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Retarded vs instantaneous interactions in high-temperature superconductors. What is the glue?[1] BUMSOO KYUNG, DAVID SENECHAL, A.-M.S. TREMBLAY, Universite de Sherbrooke — In BCS theory, the phononic origin of the attraction that leads to Cooper pairs was confirmed by theoretical and experimental developments that clearly showed that the interaction was retarded and that the corresponding energy scales were associated with phonons. Using Cellular Dynamical Mean-Field Theory with exact diagonalization at $T = 0$, we identify retardation effects in pairing and associate the corresponding energy scales with the spectral function of short-range spin fluctuations. These fluctuations are clearly seen in neutron and optical spectroscopy probes. Since the pairs have vanishing wave function at zero distance, the energy scale U is absent from the pair dynamics. That dynamics can be monitored by the anomalous spectral weight. The Heisenberg exchange J is a characteristic energy scale of that spectral weight and it appears in a manner analogous to what is found in mean-field theories. However, the anomalous spectral weight has additional structure caused by retardation.

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