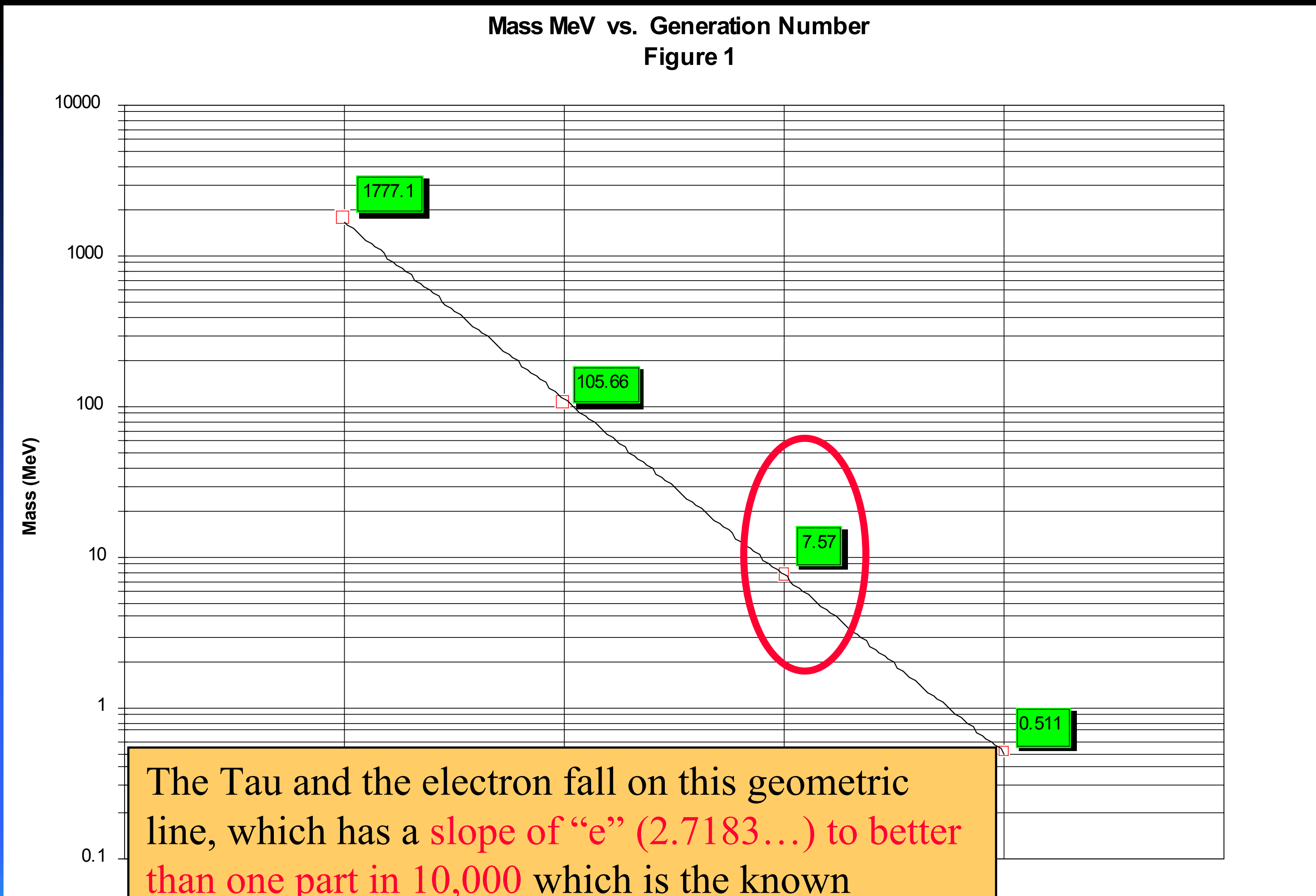
Sq rt (mass of electron times the mass of the up like quark) = mass of the down like quark.

$$M_d = \sqrt{M_u \times M_e}$$

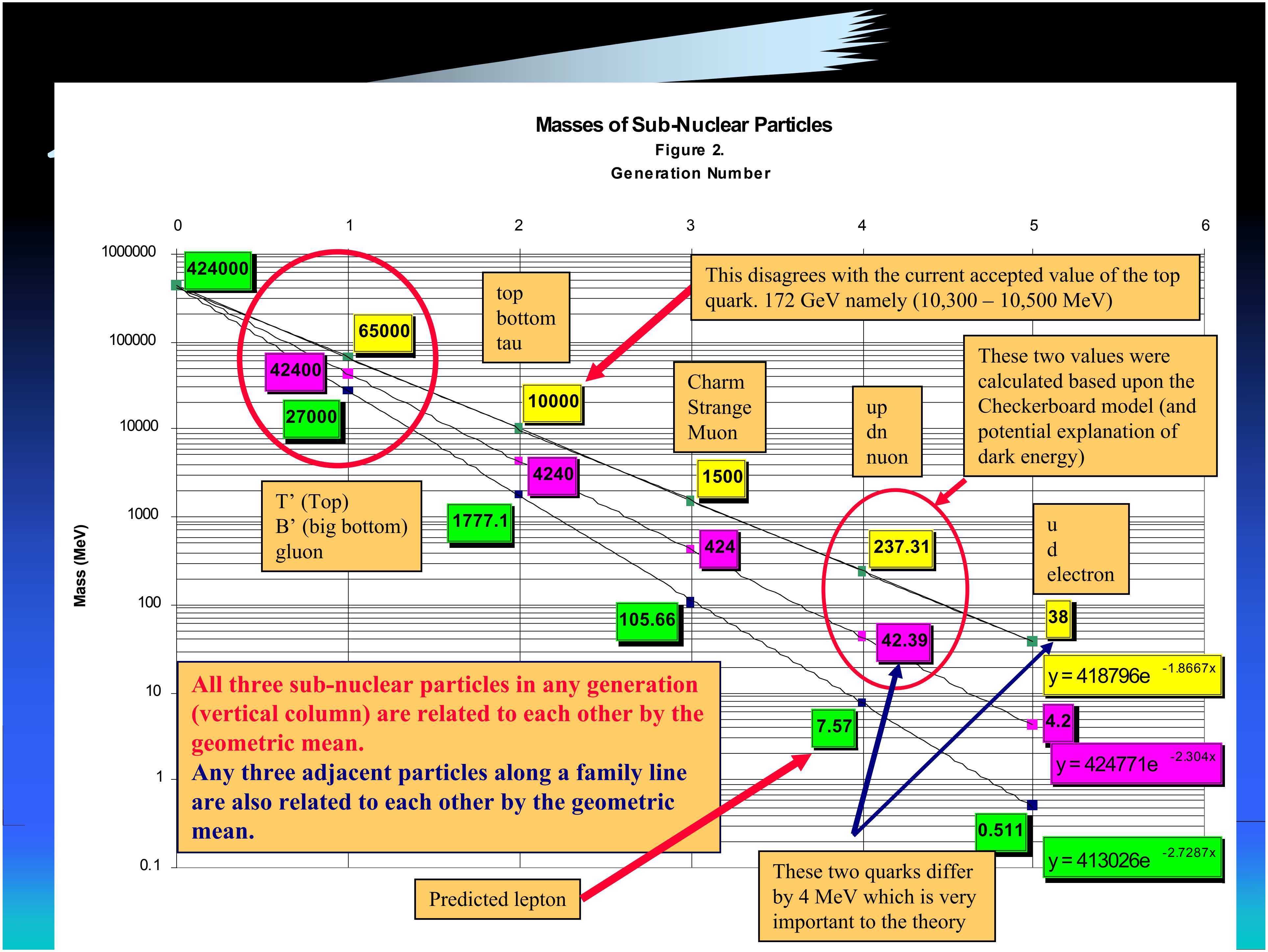
Also: the mass of any consecutive quarks of the same type (up like or dn like) are related by the geometric mean.

$$M_{X1} = \sqrt{M_{X-1} \times M_{X+1}}$$

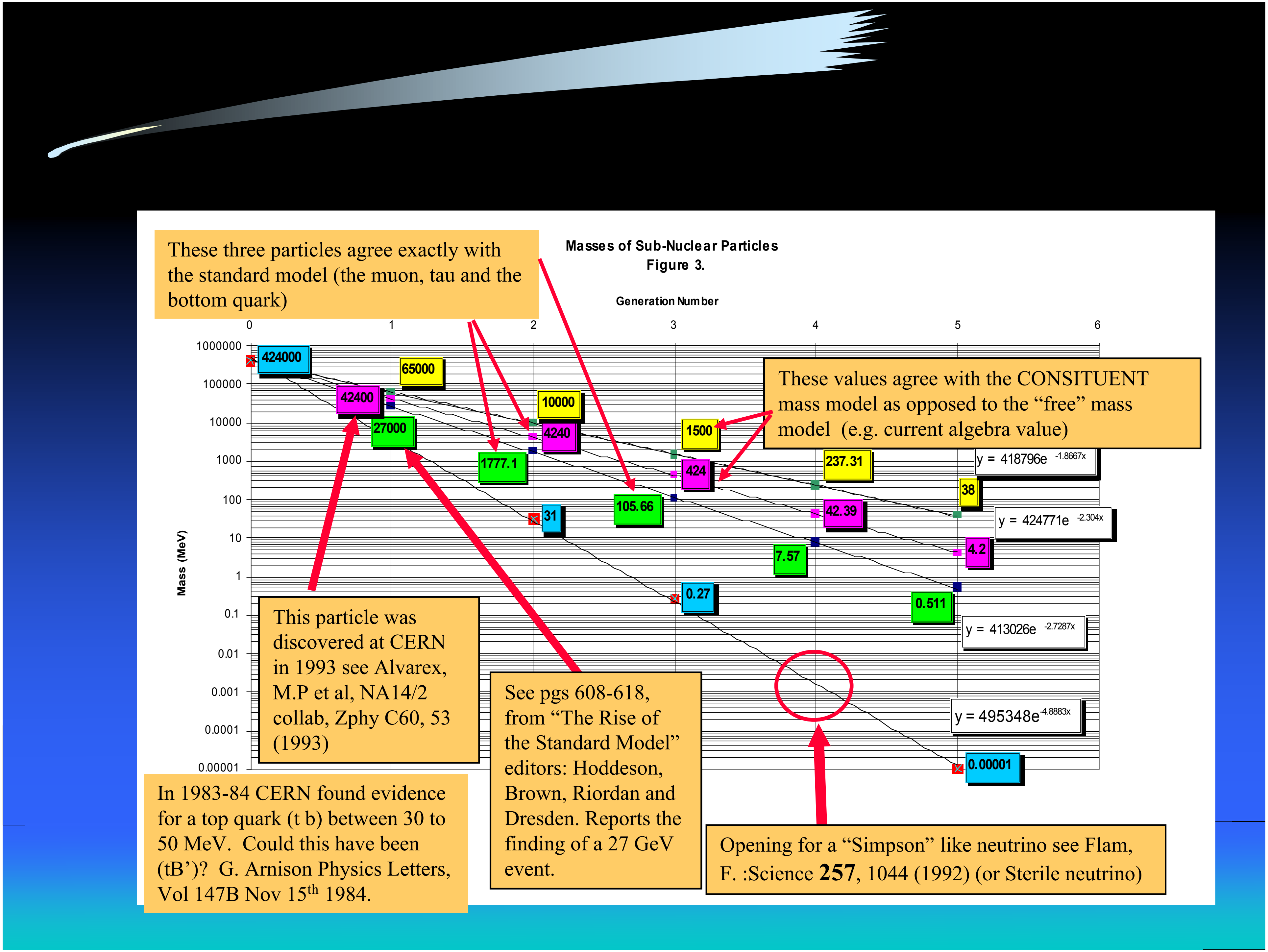
Where X = u, d, or electron family



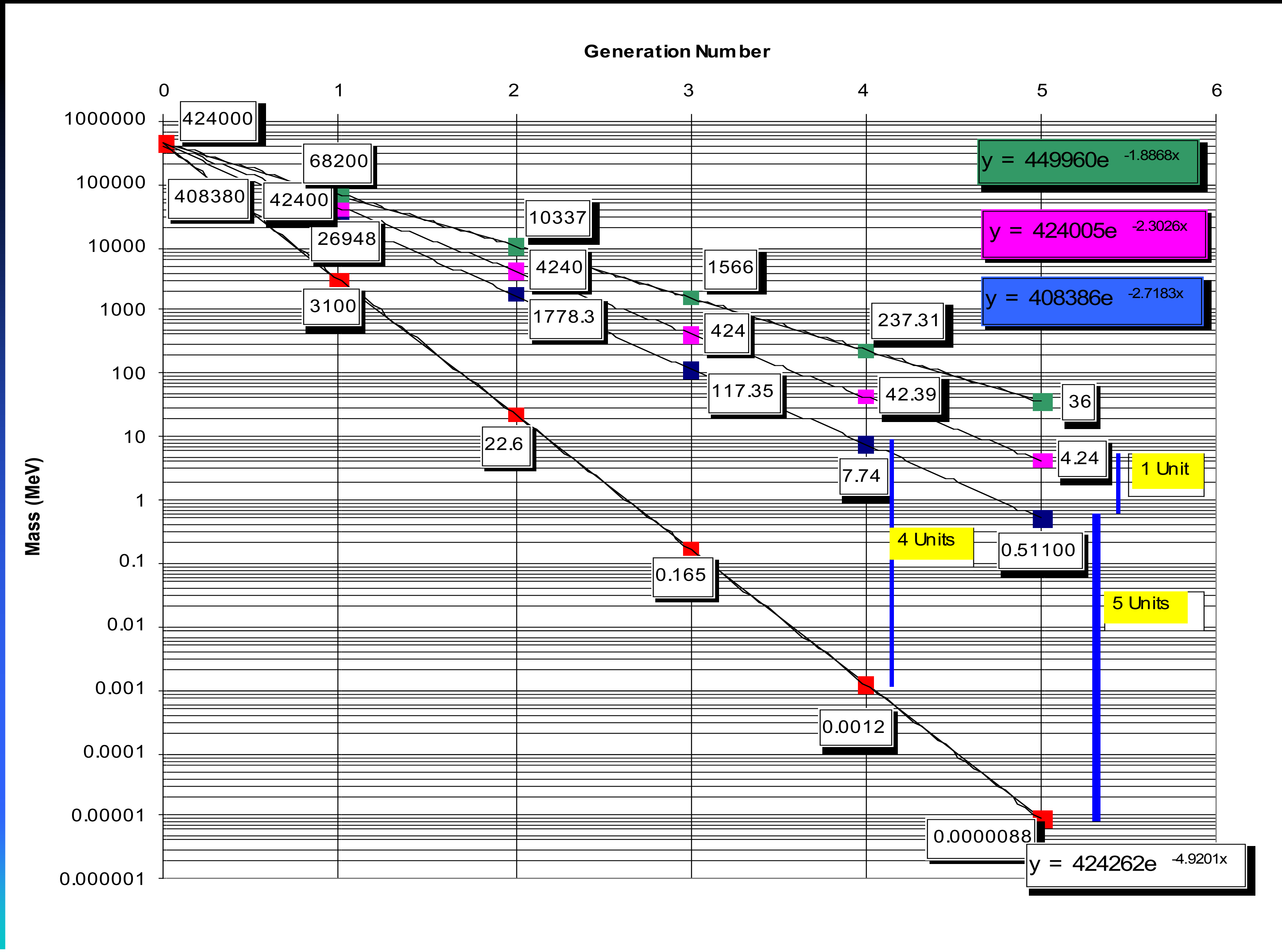
The Tau and the electron fall on this geometric line, which has a slope of "e" (2.7183…) to better than one part in 10,000 which is the known accuracy of the Tau mass.



