Clustering in neutron-rich nuclei

Martin Freer - University of Birmingham

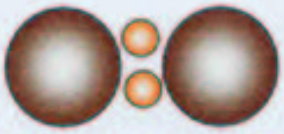
On behalf of the Charissa and DeMoN collaborations:

J.C. Angélique, N. Ashwood, L. Axelsson, B. Benoit, U. Bergmann, W.N. Catford, S.P.G. Chappell, N.M. Clarke, N. Curtis, A. D'Arrigo, E. de Góes Brennard, O. Dorvaux, B.R. Fulton, G. Giardina, B. Greenhalgh, C. Gregori, S. Grévy, F. Hanappe, G. Kelly, M. Labiche, C. Le Brun, P.J. Leask, J.L. Lecouey, S. Leenhardt, M. Lewitowicz, K. Markenroth, F.M. Marqués, J.T. Murgatroyd, T. Nilsson, A. Ninane, N.A. Orr, I. Piqueras, M.G. Saint Laurent, S.M. Singer, N. Soic, O. Sorlin, L. Stuttgé, D.L. Watson, V. Ziman.

Contents:

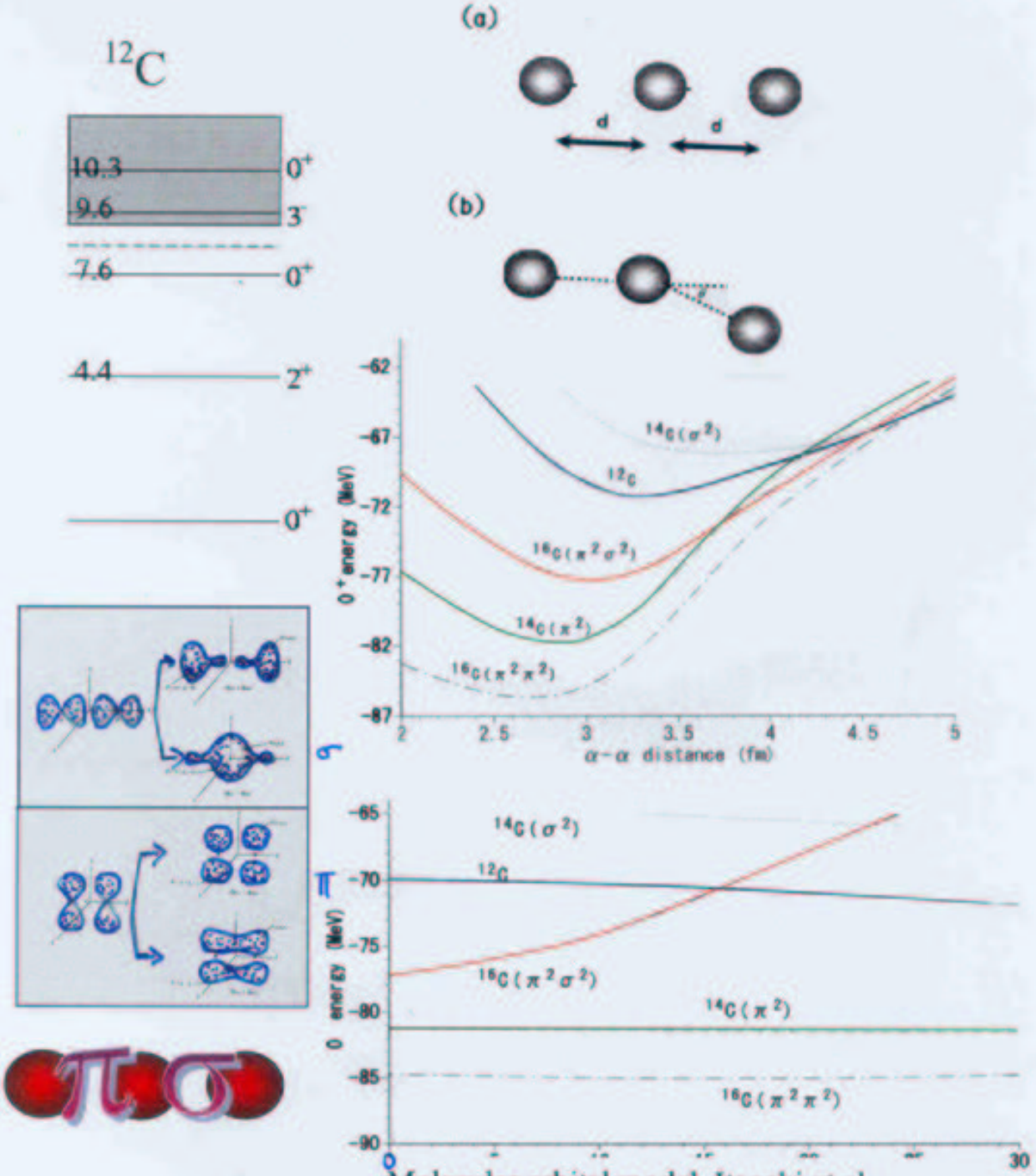
- Clustering in three centre systems

- Clustering in two centre systems



- Some future possibilities

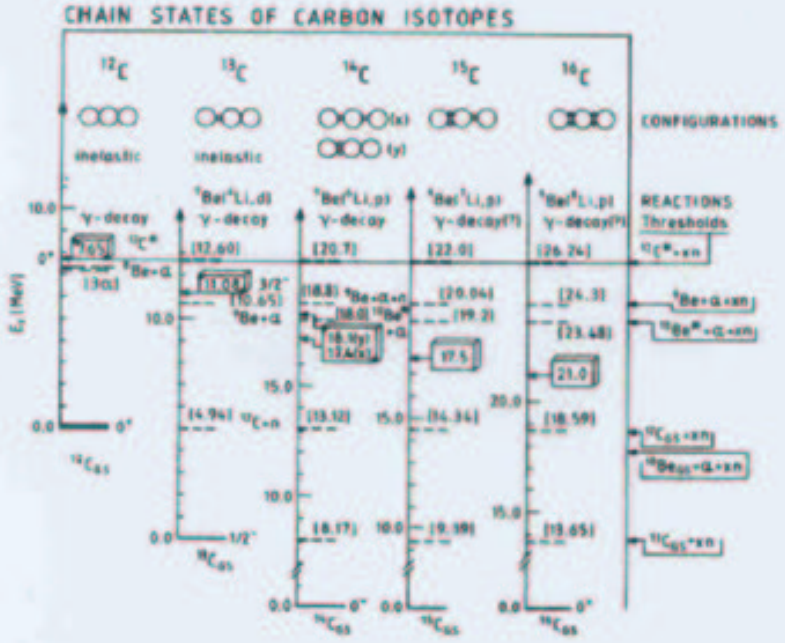
Molecular Structures in 3-centre molecules.

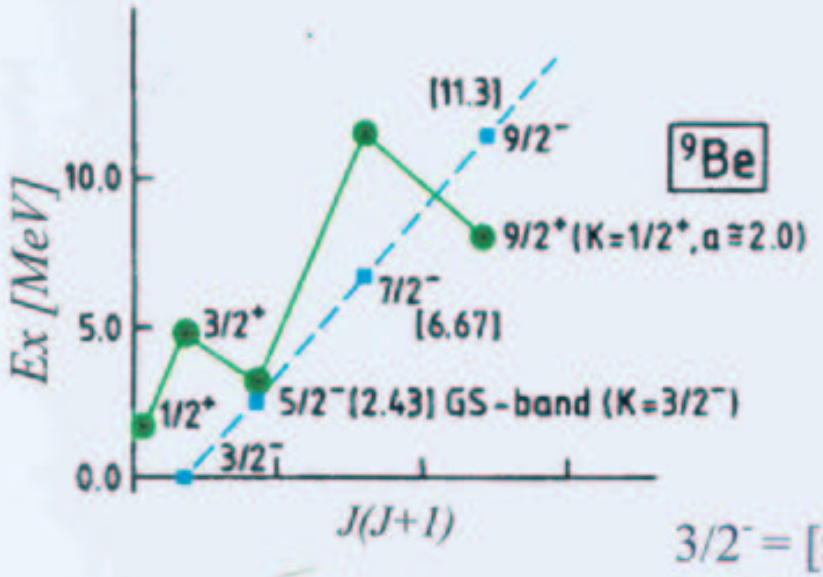


Molecular orbital model. Itagaki et al.
Phys. Rev. C **64**, 014301 (2001).

Predicted excitation energies of the molecular states in carbon isotopes.

