years ago triggered a considerable flurry of preprints on quark (etc.) stars, some of which made it into print before the report was retracted—and a few afterwards!

Neutron stars remain, of course, the most extreme environment under which we can test pictures of how superfluids and superconductors behave. They also remain awkwardly refractory to experiment.

THERE'S GOT TO BE A PONY IN THERE SOMEWHERE*

The two topics on which nearly everybody agrees that astronomers and particle physicists must cooperate if answers are ever to be found are "the solar neutrino problem" and the complex of questions concerning the existence and nature of dark matter, the origin of large-scale structure in the universe (formation and distribution of galaxies and clusters of galaxies), and whatever happened before big bang nucleosynthesis, including inflation, baryogenesis, phase transitions, and miracles. Neither is at all new to regular readers of these pages.

John Bahcall summarized the solar neutrino situation here (see the Fall/Winter 1994 *Beam Line*, Vol. 24, No. 3, page 10). I will summarize still further. First, Raymond Davis Jr.'s chlorine-37 experiment has been seeing a bit less than a third of the predicted flux of high energy neutrinos since before 1970, and the first generation of possible excuses already included many of the astronomical and weak-interaction fiddles that are still with us (for examples see the Trimble and Reines review mentioned under "more reading"). Second, three additional experiments have not clarified things as much as one might have hoped. At the very highest energies that come only from boron-8 decay, the Kamiokande electron-scattering detector has reported about half the number of expected events from the direction of the sun (none of the other devices provides any directional information). And the SAGE and GALLEX gallium detectors also see about half the expected flux, mostly in the form of lower energy neutrinos from the proton-proton reaction ($p + p \rightarrow d + e^+ + \nu_e$).

Third, it is rather difficult to make this combination come out from any fiddle you can think of, mostly because it is the middle energy range that seems to be most deficient. New weak interaction physics, along the lines of neutrino oscillations catalyzed by the presence of nuclei (MSW effect), seems to work better than non-standard models of the solar interior. Fourth, even MSW-type oscillations are squeezed into a very narrow corner of the space of neutrino masses and coupling constants when you also insist on accounting for the anomalous ratio of neutrino flavors among cosmic-ray secondaries made in the atmosphere. Fifth, new detectors under construction or planned (SNO, SuperKamiokande, Borexino) could sort things out (but need not), and I suspect that the last word has not been said on this topic, not even my last word.

Artist's conception of the Sudbury Neutrino Observatory (SNO) detector. When fully operational, it will detect all three flavors of neutrinos and give some indication of the direction from which they come. Although sensitive only to the very highest energy (boron-8) solar neutrinos, it should be able to decide if some of the missing electron neutrinos have rotated into mu- or tau-neutrinos. (Courtesy Lawrence Berkeley National Laboratory)

**Readers who remember the joke of which this is the punch line are invited to share it with those who don't, preferably keeping in mind that roughly half the preprint pile comes from my side of the interdisciplinary fence and half from yours—unless we are on the same side.*