plot of the difference between the polar and other radii as a function of latitude. This designates a tangible profile of the equatorial "bulge" having a maximum difference at zero degrees latitude of 21.6 km. A collision sufficient to increase or decrease the rotation of the earth by 5 percent (see Table III) would change the profile as indicated in Fig. 3. Hence, at 45° latitude the change in radius is 1.1 km, at 20°, 2 km, and at the equator 2.1 with increased or decreased rotation. If these changes were to be realized immediately by both the lithosphere and hydrosphere, the relative shoreline motions would not be great—perhaps only 1/100 of these amounts. However, since the lithosphere most likely would respond slowly due to friction over appreciable periods of time, whereas the hydrosphere would conform to the new rotation figure in a short time, great changes in shorelines are to be expected. Here the term shorelines is used more in the sense of establishing a sea level, and the changes may therefore be considered as changes in elevations with the corollary changes in local climate, erosion and drainage patterns, drowning of coastlines or incisive action of great river systems.

The changes are by no means all such bland ones. For example, in the zone between 15° N and 15° S latitude the change in volume of the "bulge" is about 8 percent, requiring 2×10^8 cubic km of rock to change position by all mechanisms available. Earthquakes and faulting are brought about by forces which form mountains, and according to C. F. Richter[18] the nature and cause of mountain building is the central, outstanding problem of historical geology. As shown in Table II all the earthquake energy of the earth over 1,000 years would amount only to 10^{30} ergs. Adding to this the energy to raise five tolerably large mountain ranges each an additional 300 meters still would not alter the 10^{30} erg magnitude. All this activity is less than one millionth the mechanical energy of the rotation change (in fact, it could be matched by the collision energy of a 3.2 km diameter spheroid but when noticeable axis or velocity changes cannot occur the disturbance should be more localized). If it is assumed that most of the readjustment takes place in the crust above the Mohorovicic discontinuity, the percentage of this larger volume is still appreciable—3 to 5 percent. The net volume change remains the same but the intensity of shearing is decreased and spread deeper. The change in a linear element on the surface in the same region amounts to 0.3 meters out of each kilometer, enough to set up high compressive or tensile stresses in the surface of the same order as those which might arise from a change of temperature of the entire earth by 30°C (assuming an average thermal expansion coefficient of about 10^{-6}). The stresses due to temperature changes by cooling or radioactive heating, however, would accumulate ever so slowly because the change in the heat content of the earth is high: 2×10^{36} ergs.