TABLE 15.—AVERAGE BULK COMPOSITIONS OF BIOTITE GABBROS (ROOSEVELT GABBROS) INTRUSIVE INTO GLEN MOUNTAINS LAYERED COMPLEX, WICHITA PROVINCE, OKLAHOMA

	1	2	3	4	5	6	Analytical Uncertainty*
SiO_2	47.5	46.7	47.6	46.3	50.0	45.8	0.24
TiO_2	1.39	2.95	2.49	3.42	2.66	5.06	0.10
Al_2O_3	16.1	12.9	18.3	14.1	15.9	12.5	0.16
FeO†	9.81	13.9	8.81	11.9	12.6	15.6	0.06
MnO	0.16	0.27	0.16	0.18	0.21	0.25	0.01
MgO	11.9	10.6	6.23	7.75	5.79	6.65	0.07
CaO	10.5	8.97	11.7	13.3	8.24	10.3	0.06
Na_2O	1.82	1.81	2.40	1.59	2.44	1.87	0.09
K_2O	0.25	0.62	0.23	0.13	0.59	0.35	0.01
P_2O_5	0.17	0.37	0.16	0.09	0.27	0.23	0.01
Total	99.60	99.09	98.08	98.76	98.70	98.61	
Atomic Fe/(Fe+Mg)	0.317	0.425	0.443	0.463	0.550	0.567	
Normative mol % An	66.3	56.1	62.8	67.4	54.8	56.7	

*Average estimated analytical uncertainty in absolute % of oxide; does not include sampling error.
†Total Fe expressed as FeO.
Samples:
1. Sandy Creek Gabbro, NE¼NW¼ sec.9, T.3N., R.15W., Comanche County County (WM-152).
2. Biotite-olivine gabbro dike, on boundary between sec.33, T5N.,R.17W. and sec.4, T.4N.,R.17W., Kiowa County (WM-154).
3. Glen Creek Gabbro, N½SE¼ sec.14,T.4N.,R.17W., Kiowa County (WM-266).
4. Glen Creek Gabbro, adjacent to olivine-magnetite-ilmenite segregation, NE¼SW¼ sec.14, T.4N.,R.17W., Kiowa County (MP-22).
5. Mount Sheridan Gabbro (olivine-bearing), NE¼SE¼ sec.5,T.3N., R.13W., Comanche County (T-49).
6. Mount Sheridan Gabbro at contact with Glen Mountains Layered Complex, NE¼SW¼ sec.32,T.4N.,R.13W., Comanche County (WM-117).

ites invariably crosscut and are considerably younger than the basic rocks, which are commonly (though not always) hydrothermally altered near the contacts. These and other observations germane to this question were discussed by Ham and others (1964), Powell and Fischer (1976), and Powell and others (1980). The Sandy Creek Gabbro, described in some detail later in this guidebook, provides some evidence supporting the interpretation of a considerable time hiatus between its crystallization and crystallization of the Wichita Granite Group.

RELATIVE AGES

Relative ages of the Roosevelt Gabbros are generally well established through intrusive relations in the Wichita province: younger than the Meers Quartzite and the Glen Mountains Layered Complex, and older than the Otter Creek Microdiorite, Cold Springs Breccia, Wichita Granite Group, and Carlton Rhyolite Group. (See table 2 and fig. 6.) The relationship of the Roosevelt Gabbros to the Navajoe Mountain Basalt–Spilite Group remains unclear, owing to the restriction of the latter to subsurface occurrences. Although it is perhaps logical to assume that the Navajoe Mountain basalt is the volcanic equivalent of either the Roosevelt Gabbros or the Glen Mountains Layered Complex (as did Ham and others, 1964), one should remember that the evidence is meager at best, model-dependent, and purely circumstantial. For one thing, the Navajoe Mountain basalt lacks olivine and orthopyroxene, both of which are typically present in the Raggedy Mountain Gabbro Group as a whole. A definitive study of the Navajoe Mountain Basalt–Spilite Group would make a significant contribution to Wichita geology.

ABSOLUTE AGES

In contrast with the well-established *relative* ages of the principal rocks of the Wichita province, the picture with regard to *absolute* ages remains incomplete and in places equivocal. Ham and others (1964) summarized the available data, firmly establishing the age of the Wichita Granite Group and the Carlton Rhyolite Group as 525 ± 25 m.y. [All ages given in this guidebook are corrected for the modern IUGS-recommended decay and abundance constants, after Steiger and Jager (1977) and Dalrymple (1979).] Previous radiogenic age determinations on the basic rocks of the Raggedy Mountain Gabbro Group, including the Roosevelt Gabbros, are much more limited in number and are subject to interpretation.