THE SPARTA OPHIOLITE COMPLEX, NORTHEAST OREGON: A PLUTONIC EQUIVALENT TO LOW K₂O ISLAND-ARC VOLCANISM

DAVID PHELPS* and HANS G. AVÉ LALLEMENT**

ABSTRACT. The Triassic Sparta ophiolite complex in northeastern Oregon consists of serpentinite, layered clinopyroxenite and gabbro, quartz diorite, and trondhjemite. The complex is overlain by spilitic and keratophyric flows and associated sedimentary rocks of the Middle to Upper Triassic Clover Creek Greenstone. Although the stratigraphy of the Sparta complex is similar to that of many ophiolites, the regional geologic setting and the geochemistry of the Sparta complex suggest that it may have formed in an island arc as opposed to a mid-ocean spreading center. The flat REE profiles and the low K₂O content are consistent with the model that the Sparta complex represents the plutonic equivalent of low K₂O island-arc volcanism. The chemistry of plagiogranite from the Sparta complex as well as plagiogranites from several other island-arc complexes approaches that of oceanic plagiogranite. In order to avoid confusion, we suggest that the modifier “oceanic” should be dropped from the term “oceanic plagiogranite.”

INTRODUCTION

The problem of the tectonic setting of formation of ophiolite complexes has received considerable attention in recent literature. The most popular view is that ophiolites represent fragments of oceanic crust emplaced on continental margins (Thayer, 1969; Coleman, 1971; Coleman and Peterman, 1975; Hynes, 1975). However, Ewart and Bryan (1972) suggested that ophiolites may form in young volcanic island arcs, as based on close resemblance of the overall chemistry and mineralogy of early phases of the Tongan island arc to those of ophiolites. Miyashiro (1973) proposed an island-arc origin for the Troodos ophiolite. More recently, Menzies and Blanchard (1977) and Menzies, Blanchard, and Xenophontos (1980) suggested that the Smartville ophiolite, California, formed on the flanks of an island arc, and Avé Lallemand (1976) proposed that the Canyon Mountain ophiolite of northeastern Oregon formed in an island arc or an actively spreading marginal basin.

In this paper, we present the results of a study of a Triassic dismembered ophiolitic complex near Sparta, northeastern Oregon. Major- and trace-element chemistry of plagiogranite and geologic setting of the Sparta complex indicate that it may have formed in an island-arc environment as the plutonic equivalent of low K₂O island-arc volcanism.

GEOLGY OF THE SPARTA COMPLEX

Dickinson and Thayer (1978) and Brooks and Vallier (1978) divided the pre-Jurassic rocks of the Blue Mountain region of northeastern Oregon into three approximately east-west trending zones: (A) the “Northern” or “Wallowa-Seven Devils Mountains” volcanic arc terrane, (B) the “Central Melange” or “Dismembered Oceanic Crust” terrane, and (C) the southern “Juniper Mountain-Cuddy Mountain” volcanic arc terrane (fig. 1). Although all three terranes are believed to have formed in the Permian and Triassic, the first two terranes are thought to be

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exotic (Jones, Silberling, and Hillhouse, 1978; Davis, Monger, and Burchfiel, 1978).

The Sparta complex is a dismembered ophiolitic fragment of the “Central Melange” terrane, but the overlying meta-volcanic and meta-sedimentary rocks invariably are placed in the “Northern” volcanic arc terrane. From south to north the Sparta complex consists of serpentinite, layered clinopyroxenite and gabbro, hornblende quartz diorite, and trondhjemite (fig. 2). To the south the serpentinite is in fault contact with the multiply deformed upper Paleozoic Elkhorn Ridge Argillite (Prostka and Bateman, 1962). Locally, the serpentinite is gradational into partially serpentinized clinopyroxenite. The relationship between the gabbro and clinopyroxenite is difficult to evaluate due to poor exposure. However, the clinopyroxenite appears to be interlayered with the gabbro (Phelps, 1979). Contacts between the gabbro and quartz diorite and between the quartz diorite and trondhjemite are ambiguous, appearing gradational at some locations and intrusive at others. Dikes of gabbro, diorite, and quartz keratophyre are found intruding the gabbro, quartz diorite, and trondhjemite. Although the dikes often occur in swarms, no sheeted dike complexes were found.

