

Abstract Submitted
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Galileo on Two Wheels: Why Does Newton Make Me Keep Pedaling This Thing? DAVE GARDNER, KATE OSENBACH, JOSEPH CONNOLLY, University of Scranton — As part of an effort to use examples for the bicycle to illustrate basic physics principles, we have been exploring the application of Newton's laws of motion to a moving bicycle. In particular, we have developed methods to measure the bicycle's two primary forces of resistance—tire rolling resistance and air resistance on rider and bike. With the use of minimal equipment such as stopwatches and bicycle speedometers, we have obtained data that provide a very good fit to simple models and closed differential equation solutions. We have also found that the bicycle affords a simple, low tech, and convenient method to study concepts of terminal velocity and rolling resistance. Just as Galileo made use of inclined planes to study falling objects, we used gently sloping hills to determine forces on the moving bicycle. Our methods make use of a novel technique to determine the bicycle and rider frontal cross sectional area. We hope our methods and results will be of interest to students of physics and mathematics and to the general cycling community. We have found it is possible for a cyclist to easily measure; without the use of expensive time in a wind tunnel; the effects of various body positions on wind resistance. This paper also examines the force and power consequences of riding at high speeds.

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