STOP 3—HALE SPRING LOCALITY

Relationships among Sandy Creek Gabbro, Mount Scott Granite, pegmatites of Quanah Granite, and Meers Quartzite. Secs. 3–5, 8–10, T. 3 N., R. 15 W., Comanche County, Oklahoma. **B. N. Powell, M. L. Stockton, J. D. Giddens III**, and **M. C. Gilbert**.

Introduction

Suggested parking locations are marked as P on accompanying maps (figs. 106A, 106B). Do not block ranch gates.

Access to the privately owned portions of this area is controlled by John Phelan (W½ sec. 4, E½ and SW¼ sec. 9, all of sec. 8, SE¼ sec. 5) and Jim Snell (E½ sec. 4, NW¼ sec. 9). The wildlife refuge north of State Highway 49 (sec. 3 and northern portion of sec. 10) is a special-use area, not accessible to the public. The area is regularly patrolled, and trespassers are fined. Access is by permit from the refuge manager, and generally permission is granted only for research purposes. This stop has a wealth of fascinating and key geologic features. The substrate in the immediate area is the Sandy Creek Gabbro Member of the Roosevelt Gabbros (figs. 106A, 106B, 107). Figure 108 is a photograph taken in June 1978, looking eastward across the gabbro body toward the pronounced outcrop "V" which is defined by erosion into the overlying Mount Scott Granite. The subhorizontal nature of the contact is clear. One of the type areas that Merritt (1965) used to define the Mount Scott Granite is the Ira Smith Quarry, just south of the photograph and along State Highway 49. This quarry was figured in earlier guidebooks (Stone, 1967; Powell and Fischer, 1976). However, the gabbro–granite contact, and local character of the Mount Scott, also are items of special interest here. The Hale Spring pegmatites (Johnson, 1955) are a series of pegmatoid dikes or veins cutting the Sandy Creek Gabbro and the Mount Scott Granite. Because these dikes are so similar to numerous others throughout the Quanah Granite terrane of the eastern Wichitas, they are assumed to be late emanations from a subjacent lobe of Quanah and are so shown on the cross section (fig. 107). Scofield and Gilbert (this guidebook) discuss the mineralogy of the dikes. Stockton and Giddens (this guidebook) report two new occurrences of Meers Quartzite in the area, one underlain by the Sandy Creek and one by the Mount Scott. Gilbert, and Sides and Miller (this guidebook), discuss occurrences of Meers and revisions in previous interpretations.

This stop reports on the most detailed mapping and work now available for the area. The only previous work was that of Chase (1950), whose study was more regional, and Johnson (1955), who studied the pegmatites. Alipouraghtapeh (1979) did a reconnaissance geochemical survey of part of the Raggedy Mountain Gabbro Group. The data he reported for the Sandy Creek Gabbro are given in table 27, approximately keyed to the outcrop numbers used on our map. The more detailed data generated by Powell, and reported shortly, can be used more effectively for petrogenetic interpretations. Al-Shaieb (1978) also reported new data on U and Th concentrations and their distributions in mineral phases of the Hale Spring pegmatites and Quanah Granite.

Sandy Creek Gabbro

The Sandy Creek Gabbro Member of the Roosevelt Gabbros (table 2) occurs in sec. 4 and the N½ secs. 3 and 9, T. 3 N., R. 15 W., Comanche County (see figs. 106, 119, 120). The gabbro is exposed over approximately 5 km^2. It weathers to a dark-reddish-black, very hard and dense rock, commonly with a scalloped, rough surface (fig. 109).

Although the lower boundary is not exposed, the upper limit is defined by the Mount Scott Granite, which nonconformably overlies the gabbro, forming the higher elevations on three sides of the gabbro exposure.

The contact between older gabbro and younger granite can be closely located in the SE¼NE¼NW¼ sec. 9, T. 3 N., R. 15 W. Here, the gabbro is olivine-rich, and the granite is Mount Scott. In the SW¼NE¼ sec. 3, T. 3 N., R. 15 W., the approximate contact lies between quartz–alkali feldspar–bearing gabbro and younger granite, here containing aegerine. Dips of laminated olivine gabbro in the SE¼NE¼NW¼ sec. 9, T. 3 N., R. 15 W., are approximately 20°–30° to the east-southeast (fig. 110). Assuming that the layering originally was broadly horizontal, the quartz-bearing gabbro in sec. 3 must be upsection, which is consistent with differentiation of a tholeiitic gabbro by gravitational crystal fractionation. An important implication of this interpretation is that the gabbro body must have been structurally tilted prior to granite emplacement, offering indirect evidence for a considerable time lag between the gabbroic and granitic intrusions.

The Sandy Creek Gabbro on average is a medium-grained rock with hypautomorphic-granular texture. Plagioclase is generally the most abundant phase and commonly forms euhedral laths 1 to 5 mm long. Olivine is abundant in some samples, forming rounded and embayed grains that are commonly rimmed by orthopyroxene (fig. 111). Augite typically surrounds plagioclase and olivine, forming subophitic to ophitic texture (fig. 112). Some olivine-bearing samples exhibit lamination formed by plagioclase (fig. 113). Pinkish-brown amphibole and red-brown mica—primary magmatic phases—are ubiquitous and interstitial (fig. 114). The former is typically titanian magnesio-hastingsitic hornblende in olivine-bearing rocks; the latter is phlogopite (4–5 weight percent TiO_2) in olivine gabbro, and titaniferous biotite (5.5–6.5 weight percent TiO_2) in quartz-bearing gabbro. (See tables 25 and 28.) Representative pyroxene compositions are listed in table 29 and plotted in figure 115. The relatively Fe-rich, low-Ca pyroxenes plotted in figure 115 occur in fractionated quartz-gabbro and are primary hypersthene, not inverted pigeonite. In typical differentiated gabbroic intrusions, the primary (liquidus) low-Ca pyroxene