Masses of Sub-Nuclear Particles
Figure 2.
Generation Number
0
1
2
3
4
5
6
Mass (MeV)
1000000
100000
10000
1000
100
10
1
0.1
424000
65000
42400
27000
10000
4240
1777.1
1500
424
105.66
237.31
42.39
7.57
38
4.2
0.511
top
bottom
tau
Charm
Strange
Muon
up
dn
nuon
u
d
electron
T' (Top)
B' (big bottom)
gluon
This disagrees with the current accepted value of the top quark. 172 GeV namely (10,300 – 10,500 MeV)
These two values were calculated based upon the Checkerboard model (and potential explanation of dark energy)
y = 418796e -1.8667x
y = 424771e -2.304x
y = 413026e -2.7287x
All three sub-nuclear particles in any generation (vertical column) are related to each other by the geometric mean.
Any three adjacent particles along a family line are also related to each other by the geometric mean.
Predicted lepton
These two quarks differ by 4 MeV which is very important to the theory



Masses of Sub-Nuclear Particles
Figure 3.
Generation Number
0
1
2
3
4
5
6
Mass (MeV)
1000000
100000
10000
1000
100
10
1
0.1
0.01
0.001
0.0001
0.00001
424000
65000
42400
27000
10000
4240
1777.1
1500
424
237.31
105.66
31
38
42.39
7.57
4.2
0.27
0.511
0.00001
y = 418796e -1.8667x
y = 424771e -2.304x
y = 413026e -2.7287x
y = 495348e-4.8883x
These three particles agree exactly with the standard model (the muon, tau and the bottom quark)
These values agree with the CONSITUENT mass model as opposed to the "free" mass model (e.g. current algebra value)
This particle was discovered at CERN in 1993 see Alvarex, M.P et al, NA14/2 collab, Zphy C60, 53 (1993)
See pgs 608-618, from "The Rise of the Standard Model" editors: Hoddeson, Brown, Riordan and Dresden. Reports the finding of a 27 GeV event.
In 1983-84 CERN found evidence for a top quark (t b) between 30 to 50 MeV. Could this have been (tB')? G. Arnison Physics Letters, Vol 147B Nov 15th 1984.
Opening for a "Simpson" like neutrino see Flam, F. :Science 257, 1044 (1992) (or Sterile neutrino)


Generation Number
0
1
2
3
4
5
6
Mass (MeV)
1000000
100000
10000
1000
100
10
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
424000
68200
408380
42400
26948
3100
10337
4240
1778.3
22.6
1566
424
117.35
0.165
237.31
42.39
7.74
0.0012
36
4.24
0.51100
0.0000088
y = 449960e -1.8868x
y = 424005e -2.3026x
y = 408386e -2.7183x
y = 424262e -4.9201x
1 Unit
4 Units
5 Units

Misc particles

The mass of two T’ quarks plus one B’ (baryon) would = 172.4 GeV

The mass of one T’ and one anti T’ (meson) would = 130 GeV

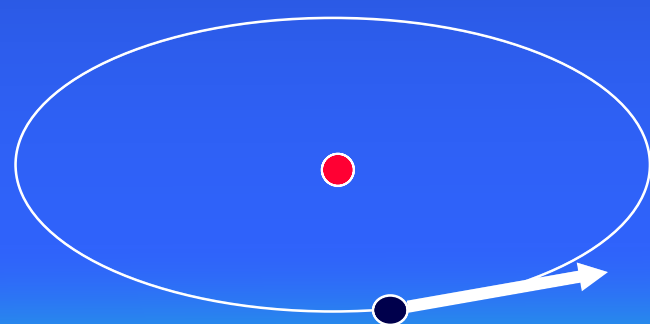
The mass of one T’ and one anti B’ (meson) would = 107.4 GeV

The mass of one B’ and one anti B’ (meson) would = 84 GeV

The mass difference between the Z and W boson is = 10.3 GeV (std model),
Which is what I believe is the mass of the top quark.

Notice on the Fermi lab today web page

Fermilab Today March 6th 2006 "Particles called B mesons are composed of an anti bottom quark and a second quark of different types. When the second is light such as an up, down or strange quark – the two particle system behaves somewhat like an atom with the heavier quark playing the role of the nucleus at the atom's center, and the lighter quark (up, down, or strange) the role of the electron orbiting the nucleus." …. "Analysis of the 1 fb dataset has also led to the first direct observation of a strange quark spinning around an anti b in an orbitally excited state, a composite state know as Bs ** (appearing as a bump in the second graphic below)"



B_s **

The Structure of the Nucleus

Assumptions:

The structure of the nucleus must be simple

Only the two quarks with like charge rotate in nucleons

Same frequency of rotation for proton and neutron

Spherical shape of nucleus is an apparent shape due to a flat structure viewed from all possible angles.

The Structure of the Nucleus

Requirements:

The structure must agree with the stability of known nuclei.

The Nucleus must have a periodic structure to explain the "fuzzy" diffraction patterns.

A nucleus may have more than one structure (isomer).

The structure must be able to logically explain alpha, beta, and gamma decay.

The Structure of the Nucleus

MAGNETIC MOMENTS: (given)

Proton = **1.41060761(47) X 10^{-26} Joules/Tesla**
2.7928473(37) $\pm$ 29 Bohr Magnetons (PDG 2000)
Neutron = **- 0.96623707(40) X 10^{-26} Joules/Tesla**
- 1.913042(7) $\pm$ 5 Bohr Magnetons (PDG 2000)

The Structure of the Nucleus

MASS: * = PDG 2000

Proton = **1836.15(3) mass electrons**
1.672623 X 10^{-27} Kg *
938.327200(0) $\pm$ 4 MeV *
1.007276466(88) $\pm$ 13 AMU *

Neutron = **1838.683(7) mass electrons**
1.6749286 X 10^{-27} Kg *
939.5653(3) $\pm$ 4 MeV *
1.008664915(78) $\pm$ 55 AMU *

Electron = 9.1093897(54) X 10^{-31} Kg

The Structure of the Nucleus

Given:

CONSTANTS:

Electron/Proton charge = $1.602095 \text{ X } 10^{-19}$ coulombs

Speed of light "c" = 2.997925 meters / sec

Plank's constant "h" = $6.62618 \text{ x}10^{-34}$ J s

EQUATIONS:

$\mu = I(A) = ef\,(\pi\, r^2) = 1/2\;(\,e\;v\;r)$ Magnetic Moment

$m_v = m_o\;(1 - v^2/c^2)^{-1/2}$ Einstein

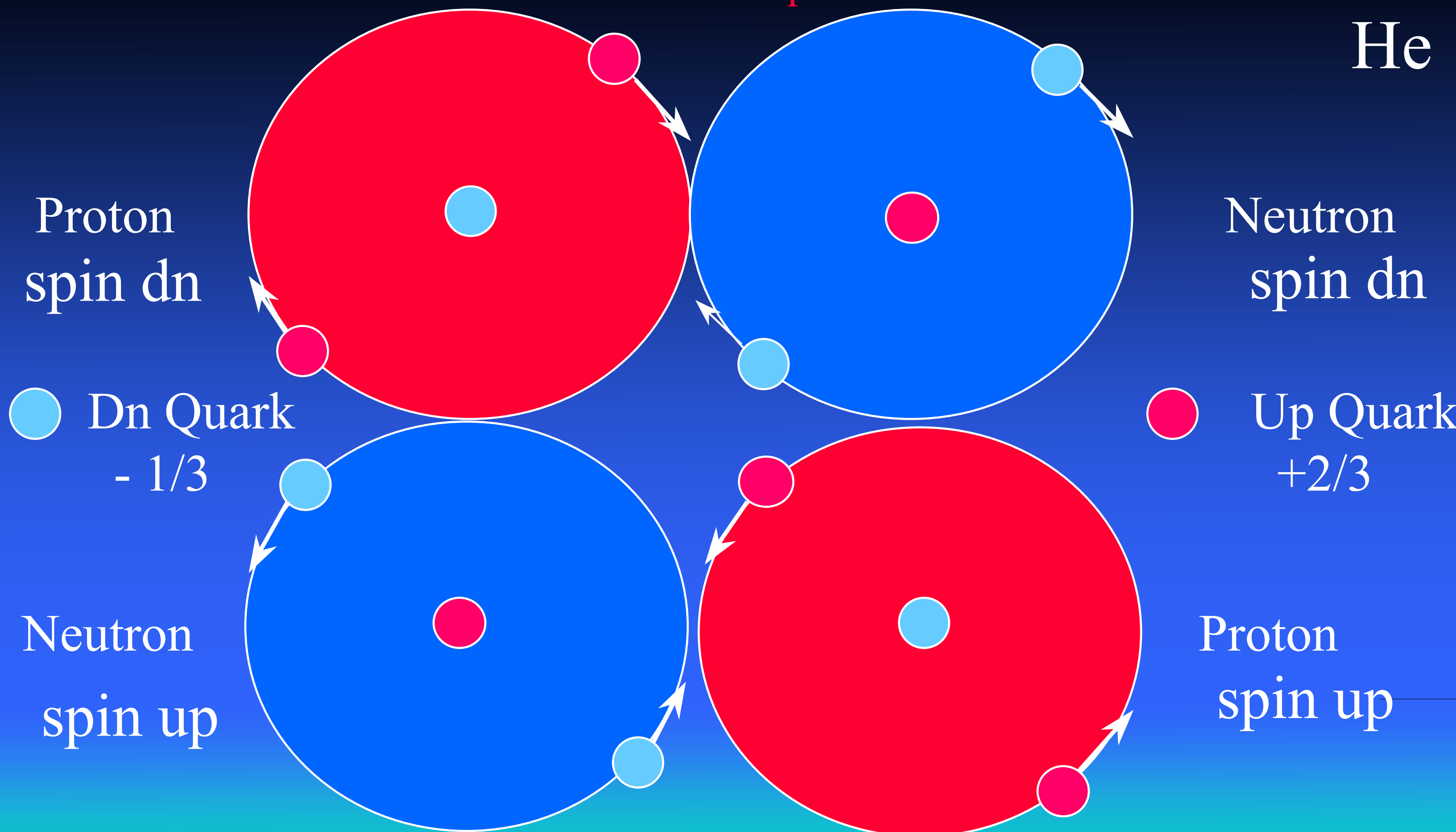
$\lambda_v = \; h\,/\,m_v v$ DeBroglie

The Structure of the Nucleus

Basic Principle

4

He



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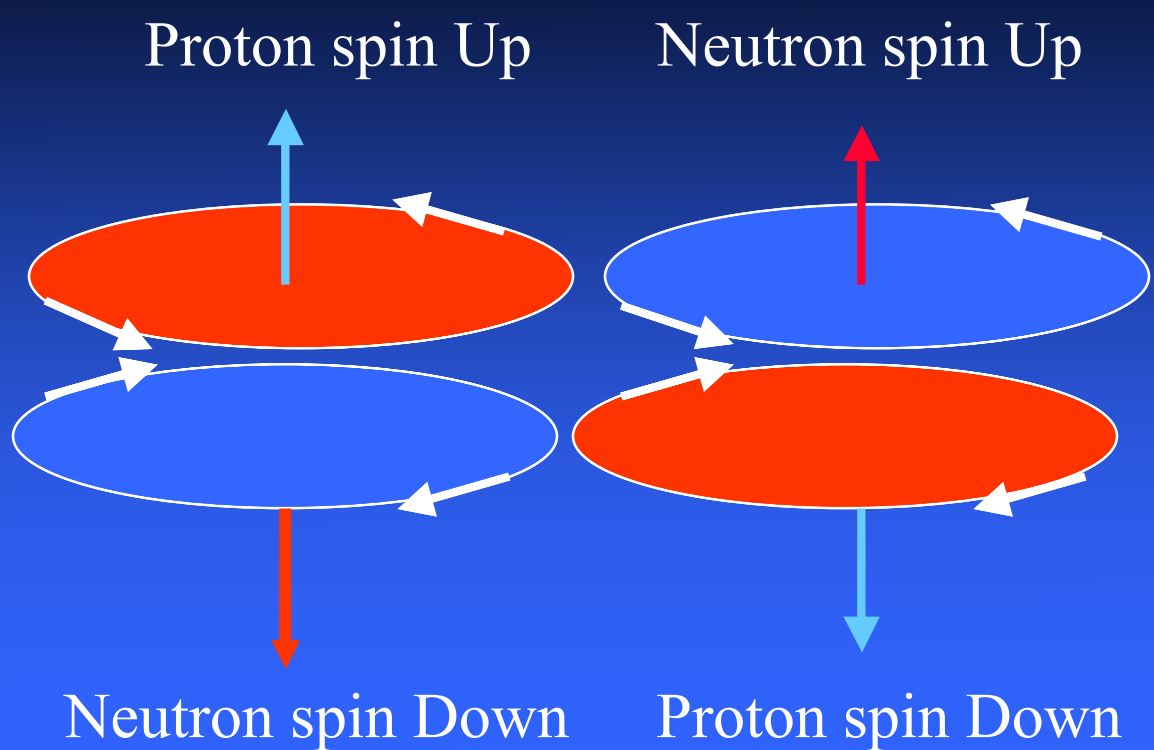
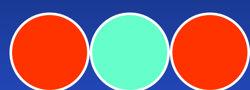
The Structure of the Nucleus

Basic Principle

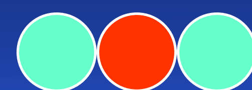


The Structure of the Nucleus

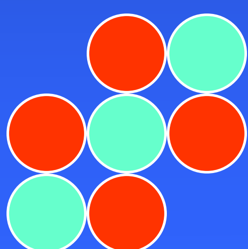
Two examples of nuclear mirror nuclei (eg. exchange the protons with neutrons you get the other nuclei)



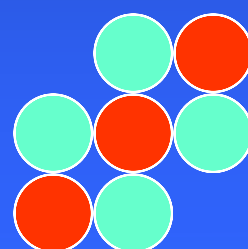
${}^{3}_{2}He$



${}^{3}_{1}H$



${}^{7}_{4}Be$

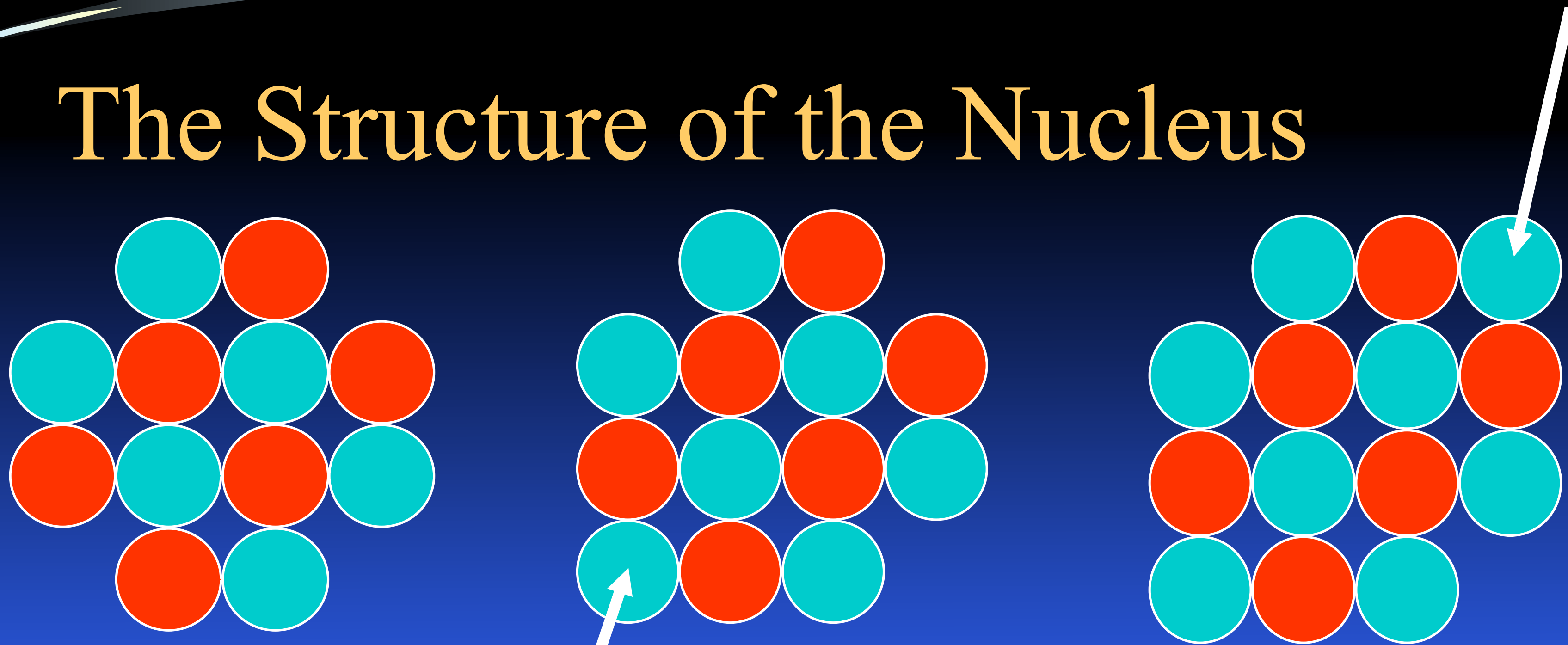


${}^{7}_{3}Li$

Proton   Neutron

The energy spectrum of the mirror nuclei are the same.

