

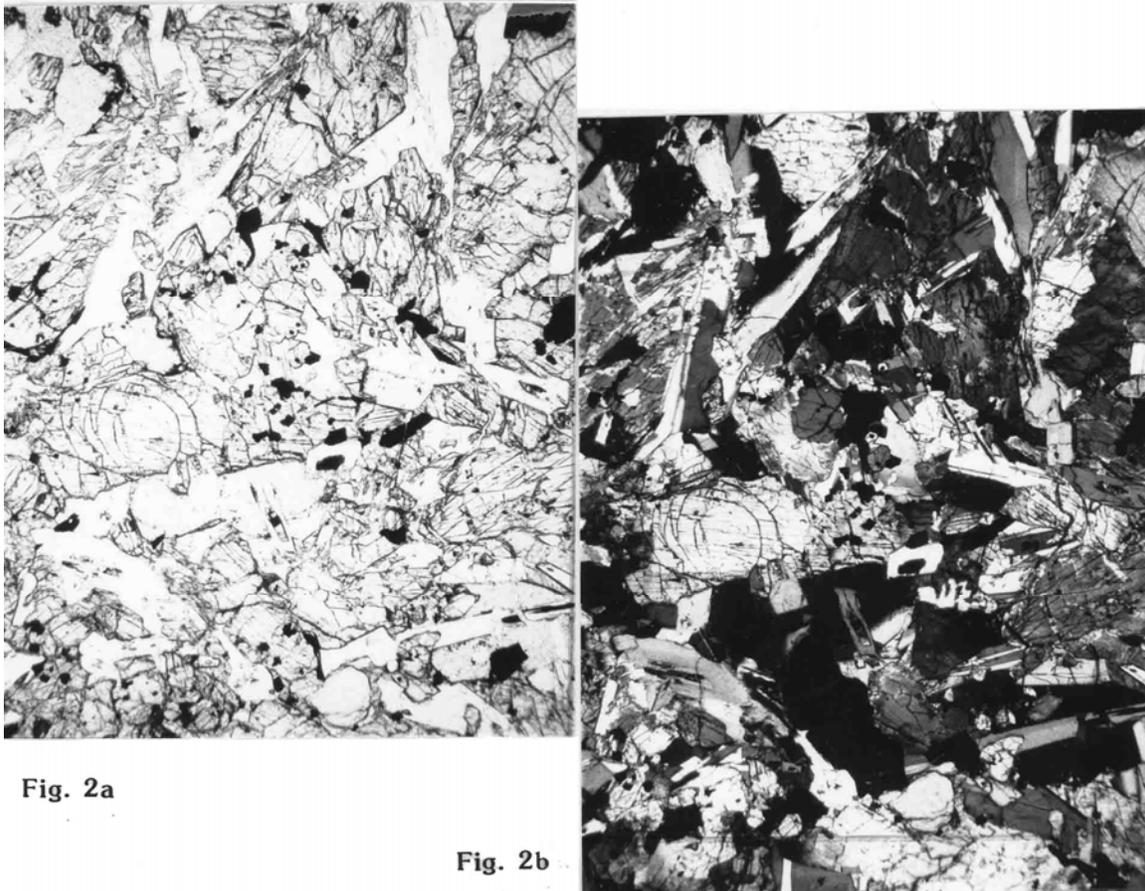
15663    MEDIUM-GRAINED OLIVINE-NORMATIVE    ST. 9A    10.30 g  
MARE BASALT

INTRODUCTION: 15663 is a medium-grained, olivine-bearing mare basalt which is vuggy and vesicular (Fig. 1). Pyroxenes are conspicuous and olivines are visible macroscopically. In chemistry, it is an average member of the Apollo 15 olivine-normative mare basalt group. It is rounded and has several (apparent) zap pits visible to the naked eye. All sides except for a few small fresh patches appear to be pitted. 15663 was collected as part of the rake sample from Station 9A.



