(4) Atmospheric disturbances related to the gases, vapors and dusts of the collision explosions (the volcanic explosion of Krakatoa, 1883, can only begin to illustrate this aspect of large meteorite collisions). Vladimir Vand[12] suggests that the rapid expansion and cooling of water vapor forced into the upper atmosphere by collision would contribute significantly to the growth of the polar ice caps, setting off a new cycle of glaciation.

(5) Contributions to sedimentary processes. It has been estimated that 2-10 $\times$ 10^6 kg of meteoritic dust are accumulated each year. This is equivalent to a single stony meteorite 17 meters in diameter. Larger meteorites would streak through the atmosphere with little loss in velocity. Consequently, bodies colliding at 10-72 km per second would actually explode, since only 1 percent of the energy at the lower velocity (10 km/sec.) is capable of vaporizing them completely. A portion of this matter no doubt is trapped in the focus and debris of the collision in the visible crater, but the balance would be broadcast widely unless the explosion were great enough to blast back through the atmosphere, carrying with it debris into accidental orbits about the sun or the earth. In effect, this operation creates *secondary* meteorites to be "harvested" by the earth at some later time. In this category might fit the carbonaceous chondrites and the tektites. (How valuable a find would be a well observed fall of a dinosaur skull encased in a huge block of siltstone, or an Egyptian style obelisk!)

(6) Disruption of the "equilibrium" composition of the atmosphere might be expected above a threshold size of meteorite. Wide dispersion of an evaporated "iron" 84 km in diameter (unlikely lump, but mentioned for order of magnitude) creates a virulent potential for decreasing the oxygen content of the air to negligible amounts. Certainly such interferences with organic and inorganic surface processes would be important *stagger* or *halt* points in the history of the earth.

All these are but an indication of the kinds of results which are possible, but it is not intended here to attempt a detailed history of large collisions. Rather, it is intended to describe possible collision effects in relation to (1) the tectonic activity of the earth and (2) the determination of the type of climate by the nature of changes in the rotation of the earth.

Returning to Table II, it is seen that the destructive horror of World War II pales into insignificance against the energy available in a few 100 megaton nuclear "devices," to use the jargon of the age. These are comparable to the energy released in the San Francisco earthquake or that estimated for the formation of the Arizona Crater. The energy required simply to "dig" the 440 km basin in Hudson Bay, in an industrious but normally inefficient manner (10 percent efficiency?), is up in even higher magnitudes.