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The Importance of Closed Shell Structures in the Synthesis of Super Heavy Elements J.H. HAMILTON, Vanderbilt University, S. HOFMANN, GSI, Y.T. OGANESSIAN, JINR — In 1965, macroscopic models predicted that nuclei beyond Z $\approx$ 100 could not be synthesized because their fission barrier would go to zero. Then came microscopic models with shell corrections. Microscopic-macroscopic models predicted large gaps in the single-particle energy levels for protons and neutrons at Z = 102, 108 and N = 152, 162 for deformed shapes. The reinforcement of the Z = 102, N = 152 and Z = 108, N = 162 level gaps at the same deformations provided the stability for nuclei in these regions to be observed. Also predicted were shell gaps for spherical shapes for N = 184 and Z = 114, 120 or 126 forming an "Island of Stability" with very long half lives for fission and alpha decay. Cold fusion reactions involving beams of Ca to Zn and targets of stable ^{208}Pb and ^{209}Bi were pioneered at GSI and used to synthesize new elements for Z = 107 to 112 and in Japan a new isotope of 113. Hot fusion reactions between radioactive actinide targets and neutron-rich ^{48}Ca beams were pioneered in JINR leading to the synthesis of new elements with Z = 113 to 118. Data showing the importance of reinforcement of the Z = 102, N = 152 and Z = 108, N = 162 single particle level gaps at the same deformation and Z = 114-126, N = 184 shell gaps in the synthesis of super heavy elements 107 to 118 will be presented along with the latest results on their synthesis.

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