

# What's Inside the Neutron?

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"The Periodic Table"

# The Periodic Chart

## NIST Physics Laboratory Holdings by Element

1 H																	2 He	
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne	
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
55 Cs	56 Ba	[Lanthanides]		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	[Actinides]		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub	114 Uuq	116 Uuh				
		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu		
		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr		

- Solid
- Liquid
- Gas
- Artificially Prepared
- Disabled - no holdings

[Instructions](#) | [Database Information](#)

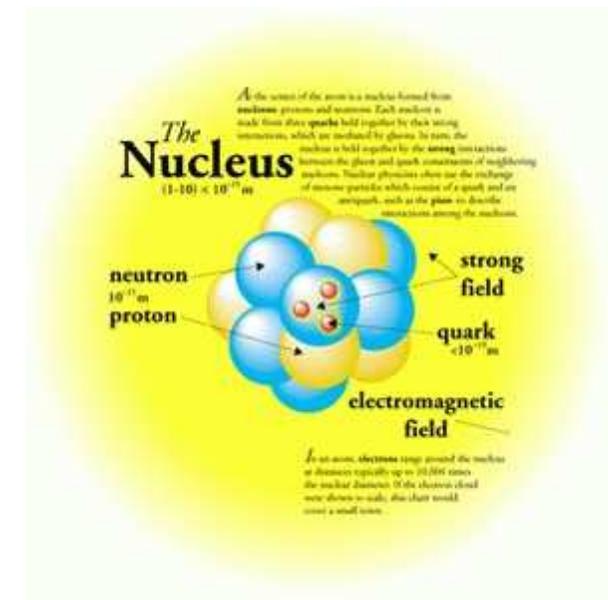
# What Do We Know?

- The Universe is made of quarks and leptons and the force carriers.

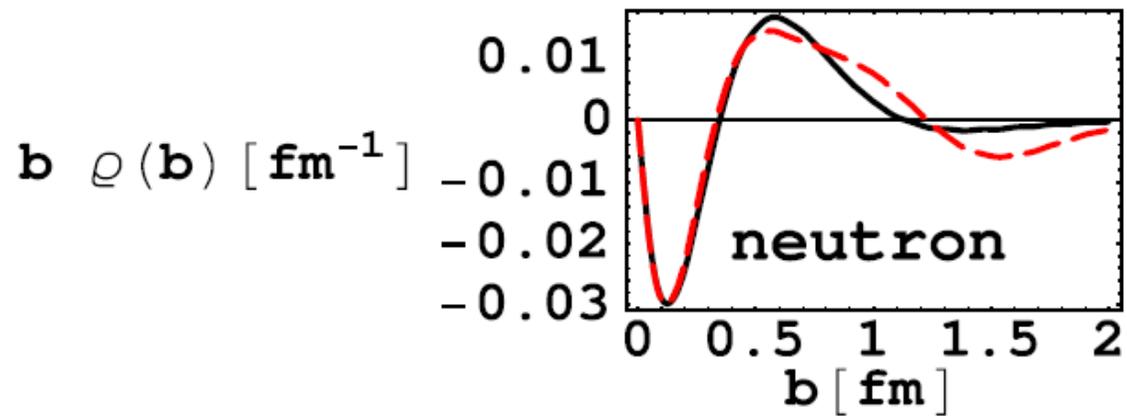
BOSONS			force carriers spin = 0, 1, 2, ...		
Unified Electroweak spin = 1			Strong (color) spin = 1		
Name	Mass GeV/c <sup>2</sup>	Electric charge	Name	Mass GeV/c <sup>2</sup>	Electric charge
$\gamma$ photon	0	0	g gluon	0	0
W <sup>-</sup>	80.4	-1			
W <sup>+</sup>	80.4	+1			
Z <sup>0</sup>	91.187	0			

FERMIONS			matter constituents spin = 1/2, 3/2, 5/2, ...		
Leptons spin = 1/2			Quarks spin = 1/2		
Flavor	Mass GeV/c <sup>2</sup>	Electric charge	Flavor	Approx. Mass GeV/c <sup>2</sup>	Electric charge
$\nu_e$ electron neutrino	$<1 \times 10^{-8}$	0	u up	0.003	2/3
e electron	0.000511	-1	d down	0.006	-1/3
$\nu_\mu$ muon neutrino	$<0.0002$	0	c charm	1.3	2/3
$\mu$ muon	0.106	-1	s strange	0.1	-1/3
$\nu_\tau$ tau neutrino	$<0.02$	0	t top	175	2/3
$\tau$ tau	1.7771	-1	b bottom	4.3	-1/3

