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Gravitational Field Inside the Earth: What You Would Weigh in a Mine Shaft

Diane Bootz
Illinois Wesleyan University

George Kambouroglou
Illinois Wesleyan University

Kevin Sonntag
Illinois Wesleyan University

Narendra Jaggi, Faculty Advisor
Illinois Wesleyan University

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GRAVITATIONAL FIELD INSIDE THE EARTH: WHAT YOU WOULD WEIGH IN A MINE SHAFT

Diane Bootz, George Kambouroglou, and Kevin Sonntag
Department of Physics, IWU, Narendra Jaggi*

Many undergraduate physics textbooks show that the gravitational field (g) DECREASES linearly as one moves from the surface to the center of the spherical earth. Experiments, however, have demonstrated that there is an initial INCREASE in g as one moves down in a mine shaft. A model of the earth was constructed to understand this discrepancy. The model consists of concentric spherical shells of different densities. The gravitational field is determined as a function of the radius. Instead of decreasing monotonically as the uniform density model predicts, the multiple shell model predicts that g first increases to a maximum beneath the surface before linearly decreasing. This result is in pleasant agreement with the experimental data.