Figure 1. Pre-saw view of 15663. S-71-49717

**PETROLOGY:** 15663 is a medium-grained, olivine-bearing mare basalt (Fig. 2). Most olivines are less than 1 mm across; the larger ones contain crystallized silicate melt inclusions. Pyroxenes are up to about 1.5 mm and somewhat elongated; they are pigeonites zoned to augite. The plagioclases are irregular laths, generally less than 1 mm long and some are hollow. A few poikilitically enclose small pyroxenes. Chromite, ulvospinel, ilmenite, fayalite, sulfide, and cristobalite are present; cristobalite is locally conspicuous. Dowty et al. (1973a, b) reported a mode of 58% pyroxene, 27% plagioclase, 8% olivine, 6% opaques, 1% silica (cristobalite); no miscellaneous fraction was reported. Dowty et al. (1973c) reported microprobe analyses of pyroxenes, plagioclases, and olivines, and Nehru et al. (1973) reported one ilmenite analysis and several spinel group mineral analyses. The opaque phases were included in the general discussion of Nehru et al. (1974) without specific additional data or comment. Ilmenites contain 0.27% MgO. The limited mineral data (Fig. 3) are similar to those of other olivine-normative mare basalts.



**Fig. 2a**

**Fig. 2b**

Figure 2. Photomicrographs of 15663,11. Widths about 3 mm. a) transmitted light; b) crossed polarizers.

**CHEMISTRY:** Helmke et al. (1973) reported a bulk rock analysis (Table 1, Fig. 4). (Their trace element data was tabulated erroneously as 15563,2.) The analysis shows 15663 to be a fairly average Apollo 15 olivine-normative mare basalt. Dowty et al. (1973a, b) reported two separate defocused beam bulk analyses. That of Dowty et al. (1973a) is fairly consistent with the Helmke et al. (1973) analysis except for the higher  $\text{TiO}_2$ .

**PROCESSING AND SUBDIVISIONS:** 15663 was sawn to produce an end (,1) which was chipped to produce ,1 through ,4. ,2 was used for chemical analysis and ,4 was mainly used to produce thin sections ,10 through ,13. ,0 is now 6.95 g.