The Structure of the Nucleus



$^{12}_{6}C$ Abundance = 98.93%

$^{13}_{6}C$ Abundance = 1.07%

$^{14}_{6}C$ half life = 5715 years

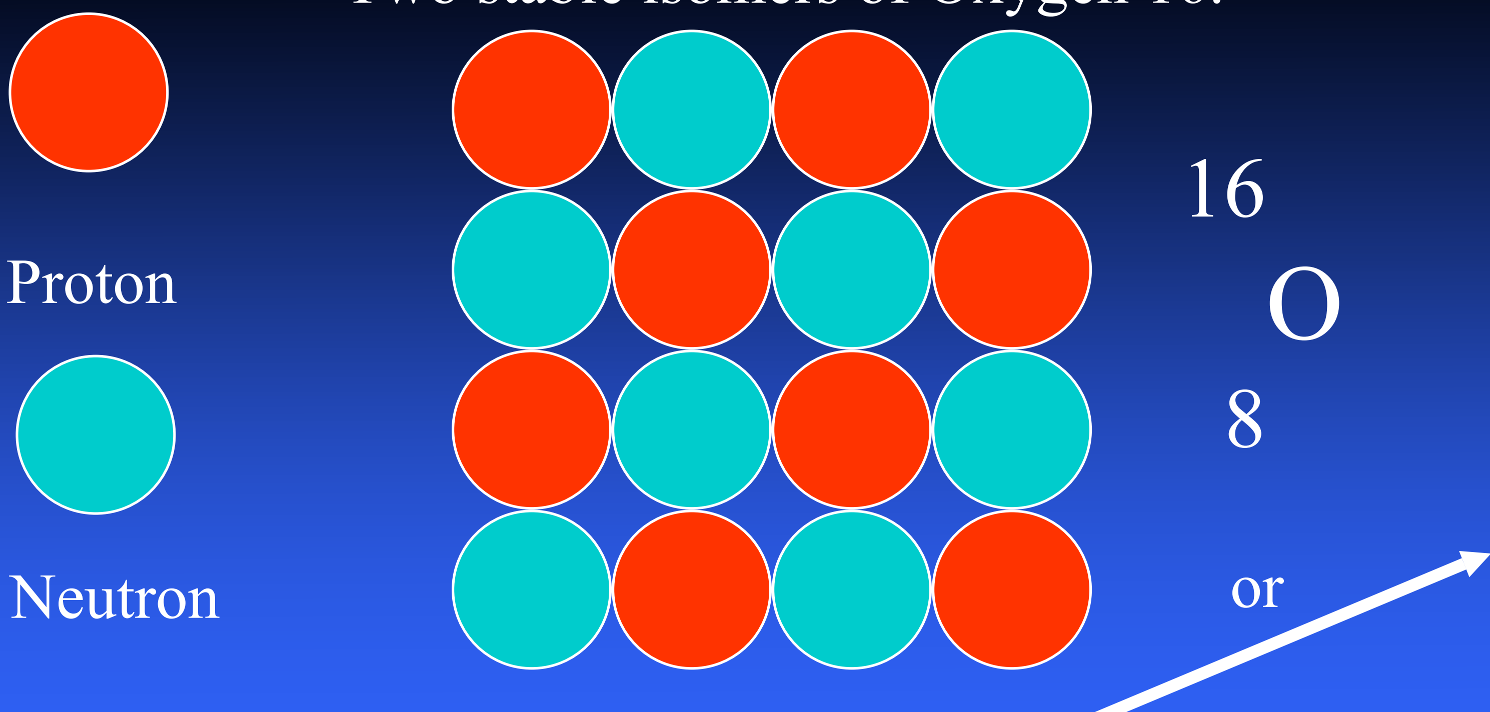
ONLY Three stable forms of the Carbon nucleus (notice how the two extra neutrons “fit” nicely into the pattern).

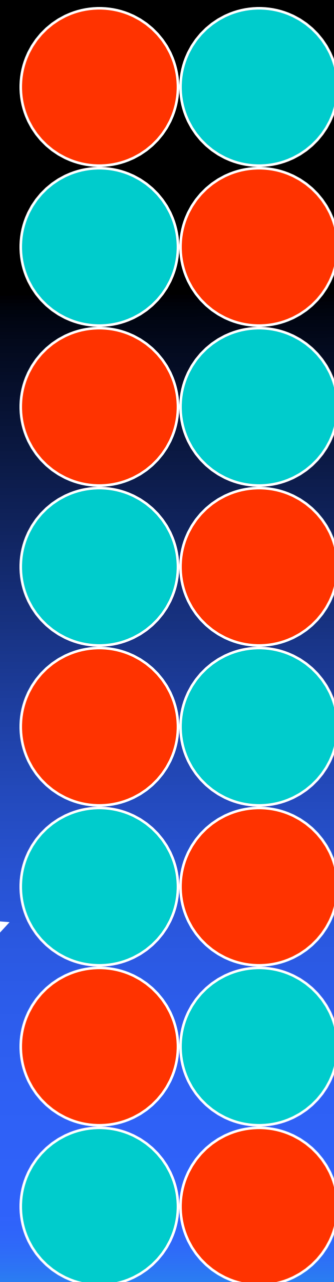
Proton

Neutron

The Structure of the Nucleus

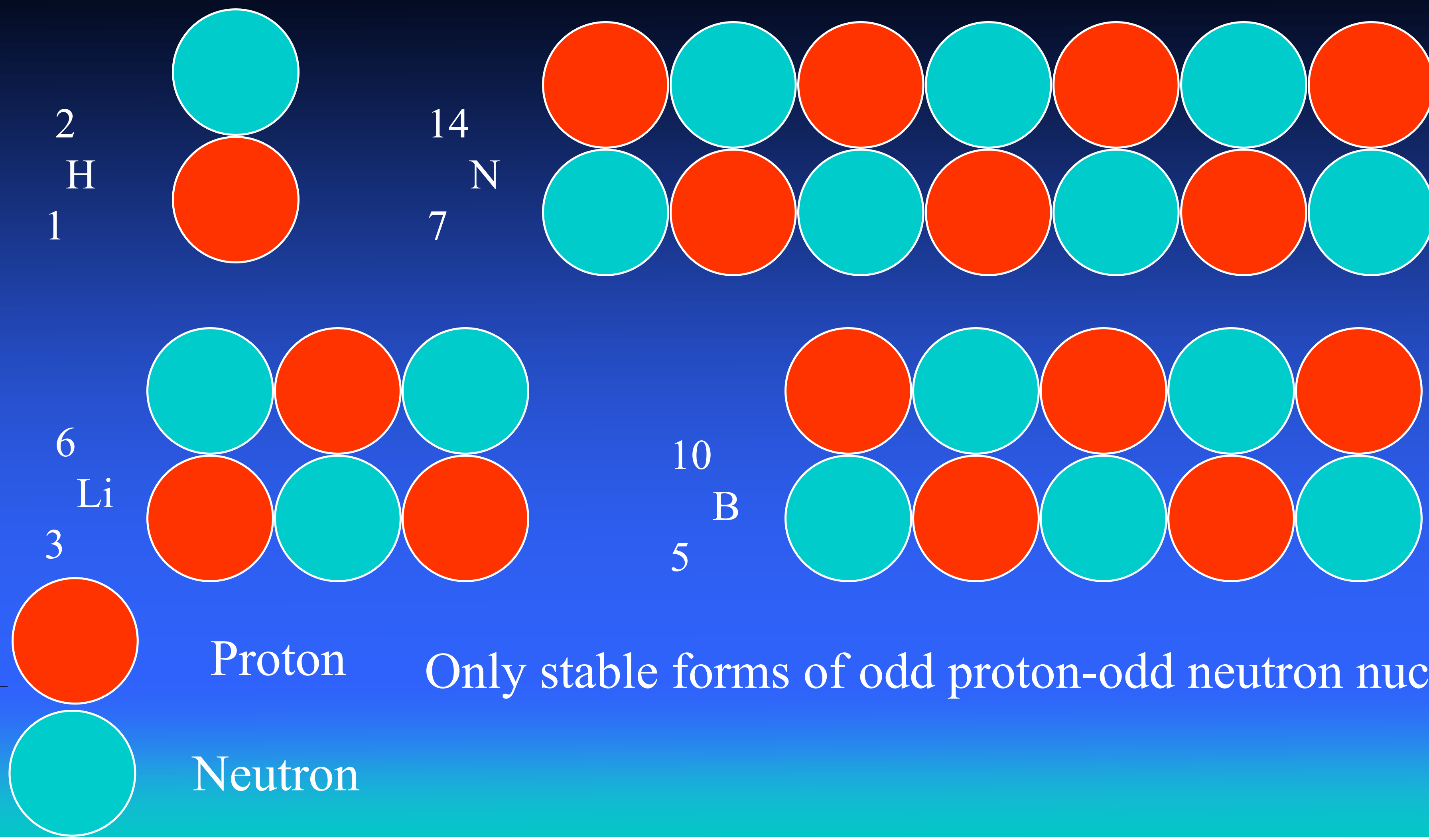
Two stable isomers of Oxygen 16.





The Nuclear Cluster Model, which predicts linear structures such as Oxygen 16 and Mg 24 is described in the Handbook of Nuclear Properties, D.N. Peonaru and W. Greiner pg 103 Evidence for linear Mg 24 was published by Wuosmaa et.al Phys. Rev. Lett., 68, 1295, 1992.

The Structure of the Nucleus

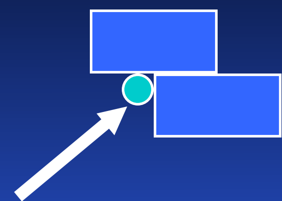


Only stable forms of odd proton-odd neutron nuclei.

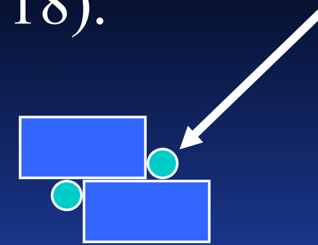
The Structure of the Nucleus

Only Stable structures from Oxygen (16, 17, 18).

$^{16}_{8}O$ 99.76%

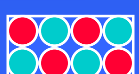


$^{17}_{8}O$ 0.038%



$^{18}_{8}O$ 0.20%

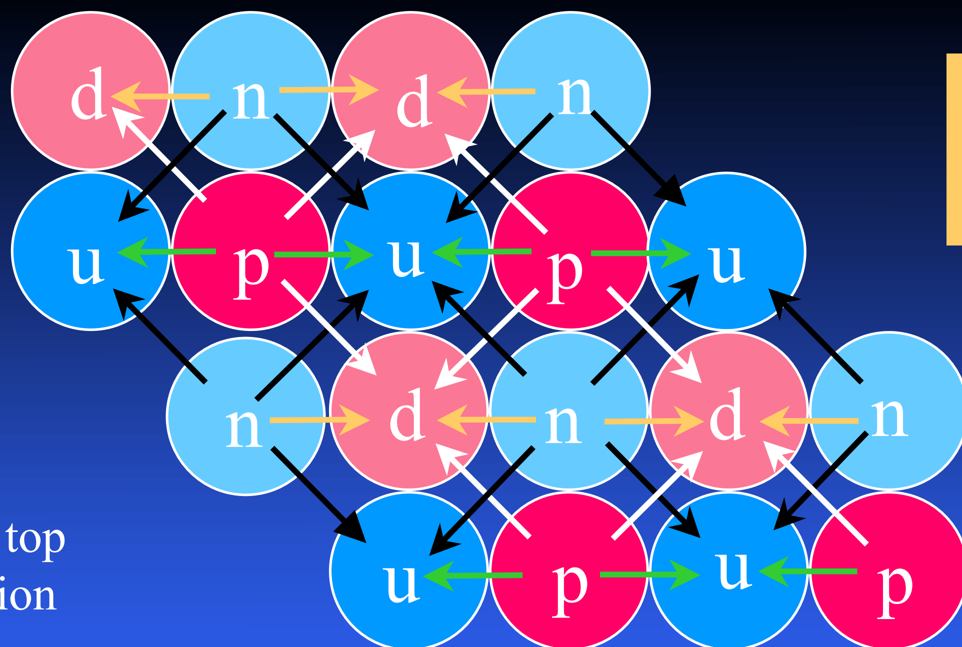
$^{19}_{9}F$ 100%

 2- Alpha Particles

● Neutron

● Proton

The Structure of the Nucleus



18 O 8

0.20%

Flux Line out / top of page / direction

Neutrons

spin down   Spin up

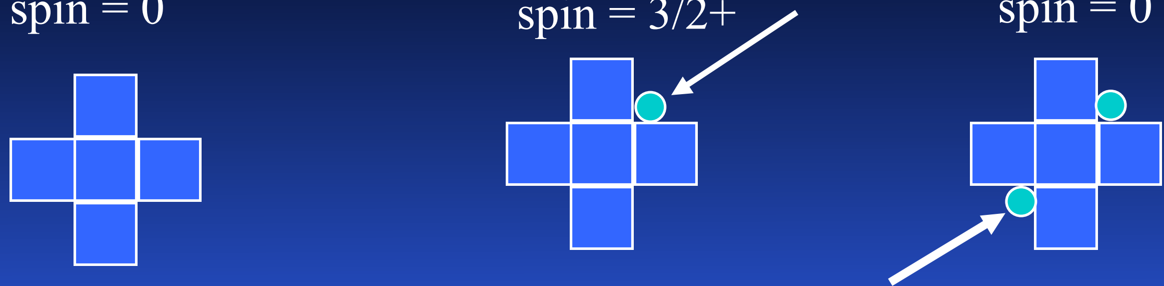
Protons

spin down   spin up

The Structure of the Nucleus

Stable structures of Neon, 5 alpha particles

spin = 0 | spin = 3/2+ | spin = 0



$^{20}_{10}Ne$ | $^{21}_{10}Ne$ | $^{22}_{10}Ne$

90.48% | 0.27% | 9.25%

Abundance

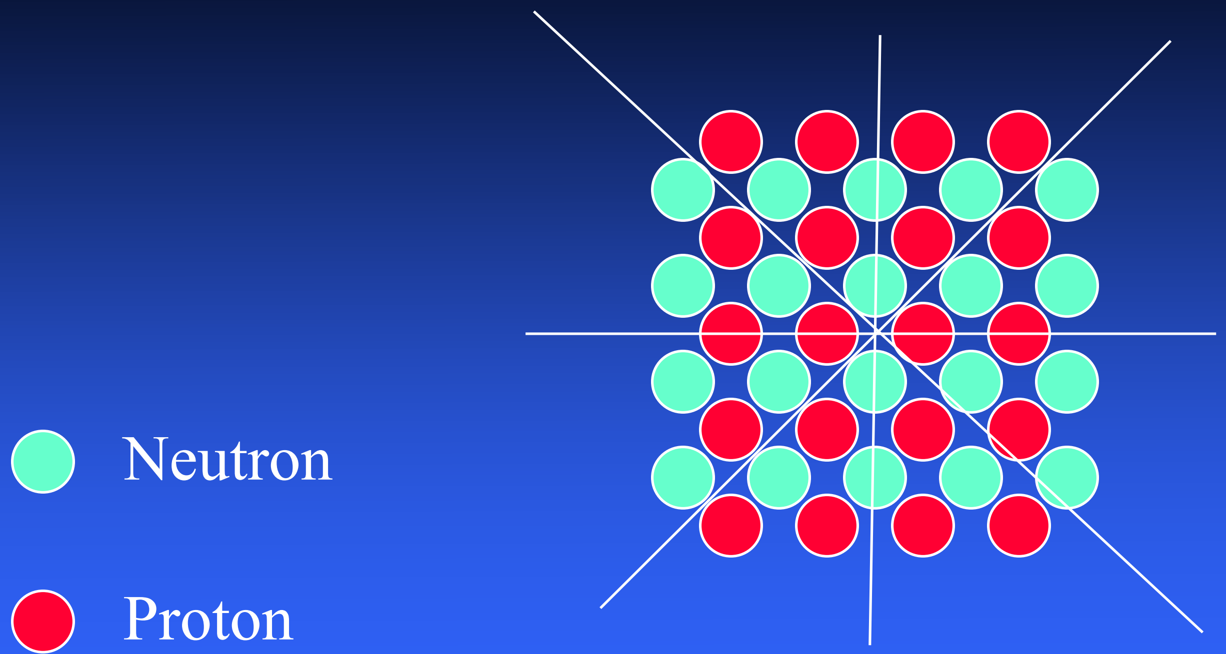
Alpha Particle

Neutron

Proton

Neon 22 has 8 additional (non structural) neutron sites that could be populated, resulting in Ne 30. To date the heaviest isotope of Ne that has been found is Ne 29 with a half life of .2 seconds.

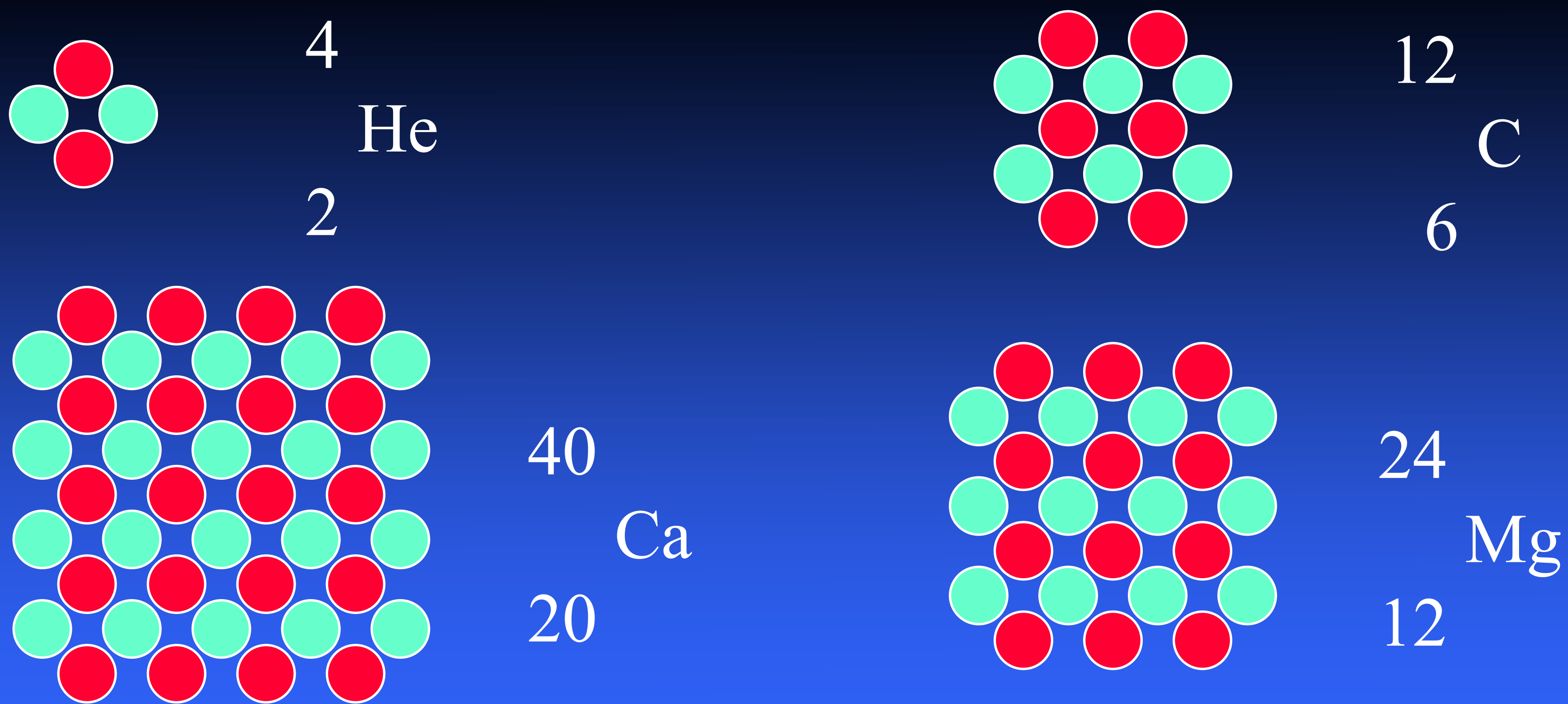
The Structure of the Nucleus



$^{40}_{20}Ca$

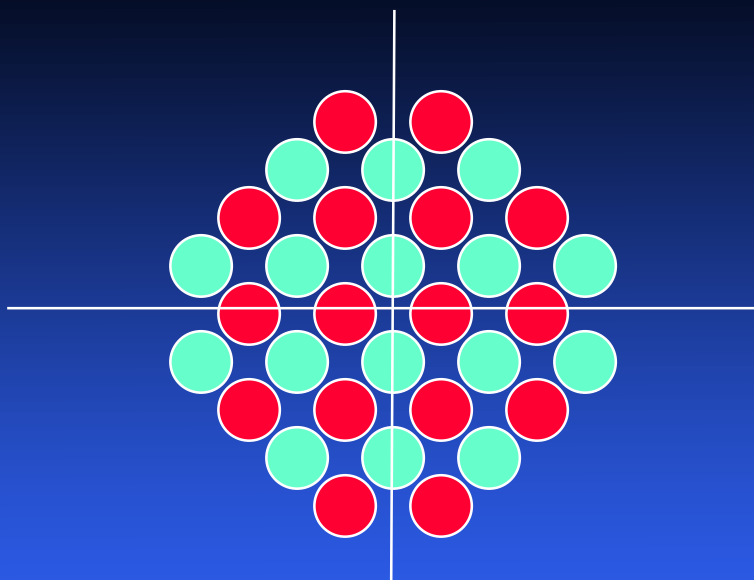
Most abundant form of Ca, 96.94%. **Double mirror symmetry**. Double Magic number Nuclei.

