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The photoelectric effect – project-based undergraduate teaching and learning optics through a modern physics experiment redesign CORNELIU RABLAU, UMA RAMABADRAN, BRENDAN BOOK, ROBERT CUNNINGHAM, Kettering University — The photoelectric effect is a cornerstone textbook experiment in any Modern Physics or Advanced Laboratory course, designed to verify Einstein's theory of the photoelectric effect, with the implicit determination of an experimental value for Planck's constant and the demonstration of the particle nature of light. The standard approach to the experiment is to illuminate the light-sensitive cathode of a vacuum-tube photocell with monochromatic light of known wavelengths; a reversed-voltage is then applied to the photocell and adjusted to bring the photoelectric current to zero. The stopping voltage is then plotted as a function of the inverse wavelength or frequency of the incident light, and Planck's constant is determined from the slope of the graph. Additionally, a value for the work function of the photocathode can be extracted from the intercept. The commercial apparatus for the experiment is available from a number of vendors (PASCO, Leybold) in various forms, degrees of performance and cost. However, designing and assembling a photoelectric effect experiment apparatus can in itself be a valuable experiential project-based undergraduate learning opportunity in Optics involving both fundamental light and optics theory and practical optics and opto-mechanical design aspects. This presentation details a project undertaken in the Applied Physics/Engineering Physics programs at Kettering University for a redesign of an existing photoelectric effect *apparatus* through an undergraduate student thesis.

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