The trondhjemite is overlain by flows and shallow intrusions of keratophyre, quartz keratophyre, spilite, and meta-andesite of the Clover

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Fig. 1. Generalized map of eastern Oregon and western Idaho showing major tectonic divisions: (A) “Northern” or “Wallowa-Seven Devils” volcanic arc terrane, (B) “Central Melange” or “Dismembered Oceanic Crust” terrane, and (C) “Juniper Mountain-Cuddy Mountain” volcanic arc terrane (after Brooks and Vallier, 1978).
Creek Greenstone (Prostka and Bateman, 1962). Interbedded within the volcanic rocks of the Clover Creek Greenstone are thick sequences of volcanic breccias, conglomerates and sandstones, and rare lenses of limestone (Prostka and Bateman, 1962). Conformably overlying the Clover Creek Greenstone is the shallow water Martin Bridge Limestone (Prostka and Bateman, 1962). The contact between the Clover Creek Greenstone and the Sparta trondhjemite is not exposed, and thus it is unclear whether the contact is faulted, intrusive, or depositional. Prostka and Bateman (1962) interpreted the contact to be depositional, with the Clover Creek Greenstone resting on the eroded surface of the Sparta complex. They based their interpretation on the occurrence in the basal sections of the Clover Creek Greenstone of quartz diorite clasts which they felt were derived from the underlying Sparta complex. However, more recent studies suggest that the Clover Creek Greenstone and the Sparta trondhjemite might be closer in age than suggested by Prostka and Bateman (1962). Vallier (1977) has shown that the quartz diorite clasts could have been derived from older, Permian quartz diorite intru-

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**Fig. 2.** Geologic map of the Sparta intrusive complex, eastern Oregon (after Phelps, 1979).
sions. In an area west of the Sparta Quadrangle, Brooks and others (1977) have mapped plagiogranite bodies intruding the Clover Creek Greenstone, and Brooks and Vallier (1978) report thermal alteration of the Clover Creek Greenstone near the Sparta trondhjemite. On the basis of whole-rock major-element chemistry, Almy (ms) has suggested that the keratophyre and quartz keratophyre of the Clover Creek Greenstone and the Sparta trondhjemite may be cogenetic.

**Geochemistry of the Sparta complex.**—Major-element variation diagrams for the common rock types found in the Sparta complex are presented in figure 3 and representative analyses are given in table 1. Elemental concentrations of the rare-earth elements (REE) are presented in table 2, and chondrite-normalized REE profiles are shown in figure 4A to G. The Sparta trondhjemite was previously interpreted as having been formed by Na-metasomatism of nearby quartz diorite (Gilluly, 1933), but recent studies have shown the trondhjemite to be of magmatic origin (Phelps, 1979). The field relations and the trace- and major-element characteristics of the trondhjemite and quartz diorite suggest a genetic relationship, but it is not possible to determine if the two rock

![Diagram](image.png)

Fig. 3. Major-element SiO₂ variation diagram for rocks from the Sparta complex. □ = quartz diorite, ○ = tonalite and trondhjemite, ◊ = gabbro, Δ = high K₂O trondhjemite, ◇ and ▼ = low K₂O dike, □ = diorite dike cutting trondhjemite and quartz diorite. Shown for comparison are a trondhjemite and quartz diorite from the Canyon Mountain ophiolite (●) (Thayer and Himmelberg, 1968), trondhjemite from the Troodos complex (■) (Coleman and Peterman, 1975), Mule Mountain trondhjemite (▲) (Barker, Millard, and Knight, 1979), and Rio Brazos trondhjemite (●) (Barker and others, 1976) (after Phelps, 1979).
types are related through magmatic differentiation or if they are the products of two partial melts of the same source region (Phelps, 1979). The genetic relationship of the gabbro to the quartz diorite is likewise ambiguous, and the available data are insufficient to distinguish between a multistage melting model and magmatic differentiation.

