How can two nucleons combine?

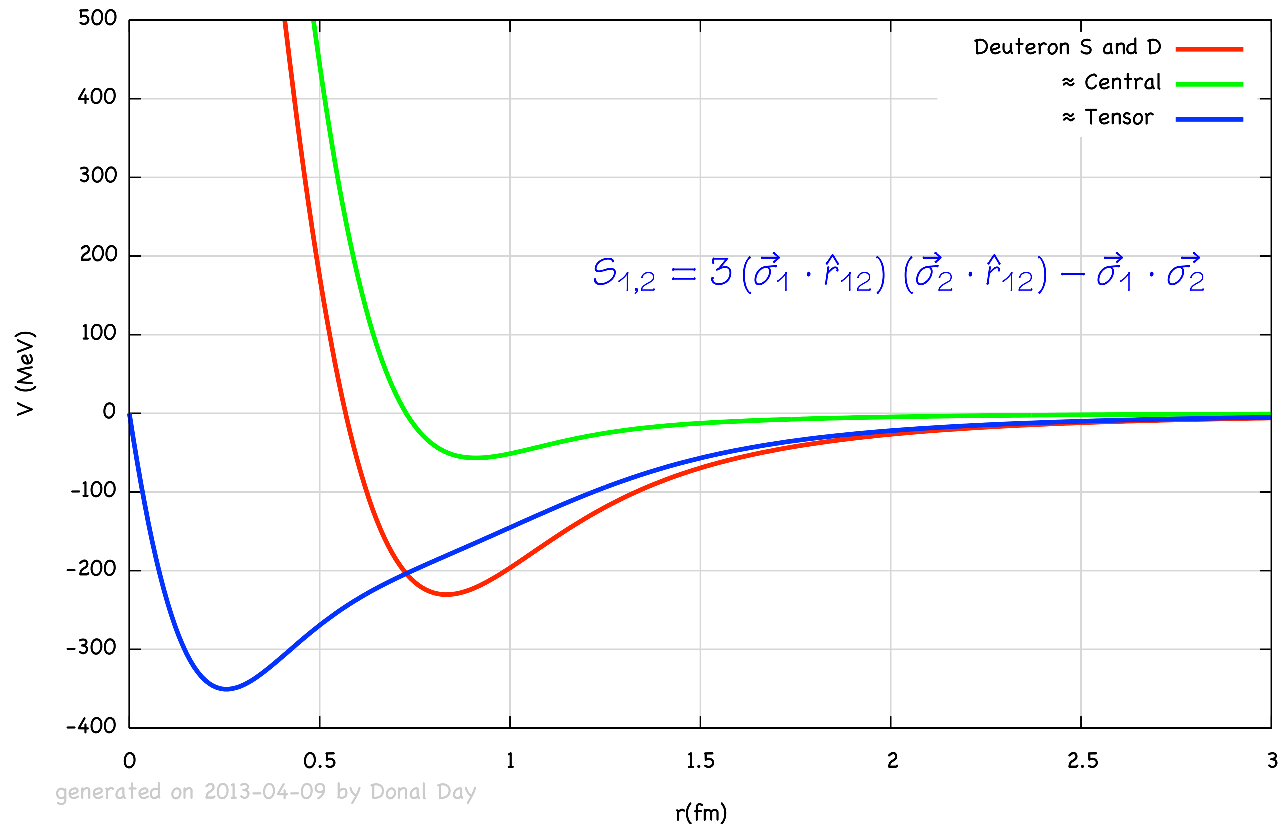
L	S	J	$\pi = -1^L$	T(L+S+T odd)	$^{2S+1}L_J$
0	0	0	+	1	$^1S_0$
0	1	1	+	0	$^3S_1$
1	0	1	-	0	$^1P_1$
1	1	0	-	1	$^3P_0$
1	1	1	-	1	$^3P_1$
1	1	2	-	1	$^3P_2$
2	0	2	+	1	$^1D_2$
2	1	1	+	0	$^3D_1$
2	1	2	+	0	$^3D_2$
2	1	3	+	0	$^3D_3$

Two-nucleon states

The Pauli principle requires that two-nucleon states be antisymmetric wrt to exchange of the nucleons' space, spin, and isospin coordinates

Without the tensor contribution the deuteron would not be bound

And it only contributes to T=0 2N states



Possible Two Nucleon states

L	S	J	$\pi = -1^L$	T(L+S+T odd)	$^{2S+1}L_J$
0	0	0	+	1	$^1S_0$
0	1	1	+	0	$^3S_1$
1	0	1	-	0	$^1P_1$
1	1	0	-	1	$^3P_0$
1	1	1	-	1	$^3P_1$
1	1	2	-	1	$^3P_2$
2	0	2	+	1	$^1D_2$
2	1	1	+	0	$^3D_1$
2	1	2	+	0	$^3D_2$
2	1	3	+	0	$^3D_3$