The Structure of the Nucleus



These 4 nuclear structures all follow the same pattern / symmetry. **They all have double mirror symmetry.** Two of these structures are double magic. The other two have very high abundance's..

The Structure of the Nucleus

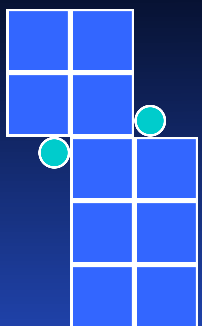


$^{32}_{16}S$

$^{40}_{20}Ca$

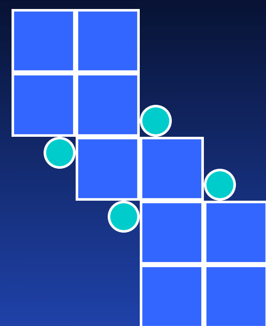
These 2 nuclear structures all have double mirror symmetry and are key nuclei for their abundance and stability.

The Structure of the Nucleus



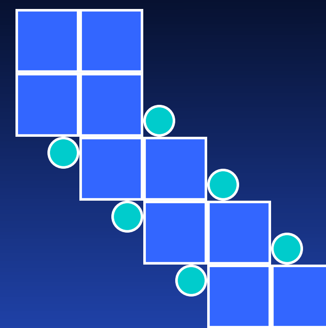
$^{42}_{20}Ca$

0.647%



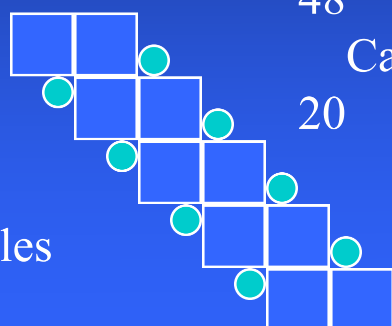
$^{44}_{20}Ca$

2.086%



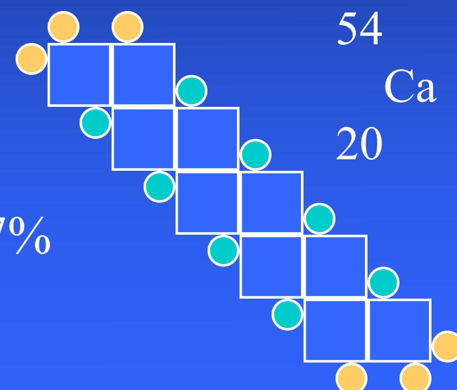
$^{46}_{20}Ca$

0.004%



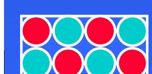
$^{48}_{20}Ca$

0.187%



$^{54}_{20}Ca$

Half life 86 ms



2- Alpha Particles

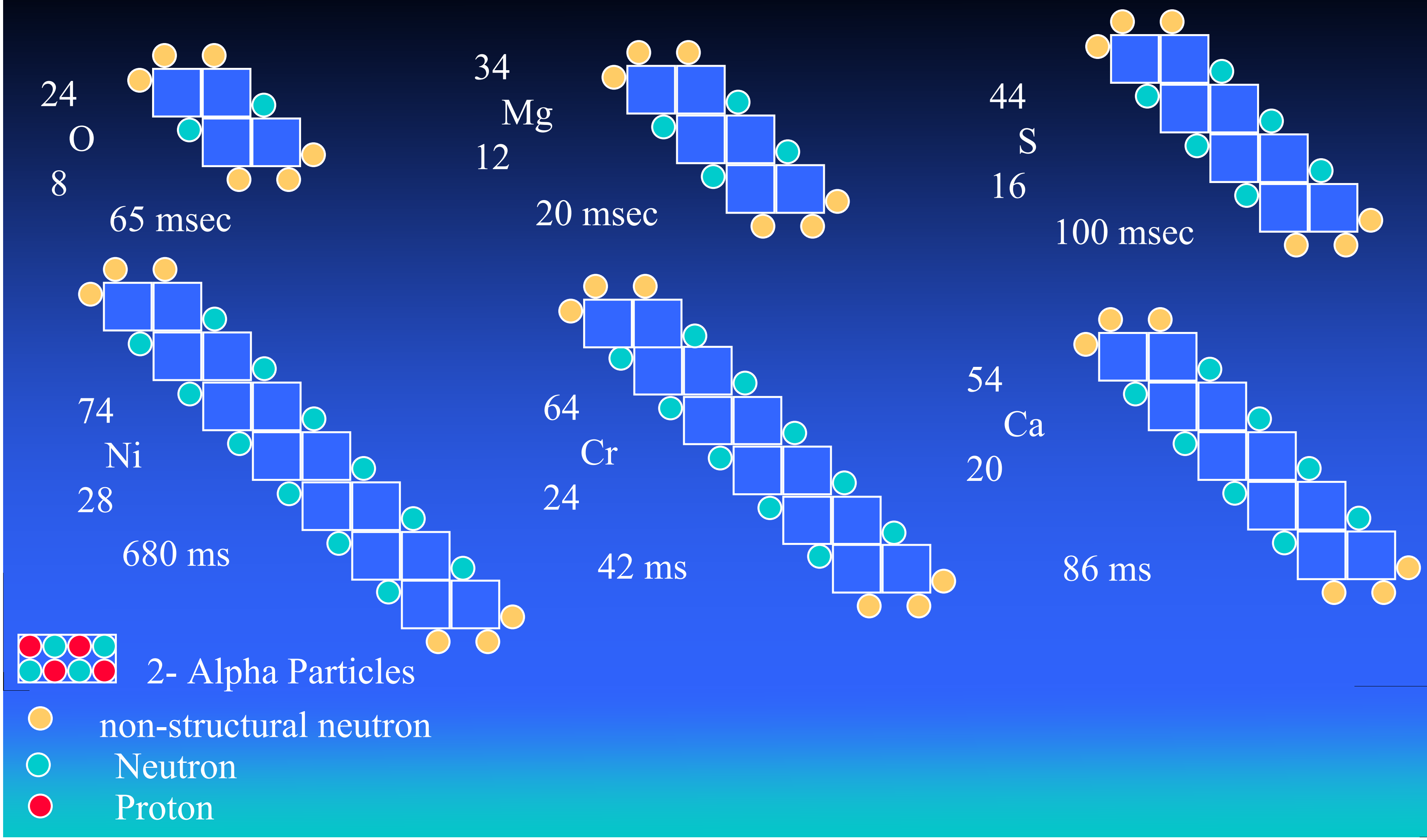
non-structural neutron

Neutron

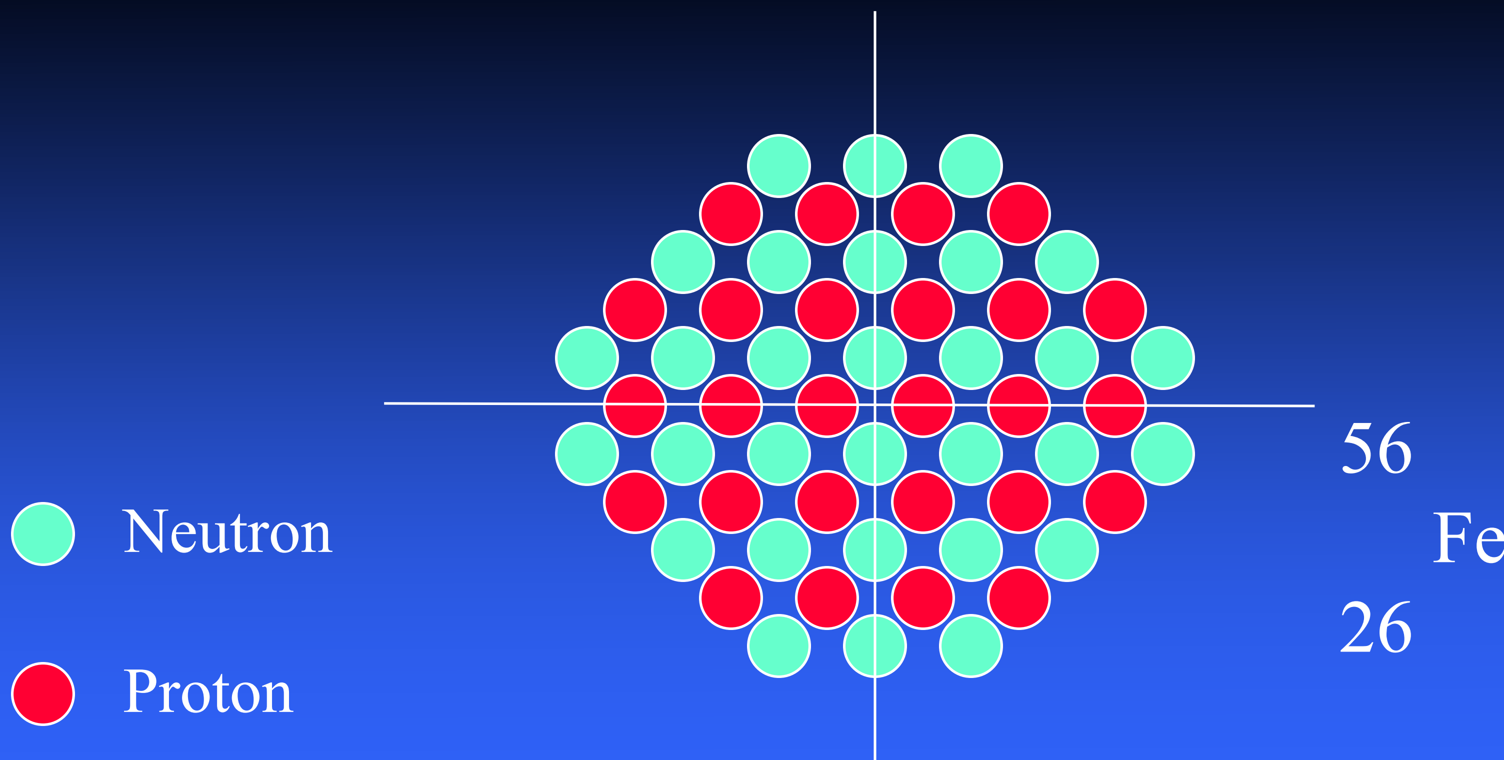
Proton

Starting with Ca 48 and filling six additional non-structural neutron sites gives Ca 54.

The Structure of the Nucleus



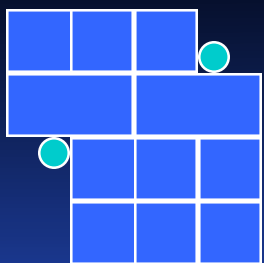
The Structure of the Nucleus



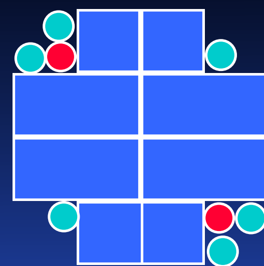
Most abundant form of Fe, 91.75%. Double mirror symmetry.

Fe 56 has the highest binding energy (pre nucleon) of any nucleus and in this theory (CBM) has the highest percentage of 4 nearest neighbor bonds..