W. von Oertzen, Z.*Phys.* *A* **354**, (1996) 37; **357**, (1997) 355





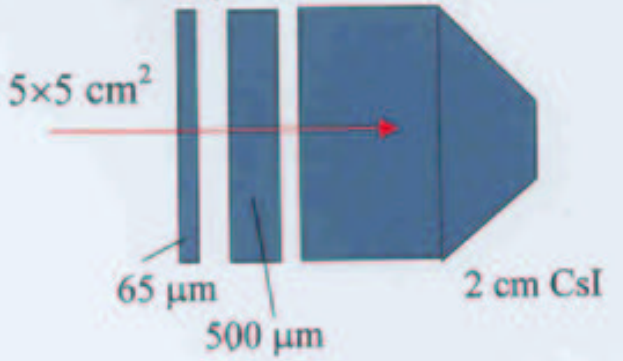
$3/2^- = [\pi_{3/2-}, g]^1$

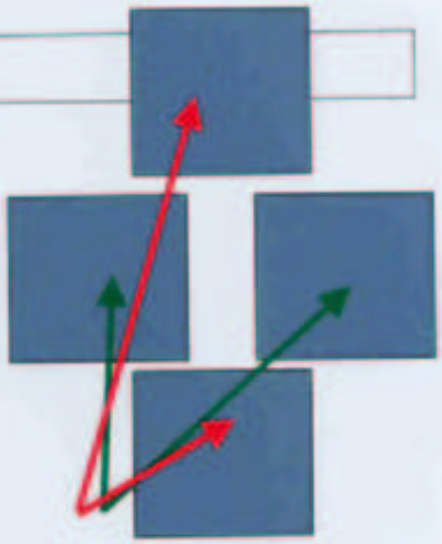
$1/2^+ = [\sigma_{1/2+}, u]^1$

^{13}C

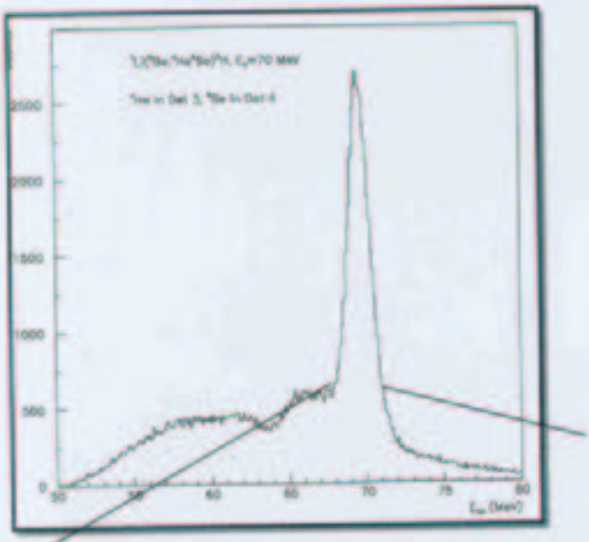
$^{7}Li(^{9}Be, ^{13}C \rightarrow \alpha + ^{9}Be)^{3}H$

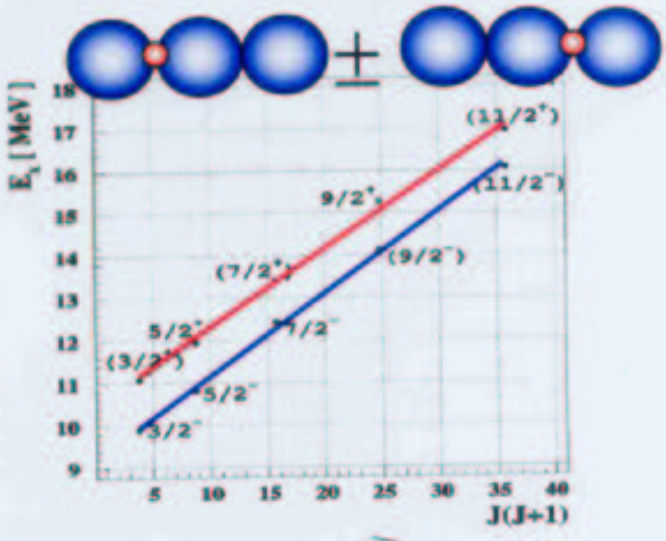
ANU (*N. Soic, L.Donadille*)