The possibility exists that the Sparta diorite and trondhjemite represent a later, separate magmatic event and that they are genetically unrelated to the gabbro. However, the geochemical evidence suggesting a genetic relationship and the widespread association of peridotite, gabbro, diorite, and trondhjemite in many west coast ophiolites in the U.S. (Coleman and Peierm, 1975; Avé Lallemant, 1976; Brown, 1977; Hopson and Frano, 1977; Menzies, Blanchard, and Xenophontos, 1980) suggests that this association is not coincidental. Menzies, Blanchard, and Xenophontos (1980) have shown that the gabbro, diorite, and trondhjemite of the Smartville ophiolite are genetically related.

The Sparta complex has been intruded by dikes and stocks of gabbro, quartz diorite, and high K₂O pegmatite. These intrusive rocks all exhibit light-REE enriched profiles (fig. 4B, E, and F) in contrast to the flat or light-depleted REE profiles of the main gabbro–quartz diorite–trondhjemite series.

⁴⁰Ar/³⁹Ar age determinations on one of the intrusive quartz diorites show a well defined plateau age of 218 mybp, the same age as the main gabbro–quartz diorite–trondhjemite series (Phelps, ms; Avé Lallemant and others, unpub. data).

### Table 1

Representative whole-rock major-element analyses of Sparta samples

<table>
<thead>
<tr>
<th>Oxide</th>
<th>Coarse-grained trondhjemite 2014</th>
<th>High K₂O trondhjemite 200A</th>
<th>Intrusive quartz diorite 206</th>
<th>Mafic dike 195</th>
<th>Gabbro 287⁰</th>
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<tbody>
<tr>
<td>SiO₂</td>
<td>72.93</td>
<td>72.07</td>
<td>51.76</td>
<td>65.65</td>
<td>53.14</td>
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<tr>
<td>TiO₂</td>
<td>0.39</td>
<td>0.43</td>
<td>0.24</td>
<td>0.96</td>
<td>0.62</td>
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<tr>
<td>Al₂O₃</td>
<td>13.40</td>
<td>13.22</td>
<td>11.89</td>
<td>17.77</td>
<td>14.46</td>
</tr>
<tr>
<td>FeO</td>
<td>3.06</td>
<td>2.90</td>
<td>1.61</td>
<td>9.03</td>
<td>5.79</td>
</tr>
<tr>
<td>MnO</td>
<td>0.13</td>
<td>0.09</td>
<td>0.04</td>
<td>0.22</td>
<td>0.12</td>
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<tr>
<td>MgO</td>
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<td>0.54</td>
<td>0.04</td>
<td>4.24</td>
<td>1.91</td>
</tr>
<tr>
<td>CaO</td>
<td>3.28</td>
<td>3.16</td>
<td>1.36</td>
<td>8.94</td>
<td>5.76</td>
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<tr>
<td>Na₂O</td>
<td>3.83</td>
<td>3.68</td>
<td>4.44</td>
<td>3.20</td>
<td>2.98</td>
</tr>
<tr>
<td>K₂O</td>
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<td>1.65</td>
<td>1.25</td>
<td>0.53</td>
</tr>
<tr>
<td>P₂O₅</td>
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<td>0.06</td>
<td>0.01</td>
<td>0.16</td>
<td>0.10</td>
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<tr>
<td>Cr₂O₃</td>
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<td>N.D.</td>
<td>N.D.</td>
<td>0.58</td>
<td>0.05</td>
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<tr>
<td>H₂O</td>
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<td>1.22</td>
<td>0.36</td>
<td>1.57</td>
<td>1.21</td>
</tr>
<tr>
<td>Total</td>
<td>103.03</td>
<td>99.29</td>
<td>99.27</td>
<td>99.66</td>
<td>99.18</td>
</tr>
</tbody>
</table>