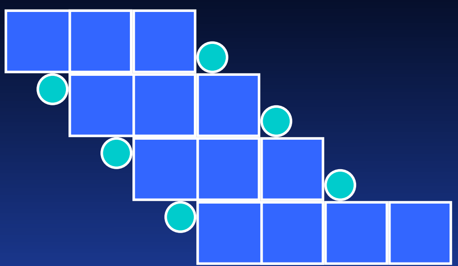
The Structure of the Nucleus



$^{54}_{26}Fe$ 5.84%

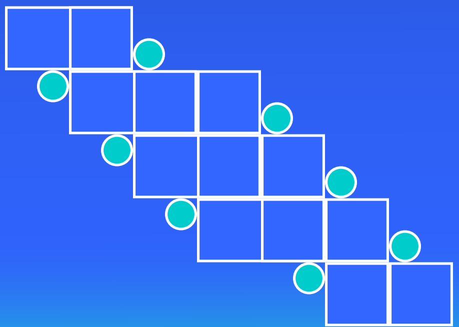


$^{56}_{26}Fe$ 91.75%



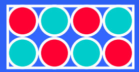
$^{58}_{26}Fe$

0.282 %



$^{60}_{26}Fe$

Half life = 2.62 X 10 ^{6} years

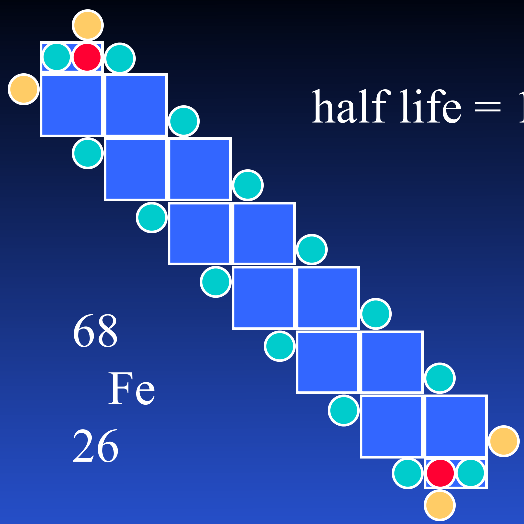
 2- Alpha Particles

Neutron

Proton

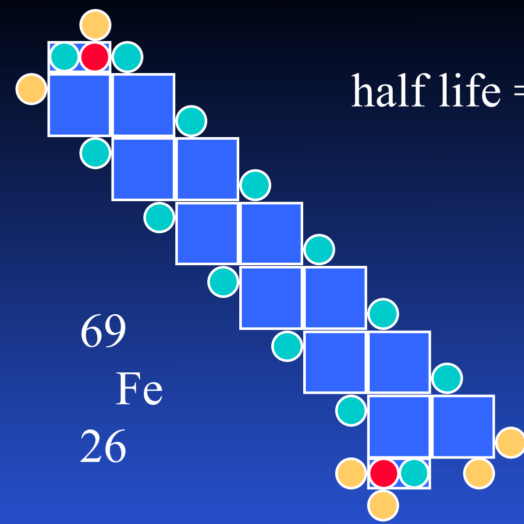
Different Forms of stable Iron nuclei

The Structure of the Nucleus



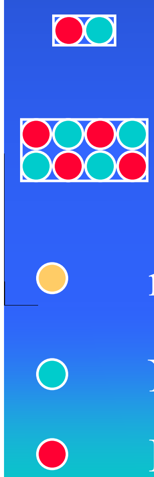
half life = 180 ms

68
Fe
26



half life = 110 ms

69
Fe
26



2
H

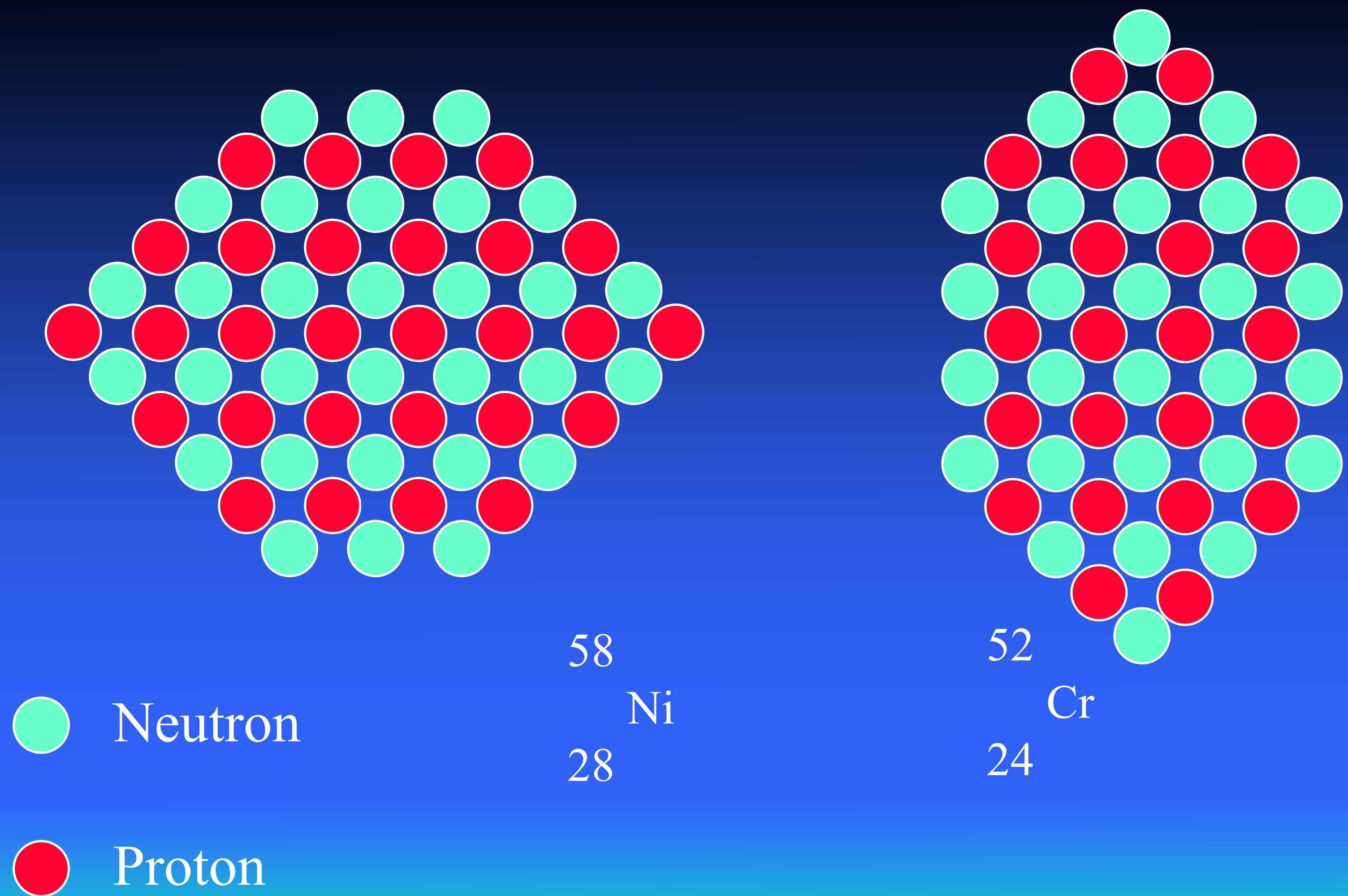
2- Alpha Particles

non-structural neutron

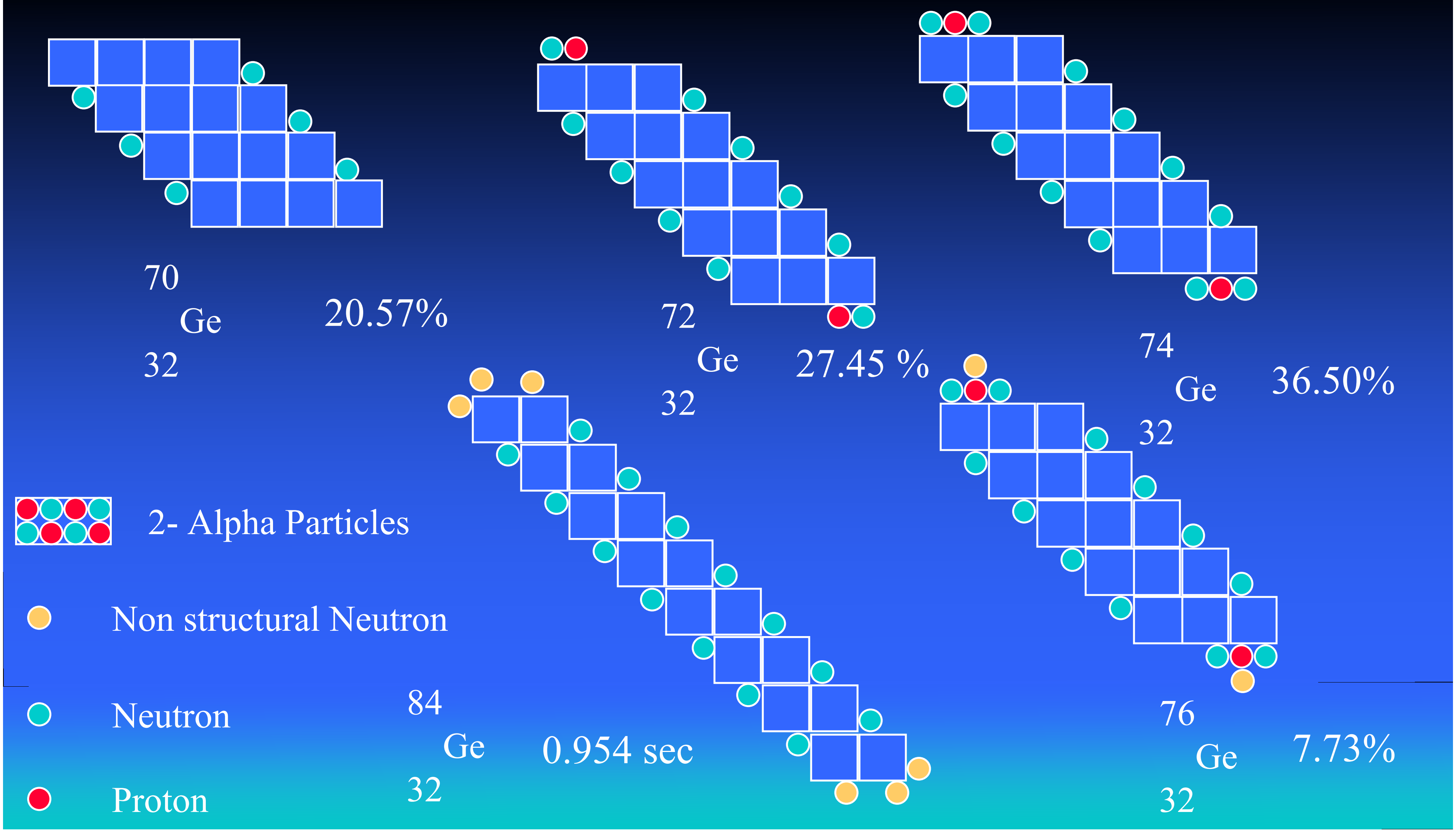
Neutron

Proton

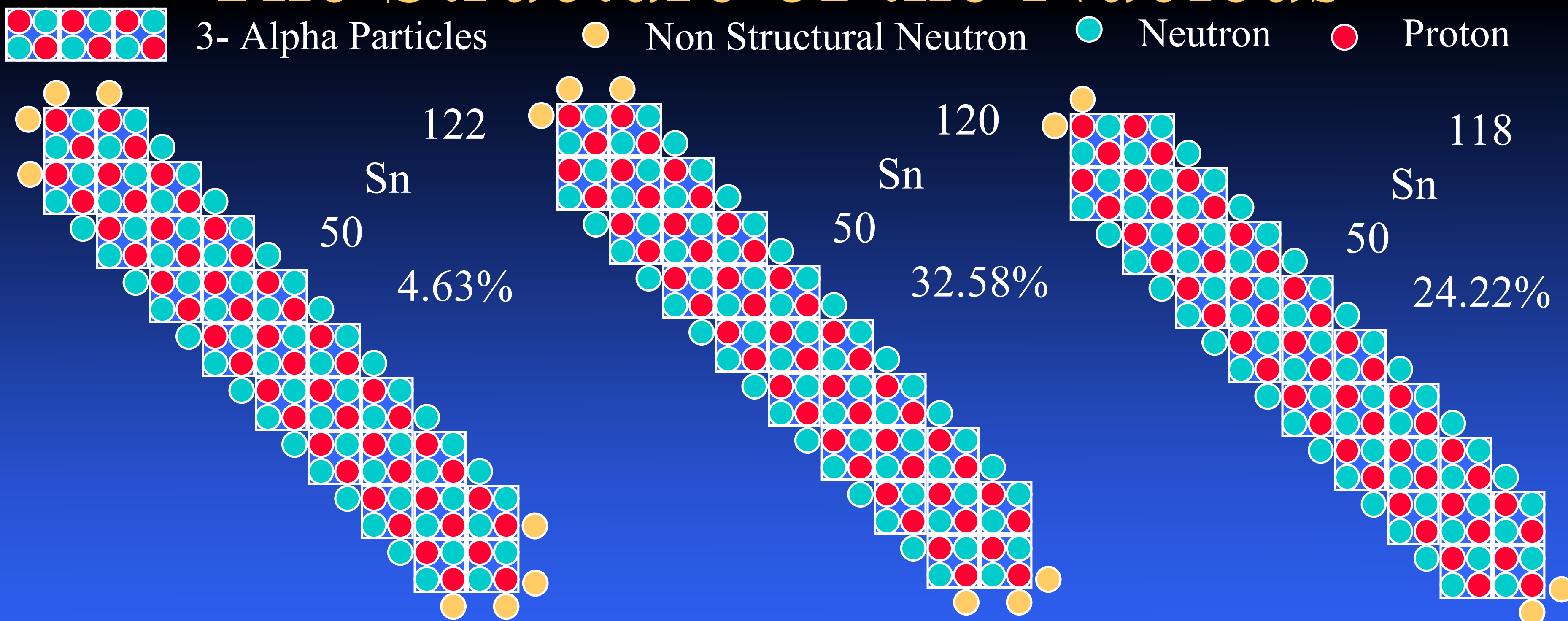
The Structure of the Nucleus



The Structure of the Nucleus



The Structure of the Nucleus



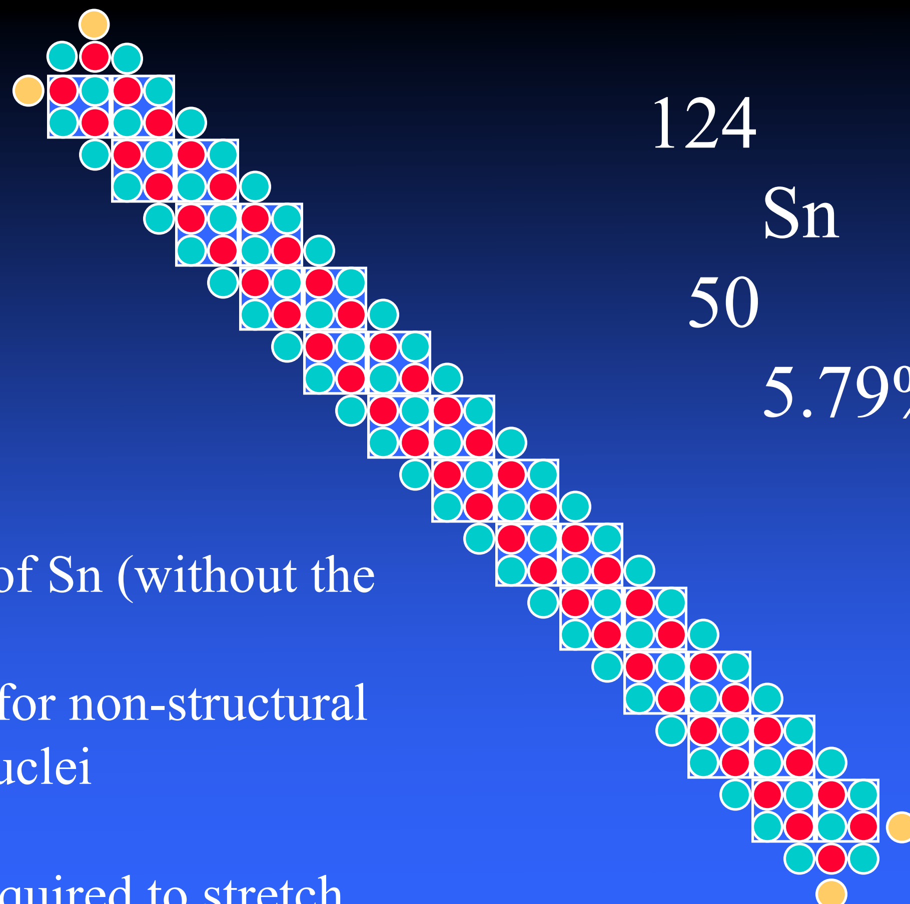
Sn 120 is the most abundant form of Sn. Subtract two non structural neutrons and you get Sn 118, 24.22% abundance, Subtract two more non structural neutrons and you get Sn 116, abundance 14.54%, subtract the last two non structural neutrons= Sn 114, abundance .66%

The Structure of the Nucleus

2- Alpha Particles

Neutron

Proton



124

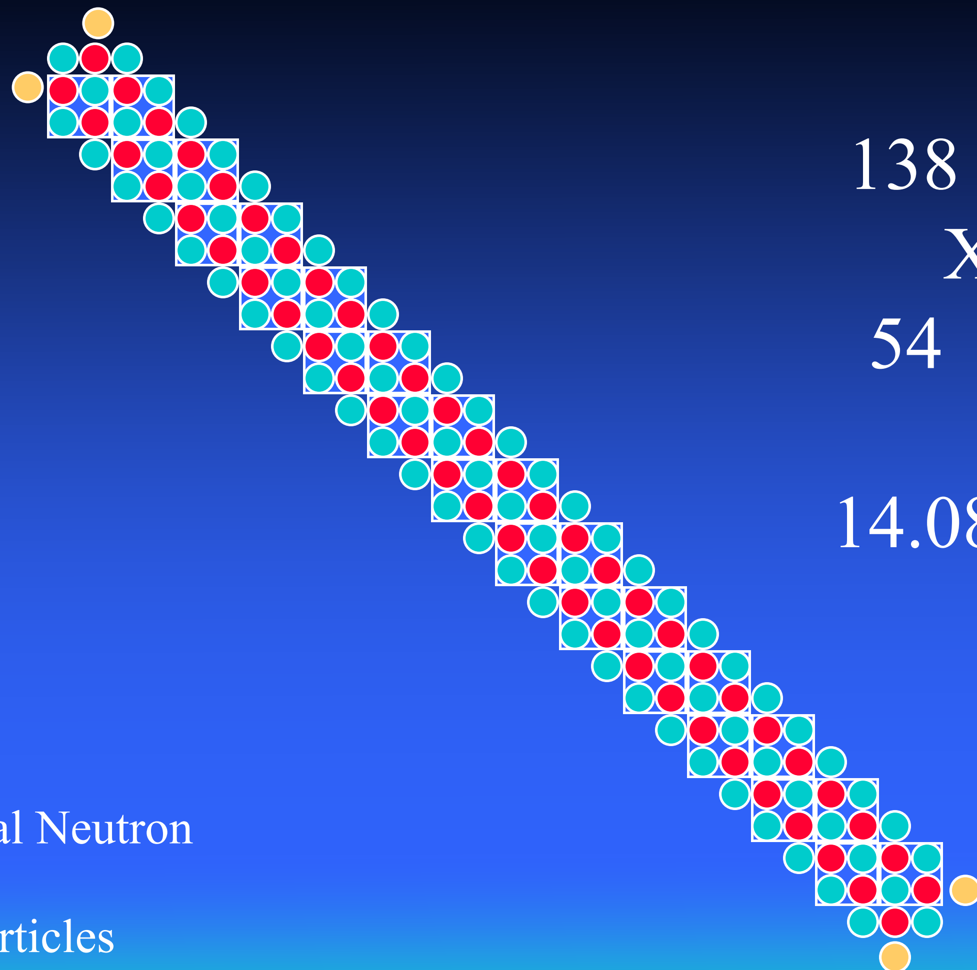
Sn

50

5.79%

Sn 124 is the last stable nuclei of Sn (without the 4 non-structural neutrons).
This structure has 4 more sites for non-structural neutron (yellow) sites so that nuclei up to Sn 128 can be explained.
(structures larger than Fe are required to stretch out to minimize the mutual repulsion of the protons) also to be able to account for the extra neutron positions of known nuclei.