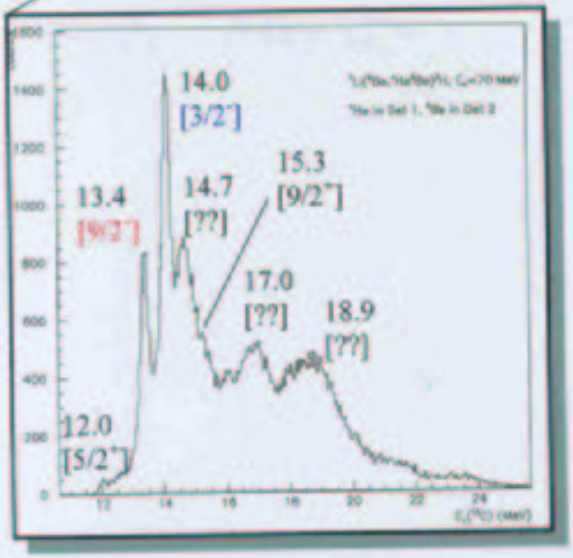


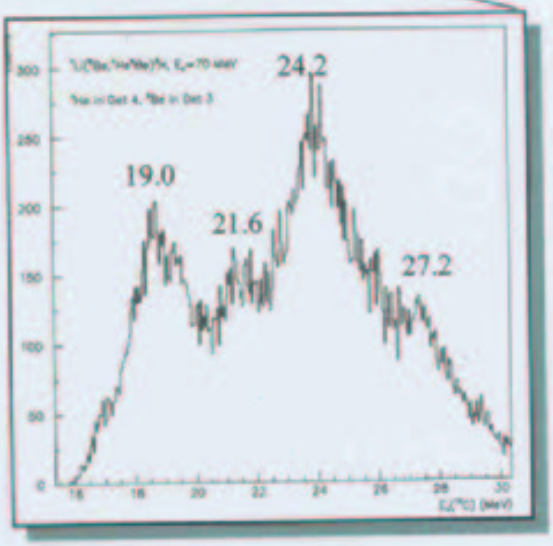


M. Milin and W. von Oertzen