All analyses by X-ray fluorescence unless otherwise noted (N.D. = not detected).
* Total Fe as FeO.
* Determined by INAA.
* Total H₂O.
* All elements (except those indicated) determined by electron microprobe analysis of fused glass beads; D. Gust, analyst.
ISLAND-ARC VERSUS MID-OCEAN ORIGIN FOR THE SPARTA COMPLEX

The stratigraphic succession and field relationships exhibited by the Sparta complex are similar to those of the plutonic members of many ophiolites. Vallier, Brooks, and Thayer (1977) and Brooks and Vallier (1978) informally refer to the Sparta complex as the Sparta ophiolite and propose that the complex represents a fragment of Triassic oceanic crust. Their classification of the Sparta complex as oceanic crust is based entirely on field relationships and the regional geologic setting. However, our investigations of the geochemistry of the Sparta complex and the regional geology of eastern Oregon provide evidence suggesting that the Sparta complex may not be a fragment of oceanic crust generated at a mid-ocean spreading center.

Table 2

Trace element composition of selected samples from the Sparta complex. Analyses are by instrumental neutron activation analysis (all values in ppm, N.D. = not detected)

<table>
<thead>
<tr>
<th>Element</th>
<th>Quartz diorites</th>
<th>Ionalite</th>
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<tr>
<td>Sp119</td>
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<td>Sp206</td>
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<tr>
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<tr>
<td>Ce</td>
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<td>Sm</td>
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<tr>
<td>Eu</td>
<td>0.96</td>
<td>1.02</td>
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<tr>
<td>Tb</td>
<td>0.72</td>
<td>0.85</td>
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<td>Yb</td>
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<tr>
<td>Lu</td>
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<td>0.42</td>
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<tr>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
<tr>
<td>Co</td>
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<td>26.30</td>
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<tr>
<td>Sc</td>
<td>25.93</td>
<td>24.92</td>
</tr>
<tr>
<td>Tb</td>
<td>2.07</td>
<td>0.43</td>
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</table>

<table>
<thead>
<tr>
<th>Coarse-grained trondhjemites</th>
<th>High K2O fine-grained trondhjemites</th>
<th>High K2O dike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sp193</td>
<td>Sp196</td>
<td>Sp201A</td>
</tr>
<tr>
<td>La</td>
<td>6.66</td>
<td>5.61</td>
</tr>
<tr>
<td>Ce</td>
<td>17.81</td>
<td>14.11</td>
</tr>
<tr>
<td>Sm</td>
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<tr>
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<td>Tb</td>
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<tr>
<td>Yb</td>
<td>4.05</td>
<td>3.53</td>
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<tr>
<td>Lu</td>
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<td>0.60</td>
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<tr>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
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<tr>
<td>Co</td>
<td>47.80</td>
<td>21.77</td>
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<tr>
<td>Sc</td>
<td>12.17</td>
<td>12.89</td>
</tr>
<tr>
<td>Tb</td>
<td>1.24</td>
<td>1.47</td>
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</table>

