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FRAGMENTATION AND CONTINENTS

From the shape of existing continents, it is often inferred that they must have belonged to a single whole continent which broke up into fragments later on.

The mathematical theory of random fragmentation of a thin sheet shows that $N(s)$, the number of fragments of area greater than S, is given by

$$\pi^{1/2} N_0 \left(\frac{S}{S_0}\right)^{1/4} \exp\left[-2\left(\frac{S}{S}\right)^{1/2}\right] \quad (1)$$

provided $S >> S_0$ where N_0 is the total number of fragments and S_0 is the average area of the fragment. In the usual picture continental structure is supposed to exist in a thin crust on the outside of the rest of the earth. A possible fragmentation of this thin crust can be treated as fragmentation of area.

From a 9-inch globe, areas of all land masses were measured and tabulated. To give theory the best chance for supporting fragmentation hypothesis, sharp peninsulas were regarded as individual fragments and also North and South Americas were considered distinct fragments. Similarly Eurasia and Africa were considered distinct fragments. The total number of area units was taken as 218. The theoretical and observed distribution are shown in Fig. 1, indicating marked difference. Naturally in actual existence there must be many more small islands and rocks that are not shown on a 9″ globe. But this will not affect materially the total area which is to break up, only N_0 and therefore S_0 will be altered. If in place of $N_0 = 218$, a considerably larger figure is used the disagreement becomes
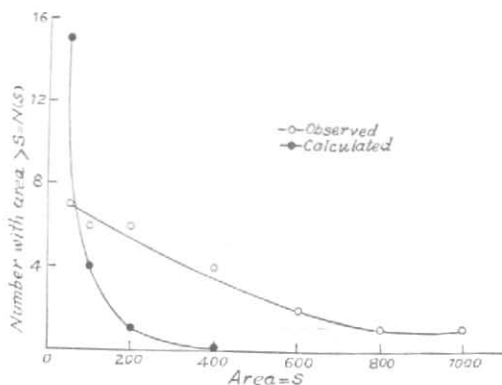

Fig. 1. Graph for testing Fragmentation Hypothesis

still more acute. Similarly if peninsulas are not considered as separate fragments, and Eurasia—Africa and the Americas are considered as single units, the disagreement again becomes more pronounced.

Thus at least from the existing size of continents, the hypothesis of a single fragmentation process regarding continents is not supported by mathematical treatment. The shape of existing continents that seems to support this hypothesis must be ascribed to some other cause, e.g., the rotation of the earth acting on viscous material of the continents of long ago.

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