When low-intensity light reflects from a mirror, its spectrum is preserved. At ultra-high laser intensity, however, any solid surface turns into a fully-ionized plasma mirror that moves at a relativistic speed. The reflected light then contains high-order harmonics of the incident light’s fundamental frequency, extending into the x-ray range. I will describe our experiments and theory studying the fundamental processes behind these relativistically-driven plasma mirrors, and explain their origin, spectral scaling and x-ray efficiency limits. With new lasers now under development, it is expected that such x-ray pulses will exceed the peak powers obtained at x-ray free-electron laser facilities.

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