<table>
<thead>
<tr>
<th>Mafic dike</th>
<th>Gabbro</th>
<th>Standard</th>
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<tr>
<td>Sp195</td>
<td>Sp96A</td>
<td>Sp177</td>
</tr>
<tr>
<td>La</td>
<td>8.20</td>
<td>2.40</td>
</tr>
<tr>
<td>Ce</td>
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<td>6.03</td>
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<tr>
<td>Sm</td>
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<tr>
<td>Eu</td>
<td>1.54</td>
<td>0.83</td>
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<td>Tb</td>
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<tr>
<td>Yb</td>
<td>3.49</td>
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<tr>
<td>Lu</td>
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<td>N.D.</td>
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<tr>
<td>Co</td>
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<tr>
<td>Sc</td>
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<td>37.65</td>
</tr>
<tr>
<td>Tb</td>
<td>0.73</td>
<td>0.16</td>
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</table>
Fig. 4. REE concentrations normalized to chondrites (Haskin and others, 1968) for the Sparta complex. (A) quartz diorite (210 is a tonalite from within the area mapped as trondhjemite); (B) quartz diorite; (C) coarse-grained trondhjemite; (D) high K$_2$O, fine-grained trondhjemite; (E) high K$_2$O dike; (F) mafic dike; (G) gabbro (after Phelps, 1975).

Geochemical evidence.—Although the stratigraphy and field relationships of the Sparta complex resemble those of other ophiolites, there are significant geochemical differences between the Sparta plagiogranite and plagiogranite found in other ophiolites or recovered from oceanic environments (oceanic plagiogranite). A comparison of the major-element composition of the Sparta plagiogranite with that of oceanic plagiogranite reveals nearly identical concentrations of most of the major elements (fig. 3) except K$_2$O (fig. 5). Whereas oceanic plagiogranite has K$_2$O values of less than 1 wt percent regardless of the SiO$_2$ content (Coleman and Peterman, 1975), plagiogranite from the Sparta complex with SiO$_2$ greater than 70 wt percent has K$_2$O concentration of 1 to 3 wt percent.

Although the K$_2$O content of the Sparta plagiogranite is considerably higher than that of typical oceanic plagiogranite, the high mobility of K$_2$O during even low-grade metamorphism makes comparisons based

\[\text{The term plagiogranite is used here as defined by Coleman and Peterman (1975) as a group name referring to a low K}_2\text{O, high SiO}_2\text{, plutonic igneous rock.}\]
solely on K$_2$O values somewhat tenuous. Although some recent evidence suggests that the light REE may be mobile during low grade metamorphism (Wood, Gibson, and Thompson, 1976; Sun and Nesbitt, 1978), the REE are thought to be generally less mobile than K$_2$O and, therefore, provide a more reliable indicator for geochemical comparisons. Reported REE profiles for oceanic plagiogranites from various locations are all strikingly similar and are typified by heavy REE concentrations of 10 to 20 times chondritic abundances, a distinct negative Eu anomaly, and a noticeable depletion in the light REE (Ce/Yb$_N$ 0.45 to 0.65) (fig. 6A). Although the REE profiles of the Sparta plagiogranite are similar in some aspects to those of oceanic plagiogranite (heavy REE abundances of 10 to 20 times chondrites and a distinct negative Eu anomaly), the light REE in the Sparta plagiogranite are undepleted (fig. 6A).

There are, however, plagiogranites and associated dacites that have been recovered from recent and ancient island arcs that are geochemically similar in all aspects to the Sparta plagiogranite. A comparison of the major-element chemistry of the Sparta plagiogranite with several island-arc plagiogranites and dacites reveals nearly identical concentrations of all elements, including K$_2$O (figs. 3 and 5). In addition, many of the