Two-nucleon states

Symmetric triplet T = 1

$^3(T)_1 = |p_1> |p_2>$ proton-proton state

$^3(T)_{-1} = |n_1> |n_2>$ neutron-neutron state

$^3(T)_0 = \frac{1}{\sqrt{2}}(|p_1> |n_2> + |p_2> |n_1>)$ neutron-proton state

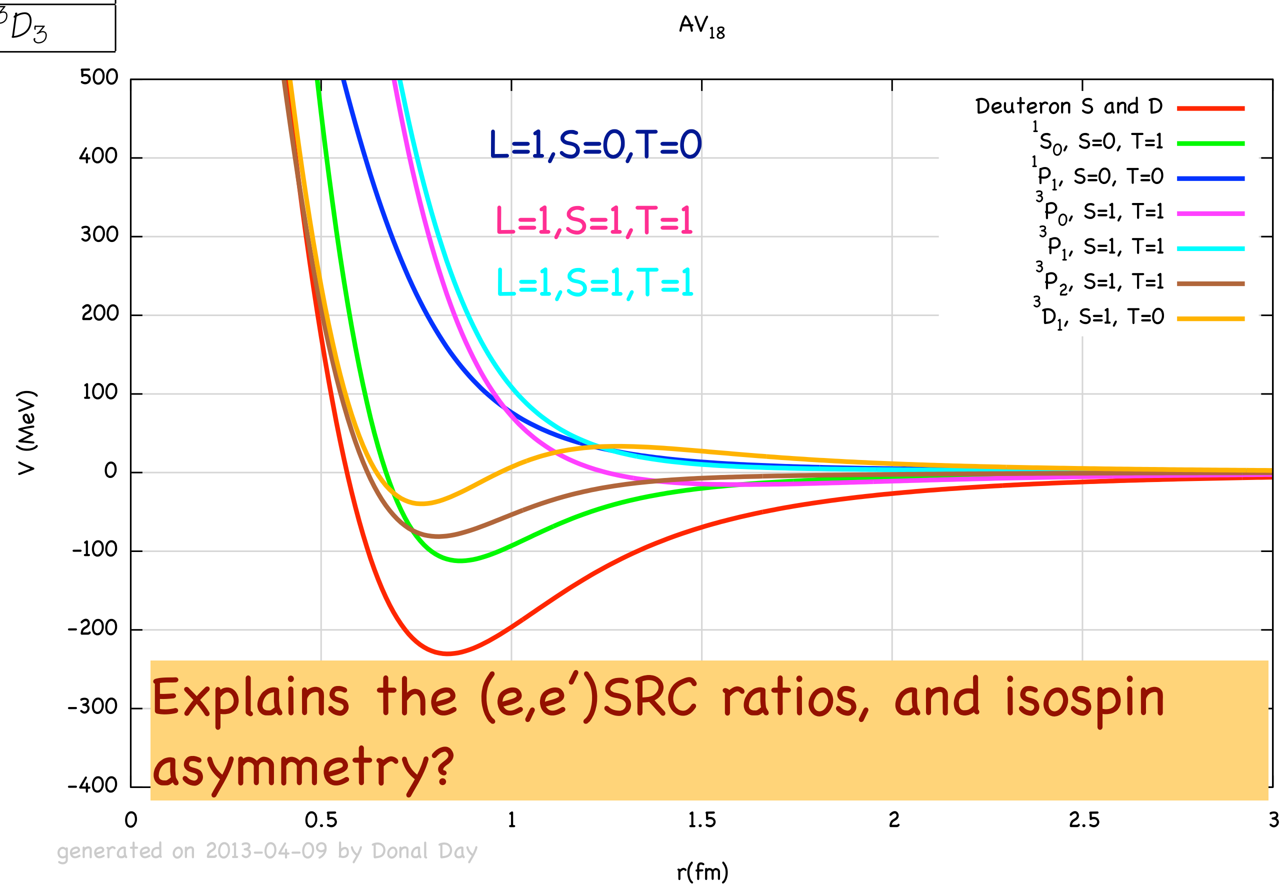
Antisymmetric singlet T = 0

$^1(T)_0 = \frac{1}{\sqrt{2}}(|p_1> |n_2> - |p_2> |n_1>)$ neutron-proton state

The SR NN attraction dominated by tensor interaction, which yields high-momentum isosinglet (np) pairs.

Absent in the isotriplet channel (pp, nn, np).

2-body distribution in nucleus should be identical to the deuteron and ratio of scattering cross sections between a heavy nucleus A and the deuteron to yield a_2 (A, Z)



Explains the (e,e')SRC ratios, and isospin asymmetry?