The Structure of the Nucleus



138
Xe
54

14.08 min

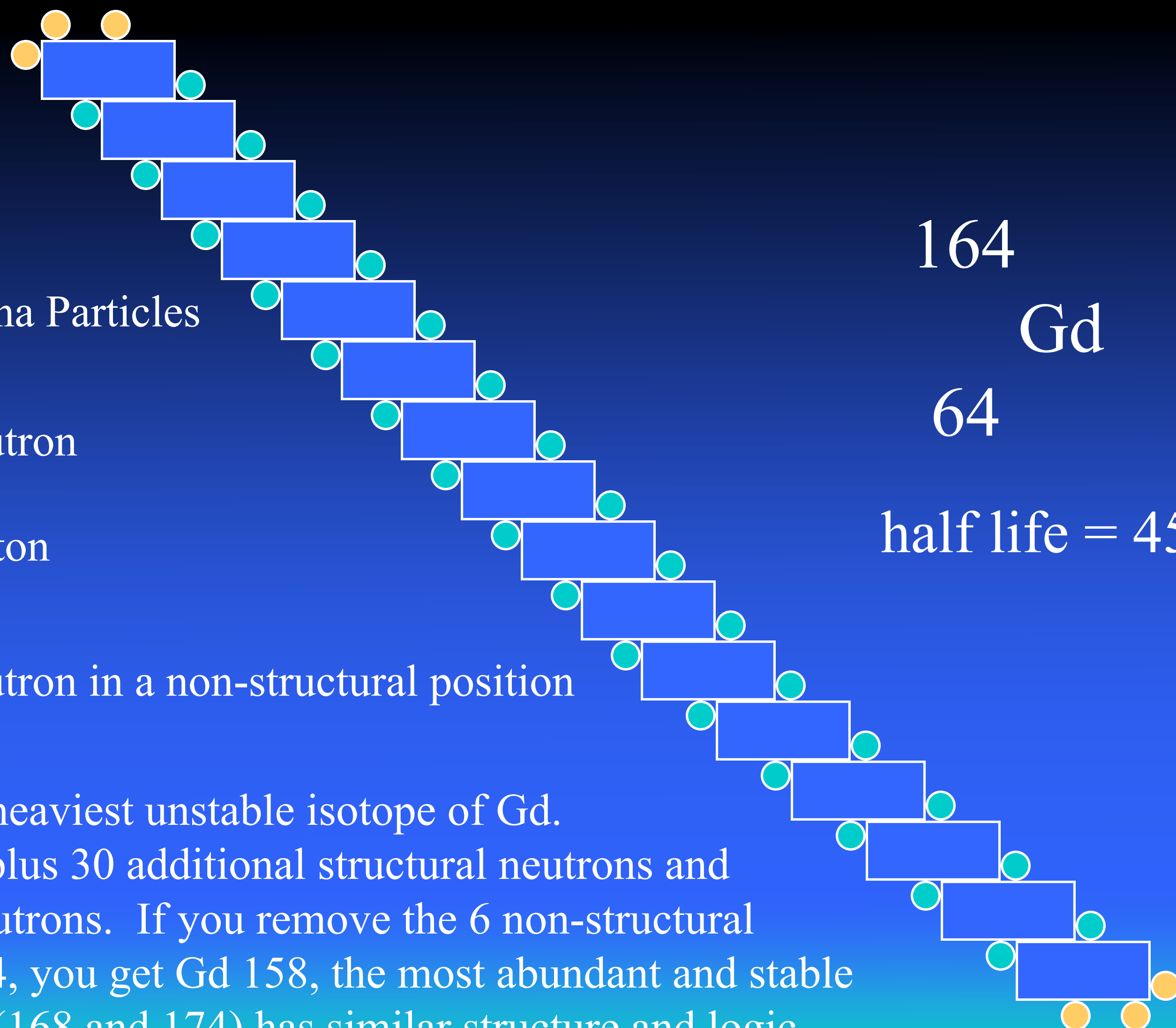
Neutron

Proton

Non Structural Neutron

2- Alpha Particles

The Structure of the Nucleus



2- Alpha Particles

Neutron

Proton

Neutron in a non-structural position

164

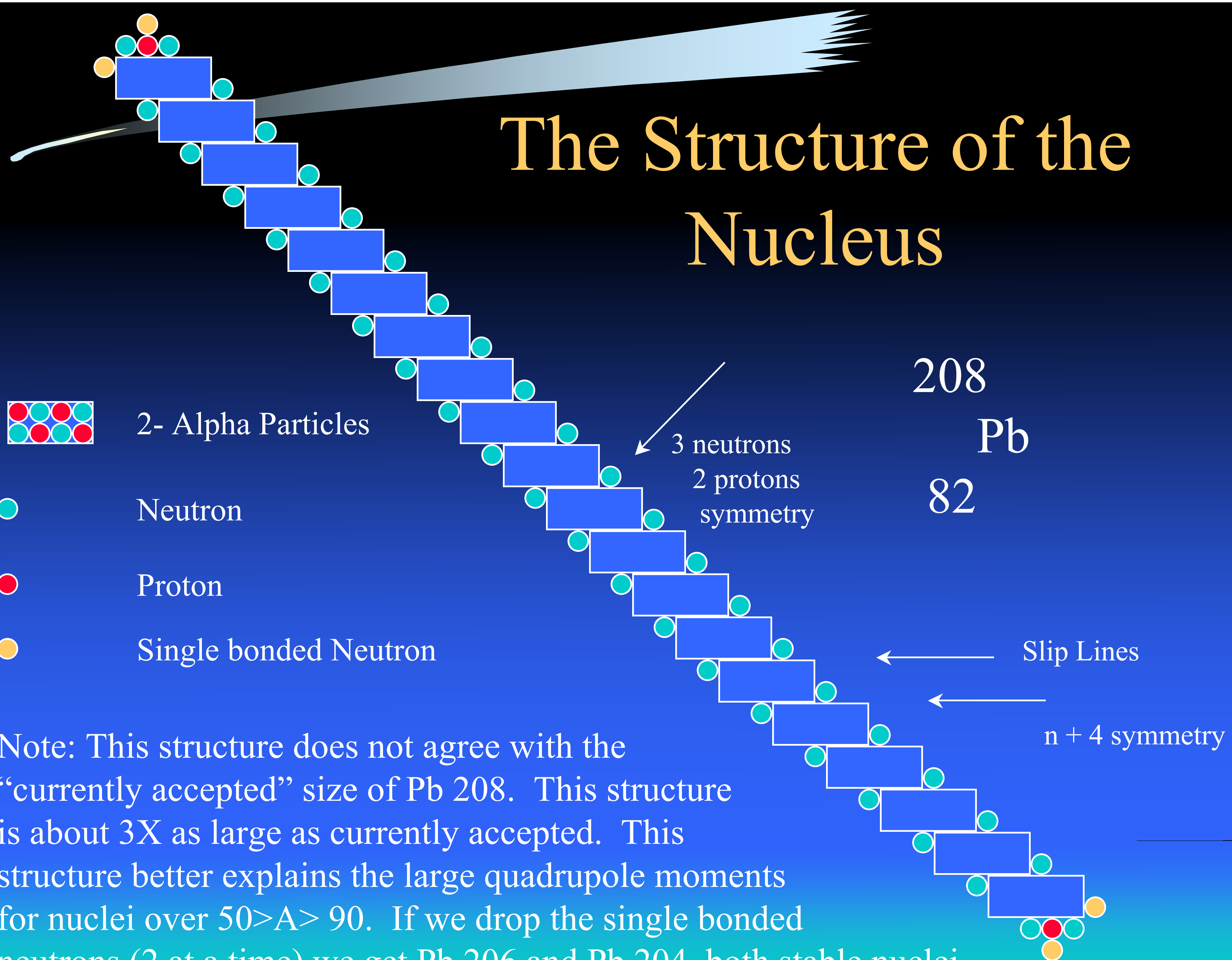
Gd

64

half life = 45 sec

Gd 164 is one of the heaviest unstable isotope of Gd.
32 Alpha structures, plus 30 additional structural neutrons and six non-structural neutrons. If you remove the 6 non-structural neutrons from Gd 164, you get Gd 158, the most abundant and stable form of Gd. Erbium (168 and 174) has similar structure and logic.

The Structure of the Nucleus



2- Alpha Particles

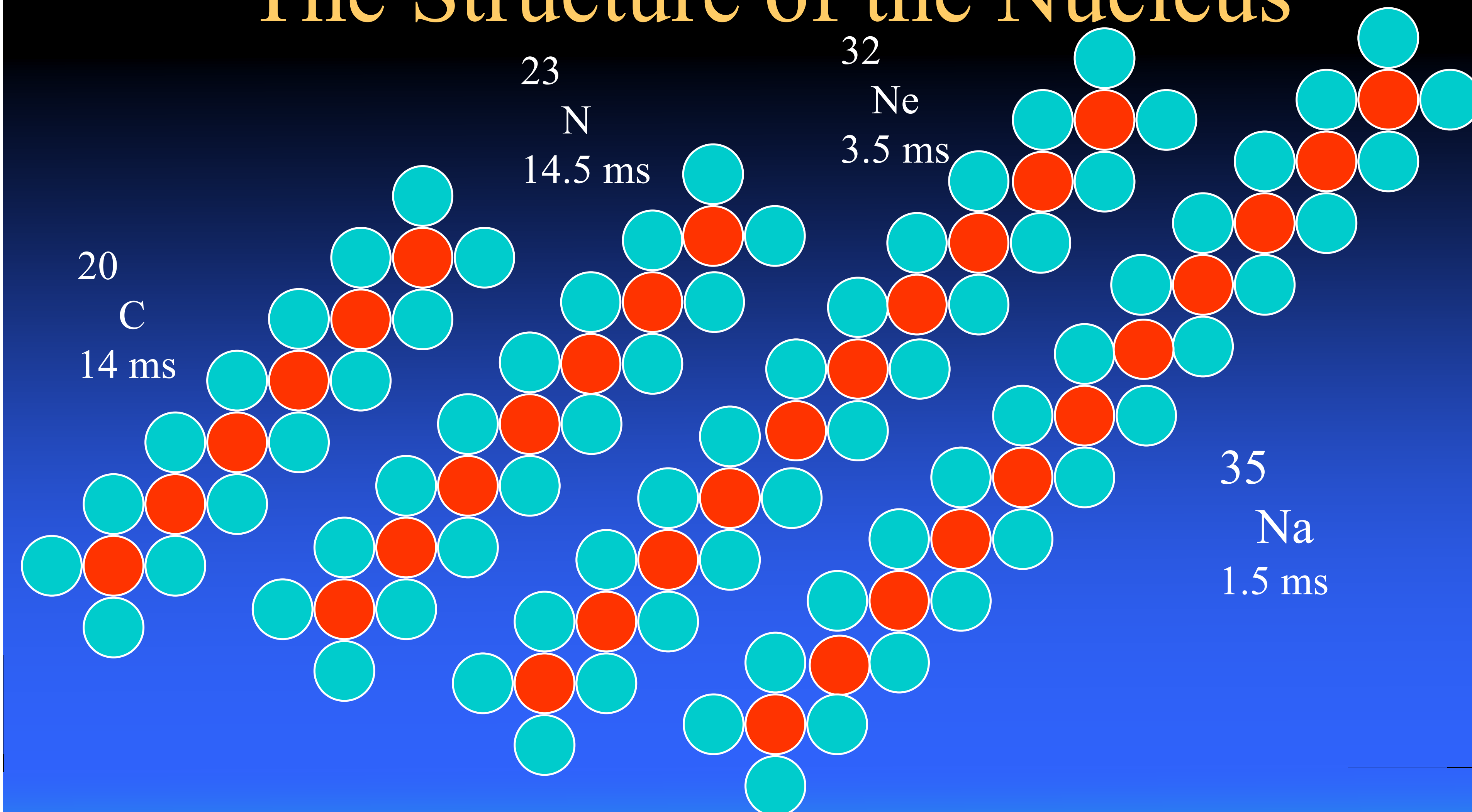
Neutron

Proton

Single bonded Neutron

Note: This structure does not agree with the "currently accepted" size of Pb 208. This structure is about 3X as large as currently accepted. This structure better explains the large quadrupole moments for nuclei over 50>A> 90. If we drop the single bonded neutrons (2 at a time) we get Pb 206 and Pb 204, both stable nuclei.

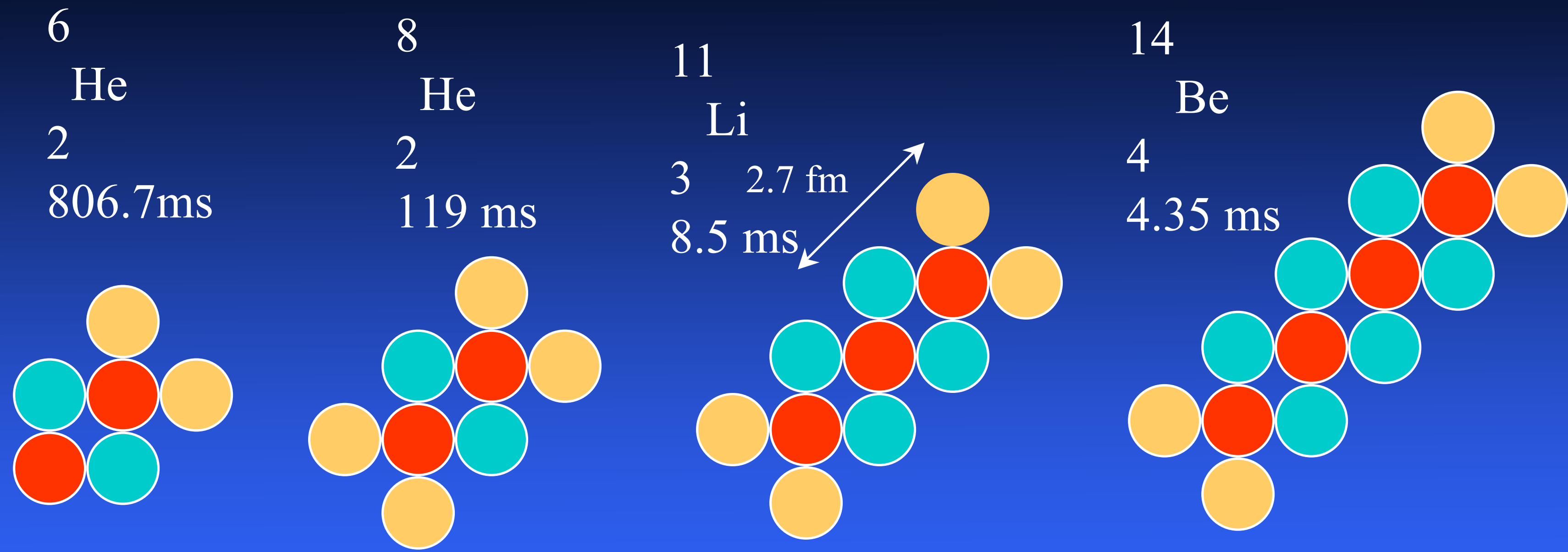
The Structure of the Nucleus



O 26, F 29 (2.5 ms), Mg 38, Si 43, P46, also fits this pattern.

The Structure of the Nucleus

Known Halo Nuclei



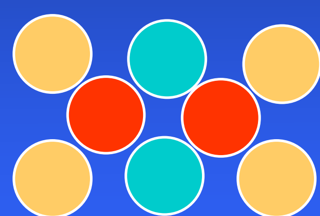
He 6, He 8, Li 11, Be 12 and Be 14 are known as the Halo Nuclei, it is know that two loosely bound neutrons are tied to the core of the nuclei. In these nuclei the mass and charge radii may differ by large amounts. The density distribution shows an extended neutron tail at low density. Li 11 extends farther out than current models can explain. B 17, also believed to be a halo nuclei, fits this pattern.

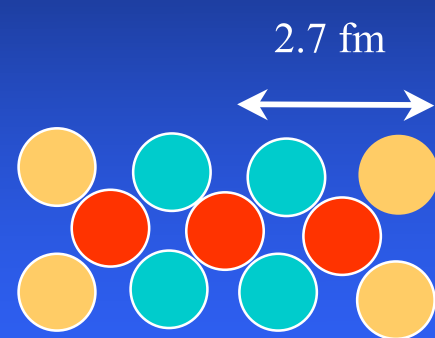
Reference: D.N. Poenaru and W. Greiner pg 139. and proceedings of ENAM 98.