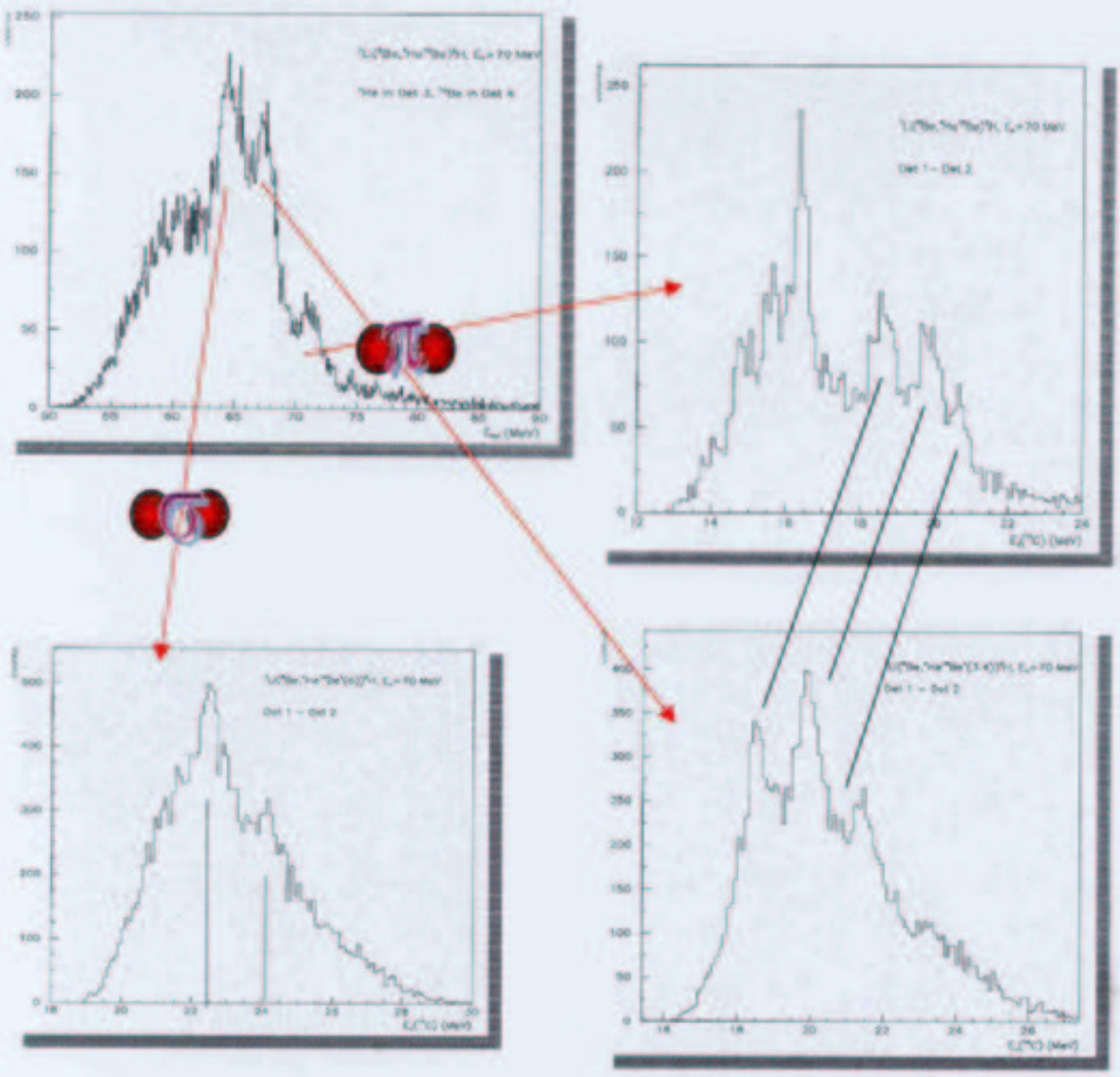




^{14}C

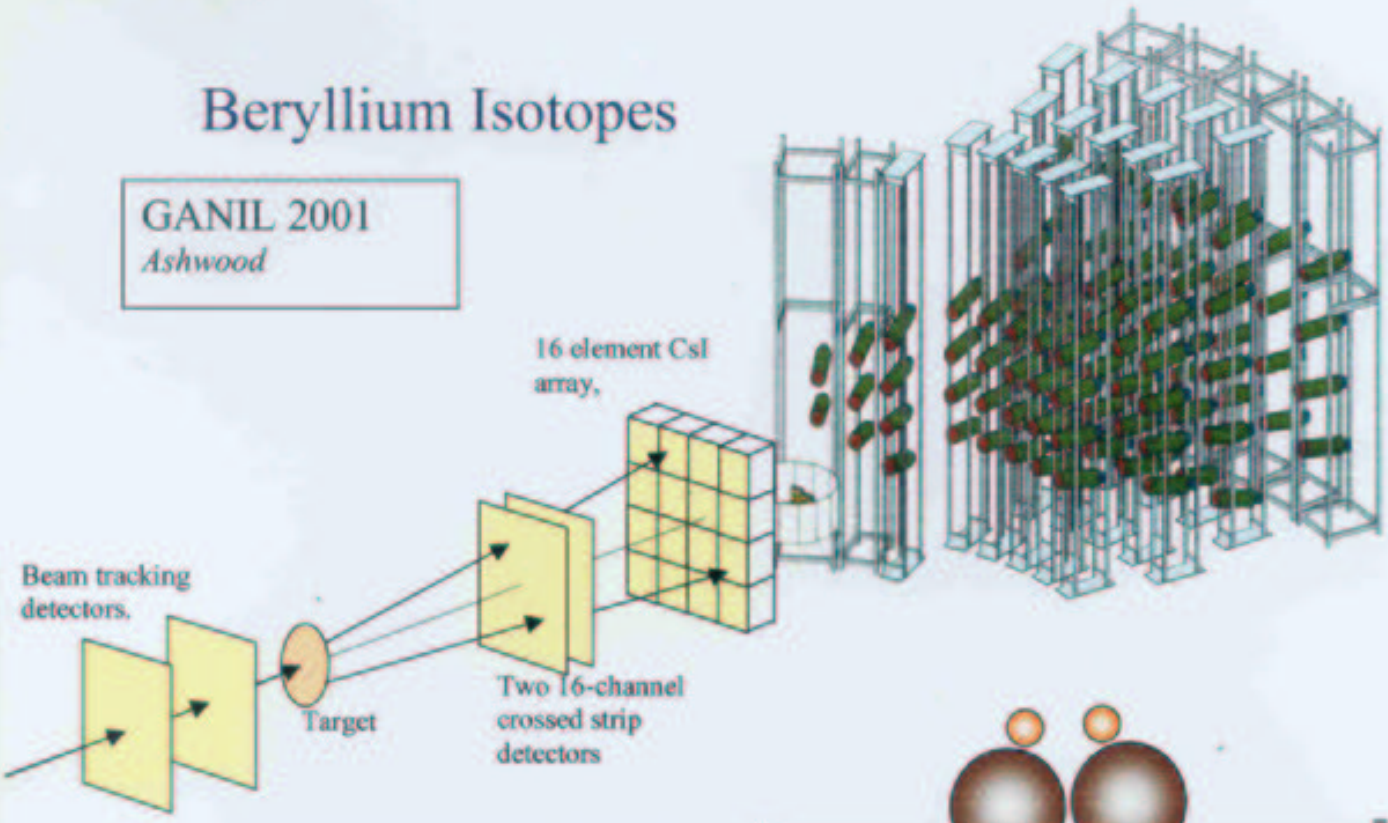
$^{7}Li(^{9}Be, ^{14}C \rightarrow \alpha + ^{10}Be)^{2}H$