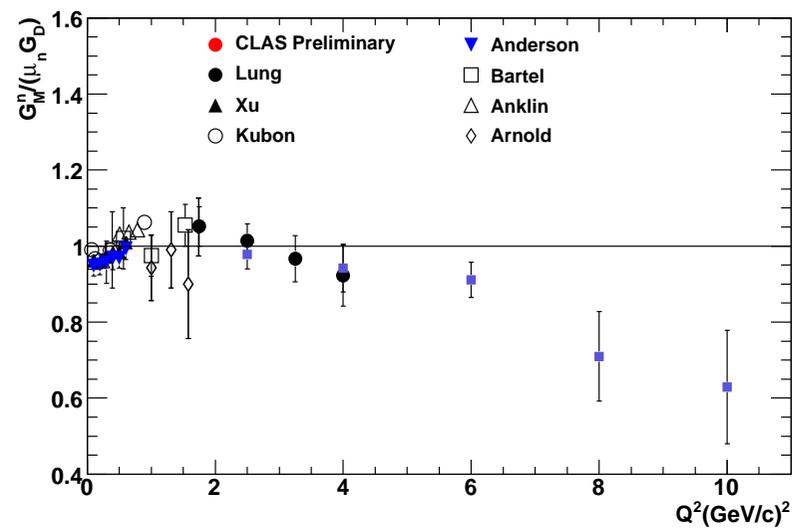
- The atomic nucleus is made of protons and neutrons bound by the strong force.
- The quarks are confined inside the protons and neutrons.
- Protons and neutrons are NOT confined.



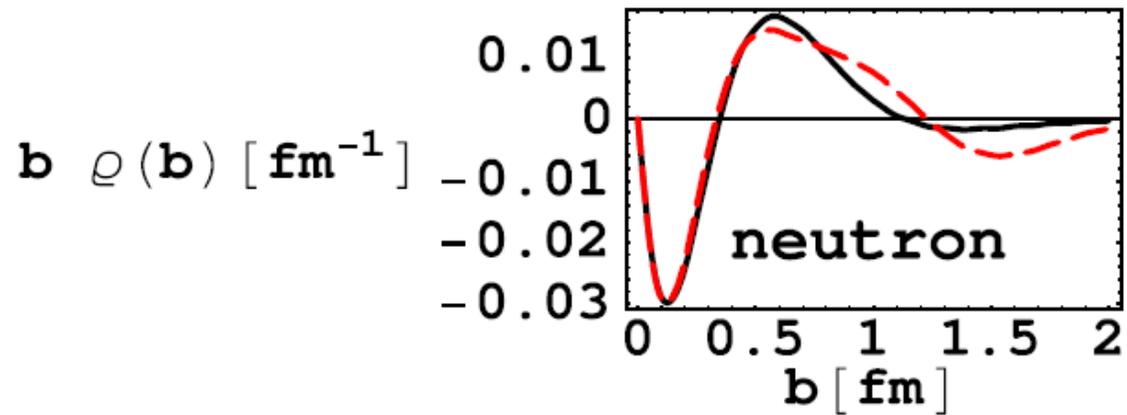
# What We Know About the Neutron.



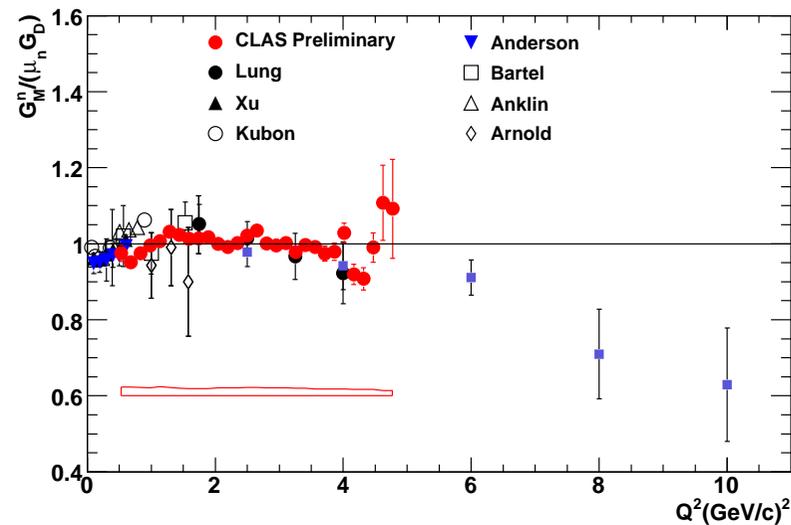
Which comes from ...