The Structure of the Nucleus

Halo Nuclei

8
He
2
119 ms



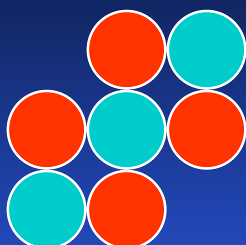


11
Li
3
8.75 ms

The Structure of the Nucleus

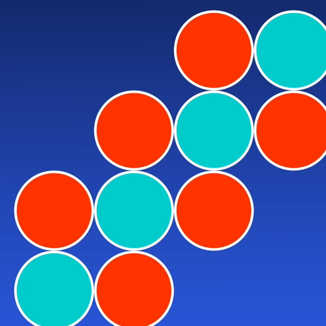
Semi stable structures along the proton drip line

half life = 53. 24 days

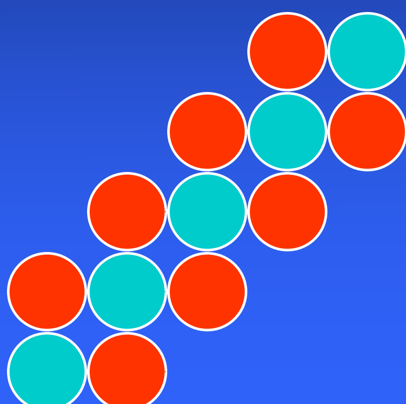


7
Be
4

half life = 19.308 seconds

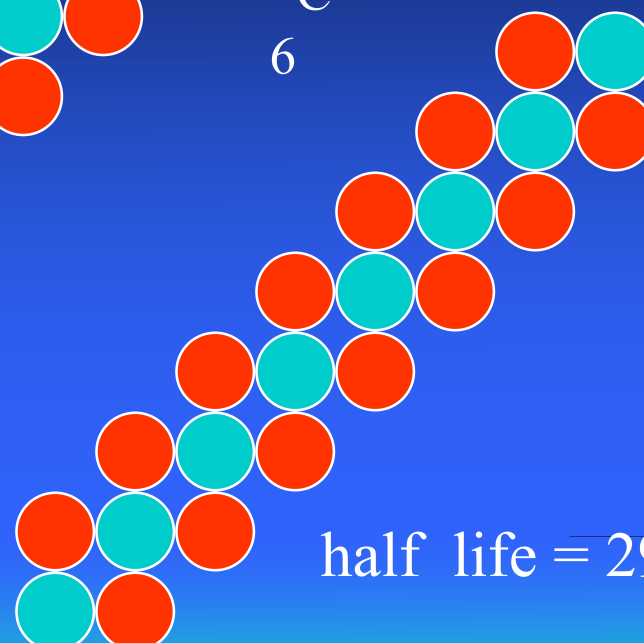


10
C
6



13
O
8

half life = 8.58 ms



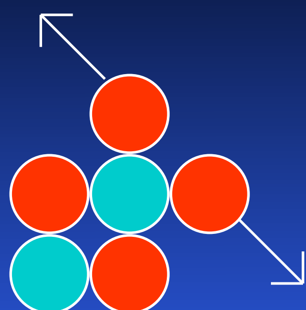
22
Si
14

half life = 29 ms

Ne 16 and Mg 19 exists and fit this pattern, their half lives “should” be between 9-30 ms

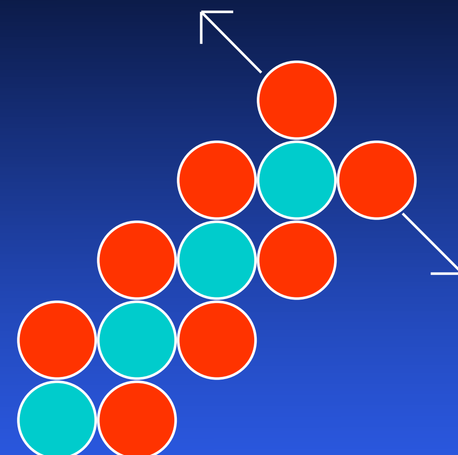
The Structure of the Nucleus

Very unstable structures that decay by double proton emission



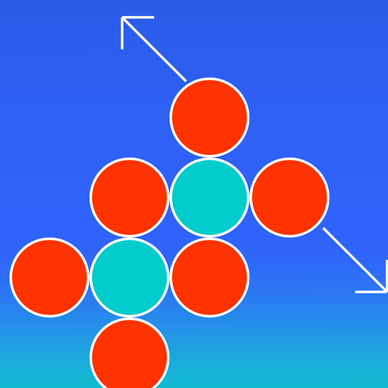
$^{6}_{4}\mathrm{Be}$

Half life 5.0×10^{-21} sec



$^{12}_{8}\mathrm{O}$

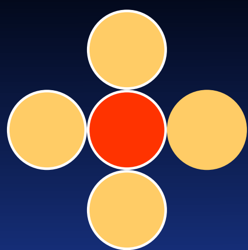
Half life 1.0×10^{-21} sec



$^{8}_{6}\mathrm{C}$

Half life $\sim 2.0 \times 10^{-21}$ sec

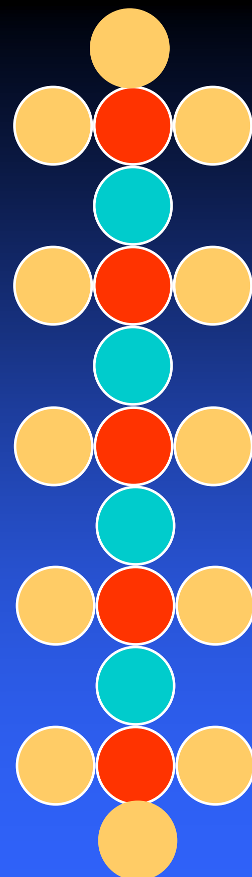
The Structure of the Nucleus



$^{5}_{1}H$

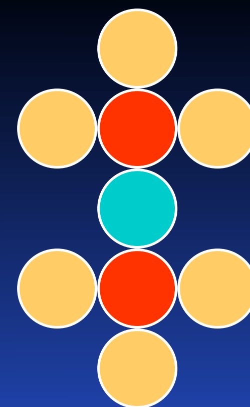
half life ~ 1×10^{-21} sec

Predictions: Hydrogen 6 will be found to be an unbound nuclei.



$^{21}_{5}B$

half life = ??



$^{9}_{2}He$

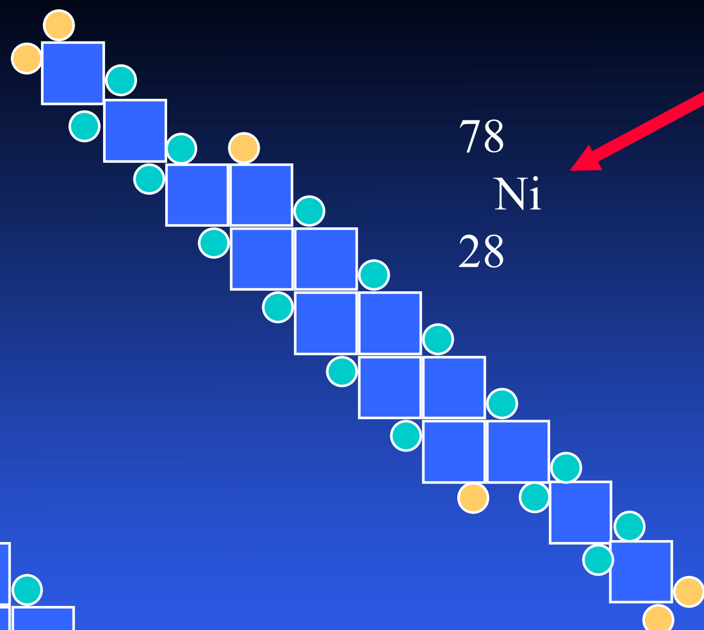
half life = ??

He 10 does not have a bound state.

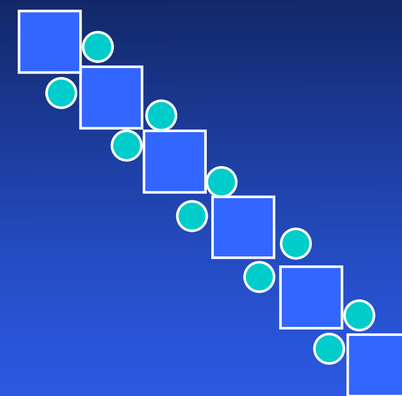
B21 is the last known (2011) isotope of Boron.

The Structure of the Nucleus

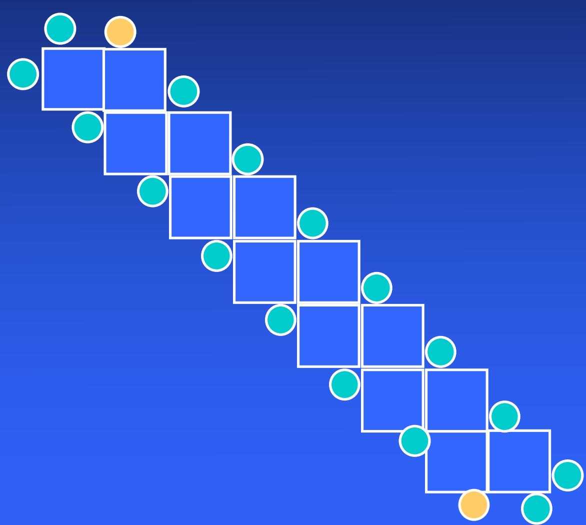
Breaking through an apparent ^{74}Ni limit.



78
Ni
28



34
Mg
12



74
Ni
28

Mg 34 is known to have a half life of 20 ms. Mg 36 half life of 3.6 ms. Mg 38 found but no half life yet.

Ni 76 has a half life of 238 ms. Ni 78 half life of 110 ms.

The Structure of the Nucleus

$$\mu = I(A) = (e_q\ f)\ \pi\ r^2 = 1/2\ (e_q\ v_q\ r)$$

$$\mu_{proton} = I(A) = 2(2/3) f\ \pi\ r_p^{\ 2}$$

$$\mu_{neutron} = I(A) = 2(-1/3) f\ \pi\ r_n^{\ 2}$$

Since ***this model assumes the frequency of rotation of the proton and neutron are the same,*** we get.

$$\mu_{proton} / \mu_{neutron} = -2\ (r_p/r_n)^2$$

$$r_n/r_p = \{2(.96623707)/1.41060761\}^{1/2}$$

$$r_n = 1.1704523\ \ r_p$$

Therefore the velocity of the dn quark in the neutron is 1.17045 the velocity of the up quark in the proton.

The Structure of the Nucleus

It is "generally accepted" that the Binding energy difference between the mirror nuclei of ^{3}He and ^{3}H is due to Coulomb repulsion between the two protons.
Blatt, Weisskoff, Theoretical Nuclear Physics,52,p 204

$$BE(^3H) = mass(^3H) - m_e - m_p - 2m_n = 8.48183 \text{ Mev}$$

$$BE(^3He) = mass(^3He) - 2m_e - 2m_p - m_n = 7.71809 \text{ Mev}$$

$$BE(^3H) - BE(^3He) = .76374 \text{ Mev}$$

$$\text{Coulomb energy in } ^3He = \Delta BE = .76374 \text{ Mev} = 6e^2/5R_c$$

R_C = separation distance between the two protons in ^{3}He.
R_C = 2.262 fm. If we assume the structure is linear, and the neutron is between the two protons and 1.1704523 times larger, we get r_p = .5211 fm and r_n = .6099 fm

Structure of the Nucleus

$$\mu_{proton} \equiv \frac{2e_{quark} \cdot v_{up,\, quarks} \cdot r_{proton}}{2}$$

$$v_{up,\, quarks} \equiv \frac{2\mu_{proton}}{2e_{up,\, quark} \cdot r_{proton}}$$

$$v_{up,\, quarks} \equiv \frac{2(1.41060761 \text{ x } 10^{-26}\, J/T)}{2(2/3)(1.602095^{-19}\, C) \cdot 0.5211 \text{ fm}}$$

$$v_{up,\, quark,\, in,\, proton} \equiv 2.53447\text{X}10^{8}\, m/s \equiv 0.8454c$$

$$v_{dn,\, quarks,\, in,\, neutron} \equiv 1.1704523 \cdot v_{up,\, quarks} \equiv 0.9895c$$

The Structure of the Nucleus

$$m_{proton} = 1836.1\ m_e = m_{dn\ quark} + \frac{2\ m_{up\ quark}}{\sqrt{1-\left(\frac{v_{up\ quark}^2}{c^2}\right)}}$$

$$m_{neutron} = 1838.6\ m_e = m_{up\ quark} + \frac{2\ m_{dn\ quark}}{\sqrt{1-\left(\frac{v_{dn\ quark}^2}{c^2}\right)}}$$

Plugging v_{up}=0.8454c and v_{dn}=0.9895c into the above 2 equations, we get two equations with two unknowns (mass of up and dn quarks). This give a mass of the up quark of 463.8 mass electrons and the dn quark of 99 mass electrons. This results in the up quark (orbiting inside the proton) having a DeBroglie wavelength of 3.30 fm, which when divided by 2π corresponds to a radius of .526 fm, which is only 1%

The Structure of the Nucleus

Iterating until the DeBrolie wavelength of the up quark in the proton exactly matches the radius of the proton we get:

Radius:

Proton = 0.519406 X 10^{-15} meters

Neutron = 0.6079394 X 10^{-15} meters

Velocity:

2 - up Quarks in Proton = . 848123 speed of light

2 - dn Quarks in Neutron = . 992685 speed of light

Mass:

up Quark mass = 237.31 MeV

dn Quark mass = 42.39 MeV

The sum of the mass of the calculated up and dn quark meeting at the perimeter of the helium nucleus between the neutron and the proton adds up to 279.7 MeV, Which is almost exactly the mass of two pi mesons (139.6 MeV X 2 = 279.2 MeV). Since the nuclear force as been explained as the exchange of TWO pi mesons this may also have some significance in supporting this theory.

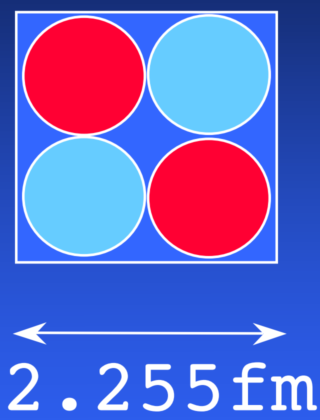
Period of Revolution = 1.283533x10^{-23} seconds

The Structure of the Nucleus

Unit cell size = 1.12735 fm

"diameter" of He nucleus = 2.255 fm

Additionally the shape of the proton is now up for debate.
Some say that that it is shaped like a donut. Work at Jefferson labs in 2006 has indicated that the shape of the proton is oblate and that the quarks are moving inside the proton at 90% the speed of light in improved agreement with this theory. If the shape is oblate or donut shape then the discussion of size is moot.

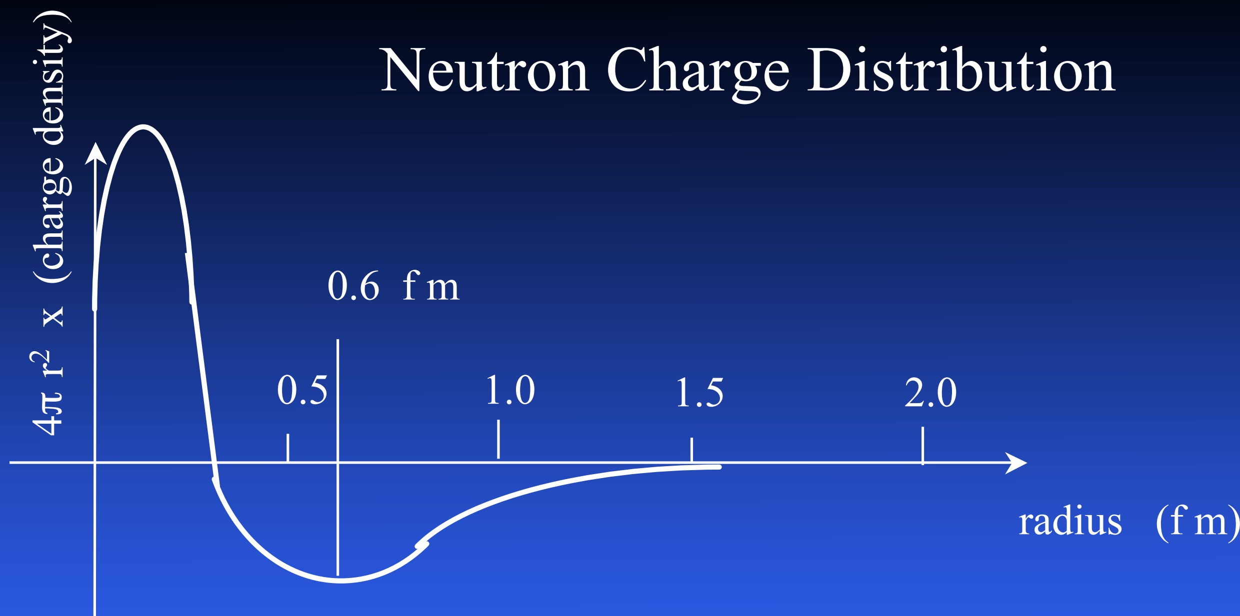


Note: there is a lot of debate about the size of the proton. Electron scattering indicates a size of 0,8768 fm, but a new method (muon energy level shifting) in 2009 determined it to be 0.84087 4% smaller and significantly different than previously though.

This model predicts a size and charge distribution of the neutron that agrees with electron scattering, pg 687 Modern Atomic and Nuclear Physics, F. Yang and J.H. Hamilton, 1996 McGraw Hill. (see text)
This model predicts a size of the proton that agrees with many nuclear physics texts, namely 0.45 fm to 0.65 fm.
Note that the linear extrapolation of the 3D model predicts a size of 1.23 fm for the proton, which is too big.

The Structure of the Nucleus

Neutron Charge Distribution



Charge Distribution for the neutron as determined by electron scattering

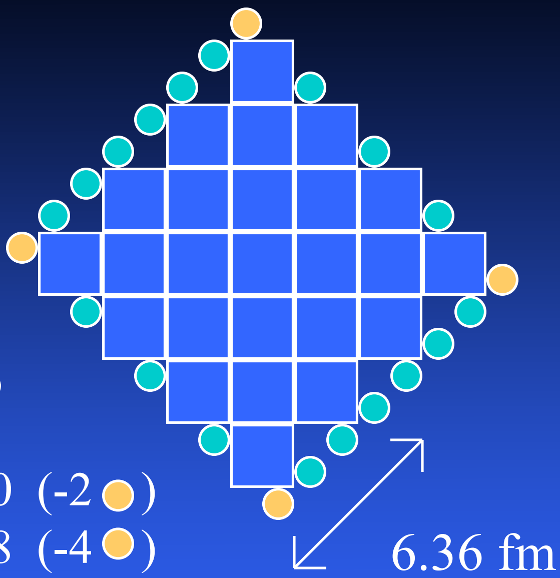
Reference: Pg 687, Figure 14.19, Fujia Yang and Joseph H. Hamilton, "Modern Atomic and Nuclear Physics, McGraw-Hill, 1996.