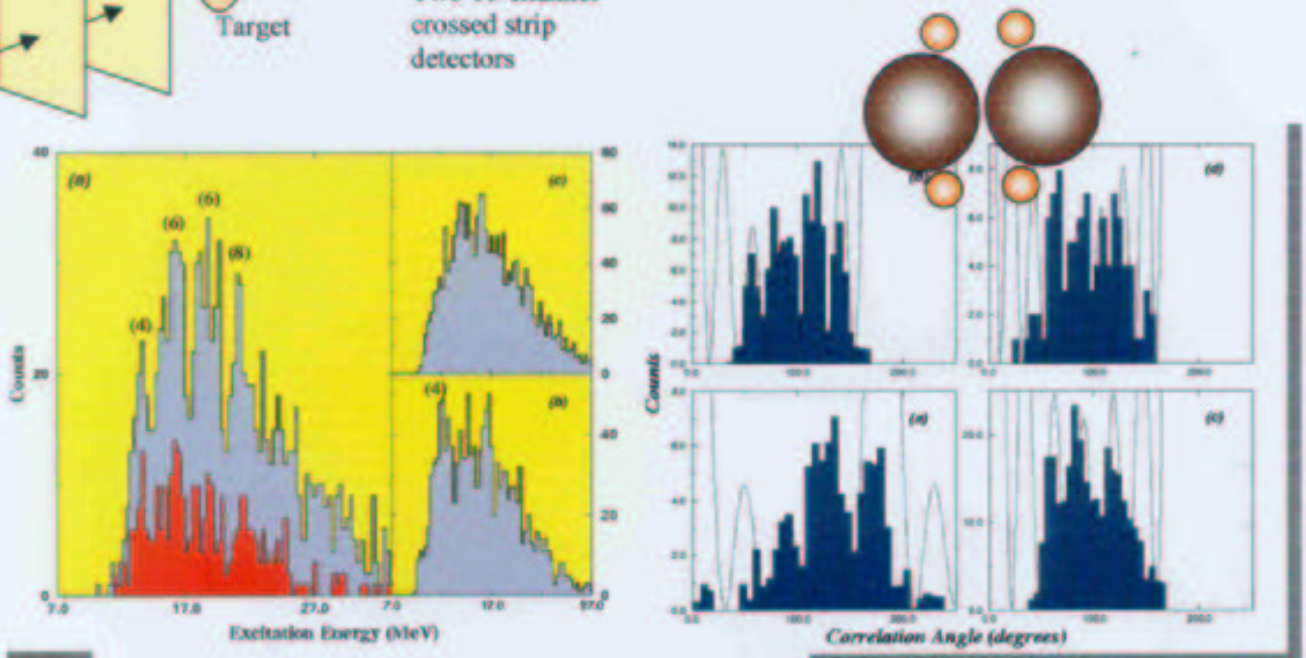
ANU (*N. Soic, L.Donadille*)



