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Solving a Five Decade-Old Mystery: Why is there Carbon Dating?

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Carbon dating is due to the fact that the half-life of 14C is unusually long, namely, 5730 years, after which it decays in to 14N. *A priori* one would not expect the beta decay of 14C to extend over archaeological times, because the quantum numbers of the initial and final states satisfy the selection rules for an allowed Gamow-Teller transition. The expected half-live would therefore be in the order of minutes or hours. The corresponding nuclear transition matrix element is very small, but it has been a mystery for half a century why it is so small. In a recently published paper [1], we have shown that by incorporating hadronic medium modifications into the one-boson-exchange model of the nuclear force the decay of 14C is strongly suppressed, explaining the long life-time. The medium modifications are based upon Brown-Rho scaling [2], which predicts that hadron masses decrease at finite nuclear density due to the partial restoration of chiral symmetry.

[1] J.W. Holt, G.E. Brown, T.T.S. Kuo, J.D. Holt, and R. Machleidt, Phys. Rev. Lett. **100**, 062501 (2008).
[2] G.E. Brown and M. Rho, Phys. Rev. Lett. **66**, 2720 (1991).