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Fundamental Physics with Table-Top Optics

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Experimental physics research at an undergraduate institution poses the challenge of requiring the production of publishable results while also being a suitable setting for mentoring undergraduates in research. It is tempting for young faculty to copy/adapt "big-machine" university research, but that is a tough enterprise that is hard to sustain. An option that suits the undergraduate setting better is a small, table-top, apparatus devoted to projects with promising potential. In optics I found such a setting, and a successful transition from big-machine to table-top setups. Optics is a fertile ground for student projects that does not involve heavy maintenance, can achieve substantial depth, and enables student independence. It also allows the creation of projects that match the abilities of the not-so-high achievers. At the conference I will present examples of recent projects involving the study of classical light beams that carry optical vortices and non-classical beams that encode qubits. This work has been funded by Research Corporation, NSF and Air Force.