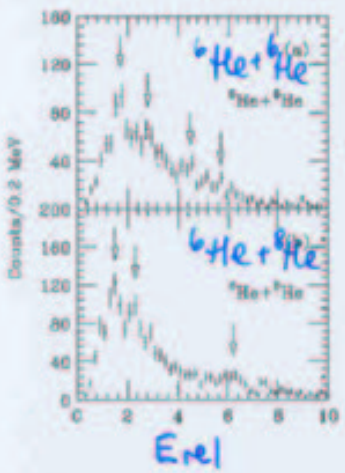
Beryllium Isotopes

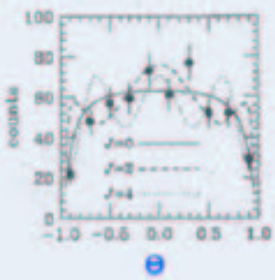
GANIL 2001
Ashwood



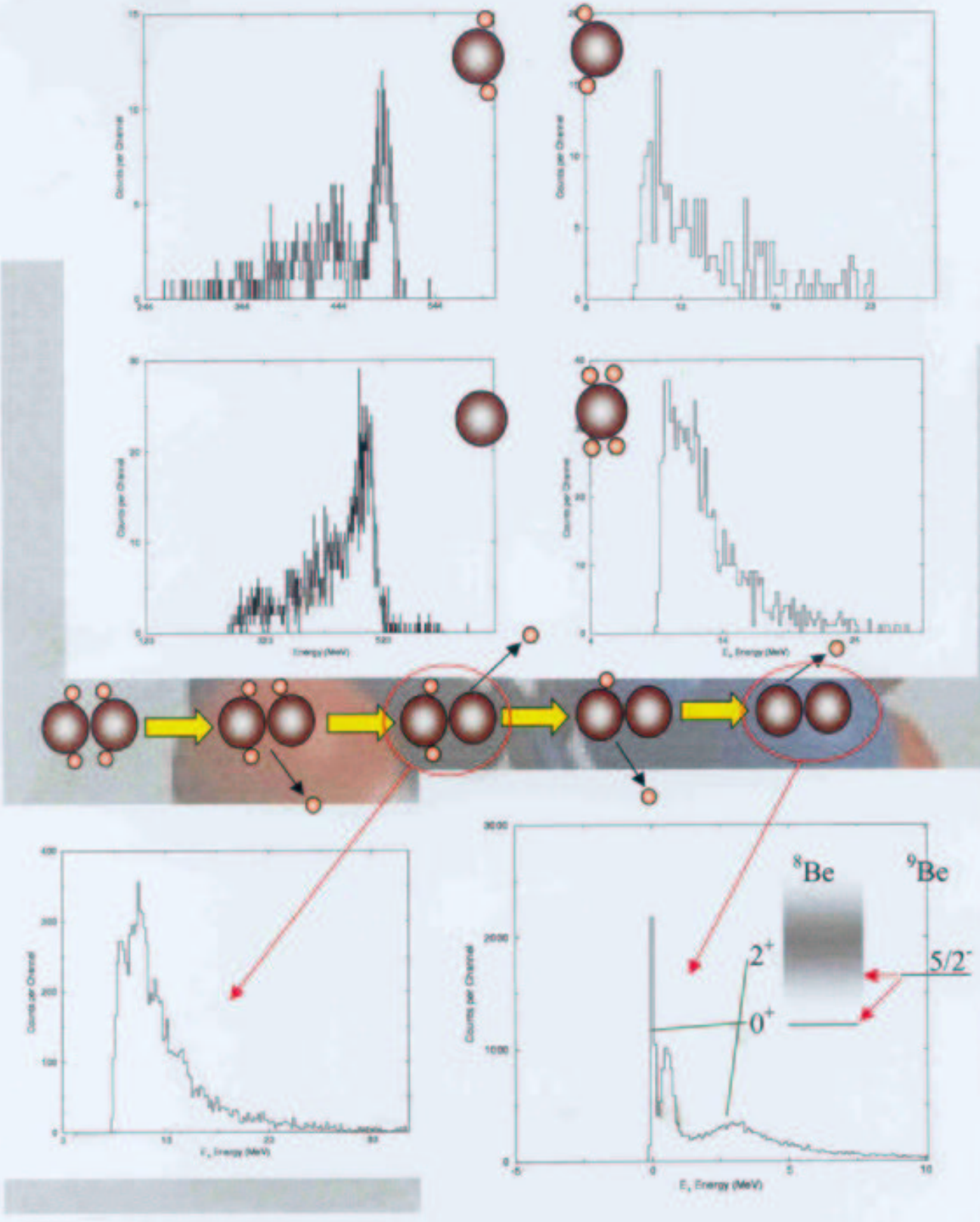


Saito, et al. World Scientific 2002