Fig. 5. K$_2$O versus SiO$_2$ for the Sparta trondhjemite compared to K$_2$O versus SiO$_2$ for plagiogranites, quartz keratophyres, and dacites from various tectonic settings. ▼ = plagiogranite, mid-ocean ridge (Miyashiro, Shido, and Ewing, 1970; Aumento, 1969; Engel and Fisher, 1975); ○ = plagiogranite, scamount (Ishizaka and Yanagi, 1975); □ = plagiogranite, Troodos ophiolite (Coleman and Peterman, 1975); ◊ = plagiogranite, Canyon Mountain ophiolite (Thayer and Himmelberg, 1968); ◊ = quartz keratophyre, Coast Range ophiolite (Bailey and Blake, 1974); △ = Mule Mountain trondhjemite (Barker, Millard, and Knight, 1979); ▲ = Saipan dacite (Barker and others, 1976); ★ = Rio Brazos trondhjemite (Barker and others, 1976); ◊ = twilight gneiss (Barker and others, 1976); ○ = Tanzawa tonalite (Ishizaka and Yanagi, 1977); · = Viti Levu tonalite (Gill, 1970); □ = Tonga dacite (Bryan, Stice, and Ewart, 1972); ◊ = Fonualei (Tonga) dacite (Ewart, Bryan, and Gill, 1973); × = Sparta trondhjemite and quartz diorite (this study).
island-arc plagiogranites and dacites have flat REE profiles similar to the flat profiles of the Sparta plagiogranite (fig. 6B).

The above comparisons show that there are small but significant differences between the Sparta plagiogranite and oceanic plagiogranite. A comparison of the Sparta plagiogranite with plagiogranites and dacites from several island arcs reveals a very close match for both the major elements and the REE. The similarity of the Sparta plagiogranite to island-arc plagiogranite is compatible with formation of the Sparta com-

*Fig. 6. (A) REE profiles of oceanic plagiogranite and an andesitic glass from the Juan de Fuca Ridge compared to the REE profiles of the Sparta quartz diorite and trondhjemite. (B) REE profiles of trondhjemites and high SiO₂ dacites from island arcs compared to the REE profiles of the Sparta quartz diorite and trondhjemite.*
plex in an island arc. However, the meager data base for plagiogranites and the complex geologic setting of most ophiolites (and hence plagiogranite) hinder the use of geochemistry of plagiogranite alone as a discriminator of tectonic environments of ophiolites. The problems of using the geochemistry of basaltic rocks as an indicator of the tectonic setting of an ophiolite have been pointed out by Kay and Senechal (1976) and Menzies, Blanchard, and Xenophontos (1980).

**Geologic evidence.**—In order to determine the tectonic environment of an ophiolite, other factors in addition to the geochemistry must be considered. Evidence suggesting an island-arc origin for the Sparta complex is provided by the regional geologic setting. $^{40}$Ar/$^{39}$Ar age determinations on a trondhjemite and quartz diorite show the age of the Sparta complex to be 218 mybp (Phelps, ms; Avé Lallemant and others, unpub. data). Blueschists of the same age as the Sparta complex (220 mybp; Hotz, Lanphere, and Swanson, 1977) occur in central Oregon and have been interpreted as an indication of subduction in central Oregon at this time (Hotz, Lanphere, and Swanson, 1977). The occurrence of a Middle to Upper Triassic island-arc assemblage throughout eastern Oregon (Gilluly, 1937; Vallier, Brooks, and Thayer, 1977; Vallier and Batiza, 1978; Brooks and Vallier, 1978) provides evidence that the subduction zone was east or southeast dipping. The Sparta complex, lying east of and being of the same age as the central Oregon blueschists, is in the proper position to have formed as part of a magmatic arc generated in response to east or southeast subduction in central Oregon.

Additional evidence suggesting that the Sparta complex formed in an island arc comes from the local geology. The Sparta complex is directly overlain by the Clover Creek Greenstone, which has been interpreted by Vallier, Brooks, and Thayer (1977), Vallier and Batiza (1978), and Brooks and Vallier (1978) to be part of the Middle and Upper Triassic island arc. As shown earlier, the field relations between the Clover Creek Greenstone and the Sparta complex are not clear, and there is some evidence that, at least locally, the intrusion of the Sparta trondhjemite postdates deposition of the lower units of the Triassic island-arc assemblage represented by the Clover Creek Greenstone (Brooks and Vallier, 1978; Brooks and others, 1977). Thus the “Northern” island-arc terrane (including the Clover Creek Greenstone) and the “Dismembered Oceanic Crust” terrane (including the Sparta complex), both of which are believed to be exotic and have formed at tropical latitudes in Permo-Triassic times (Jones, Silberling, and Hillhouse, 1978; Davis, Monger, and Burchfiel, 1978), may constitute just one single exotic terrane.

