he concluded "that the rigidity of the earth's interior substance could not be less than a millionth of the rigidity of glass without very sensibly augmenting the lunar nineteen-yearly nutation."[54]

In Hopkins' hypothesis he assumed the crust to be infinitely rigid and unyielding, which is not true of any material substance. Lord Kelvin subsequently returning to the problem, in the light of his own researches in vortex-motion, found that, while the argument against a thin crust and vast liquid interior is still invincible, the phenomena of precession and nutation do not decisively settle the question of internal fluidity, as Hopkins, and others following him, had believed, though the solar semi-annual and lunar fortnightly nutations absolutely disprove the existence of a thin rigid shell full of liquid. If the inner surface of the crust or shell were rigorously spherical, the interior mass of supposed liquid could experience no precessional or nutational influence, except in so far as, if heterogeneous in composition, it might suffer from external attraction due to non-sphericity of its surfaces of equal density. But "a very slight deviation of the inner surface of the shell from perfect sphericity would suffice, in virtue of the quasi-rigidity due to vortex-motion, to hold back the shell from taking sensibly more precession than it would give to the liquid, and to cause the liquid (homogeneous or heterogeneous) and the shell to have sensibly the same precessional motion as if the whole constituted one rigid body."[55] The problem presented by the precession of a viscous spheroid has more recently been discussed by Prof. George Darwin, who arrives at results nearly the same as those announced by Lord Kel-

[54] Loc. cit. p. 258.
[55] Lord Kelvin (Sir W. Thomson), Brit. Assoc. Rep. 1876, Sections, p. 5.