Further Foundations of Fusion

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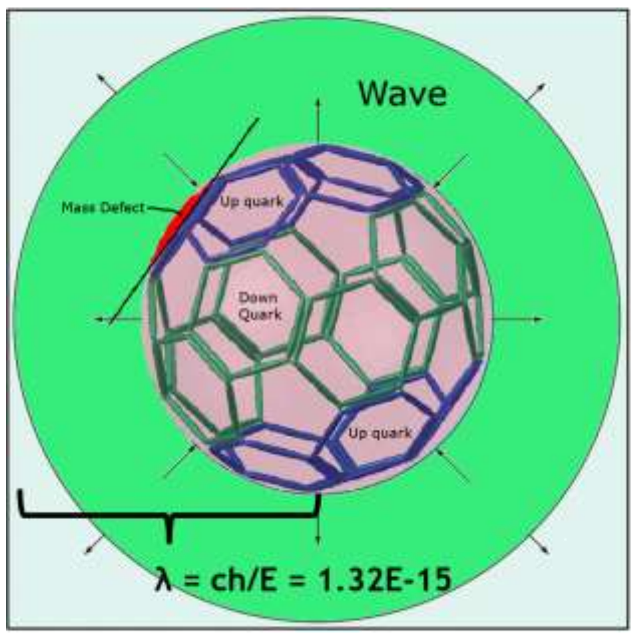
Since the discovery cold fusion in 1989, no theoretical model has been able to fully account for the observed phenomena. This is in part because, although nuclear binding energy is the best measured property of fusion, no previous model of the nucleus has accurately explained the experimental data for small nuclei. Current models either get the general shape of the curve right but the magnitudes wrong, or get closer to the magnitudes but deviate from the shape of the curve [1].

Previously we introduced a model of nuclear fusion free of these defects [2]. Average absolute difference between the model and experimental data is 1.43%, a significant improvement over previous models.

Table 1. Accuracy of models of binding energy

Model	Average Absolute Error	Correlation Coefficient
Quantum Spring Theory	1.430%	0.99893
Face-Centered Cubic	10.950%	0.91500
Liquid Drop	55.918%	0.98057

This excellent fit of theory to experimental data is the result of plausible models of protons and neutrons deduced from their known properties, which lead to a simple physical interpretation of the mass defect, or binding energy, of fusion.



These particle models of protons and neutrons combine with electromagnetic forces to duplicate the binding energy of 12 isotopes from deuterium through carbon with correlation 0.99893. In this paper we summarize previous results, then present some new evidence that the model is plausible. We include for the first time images of the models of isotope nuclei from Deuterium through Carbon which yield these results.

Our new findings show how the wave-particle duality explains well-established data on the so-called "nuclear skin" [1]. The figure (right) shows the proton model in the centre surrounded by the first nuclear quantum level of compressed space which has radius equal to the wavelength of the proton, identical to the long-established measurement of the nuclear skin. The red spherical cap, which is lost when the proton butts up against another proton or a neutron, is the mass defect. We introduce additional new evidence supporting the model, derived from examining diffraction at a single edge, the relationship between the nuclear and electron quantum levels, and the increase in mass when approaching the speed of light in a vacuum.

[1] Cook, N.D., *Models of the Atomic Nucleus*, Springer, The Netherlands, 2006.
[2] Blake, R., "The architecture of nuclear binding energy", Physics Procedia, Volume 22, pp. 40-55, 2011.