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Laboratory Nuclear Astrophysics, viewing the universe from underground. JOHN E. ELLSWORTH, STEVEN E. JONES, LAWRENCE B. REES, CLARK G. CHRISTENSEN, Physics and Astronomy, Brigham Young University — Our sun emits 380 yottawatt, yet the nuclear reactant energies producing that power are very low ($\sim$1 keV). Replication of such reactions in the laboratory produces rates that are nearly impossible to detect. Unlike the historical efforts to understand stellar processes by extrapolating down from higher energy beam experiments, we report efforts to study reactions using low energy reactants. To do so requires specialized equipment and environments. Research to study muon catalysis[1] began at BYU in 1982 in collaboration with INEL and LANL. This led to the 1986 BYU hypothesis that 'metals can catalyze d-d fusion' and a theory for heat production in planets[2]. Experiments followed[3-5]. Since the mid 1990s a body of data for the screening potentials of metals has grown out of accelerator experiments[6-10].
[1]Nature 1986 321:p327. [2]J. Phys. G:12:213-221. [3]Nature 338:737-740. [4]SE Jones, Four Corners Fall Meeting, APS, (2004). [5]CMNS 2005, London:World Scientific, p509&p525. [6]Z. Phys. A351:107. [7]JETP Letters, 68:823. [8]Europhys. Lett. 54:449. [9]Eur. Phys. J, A19:283. [10]J. Phys. Soc. Japan, 73:608.

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