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THE IRON PROJECT & THE IRON OPACITY PROJECT: Re-establishing the Sun as the Astrophysical Rosetta Stone[1] ETHAN PALAY, SULTANA NAHAR, ANIL PRADHAN, MARC PINNSONOAULT, Ohio State U, JAMES BAILEY, Sandia Natl Lab — The aims of the two projects are detailed studies of radiative and collisional processes of astrophysically abundant atoms and ions, mainly iron and iron-peak elements, over a wide energy range, from infra-red to X-rays. One of the most fundamental astrophysical problem today is the discrepancy in the abundances of the most common volatile elements C, N, O, Ne, etc in the sun. These have been spectroscopically measured to be up to 50% lower than the canonical abundances long employed in stellar interior models. A potential solution to this problem is if stellar opacities are at least 30% higher, given the inverse but complex relationship between opacities and abundances. We report on new iron opacity calcultions, including hitherto neglected atomic physics of resonances which are largely treated as lines in existing opacities calculations. We also describe recent laboratory experiements of monochromatic opacities at the Sandia Z-pinch device. We will present Breit-Pauli R-matrix results for Fe VIII with 567 fine structure levels with n $\leq$10, l $\leq$9, and 0.5$\leq$ J $\leq$9.5, and 35,504 electric dipole allowed fine structure transitions. Results for forbidden transitions will also be presented.

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