would be compatible with a model of either partial melting (restites) or crystal fractionation.

If a partial-melt model were assumed, then the Fort Sill section would represent an early liquid, as argued on stratigraphic grounds earlier (see also Hanson, 1977). The phenocryst assemblage of quartz + alkali feldspar in the Fort Sill rhyolites is consistent with derivation on a high-pressure boundary curve, although it is not likely that the observed phenocrysts are left over from the melting. The rhyolites have no exotic inclusions that could be related to lower or middle crustal regimes. Only the less common plagioclase crystals may be a precursor material. The separation of the partial melt from its source appears to have been a high-temperature, mechanically clean, and rather complete event. This melt must have had a bulk composition of about 35 percent SiO_2 in Qtz–Ab–Or. After rising to near the surface, the melt must plot close to the lower pressure boundary curve to generate 40 percent quartz phenocrysts. Tie-line constraints would place the boundary curve on the feldspar side of the bulk-melt composition. A more quantitative model can be constructed when additional data are available on the phenocryst and groundmass feldspars.

The other three outcrop areas, in contrast, have phenocryst assemblages with little quartz. The boundary curve for these rocks must lie on the quartz side of their bulk isopleths. This implies different bulk compositions, or different depths (pressures) of phenocryst crystallization, or different water contents. Study of the granites shows several distinct chemical classes (Myers and Gilbert, 1980; Myers and others, 1981). Because of the presumed intimate chemical relation between granites and rhyolites, distinctions found in the granites should apply equally to the rhyolites. The differences are subtle, however, and many highly precise determinations are necessary to make the comparison. These are not yet available.

In summary, before turning to the granites, table 4 documents a real difference between the Fort Sill section of the Carlton Group and the other three areas. The most obvious of these are (1) phenocryst ratios, (2) normative quartz content, and (3) concentrations of the trace elements Sr, Ba, and Mn. Interestingly, the Mount Scott Granite, an early one, is much less siliceous than the Fort Sill section (normative qtz = 32) but very close in its Sr content of 91 ppm (table 3). Because the Sr content normally falls with increasing SiO_2, and does so in the Wichita granites, the Fort Sill rocks present something of an anomaly for the province. It may be that many of the quartz phenocrysts in this early section are xenocrysts picked up from a quartzitic sedimentary section.

Wichita Granite Group

Hoffman (1930), indirectly Merritt (1958), and Ham and others (1964) and Merritt (1967) provided the lithostratigraphic framework used with this group until recently. Powell and others (1980) accepted that framework in their overall revision of the igneous stratigraphy of the province. Myers and others (1981) provisionally modified the granite nomenclature, partly on the basis of new chemical data and partly on the basis of new mapping by Gilbert. These are incorporated into table 2, amplified in tables 5 and 6, and shown in figure 8. For this review, table 7 is helpful in noting the factors employed in the geological analysis of the granites. Each of these internal and external factors has possible ambiguity, so that the answer sought on primary aspects is not always clear-cut. Nevertheless, all these factors have been utilized individually or as groups. Much of the detailed work is still in progress; therefore, discussion will be limited.

Two factors not employed by earlier workers in the Wichitas are layering and fracture patterns. Layering, defined by alignment of the alkali feldspars, is subtle but surprisingly common where crystal shapes approximate rectangular parallelepipeds. This alignment reflects magmatic flow conditions during intrusion. Whereas many local variations are particularly noticeable near high-angle, intrusive contacts, some regularity prevails at the scale of 10^2–10^3 m. Overall, the layering is taken to be parallel to the margins of the granites, as the flow directions must have been. The granites appear to have been emplaced as subhorizontal sheets. Thus, the attitude of the layering today is a measure of the imposed structure.

The fractures so prominent in the granites can be classified according to age and origin into primary and secondary types (Gilbert, 1982). Primary fractures are Cambrian in age and reflect the physical conditions of emplacement. These primary fractures can be divided into two classes: (1) those subparallel to the layering, with generally shallow dips regionally, and (2) those resulting from contraction on solidification, a kind of cooling column analogous to that commonly seen in surface basalts but much more ill defined, with generally steep dips, and perpendicular to layering fractures. Secondary fractures are Pennsylvanian in age and tectonically induced, reflecting strain in the brittle sheet during uplift. These are high-angle to vertical, some kilometers in length, and dominate the topography. They are discussed with the structure.

Miarolitic cavities are distinctive features of certain exposures of the granites. They represent vapor-phase formation from saturation of volatile constituents in the melt. Presumably, this vapor was mostly H_2O (and CO_2?), and was released as the melt was emplaced at very shallow depths. Pressures are estimated to have been in the 10^1–10^2-bar range, on the basis of the stratigraphy, abundant quench textures, cooling-related fractures, and body shape. Consequently, although a late vapor phase did form, the H_2O content of the melt was probably less than 1 to 2 weight percent, a quite "dry" magma (Burnham and Jahns, 1962). The vapor phase forming the cavities was released during the crystallization of the groundmass but after flow had ceased, because the cavities