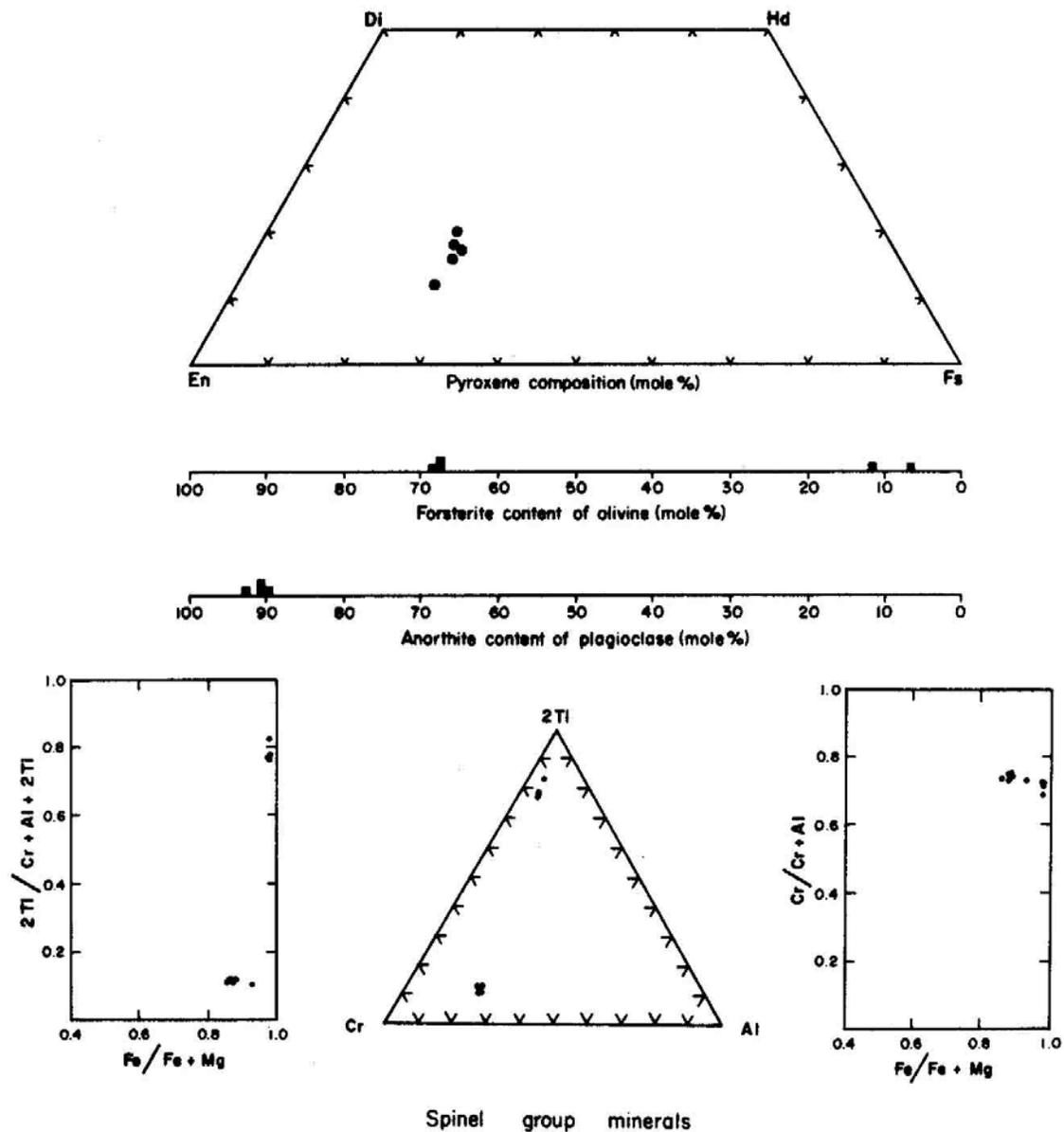


Figure 3. Chemistry of minerals in 15663 (Dowty et al., 1973b).

TABLE 15663-1. Bulk rock chemical analysis

|       |                                |       |
|-------|--------------------------------|-------|
|       |                                | .2    |
| WE %  | SiO <sub>2</sub>               | 46.5  |
|       | TiO <sub>2</sub>               | 2.39  |
|       | Al <sub>2</sub> O <sub>3</sub> | 8.73  |
|       | FeO                            | 21.8  |
|       | MgO                            | 10.4  |
|       | CaO                            | 10.6  |
|       | Na <sub>2</sub> O              | 0.261 |
|       | K <sub>2</sub> O               | 0.046 |
|       | P <sub>2</sub> O <sub>5</sub>  |       |
| (ppm) | Sc                             | 47    |
|       | V                              |       |
|       | Cr                             | 3930  |
|       | Mn                             | 2150  |
|       | Co                             | 56    |
|       | Ni                             |       |
|       | Rb                             | 0.5   |
|       | Sr                             |       |
|       | Y                              |       |
|       | Zr                             |       |
|       | Nb                             |       |
|       | Hf                             | 2.5   |
|       | Ba                             |       |
|       | Th                             |       |
|       | U                              |       |
|       | Pb                             |       |
|       | La                             | 4.93  |
|       | Ce                             | 13.4  |
|       | Pr                             |       |
|       | Nd                             | 10.8  |
|       | Sm                             | 3.54  |
|       | Eu                             | 0.88  |
|       | Gd                             | 4.6   |
|       | Tb                             | 0.81  |
|       | Dy                             | 5.7   |
|       | Ho                             | 1.04  |
|       | Er                             | 3     |
|       | Tm                             |       |
|       | Yb                             | 2.26  |
|       | Lu                             | 0.328 |
|       | Li                             |       |
|       | Be                             |       |
|       | B                              |       |
|       | C                              |       |
|       | N                              |       |
|       | S                              |       |
|       | F                              |       |
|       | Cl                             |       |
|       | Br                             |       |
|       | Cu                             |       |
|       | Zn                             | <3    |
| (ppb) | I                              |       |
|       | At                             |       |
|       | Ga                             | 2900  |
|       | Ge                             |       |
|       | As                             |       |
|       | Se                             |       |
|       | Mo                             |       |
|       | Tc                             |       |
|       | Ru                             |       |
|       | Rh                             |       |
|       | Pd                             |       |
|       | Ag                             |       |
|       | Cd                             |       |
|       | In                             |       |
|       | Sn                             |       |
|       | Sb                             |       |
|       | Te                             |       |
|       | Cs                             | 17    |
|       | Ta                             |       |
|       | W                              |       |
|       | Re                             |       |
|       | Os                             |       |
|       | Ir                             |       |
|       | Pt                             |       |
|       | Au                             |       |
|       | Hg                             |       |
|       | Tl                             |       |
|       | Pb                             |       |

