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New science opportunities in multi-kJ, petawatt laser facilities relevant to fast ignition PETER NORREYS, CCLRC Rutherford Appleton Laboratory — The near completion of second generation multi-kJ lasers around the world opens a host of new and interesting opportunities to investigate high intensity laser-plasma interaction physics phenomena that are directly relevant to fast ignition. I will review the facilities now under construction in the United States, Japan and Europe together some of the most interesting proposed physics investigations that they are designed to address. The latter will be illustrated by results obtained from recent experiments that have been performed on the Vulcan petawatt laser facility. They include: the study of the different plasma instabilities that affect energy transport in high temperature, dense plasmas, particularly the two-stream and the Weibel instabilities; new diagnostic techniques to measure strong magnetic fields that are generated during the interaction; the production of high brightness X-ray harmonic and radiation backlighting sources; the generation of relativistic particles in ultra-intense laser-produced plasmas and their potential diagnostic applications.

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