



Figure 3. Diagrammatic structural and topographic profile along axis of Wichita Mountains, emphasizing Permian unconformity and overlying units.

of the geologic development of the Wichita Uplift region, and table 1 is an abbreviated listing of the stratigraphic units. The figure shows five stages in the development, from the mid-Proterozoic to the Permian. Stage 1 includes the earlier generation and emplacement of granitoids, perhaps equivalent to the Eastern Arbuckle province (for example, Tishomingo Granite); uplift to strip away the cover rocks of which we have no obvious record; and then profound subsidence during which the Tillman Group accumulated to thicknesses of more than 10 km, with an apparent depositional axis somewhere south of the present mountains. These sediments appear to thin to the north, as Brewer discusses later.

Stage 2 encompasses three events wherein massive amounts of basaltic liquid rose into the upper crust. The oldest of these (as yet undated) is the intrusion of a large, layered, gabbroic lopolith whose characteristics are like the Stillwater and Bushveld and similar bodies (Powell and others, 1980). Whether other events preceded this one, to arrive at stage 2, is unclear. We do not know what the host rock was for this intrusion, although most have assumed that it was the Tillman, and the Meers Quartzite has been so interpreted as inclusions of the Tillman Group (Ham and others, 1964; Powell and others, 1980). Several alternative views are worth considering and will be discussed later. In any case, the drawing shows the Tillman as host. Brewer and others (1981) argued that the Pennsylvanian Burch Fault had an earlier (Proterozoic?) history, and it is shown as having been initiated during this stage with the intrusion of the lopolith. The minimum size of the body was estimated to be 65 km in length, and 4,000 km³ (Gilbert, 1982). The basalts defined by Ham and others (1964) as the Navajoe Mountain Basalt-Spilite Group were seen by them as the surface expression of the gabbroic intrusions (Raggedy Mountain Gabbro Group) (basaltic 1, 3). However, at that time, the two distinct components of the group were not recognized,

so the basaltic pulse to which the extrusives should be related is now unclear. They are shown as related to the Glen Mountains Layered Complex. Powell and Phelps (1977) and Powell and others (1980) emphasized that the phase chemistry of the exposed portions of the complex shows clearly that the analyzed minerals were not at the roof of the body but must have been down inside at some depth. Several kilometers of overlying gabbroic material and its host rock would need to be stripped away before the later rhyolitic extrusions occurred. In any case, before this uplift was fully accomplished, hydrous gabbros rose and intruded the complex, forming a series of plutons (the Roosevelt Gabbros—basaltic 3), themselves internally layered. All of these are biotite (and hornblende) bearing. Four have been recognized at the surface. The largest is the Mount Sheridan, at 8 km in diameter, and the most recently identified is the Mount Baker hornblende gabbro, noted briefly by Stockton and Giddens in this guidebook. Powell and others (1980) noted that biotite-bearing basement samples are common in the descriptions listed in Ham and others (1964), particularly toward the west. Consequently, these units may turn out to be as significant volumetrically as the Glen Mountains Layered Complex. Powell gives an updated description of these gabbros later in this guidebook. During stage 2, both up and down motions seem probable, resulting in net uplift and erosion into the gabbroic units. A significant part of this happened between 550 and 525 m.y. ago, based on the new work reported by Bowring and Hoppe.

Stage 3 begins with a profound erosional unconformity on the substrate gabbros. Ham and others (1964) first presented this argument primarily on the basis of relations determined by study of basement wells. Powell and others (1980) accepted and further amplified the reasoning, using phase chemistry. Some workers have disputed this interpretation, but mapping in the eastern Wichitas by Gilbert and by