(1)

References and methods:

(1) Helmke et al. (1973);  
INAA, RFA, AAS

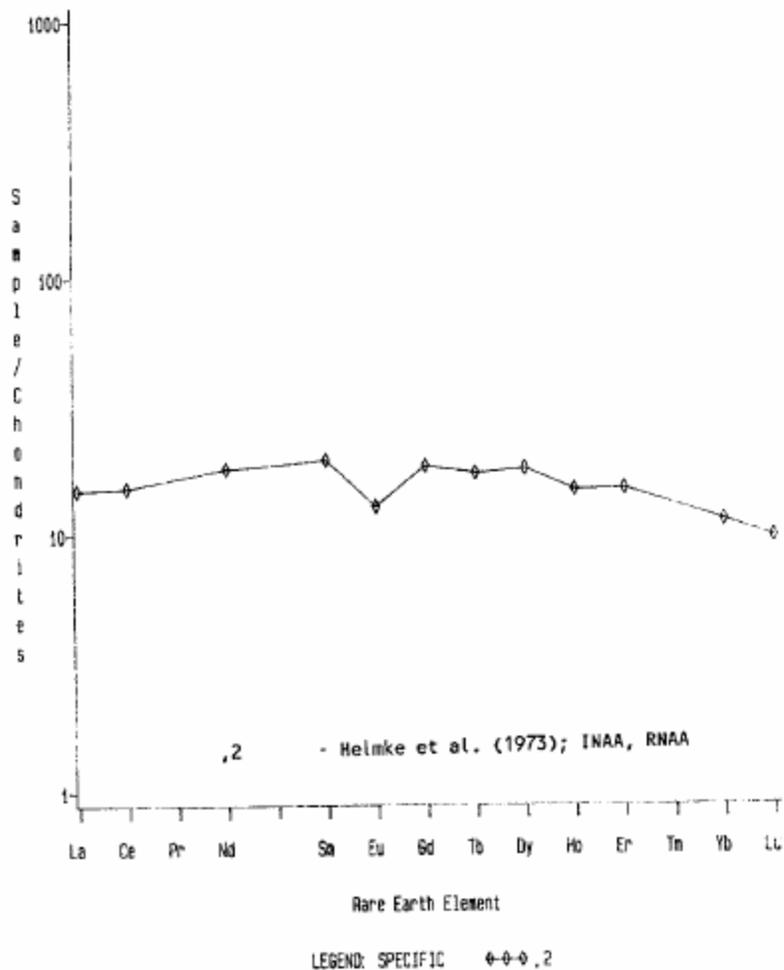


Figure 4. Rare earths in 15663

TABLE 15663-2. Defocussed beam microprobe bulk rock analyses

|      |                                |       |       |
|------|--------------------------------|-------|-------|
| Wt % | SiO <sub>2</sub>               | 42.3  | 44.5  |
|      | TiO <sub>2</sub>               | 2.66  | 2.89  |
|      | Al <sub>2</sub> O <sub>3</sub> | 7.7   | 8.4   |
|      | FeO                            | 22.5  | 22.2  |
|      | MgO                            | 13.0  | 10.3  |
|      | CaO                            | 10.2  | 10.1  |
|      | Na <sub>2</sub> O              | 0.49  | 0.37  |
|      | K <sub>2</sub> O               | 0.05  | 0.08  |
|      | P <sub>2</sub> O <sub>5</sub>  | 0.06  | 0.07  |
|      | ppm                            | Cr    | 4040  |
| Mn   |                                | 1940  | 2015  |
|      |                                | 100.0 | 99.06 |
|      | (1)                            | (2)   |       |

(1) Dowty *et al.* (1973b), normalized to 100%

(2) Dowty *et al.* (1973a)