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Design of Holographic Lightfields for Manipulation of Quantum Degenerate Gases[1] SAMANTHA KREPPEL, Carthage College, PETER ENGELS, CHRIS HAMNER, JIAJIA CHANG — Experiments with ultracold quantum degenerate gases are at the forefront of modern atomic physics. Since these gases require temperatures near absolute zero, they must be well isolated. Therefore, mechanical forces that laser beams exert on atoms can be exploited for trapping and manipulating these atoms. The goal of our studies was the investigation of holographic techniques to generate nearly arbitrary lightfields for the manipulation of ultracold quantum gases.the frame of this project, a variety of techniques for the creation of interesting lightfields were investigated both theoretically and experimentally. They include diffraction fields behind material masks made by holes in a metal plate, more complex patterns produced by transmissions masks printed on overhead transparencies, as well as computer generated binary holograms. For these cases, a Mathematica program was written to calculate the light patterns and an optical setup was built for testing the generated patterns. The next major step for this predict is testing these lightfields on Fermi degenerate gases and Bose-Einstein condensates.

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Kevin Crosby
Carthage College

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