# What We Know About the Neutron.



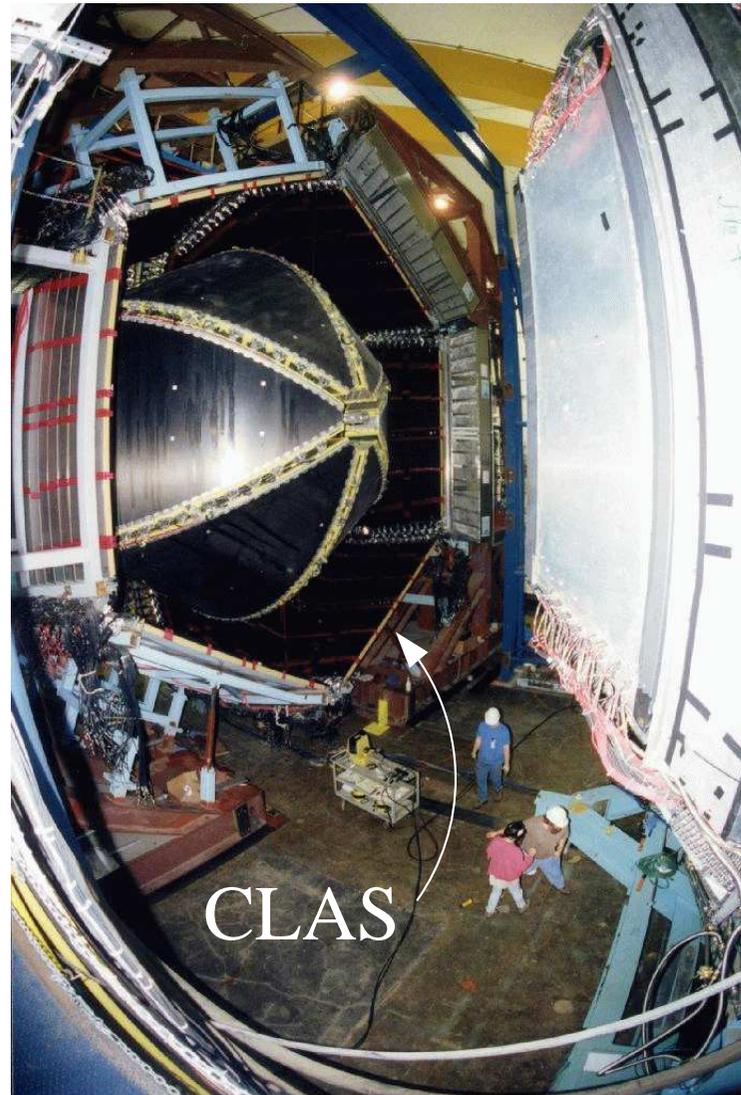
Which comes from ...



# Experiments at Jefferson Lab



# The CEBAF Large Acceptance Spectrometer (CLAS)

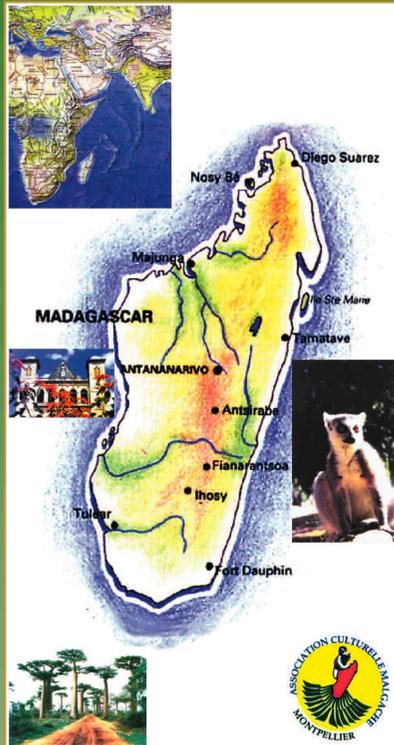


# Life on the Frontiers of Knowledge

## HEP-MAD 07

3rd High-Energy Physics  
Conference in Madagascar

10-15th September 2007 (Antananarivo)



### Scientific program

Physics at LHC,  
Perturbative & Non perturbative QCD,  
Weak, rare decays and CP-violation,  
Physics beyond the standard model,  
Neutrino Oscillations.

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### Deadline for registration

10th August 2007

### Web Address

For more informations please consult:  
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