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Stokes and the Pendulum

During the first half of the 19th century, the pendulum occupied an important place in experimental physics and in surveying. Precision pendulum measurements were used, for example, to determine accurate values of the gravitational constant and to determine the exact shape of the earth. The desire for exceedingly precise measurement meant that temperature, humidity, altitude, external vibrations, and the medium through which the pendulum swung had to be controlled or corrected for. Simultaneous measurements being made at a variety of locations around the world meant that assurance was needed that what was being compared from one location to the other was actually comparable. Further, theory was needed to support the various experimental results and to predict the effect of changing conditions on the pendulum period. In particular, the computation, from theory, of a vacuum to air correction factor for a given pendulum was important. Sir George Gabriel Stokes provided this theory in 1848 and he used divergent series to do so. This talk will use a portion of the fascinating history of the pendulum during the early 19th century to establish their importance and then will take a close look at the mathematics that Stokes developed in support of this effort.