Addendum: The Density and Mass Distribution of Meteoritic Bodies in the Neighborhood of the Earth's Orbit[1]

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In an earlier paper [*Brown*, 1960], the author estimated the frequency of meteorite impact upon the earth and moon on the basis of the numbers of observed falls over a period of a century in Japan, India, and Western Europe. All of these areas have had high rural population densities during the entire period. It was recognized, however, that the estimated fall density of 0.32 falls/year/10^6/km² was probably low.

Recently, in connection with the compilation of maps showing the locations of observed meteorite falls, it has been noticed that approximately ⅛ of the Indian falls have been recovered in the relatively small area of 330,000 km² embracing most of the United Provinces, the eastern parts of the Punjab and Rajputana, and the western part of Bihar Province. This region is characterized by the large river network that includes the Ganges, the Jumna, the Gogra, the Chauka, the Son, and the Gandak. The region is extremely fertile and level, with the result that it has one of the highest rural population densities in the world—more than 500 persons per square mile.

During the half-century 1860–1909 twenty

meteorites were observed to fall in this region. In the following half-century (1910–1959) an additional 13 were observed, bringing the total for one century to 33. The annual rate of fall per unit area in this region corresponds, then, to 1.0 falls/year/10^6/km². This is higher than the earlier estimate by a factor of 3.

It is noted that there are similar concentrations of falls in other parts of the world. Correcting the Japanese data for the fact that most falls there have been observed in the southern regions, the Japanese rate of fall per unit area appears to be identical with that in the United Provinces of India within statistical error. A similar high rate has prevailed in the Po Valley in northern Italy where 7 meteorites have been observed to fall in the past 150 years in an area of only 43,000 square kilometers.

The observed rates of fall in the regions of unusually high fall density in India and Japan are summarized in Table 1.

Using the term 'fall' to denote a meteorite that passes through the atmosphere and, after landing, is large enough to be found and picked up, the total rate of fall upon the earth appears to be about 560 meteorites per year. In view of the higher value of the estimated fall density upon the earth, all of the computed impact frequencies of meteorites upon the earth and

TABLE 1. Meteorite Falls in Selected Regions, 1860–1959

Region	Area 10^3km²	Number		Falls/year/10^6km²	
		1860–1909	1910–1959	1860–1909	1910–1959
North-central India	330	20	13	1.2	0.8
Southern Japan	190	11	10	1.2	1.1
Total	520	33	23	1.3	0.9
Average for century				1.1	

moon, given in Table 3 [*Brown*, p. 1682, 1960] should be multiplied by a factor of 3.4.

REFERENCES

Brown, Harrison, The density and mass distribution of meteoritic bodies in the neighborhood of the earth's orbit, *J. Geophys. Research, 65,* 1679–1683, 1960.

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