

REINTERPRETATION OF METAMORPHIC ROCKS ALONG CARLTON RHYOLITE-MOUNT SCOTT GRANITE CONTACT WICHITA MOUNTAINS

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INTRODUCTION

Basement rocks of Oklahoma crop out in two major geologic terranes, the Wichita Mountain Uplift in the southwest and the Arbuckle Mountain Uplift in the south. These uplifts are flanked by deep Paleozoic basins that include the Anadarko, Hardeman-Hollis, Arkoma, Marietta, and Ardmore Basins (fig. 1). This structural system developed in late Proterozoic or Early Cambrian time as a rift system, called the Southern Oklahoma Geosyncline (Ham and others, 1964). Hoffman and others (1974) named it the Southern Oklahoma Aulacogen and considered it to be the type aulacogen in the United States. Burke and Dewey (1973) described the aulacogen as the failed arm of the Dallas triple junction. The aulacogen received sediments throughout most of the Paleozoic; however, Pennsylvanian deformation uplifted parts of it and left the deep basins as remnants (Ham and others, 1964). The disrupted aulacogen is marked by strong gravity, magnetic, and seismic anomalies, which are unique to North America.

Basement rocks of southern Oklahoma are divided into two provinces, the Wichita province, associated with the Wichita Mountain Uplift, and the Eastern Arbuckle province, associated with the Arbuckle Mountain Uplift (Ham and others, 1964).

The Wichita province consists mostly of Cambrian igneous and metamorphic rocks that occur over an area of at least 35,000 km² in Oklahoma and Texas. The province includes the most voluminous occurrence of Cambrian igneous rocks known in North America. The province consists of five major groups: Carlton Rhyolite Group, Wichita Granite Group, Raggedy Mountain Gabbro Group, Navajoe Mountain Basalt-Spilitic Group, and Tillman Metasedimentary Group. Most of these units are described elsewhere in this guidebook and are not emphasized here. However, two of the units are of special significance for this paper and are described briefly below.

Carlton Rhyolite Group

The Carlton Rhyolite Group is a thick sequence of pyroclastic rocks, lavas, and agglomerates of rhyolitic composition. The unit crops out over an area of about 39 km² in the Bally Mountain, Blue Creek, and Fort Sill areas. Subsurface data indicate that it underlies at least 18,100 km² and possibly 44,000 km² of southern Oklahoma, and has a drilled thickness of 1.37 km (Ham and others, 1964). The enormous volume of the unit ranks it as one of the major volcan-

ic units of North America. The Carlton Rhyolite has been studied in outcrop by Hoffman (1930), Schoonover (1948), and Ham and others (1964), who described a measured section of 1.1 km in the Bally Mountain area. The unit is correlated with the Colbert Porphyry, which crops out in the Arbuckle Mountains (Ham and others, 1964). The unit is mostly porphyritic with phenocrysts of perthite, quartz, and minor plagioclase in a quartzofeldspathic matrix (table 12). Flow-banding, spherulites, perlitic cracks, banding in water-laid tuffs, and glass shards in pyroclastic units are common (Ham and others, 1964; Powell and others, 1980). Chemically, Carlton rhyolite is highly silicic and subalkaline, and is chemically indistinguishable from rocks of the Wichita Granite Group (Adams, 1977; Hanson, 1977). Carlton rhyolite was generally intruded by the Wichita granites; however, some rhyolite dikes cut the granites, and the two units are considered to be nearly contemporaneous (Ham and others, 1964; Hanson, 1977; Powell and others, 1980). Three whole-rock Rb/Sr determinations and one zircon U/Pb determination suggest an age for the unit of 525 ± 25 m.y. The Carlton Rhyolite is considered one of the youngest major igneous units in the Wichita province because it overlies all other major igneous units.

Tillman Metasedimentary Group

The Tillman Metasedimentary Group is composed of generally low-grade metamorphosed graywackes, shales, siltstones, sandstones, arkoses, and bedded cherts. Locally, the unit consists of mica schists and hornfels (table 13). The unit is known only in the subsurface of Tillman, Jackson, and Cotton Counties of southern Oklahoma, and occurs over an area of about 3,460 km² (Ham and others, 1964). Correlative rocks probably occur in the subsurface of Wichita, Archer, and Clay Counties of Texas (Ham and others, 1964), in the Red River Mobile Belt of Flawn (1956). Ham and others (1964) concluded that the metasediments are flanked by, and presumably overlie, older granitic and high-grade metamorphic rocks of the Eastern Arbuckle province. They concluded that the unit is older than the Raggedy Mountain Gabbro Group, because large inclusions of Meers Quartzite (table 13) occur in the gabbros. The Meers Quartzite consists of recrystallized sandstone that contains variable amounts of microcline, sillimanite, epidote, chlorite, and biotite, and may correlate with the Tillman Metasedimentary Group. The rock is known only as inclusions within the Raggedy Mountain