**Affinity of the Sparta Complex to the Island-Arc Tholeiitic Magmatic Series**

Jakeš and Gill (1970) have shown that island-arc magmatism can be divided into three petrologically distinct series: (1) the tholeiitic series, (2) the calc-alkaline series, and (3) the alkaline series. Both the calc-alkaline
and alkalic island-arc series are characterized by moderate to high K₂O contents, enrichment in the large-ion-lithophile elements, and moderately to strongly light-enriched REE profiles. The island-arc tholeiitic series, on the other hand, is characterized by low K₂O contents, little if any enrichment in the large-ion-lithophile elements, and flat to light-depleted REE profiles. The rocks of the Sparta complex are clearly not alkalic. The low K₂O contents in combination with the light-depleted and flat REE profiles of the Sparta gabbro and plagiogranite respectively indicate that the Sparta complex is more closely allied to the island-arc tholeiitic series than to the calc-alkaline series. The intrusive quartz diorite, gabbro, and high K₂O pegmatites with light-enriched REE profiles may represent rocks transitional between the tholeiitic and calc-alkaline series.

**OCEANIC PLAGIOGRANITE VERSUS ISLAND-ARC PLAGIOGRANITE**

As shown earlier, the chemistry of the Sparta plagiogranite approaches that of oceanic plagiogranite, but small, significant differences exist in the K₂O contents and REE patterns. Island-arc plagiogranites and dacites with major-element and REE characteristics similar to the Sparta plagiogranite have been reported from Tonga (Ewart, Bryan, and Gill, 1973), Izu-Hakone (Yajima, Higuchi and Nagasawa, 1972), Saipan (Barker and others, 1976), Viti Levu (Gill, 1970), the Tazawa complex, Japan (Ishizaka and Yanagi, 1977), and from a Devonian island-arc complex in the West Shasta district of California (Barker, Millard, and Knight, 1979) (figs. 3, 5, and 6B). Although the data are limited, the composition of all these rocks approaches that of oceanic plagiogranite, and in many cases it would be difficult on the basis of geochemistry alone to distinguish these island-arc plagiogranites and dacites from true oceanic plagiogranite. In addition, plagiogranite with the characteristics of oceanic plagiogranite has been reported from the Smartville ophiolite (Menzies and Blanchard, 1977) and the Canyon Mountain ophiolite (Thayer and Himan, 1968) (figs. 3, 5, and 6), both of which are now considered to have formed in island arcs or marginal basins (Avé Lallemant, 1976; Menzies and Blanchard, 1977; Xenophontos, Moores, and Menzies, 1978; Menzies, Blanchard, and Xenophontos, 1980).

**CONCLUSIONS**

1. The regional geologic setting and the geochemical characteristics of the Sparta ophiolite complex are compatible with formation of the complex in an island arc. Low K₂O contents and flat REE patterns are consistent with the Sparta complex being the plutonic equivalent to the low K₂O, tholeiitic island-arc magmatic series.

2. Rocks that have previously been assigned to two exotic Permo-Triassic terranes of northeastern Oregon (the Wallowa-Seven Devils Mountains volcanic arc terrane and the Dismembered Oceanic Crust terrane) may constitute just one exotic terrane.
3. It is clear that plagiogranite with the characteristics of oceanic plagiogranite can form in tectonic settings other than mid-ocean spreading centers. In such cases use of the term "oceanic plagiogranite" could lead to confusion. In order to remove the confusion, yet retain a group name that refers to this general class of low K$_2$O, high SiO$_2$ plutonic rocks, we suggest dropping the modifier "oceanic" from the term. The result is a non-genetic name that could be used to describe suitable rocks from any tectonic environment.

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