long periods. It is suggested that the erosional and sedimentary history of continental-sized areas may be correlatable with a mechanism of this type.

A change of rotation of a "rigid" earth about an axis through the center of mass would be a "comfortable" one compared with a rotation about an impact axis not symmetrically placed. Also, the very small axis changes might be as nothing compared with geographical displacements of the old poles if, on impact, the core and mantle of the earth were to turn relative to each other. In fact, such reaction is inevitable in view of the interpretation that the outer core may be "liquid" and that marked changes in density, composition and rigidity occur at the core boundary. Further, if the earth were a homogeneous solid the moment of inertia of the core, and hence the angular momentum, would be about 1/20 that of the whole; but because of the high core density (10-17 gm/cm^3) the value is slightly less than ⅛. In effect, the core has "more a mind of its own" to maintain its original rotation and thereby increases the tendency to shear at the core boundary. Under any specific impulsive torque the mantle (plus the crust) can be displaced by a greater amount roughly proportional to this factor ⅛. The core (just as the oceans and atmosphere on the surface) can churn and bump away in the liquid lining about the original axis while the mantle strives to attain rotation about some other axis. The energy of this fractious fetus's activity is appreciable (8×10^{31} ergs) for only one minute of arc (rotational energy of core $\times$ tan 0°1′), an amount equal to 10,000 years' heat flow at the earth's present rate.

Temperatures produced by such frictional processes depend on many factors. It will suffice to note that a shell at the core boundary 5 km thick could have 3,600 cal/gm pumped into it, sufficient to melt it and cause fractionation into metallic and oxide phases. The question must be asked: Is it possible that the "metallic" core owes its very existence to a long history of large scale bombardments?

Climatic Change

Papers by specialists collated in *Climatic Change*" may guide a reader to conclude that (1) the evidences of climatic change on a planet-wide scale are good and acceptable; (2) geological causes to bring about these changes are plainly insufficient; (3) astronomical causes (solar variation, perturbation of earth's orbit, etc.) are likewise insufficient; (4) the highly important influence of an axis change is recognized but is considered as untenable because *great external forces* would be necessary.

In the foregoing discussion the "mechanical sufficiency" of large meteorite collisions has been described in quantitative approximations. Given large enough or frequent enough collisions appreciable axis changes are to be expected, with highly important changes of