Quote from that text: "The neutron charge distribution with an inner positive charge and outer layer of negative charge is consistent with its negative magnetic moment"

Additional references: R.M. Littauer, H.F. Schopper, R.R. Wilson "Structure of the Proton and Neutron, Physical Review Letters, Vol7, no.4 page 144. , ,
.

The Structure of the Nucleus

$r = r_0 A^{1/3} = 1.23 A^{1/3} = 6.10$ fm



122 Sn 50

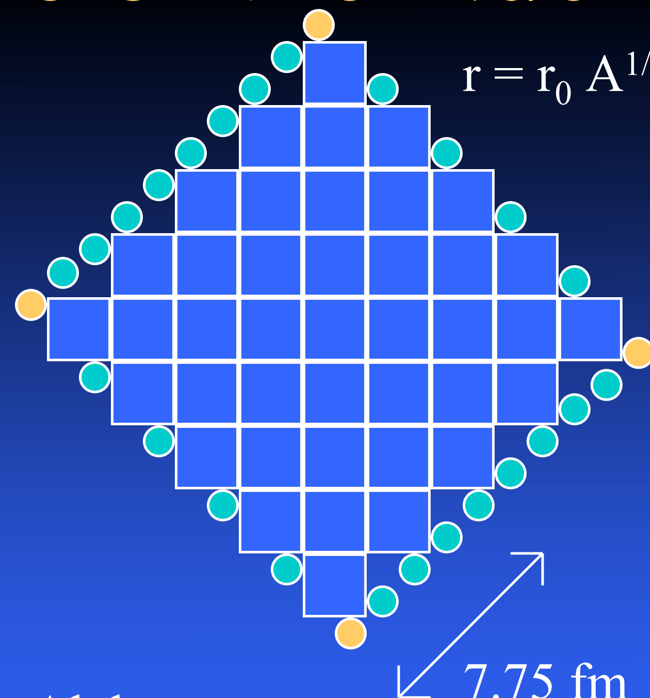
4.63%

Sn 120 (-2)
Sn 118 (-4)

1 3 5 7 5 3 1 -- 25

1 3 5 7 9 7 5 3 1 -- 41 Alphas

$r = r_0 A^{1/3} = 7.17$ fm



3.5 min.

192 Pb 82

2- Alphas

non-structural neutron

Neutron

Proton

Notice that the above diamond structures give consecutive magic numbers. The Sn structure is stable because square structures of Sn are stable, on the other hand the above structure of Pb is not as stable. Since this model has derived the size of a Helium nucleus as 2.255 fm this can be used to calculate the size of the above structures, and good agreement is found with established values.

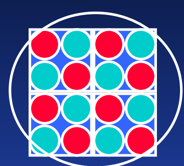
The Structure of the Nucleus

$r = r_0\, A^{1/3} = 1.23\, A^{1/3} = 3.10$ fm

16

O

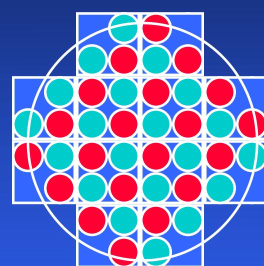
8



2.255 fm

R of circle = 3.18 fm

$r = r_0\, A^{1/3} = 4.21$ fm or .128 n/fm3



40

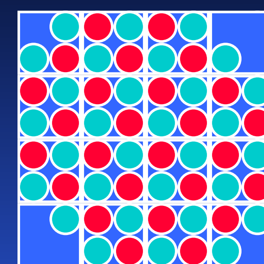
Ca

20

4.51 fm which equates to 0.10 n/fm3

R of circle = 4.25 fm

$r = r_0\, A^{1/3} = 4.71$ fm



56

Fe

26

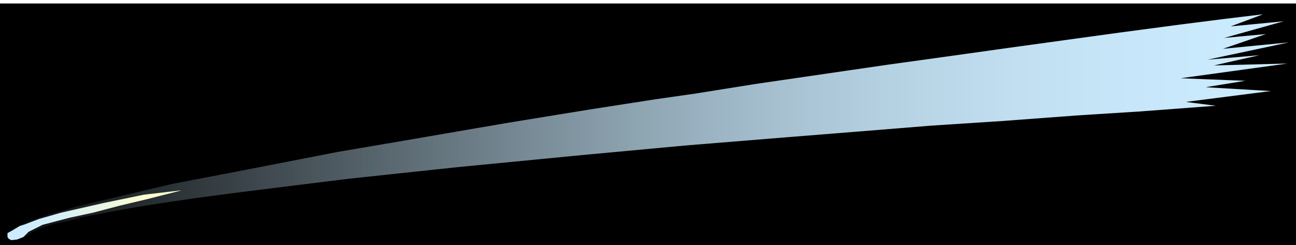
4.51 fm

1- Alpha

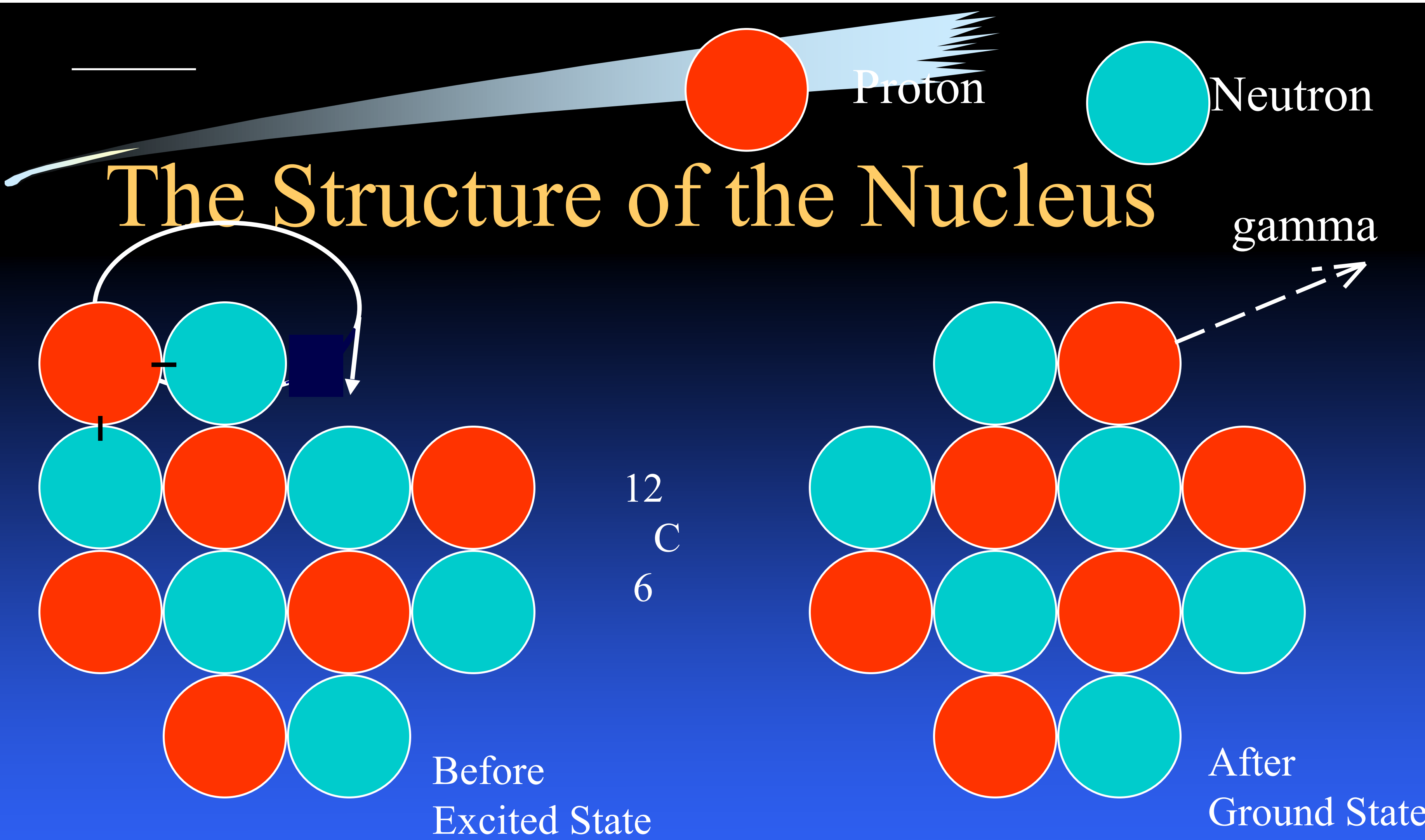
Neutron

Proton

Notice that the above structures of O 16, Ca 40, and Fe 56 give good agreement to the accepted size of these structures. This model has derived the size of a Helium nucleus as 2.255 fm and this can be used to compare against the accepted size of these nuclei.



The Structure of the Nucleus



Gamma emission is represented by a shift of one proton around an adjacent neutron position (depicted above) to a lower energy state. Beta (-) emission is the shift of one neutron one lattice position (into a proton position) and the emission of an electron (not shown above).

Structure of the Nucleus

What reasons can account for the different structures above and below Pb?

If the Uranium nuclei are really linear, then they are shorter by a factor of the square root of 2 than they would be if they were diagonal. This would mean that the structure has extra stored up potential energy in the form of repulsion of all those protons. Because the structure has just as many bonds (4) at any point along the structure, it should be just as strong a structure as Pb, just that it contain that potential energy of all the repelling protons. Therefore it is like a compressed spring waiting for an alpha decay to make the structure unstable resulting in it expanding to the diagonal size of the Pb nuclei. It would be expected that this would explain the back bending the of I vs ω for the yrast states of Dy 156 and other such nuclei. Also it would explain why each emission is the same in energy and why the number of steps in these spectrum is approximately the same number as the number of steps in this model.

The Structure of the Nucleus

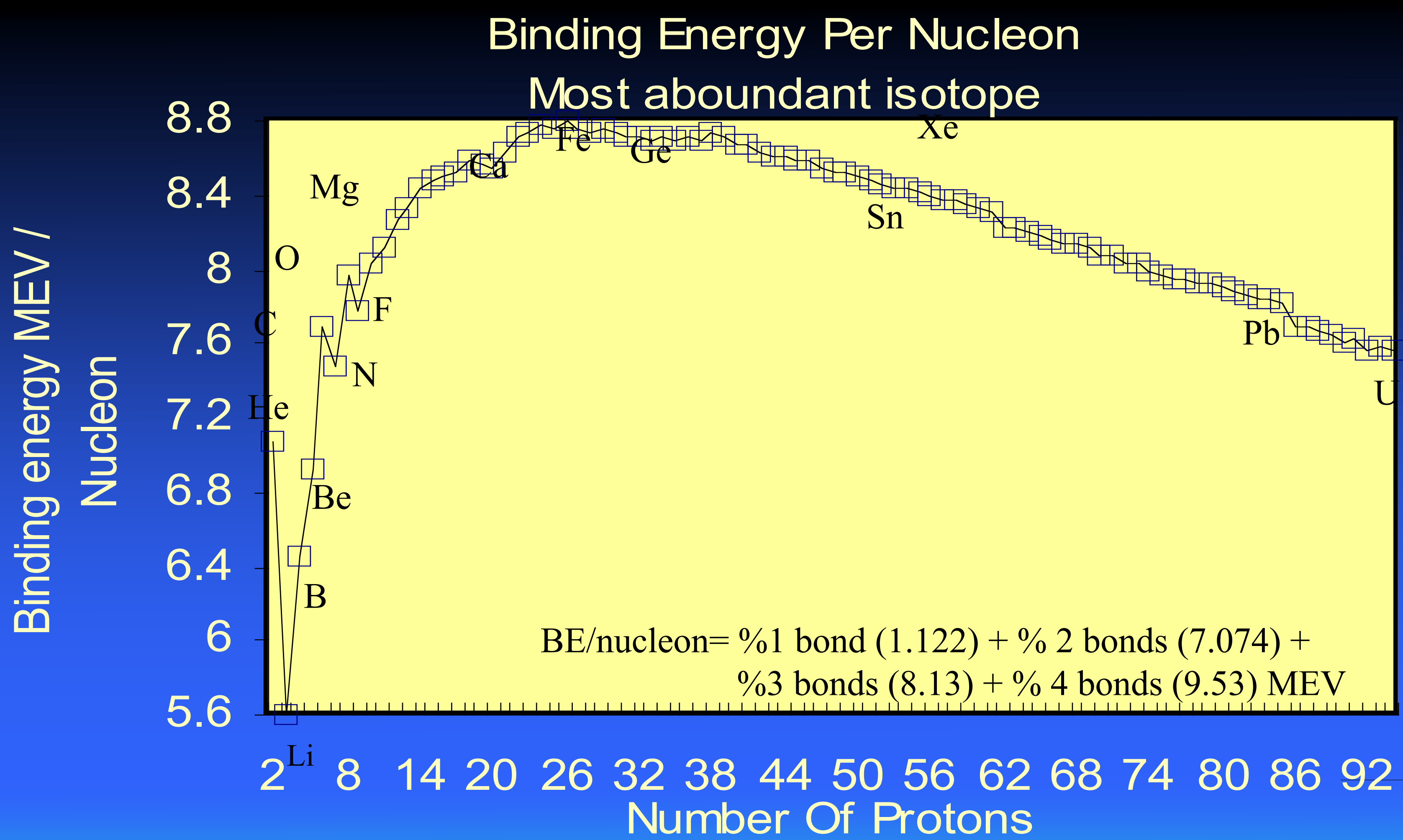
Mass difference of the Phi(1020) and W(782)

The mass difference between the Phi (1020) meson and the W (782) meson is 237.47 +- 0.13 MeV based upon the previous data from the Particle Data Group. What is interesting is that this difference is almost exactly that of the predicted mass of the up quark in the CBM model.

237. 31 MeV

Why these two mesons are significant is that since they are the lowest excited state of the Pi meson, we know their masses better than the higher excited states and we know that all the quantum numbers of both of these mesons are the same and they are composed only of up and down quarks. It must be more than just coincidence that this mass difference is in agreement with this models mass of the up quark.

The Structure of the Nucleus



The Structure of the Nucleus

The CBM Model of the Nucleus Explains

- Central Force term (center stationary quarks) and the Stronger Tensor Term (orbiting quarks causing the magnetic coupling in and out of the plane of the structure).
- Accounts very well for the stability of the He 4 nucleus (as the basis for all others)
- Why the volume of the nucleus is mostly empty (flat structure)
- Why the force is repulsive at $r < 0.5$ fm (size of the proton, incompressible)
- Saturation of the binding energy at Fe 56 (highest % of 4 nearest neighbors)
- Explains the exact magnetic moments of the nucleons, especially the neutron
- Relativistic mass of the up and dn quarks in the nucleon account for the mass (p,n)
- Why the nucleus can have only half integer spins (flat; up or down)
- The size of key “square / diamond” nuclei agree well with accepted values (not Pb 208)
- Explains Gamma and Beta emission as nucleon lattice movement
- Does a good job of explaining most of the Magic numbers (4,8,50,82)
- Thermal neutrons react with nuclei (better able to align / attach to flat structure)
- Explains the linear alpha chains recently discovered such as Mg 24
- Explains the large Electronic Quadrupole Moments of rare earth and actinides
- Why there is a neutron skin of about 0.1 fm on many nuclei (see structures)

Who is Theodore M. Lach

B.S. Physics 1968 U of I   M.S. Physics 1969 U of I
Joined AT&T Sept 1969 as Dev Eng.
Clean Room design, D.I. Water system design Eng.
Hybrid IC manufacturing 4ESS FA packs
MS Material Sc. Northwestern Thesis D.L. Johnson
Ceramic material specialist
1976 Registered Prof. Eng of Ill.
1978 R&D Member of Technical Staff (IC packaging)
1980 R&D MTS mask making and fab room design.
1982 Senior R&D MTS (IC wafer fabrication, mask making)
1985 5ESS component Reliability MTS
1987 5ESS circuit pack and system Reliability
1995 Distinguished MTS 5ESS Reliability
2000 Consulting MTS Switching Division and core Enterprise
2001 Home Land Security NRIC -6 Lucent Representative for Hardware
2002 Bell Labs Fellow
2006 Alcatel-Lucent Fellow and Life member of ALU Technical Academy
2007 ATCAv2 and other core Enterprise products such as Telica servers and wireless Packet switches.
2012 Retired after 42.5 years in AT&T, Western Electric, Teletype, Bell Labs, Lucent, Alcatel-Lucent

Ted’s areas of Reliability

IC, bipolar, CMOS, GaN, memory integrated Circuits, … (JEDEC representative)
Resistors, Capacitors, inductors, and all other passives (IEC representative)
Connector Reliability, socket reliability,…
Power mods, RF power amplifiers, high voltage IC’s, …
Disk Drives, Tape drives, toggle switches, …
Circuit pack level reliability, over 20,000,000 packs in the field many over 25 yr.
ESD, Tin Whiskers, Moistures Sensitivity, Solder joint fatigue, PWB failure modes
Hygroscopic dust and corrosion failure modes.
IC failure modes: Electromigration, TDDB, hot carriers, NBTI, …
Fire Resistance, Fire initiation, Earthquake resistance, Temp and Humidity stds.
System Reliability, fault tolerant, redundancy, RAID, Hamming …
Hybrid metallization failures (thermal compression bond failures)
Noise in Thin Film resistors.

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