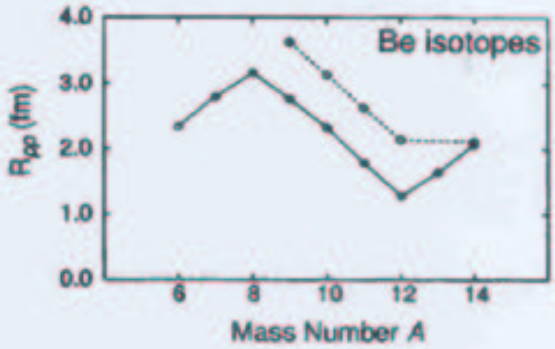


^{12}Be beam - carbon target (preliminary)

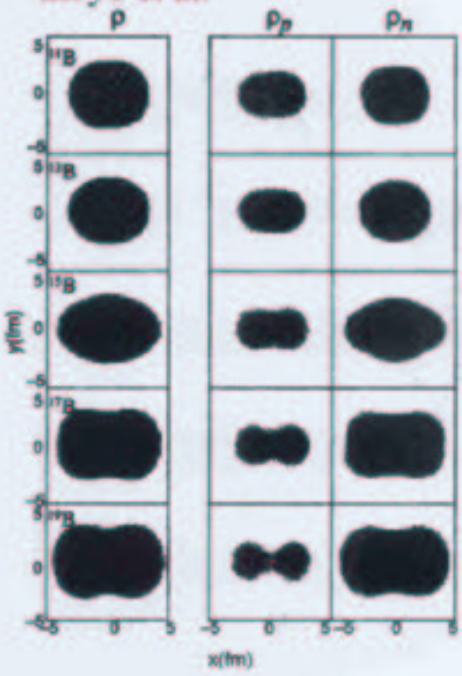


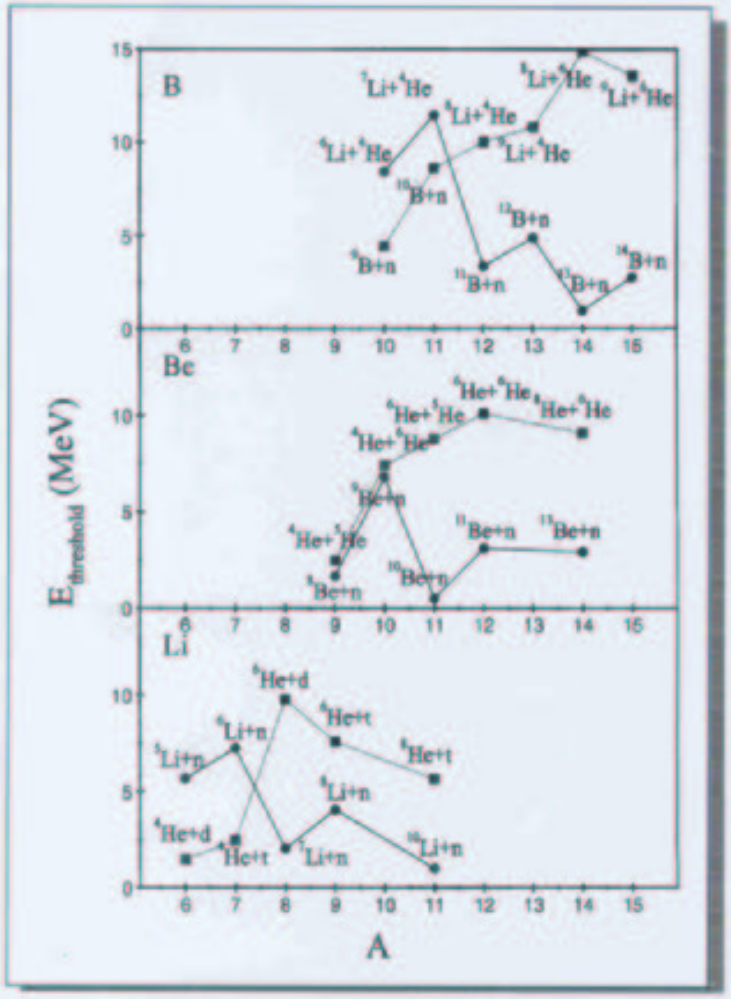
Clustering at the drip-line?

