still shows alternations of millimeters-thin fine sand and silt layers, passing upward into siltstones. The most conspicuous lithologic feature of Unit IV is a 5- to 10-cm-thick calcareous siltstone or mudstone layer (limestone unit F of Hansen et al., 1987), which can be traced over most K/T outcrops in northeastern Mexico and at Brazos River.

THE STRATIGRAPHIC POSITION OF THE K/T BOUNDARY IN THE GULF COAST AREA

The placement of the K/T boundary in the Brazos River sections in Texas and in sections in eastern Mexico containing the K/T sandstone complex is controversial, as mentioned in the introduction (Smit et al., 1994a; Stinnesbeck et al., 1994b). Some place the K/T boundary above the complex (Beeson et al., 1994; Jiang and Gartner, 1986; Keller et al., 1993, 1994b; Stinnesbeck et al., 1993, 1994b) and some at the base of the clastic beds (Bourgeois et al., 1988; Hansen et al., 1987; Montgomery et al., 1992; Olsson and Liu, 1993; Smit et al., 1992b; Smit and Romein, 1985). Formally, the Global Stratotype Section and Point (GSSP) of the K/T boundary is defined (Cowie et al., 1989) in the El Kef section in Tunisia. At El Kef the K/T boundary is defined at the base of the boundary clay, directly above marls with an abundant and diverse Cretaceous planktic flora and fauna. The boundary clay at El Kef includes at its base a few-millimeters-thick—often rusty—clay layer, anomalously enriched in iridium. The layer also contains crystalline spherules (altered microkrystites; Smit et al., 1992a), Ni-rich spinels, and shocked minerals and is regarded by many as a distal ejecta—or fallout—layer. In other words, the K/T boundary in its type section is defined directly below a thin layer with impact ejecta. Given the hypothesis that this layer is globally produced by one near-synchronous impact event, it would make most sense to chronostratigraphically place the K/T boundary at the beginning of the event that produced the ejecta layer. Consequently, *all* deposits with the ejecta from the K/T impact event are Paleocene in age.

When locating the K/T boundary in sections other than the type locality, one can choose among several tools to make the correlation to the K/T boundary stratotype section at El Kef. Biostratigraphically, the correlation can best be achieved by using the mass-extinction–mass-mortality horizon, although that level may often be blurred by reworking. Using the first appearance datum (FAD) of the new Paleocene planktic species such as *Globigerina minutula* (=*Globoconusa conusa* sensu [Keller, 1988]) is more ambiguous. At El Kef, the FAD of *G. minutula* is 23 cm, and the FAD of *Globigerina eugubina*—a widely used biomarker for the basal Paleocene—is about 25 cm above the K/T boundary at El Kef. According to work currently underway by H. Vonhof and J. Smit, this means that the FADs of these species are at least 5 k.y. above the K/T boundary in the Kef section, using the average sedimentation rate of 40 m/m.y. of the Upper Cretaceous and Paleocene at El Kef. Another way to locate the K/T boundary is by means of the worldwide dispersed ejecta, including iridium-rich dust, shocked minerals, and spherules produced by the presumed K/T impact event. The K/T boundary should be placed at the base of all these ejecta. We intend to demonstrate in this chapter that the sandstone complex at the K/T boundary postdates the planktic mass mortality and was deposited in one complex but coherent event and that the ejecta found in the base of the sandstone units (altered impact glass, shocked minerals) and at the top of the sandstone complex (iridium anomaly), although separated by a few meters, are easiest to explain as products of one and the same impact event. If this option is followed, the K/T boundary in the Gulf Coast outcrops should be placed at the base of the ejecta-bearing clastic deposits. When using a single tool such as the iridium anomaly, one could favor the K/T boundary being drawn just below the Ir anomaly, well above the base of the sandstone unit. However, the iridium anomaly in the Gulf Coast outcrops is dispersed and usually consists of multiple peaks. Because the Ir carrier is very fine grained (a particulate "carrier" for the iridium has yet to be found), it is not surprising that Ir settled more slowly through the atmosphere and water column than the coarse ejecta and that both occur in separate levels in the K/T sandstone unit. The mass-extinction horizon in the Gulf Coast outcrops, that is, the level where the abundance of Cretaceous planktic foraminifers drops by an order of magnitude, locates the K/T boundary again at the base of the clastic (ejecta) deposits: The last (hemi)pelagic sediments with abundant Cretaceous planktic faunas invariably occur below the K/T sandstone unit. The FAD of Paleocene foraminifers may be used as proxy for the K/T boundary as well. The FAD of Paleocene foraminifers in the Brazos River sections (Keller, 1989a; Beeson et al., 1994) is about 25 cm above the highest rippled sandstone layer. However, as said above, it should be kept in mind that the FAD of unequivocal Paleocene foraminifers is several thousands of years above the type K/T boundary in the Kef section and probably also in the Brazos River sections.

SECTIONS CONTAINING K/T SANDSTONE COMPLEX IN THE U.S. GULF COAST AND MEXICO

Moscow Landing, Alabama

The easternmost outcrop studied containing the K/T sandstone complex is at Moscow Landing, Alabama. The K/T sandstone complex occurs here as a series of discontinuous lenticular sandstone bodies, known as the Clayton basal sands of the Clayton Formation, overlying the fossiliferous upper Maastrichtian Prairie Bluff Chalk with an erosional contact. The Prairie Bluff Chalk is a gray sandy fossiliferous chalk, containing about 1 m below the K/T boundary a conspicuous phosphatic macrofossil lag bed, interpreted as a condensed section (Mancini et al., 1989). Bedding planes dip slightly to the south (2°), but as a result of repeated offsets by small normal faults, the K/T boundary remains exposed for more than 1 km along the east bank of the Tombigbee River.

The basal Clayton sands are usually interpreted in sequence stratigraphic terms (Habib et al., 1992; Mancini and Tew, 1993;