insolation of the north and south hemispheres. In effect, the two hemispheres are alternately hot and cold sinks which in time with the revolution of the earth in its orbit set up the atmospheric and oceanic circulation patterns, storms, local seasonal changes, determine the growth and recession of ice caps and so on. If one sets up "end members" as in Fig. 5, the control of planetary climate by the axis position relative to the orbital plane becomes obvious. In addition to the tilt of the axis, the collision mechanism provides that the poles in the earth also are changed in a geographical sense, as unquestionably they have been in the past.

Climate is merely another physical system until it is looked at in a manner similar to that of Harlow Shapley, who says, "Next to the genes and chromosomes,—climate is the major factor in organic evolution."[4] Major forms of life may well have been consolidated by the onset and duration of certain types of planetary climate. For example, Type I might have been the most favorable for the amphibian and reptilian forms whereas Type IV (if not completely hostile to the maintenance of life if of long duration) might have "crystallized" the optimum development of birds and other creatures capable of rapid migration or of efficient hibernation and estivation. Type II fits man reasonably well although the distribution of dense populations and the vacation preferences of people suggest that a change of about 5° toward Type I would suit him better, complete with fig leaves! Type III would have retarded and cowed man while serving favorably the giant mammals. Interwoven with the influence of type of climate is the very important factor of the *accidental survival* of sufficient but not large numbers of any one species to establish a new ecological balance after major collisions. The survival of a necessary *minimum number* of any species greatly favors the chances of concentrating inheritable characteristics *accidentally* best fitted to the new conditions and hence to evolutionary change. If these characteristics should already be found in variants forming minute proportions of pre-collision populations, the accidental concentration of these variants among the survivors will increase their chances of becoming established. In the aftermaths of collision nature certainly could have the two most important factors working together—chromosomes and climate.

FIGURE 5.—The probable conditions of the ice caps for different inclinations are shown as dark areas in the four panels. The climate of Type I would be even and relatively free of storms; the severity of storms would increase with the increase in tilt of axis, as the air masses raced from cold areas to hot areas. Day and night would be uniform all through the year in Type I but approaching Type 4, continuous, unbroken night would persist for months in the winter season; in summer, a "noonday" sun would stare down on the exposed polar areas for months without interruption. Only the tempering effects of the large oceans (the cradle of all early and persistent forms of life) and the atmosphere would keep the earth from developing the extremes of temperature that occur on the surface of the moon. (From A. O. Kelly and F. Dachille, *Target: Earth*[5])