K. Ikeda, et al. Suppl. Prog. Phys. (Japan) Extra Nos. (1968) 464

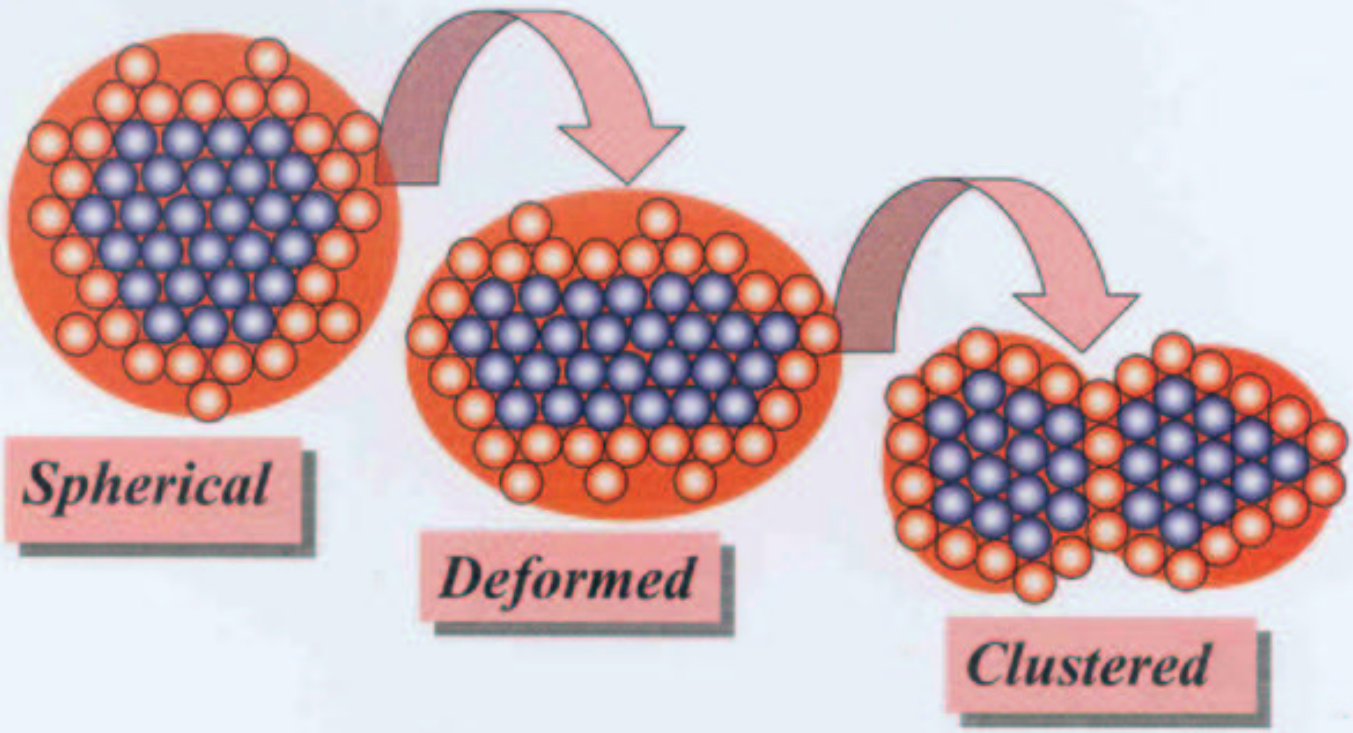


AMD - Horiuchi, Kanada En'yo et al.





^{19}B possible di-cluster structure is ^{8}He+^{11}Li. But decay threshold is 12.73 MeV!



Breakup cross sections for Be isotopes