chances of a large chunk of ice entering the atmosphere are small. Most or all of the meteors during regular meteor showers are undoubtedly of the dustball variety.

4. Size-Frequency Distributions for Cometoids

The comet in general is a complicated object capable of exploding. It is therefore not possible to give a strictly quantitative formula for the distribution of sizes following a disruption by tidal action. However, a rough idea of what could occur can be obtained by one or two hypothetical cases. Suppose that we take a small faint comet with a radius of 1000 m. If this object divided into small spheres, each having a radius of 1 m. (3·28 ft.) there would be 10^9 of them. A more realistic distribution might be obtained by assuming that the number-mass distribution is similar to that found for meteoroids. This is done in Table II, where it is

Table II.—*Initial Data—Comet Radius: 1000 m.; Comet Density: 0.5g./cm³.; Comet Mass: 4.2 × 10¹⁵g.*

Number	Radius		Total mass, g.
	m.	ft.	
1	464	1522	$4·2 \times 10^{14}$
10	215	695	$4·2 \times 10^{14}$
100	100	328	$4·2 \times 10^{14}$
1000	46·4	152	$4·2 \times 10^{14}$
10,000	21·5	69·5	$4·2 \times 10^{14}$
100,000	10·0	32·8	$4·2 \times 10^{14}$
1,000,000	4·64	15·2	$4·2 \times 10^{14}$
10,000,000	2·15	7·0	$4·2 \times 10^{14}$
100,000,000	1·0	3·3	$4·2 \times 10^{14}$
1,000,000,000	0·464	1·5	$4·2 \times 10^{14}$

assumed that the densities are constant. The sizes range from 3 to 3000 ft. in diameter. Some of the larger pieces might still appear as faint comets if they became positioned favourably with respect to the Earth. Actually the sizes of nuclei are not well established. Halley's comet vanished in front of the Sun and could not have exceeded 70 km. in diameter. The great comet of 1841 I observed by H. Struve and O. Struve must have had a diameter of 100 km. or more. Clearly, a larger comet would be capable of producing myriads of small entities as well as many cometary-size objects.

5. Lifetime of Cometoids

The lifetime of ice chunks in short-period orbits will not be unlimited. Based on our knowledge of comets, the probable lifetime of cometoids may be calculated. Arguments by Whipple[14] and others have demonstrated that nuclei, in general, are extremely poor thermal conductors. It follows therefore that the rate of sublimation is approximately independent of the radius. Small spheres of ice will consequently tend to lose the same increment from their radii as large spheres or comets, assuming that they have identical environments and similar compositions. The lifetime of a comet with radius 1 km., which has a perihelion distance of 1 A.U., is of the order of 1000–10,000 years. This corresponds to a loss in radius of 10–100 cm./year on the average. Thus the 10^9 smaller pieces, with a 50-cm. initial radius from Table II, would completely sublimate after an exposure of 6 months to about 5 years. Another hundred million objects with an initial diameter of 6·6 ft. will have sublimated (leaving only dust structures) after a period of 1–10 years. The largest object should last from 500 to 1000 years. The conservative picture of a 1000-year lifetime for the parent comet is probably more realistic. The lifetime of the fragments in Table II, expressed in years, is then numerically equal to the radius in metres. That is, an object with a diameter of 304 ft. or a radius of 46·4 m. would take 46·4 years to sublimate. Thus, with the passage of time following disruption larger-diameter cometoids gradually become numerically predominant. This is shown in Table III,

Table III

Time duration, years	Number	Most abundant diameter,	
		m.	ft.
Breakup	1,000,000,000	1	3·28
0·46	100,000,000	1·08	3·51
1·0	10,000,000	2·3	7·55
2·15	1,000,000	4·98	16·3
4·64	100,000	10·1	33·1
10·0	10,000	23·0	75·5
21·5	1000	49·8	163·5
46·4	100	107·2	351
100	10	230	755
215	1	498	1635

where, *e.g.*, after 4·6 years, 99·99% have vanished and of the remainder, the most numerous have diameters of at least 10·7 m. (35·1 ft.). Thus, with the assumed distribution, if the Earth intersected a new cometoid stream, there would be a great numer of small fireballs observed during the first encounter. Some years later, far fewer objects would be observed, but they would be relatively large. Finally, only one, the largest, could be seen. The most important observation is that the numerous small objects, of the order of a few feet, would tend to be wiped out in a year or two. Of course, this is highly qualitative, because many other factors enter in, *e.g.*, orbital eccentricity, divergence of the stream, etc.

A detailed discussion of the expected lifetime of several ices in space is presented elsewhere.[18]

Any one of the objects, in Table II, entering the Earth's atmosphere at a small angle with the local horizontal and with a relative speed near the low end of the spectrum (9 to 10 miles/sec.), would give rise to UFO phenomena. That is, if the entry angle was not too steep the speed would drop down to the terminal value (a few hundred miles/hr.) and a truly bizarre meteor would result. The most favourable time for such objects to survive atmosphere entry is after sunset when they would be coming