BY THE way...

The first space mission to study an asteroid up-close arrived at the asteroid Eros on Valentine's Day, 2000. The mission, called the Near Earth Asteroid Rendezvous (NEAR), should help scientists understand the threat posed by asteroids and how we might deflect an asteroid if we ever discover one heading toward Earth.

hit the Earth, leaving a 200-kilometer-wide crater on the coast of the Yucatan peninsula in Mexico. Many scientists believe this impact caused the extinction of about three-quarters of all species living on Earth at the time, including all the dinosaurs.

Clearly, a similar impact would be bad news for our civilization. Thus, we might want to understand the likelihood of such an event occurring. Figure 3.42 shows a graph relating the size of impacting asteroids and comets to the frequency with which such objects hit the Earth. Because of the wide range of sizes and time scales involved, *both* axes on this graph are exponential. The horizontal axis shows sizes, with each tick representing a power of 10. The vertical axis shows the frequency of impact; moving up on the vertical axis corresponds to (exponentially) more frequent events. With this double exponential graph, we can see trends clearly. For example, small objects of about 1 meter in size strike the Earth every day, but cause little damage. At the other extreme, objects large enough to cause a mass extinction hit only about once every hundred million years.

The intermediate cases are probably the most worrisome. The graph indicates that objects that could cause "widespread devastation" — such as wiping out the population of a small state — can be expected as often as once every thousand years. This is often enough to warrant at least some preventive action. Currently, astronomers are trying to make more precise predictions about when an object

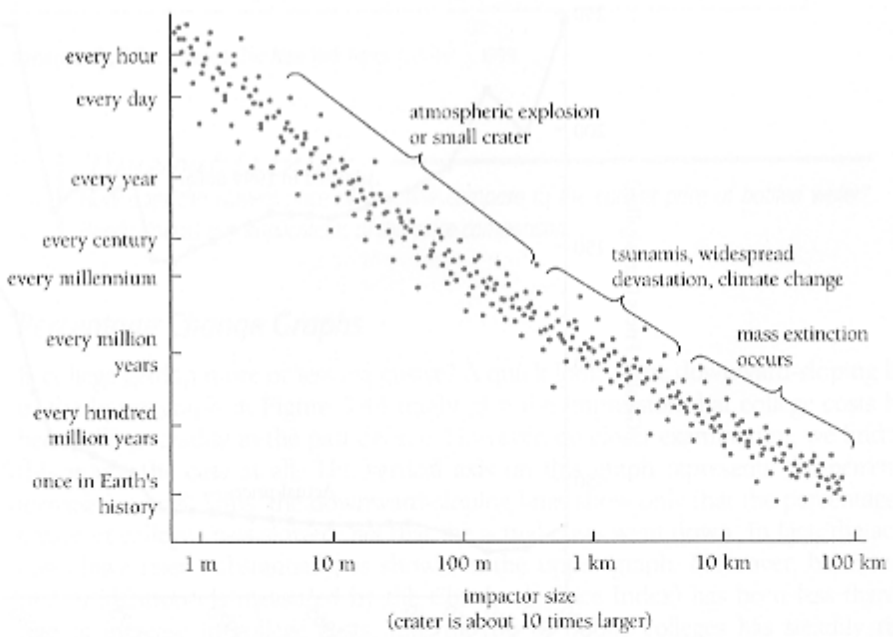

FIGURE 3.42. This graph shows how the frequency of impacts — and the magnitude of their effects — depends on the size of the impactor. Note that smaller impacts are much more frequent than larger ones.