

# **A Simple Calculation of the Inter-Nucleon Up-to-Down Quark Bond and its Implications for Nuclear Binding**

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This paper describes an interesting and potentially significant phenomenon regarding the properties of up and down quarks within the nucleus, and how the possible inter-nucleon bonding of these quarks relates to the bonding energy of the nuclear force. A very simple calculation is used, which involves a bond between two inter-nucleon up and down quarks. This simple calculation does not depend on the type or mechanism for the bond; furthermore, this simple calculation does not specify the shape or structure for the nucleus. This calculation only examines the energy of all possible up-to-down inter-nucleon bonds that may be formed within a quantum nucleus.

A comparison of this energy is made to the experimental binding energy with excellent duplication of experimental results, using only one parameter (instead of five, as in the semi-empirical formula). The binding energies are calculated for a representative sample of stable nuclides, going up to uranium U-238. The resulting errors of this calculation are on the order of a few percent (the average error from A=12 to A=50 is 1.68%.)

The potential significance of this finding is briefly discussed. A possible implication of these results is that some significant part of the nucleon-to-nucleon force is not only the residual chromo-dynamic force, but the electromagnetic force as well. The excellent reproduction of experimental data strongly suggests that the inter-nuclear up-to-down quark bonding is a concept that should be more thoroughly examined, and this result should not be relegated as being simply a coincidence.