55 samples across the K/T sandstone complex in the Brazos River section was determined with a Fritsch A-22 laser particle-sizer. The samples were dissolved in HCl and oxidized with H_2O_2 to remove carbonate, organic material and some authigenic phases, such as pyrite. The remaining residue was treated in $Na_4(P_2O_7)$ to prevent coagulation of the clay particles. The laser diffraction patterns were translated to a grain-size distribution according to the Fraunhofer model (Hess and Gatzemeier, 1991). From a few key profiles the iridium content was determined by coincidence neutron activation methods (F. Asaro, personal communication, 1991; Mimbral and Brazos River).

THE K/T BOUNDARY SEQUENCE IN THE GULF OF MEXICO AREA

Although the details may differ locally, there appears to be a consistent depositional sequence in all outcrops of the K/T sandstone complex (Fig. 2). The K/T sandstone complex can be subdivided into four lithologic units. The lower three were defined earlier (Smit et al., 1992b) and can be recognized in most outcrops. However, in some outcrops (e.g., Brazos River) a fourth unit occurs on top of the sequence.

1. The basal Unit I consists of poorly sorted, coarse-grained sediments, usually pebbly sandstones, filling irregular scours and channels in the topmost Cretaceous formations. Unit I is principally characterized by and locally rich in a peculiar type of spherules. The most common forms are spherules and droplets with an internal bubbly texture, interpreted as altered impact ejecta. The various sublayers of Unit I are laminated and contain variable mixtures of spherules, small limestone clasts, rip-up clasts and boulders from underlying formations, planktic and benthic foraminifers, and—rarely—phosphatic and glauconitic debris. Size grading within Unit I is often not apparent. Lithic grains occur but are less abundant than in the overlying units. The most common texture is large-scale, channel-fill cross-bedding. Some larger channels display accretion-type lateral infilling. Burrowing has not been observed within the basal Unit I or extending from it at the bottom.

2. Unit II usually displays a stack of shallow lenses (or channels?) filling in shallow erosional depressions or blankets of fining-upward medium- to fine-grained sandstones, displaying a wide variety of sedimentary structures, such as parallel lamination associated with primary current-lineation, two- and three-dimensional—lunate and linguid—ripples, in-drift and in-phase climbing ripples of variable dimensions, and rare antidune-like ripple structures. In the case where Unit I is absent and Unit II is directly in contact with the underlying fine-grained sediments, flute- and groove-casts occur at the base. Current directions inferred from such sedimentary structures indicate variable—often 180° different—current directions in successive sublayers. The sandstones are highly variable in composition but usually form a mixture of foraminifers and lithic grains, with minor plant debris. Armored mudballs frequently occur at the base, with an armor of the above-mentioned bubbly spherules and lime clasts.

3. Unit III consists of thinning- and fining-upward, small-scale cross-bedded, fine sandstone layers alternating with thin layers of silt/mud draping over the sand layers.

In particular the thin silt layers contain anomalous iridium concentrations (Smit et al., 1992b) and Ni-rich spinels (Robin et al., 1994). The top ripple layers of Unit III are burrowed but mostly at the upper surface. The topmost rippled sandstone layer is often severely bioturbated. The ichnofabric of the trace fossils is usually tiered. Different types of burrows occur at different levels.

4. Unit IV overlies Unit III, sometimes gradually, sometimes more abruptly. In thin section the very base of Unit IV

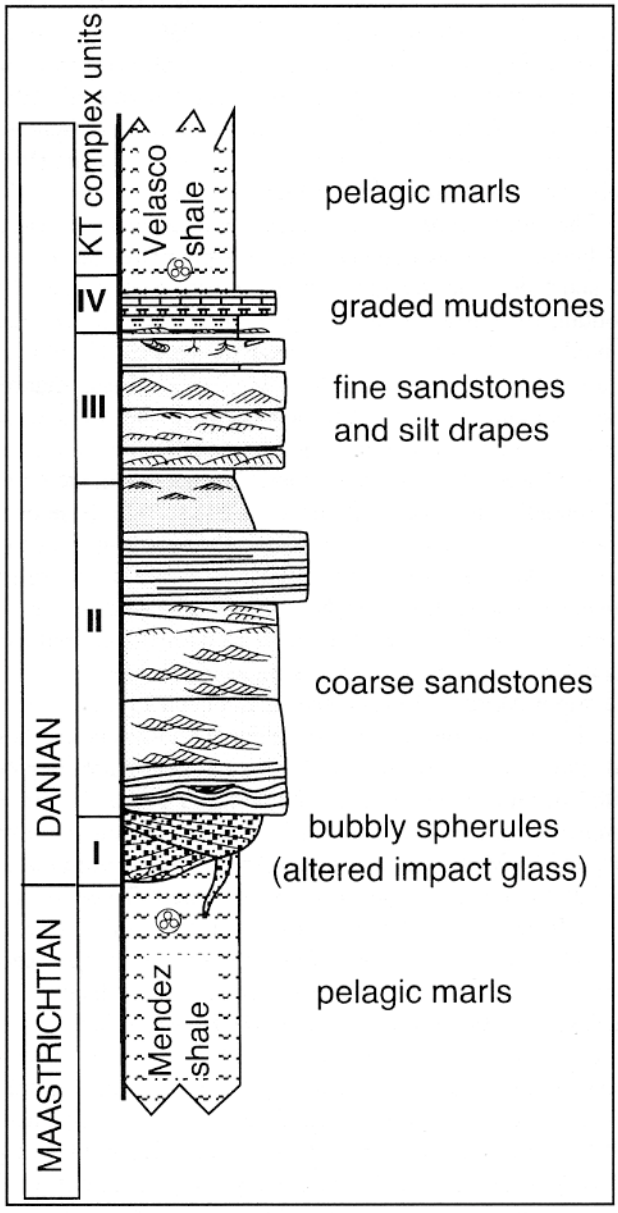

Figure 2. Lithologic column of the K/T sandstone complex (La Lajilla, northeastern Mexico), showing the main lithological subdivisions (Units I through IV), and the position of the K/T boundary.