

quence of the group. Presumably, the section of Colbert porphyry in the Arbuckles likewise is high, because it also lies under the upper unconformity. On the other hand, the Fort Sill section is probably very low in the group, because the Mount Scott Granite, which has intruded along the lower unconformity on the gabbros and rests on gabbro on the north side of Mount Scott itself, *overlies* at least part of the rhyolite, as seen on the south side of Mount Scott. Abundant outcrops of Meers Quartzite also occur in the vicinity, and, as amplified below, this unit may have its stratigraphic "home" on this lower unconformity.

Much of this basal sequence generally has a more massive character in comparison with the Bally Mountain section. Hanson (1977) gave the most comprehensive recent discussion of the Carlton Group, reporting a considerable amount of reconnaissance geochemistry. However, problems exist in working with the chemical composition of extrusive rocks because much post-consolidation alteration is common in volcanics. Furthermore, the Carlton Group has been exposed to near-surface weathering and ground-water circulation three different times in its history (see table 1). Consequently, it may be more useful to explore the granite chemistries, which are assumed to be derived from equivalent liquids, as guides to ultimate sources of the liquids. In addition, Hanson's analyses appear to have variable precision, so that arguments based on small differences cannot be built on his data alone. Nevertheless, compilation of data from his thesis yields table 4, from which some interesting observations follow. The Fort Sill section is petrographically different from the other three in that quartz represents about 40 percent of the alkali-feldspar-quartz-phenocryst assemblage. The other sections are also quartz-saturated, but they have less than 10 percent quartz phenocrysts. The groundmass of most reported Carlton samples (all investigators) is between 80 and 90 percent, with most phenocryst percentages clustering around 9 to 15.

These data, taken together, imply that:

1. The bulk-rock system closely approaches the synthetic system $\text{SiO}_2\text{--NaAlSi}_3\text{O}_8\text{--KAlSi}_3\text{O}_8$, which can thus be used as an interpretive guide; the phenocrysts can be plotted as the crystal phases, and the groundmass (balance of rock) treated as quenched liquid.
2. The rhyolite magmas were near-liquidus and thus of high temperature, probably not less than $950^\circ\text{--}1,000^\circ\text{C}$.
3. Because quartz is the phenocrystic phase, rather than tridymite, which is the stable SiO_2 polymorph for the emplacement T and P , the crystallization of the phenocrysts occurred at some depth.

the defile through which the highway and creek pass, once known as Blue Creek Canyon, as Stumbling Bear Pass. Another source of confusion lies in the name of that portion of the Wichitas underlain by carbonate rocks. Geologists have generally referred to these as the Limestone Hills, whereas many local people have called them the Slick Hills. These names are used interchangeably in this guidebook.

Thus, the liquid was not generated near the surface (at low pressure), as might be expected in a meteoritic impact or melting of roof rock by a gabbro.

4. Provided that preferential mechanical segregation of quartz phenocrysts relative to alkali feldspar did not occur, the Fort Sill section was probably emplaced at *lower* temperatures than were the other three sections.
5. The bulk composition of the magma(s), and their source rock(s), lie on the feldspar side of the boundary curve in the system $\text{SiO}_2\text{--NaAlSi}_3\text{O}_8\text{--KAlSi}_3\text{O}_8$ (Qtz-Ab-Or).
6. On a worldwide basis, Carlton rhyolites compare most closely with rhyolites from bimodal mafic-silicic associations, as in southern Queensland (Ewart, 1979). Only such rhyolites have alkali feldspar phenocrysts dominating over plagioclase, and with plagioclase low to absent.

If the composition of alkali feldspar phenocrysts were determined, model three-phase triangles in Qtz-Ab-Or could be constructed. None being available as yet, the normative ab-or values can be used as an estimate. Hanson's data (1977) generally show $ab/(ab + or)$ or $(ab + an)/(ab + an + or)$ in the range of 50 to 60 percent, with the exception of the Blue Creek Canyon section. Data from a few individual analyses in Ham and others (1964), and some others generated by Gilbert and Myers (unpublished, 1981), also show this range. Burwell (1956) reported six feldspar analyses from Wichita granites (which should be similar) that yield similar values. This establishes the most Or-rich composition possible for the feldspar portion of the quartz-alkali feldspar tie-line, and the trailing edge of the three-phase triangle, L (liquid)-Qtz-F (alkali feldspar). This line falls on the Ab-Qtz side of the minimum in the higher pressure, dry system. If the system were H_2O -saturated, this line would be on the Or-Qtz side. However, there is no evidence for a wet original condition, but only that the magma became H_2O -saturated during emplacement at very low pressure, necessitating a very low water fugacity and low absolute water content (probably less than 1 to 2 weight percent H_2O). Thus, the L position on the boundary curve must be to the right of this Qtz-F line, and the triangle faces (points) toward Qtz-Or. This means that the source of the magma was probably ultimately plagioclase-saturated. We cannot specifically exclude a composition that was very quartz-poor and K-spar-saturated, because the exact position of the boundary curve, its minimum, and the thermal trough in the feldspar liquidus-phase field are all unknown at elevated pressure in the H_2O -free system. The range of bulk compositions that would permit this phase behavior on extreme fractional crystallization is limited and therefore not considered further at this time.

Plagioclase is rare as a primary phase in the rhyolites. The question arises as to whether such plagioclases are xenocrysts, restites, or parts of a fractional crystallization process. No definitive answer is possible as yet, but the discussion above