The discovery of an iridium concentration at the Cretaceous/Tertiary boundary suggests that a large impact took place at that time (1). Assuming that this interpretation is correct, we might expect other large impacts to be recorded in the rock record by iridium anomalies. Although not all agree (2), most researchers now believe that tektites were produced by melting of terrestrial surface deposits by large impact events. Mierotektites found in deep-sea sediments have been used to determine the geographic extent and mass of the Australasian, Ivory Coast, and North American tektite strewnfields (3). These data indicate that the late Eocene North American tektite event was the largest. The North American strewnfield apparently extends at least halfway around the Earth and may contain at least $10^{13}$ kg of glass (3).

At the conference on Large Body Impacts and Terrestrial Evolution held in Snowbird, Utah, Oct. 19-22, 1981, Asaro et al. (4) reported finding an iridium concentration associated with the North American microtektite layer in a core from DSDP Site 149 in the Caribbean Sea. Unfortunately, the greatest number of microtektites and the highest iridium concentration were found at the top of the core and there is as much as fourteen meters missing between the top of the core and the bottom of the next higher core. Thus, there is a good chance that the major part of the layer was not recovered, and as a result the exact relationship between the iridium anomaly and the North American microtektite layer was not determined.

Ganapathy (5) reported an iridium anomaly "associated" with the North American microtektite layer in a piston core (RC9-58) which is also from the Caribbean Sea. However, Ganapathy (6) found the iridium anomaly to be approximately 30 cm below the peak in microtektite abundance. The iridium anomaly appeared to correlate with the occurrence of clinopyroxene-bearing glass spherules (cpx spherules) at the base of the microtektite layer. John and Glass (7) had previously described the cpx spherules and suggested that they were part of the North American microtektite layer which had settled deeper in the sediment due to their greater density. In order to determine whether the iridium anomaly correlates with the peak abundance of the cpx spherules, we counted the microtektites and cpx spherules in portions of the samples that were used by Ganapathy to determine the iridium concentrations. We found that the iridium concentration correlates directly with the concentration of cpx spherules.

The samples originally used to define the microtektite layer in core RC9-58 were taken at 10-20 cm intervals. Ganapathy's samples were at 2 cm intervals. The close sampling interval allowed us to define the microtektite layer better and to determine more precisely the relationship between the cpx spherules and the microtektite layer. To our surprise, we found that the cpx spherules did not occur at the bottom of the microtektite layer as previous data suggested, but instead they occur in a separate layer with the peak abundance occurring about 25 cm below the peak abundance of the microtektites. There is a zone, about 5 cm thick, between the two peaks where both the microtektites and cpx spherules are not very abundant. In contrast to previous studies, the cpx spherules were found to be as abundant or more abundant than the microtektites from the upper layer. We are studying the cpx spherules by neutron activation analysis to determine whether the iridium anomaly is associated with these spherules or some other particles in the cpx spherule layer.

Some transparent glassy spherules were found in the cpx spherule layer.
These spherules are similar in appearance to the microtektites in the upper layer and were originally counted as normal microtektites. This assumption was partly responsible for the previous suggestion that the cpx spherules were concentrated at the base of the microtektite layer. However, most of the transparent spherules from the cpx spherule layer were found to be microcrystalline and chemically distinct from the overlying microtektites. Ten transparent spherules from the cpx spherule layer and ten microtektites from the overlying microtektite layer were analyzed by energy dispersive x-ray analysis. Although the transparent spherules from the cpx spherule layer have SiO₂, FeO, Na₂O, and TiO₂ contents that overlap those of the normal microtektites from the upper layer, they have higher CaO and MgO and lower Al₂O₃ contents than the microtektites. The transparent spherules have CaO >8% (by weight), MgO >7%, and Al₂O₃ <9%; whereas the microtektites have CaO and MgO <4% and Al₂O₃ >11%.

Spherules similar in composition to both the normal microtektites and the Ca,Mg-rich transparent spherules from the cpx spherule layer in Core RC9-58 have been found at several DSDP Sites. At many of the sites, we have observed cpx spherules fused to transparent glassy spherules. At DSDP Site 216 in the Indian Ocean we found a small translucent white spherule attached to a large transparent colorless spherule. The small white spherule is similar in composition to the Ca,Mg-rich transparent spherules from the cpx spherule layer in Core RC9-58 and the large-transparent spherule is similar in composition to the normal microtektites from the upper layer in Core RC9-58. Since the two spherules are fused together, it suggests that they were both produced by the same event. Similar appearing fused pairs have been found in sediment from Core RC9-58. If cpx or Ca,Mg-rich spherules are found fused to microtektites with compositions indistinguishable from those found in the upper layer in RC9-58, then it would strongly suggest that all of the spherules from that core were produced by a single event and that the particles were physically separated into two layers as previously suggested (7). John and Glass (7) suggested that the separation was due to the greater density of the clinopyroxene-bearing spherules which caused them to settle deeper in the sediment. However, the cpx spherules are generally smaller than the normal microtektites and the chemical composition of some of the transparent spherules from the cpx spherule layer indicates that they have lower densities than some of the silica-poor normal microtektites from the upper layer. Thus, we know of no process which could have caused the particles to separate into two separate layers.

If the two layers do represents separate events, then it would be interesting to know the length of time between the two events. Unfortunately, the sediment accumulation rate is not known for the sediments in Core RC9-58. However, the accumulation rate is 2.7 m/m.y. for similar sediments of the same age at DSDP Site 149 approximately 170 km to the northeast. Using this accumulation rate, it appears that the two layers were deposited about 90,000 yrs. apart. We have begun a search to see if the two layers are present at other sites where the North American microtektite layer has been identified.