Shapes and correlations along the N=Z Line

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N=Z nuclei have long been prized for the symmetry imposed by equal numbers of protons and neutrons. This leads to unusually large binding energies, and special selection rules in reactions and decays that can teach us about the underlying Hamiltonian and the nuclear force. In recent times, great effort has been directed at the N=Z nuclei above ^{56}Ni. Now, something is known about almost all the nuclei to ^{100}Sn, but a great deal still remains unknown. Despite impressive progress in producing radioactive beams, these nuclei remain at the limit of our technical capability. The nuclei are especially interesting, as the N=Z line becomes the proton dripline in some cases, so issues of marginal binding energy become important. Coulomb energies rise, and isospin purity comes into question. Neutron-proton correlations become uniquely important. The region has become a forefront testing ground for very large basis shell model calculations. Beyond spectroscopy, we now know that nuclei along the N=Z line fuel rp-nucleosynthesis process and determine the rate and reach of X-ray bursts. I will discuss shape evolution and shape co-existence across these nuclei and the progress we have made in understanding pairing correlations. I will discuss some important things we still need to find out, and why.

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