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Singlet-triplet splitting and electron localization in elliptic quantum dots[1] CONSTANTINE YANNOULEAS, UZI LANDMAN, School of Physics, Georgia Institute of Technology — Experimental control of the singlet-triplet splitting in a two- electron ($2e$) quantum dot molecule (QDM) as a function of the magnetic field is an important step in the implementation of quantum logic gates.[2] Using symmetry breaking at the unrestricted Hartree-Fock level and subsequent symmetry restoration via projection techniques, we show that the two electrons localize and form a molecule (in the sense of Heitler- London) even when the interdot barrier *vanishes*.[3] This $2e$ molecule is characterized by a singlet-triplet curve similar to that of a QDM with a *finite* interdot barrier.[3] Most importantly, we find that a $2e$ molecule exhibiting a similar singlet-triplet curve is also formed in the case of a *single*, but *elliptic* QD; this is in agreement with experimental observations.[2]

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[2]D.M. Zumbühl *et al.*, cond-mat/0408276
[3]C. Yannouleas and U. Landman, Int. J. Quantum Chem. **90**, 699 (2002)

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