# 12055

Pigeonite Basalt

912 grams

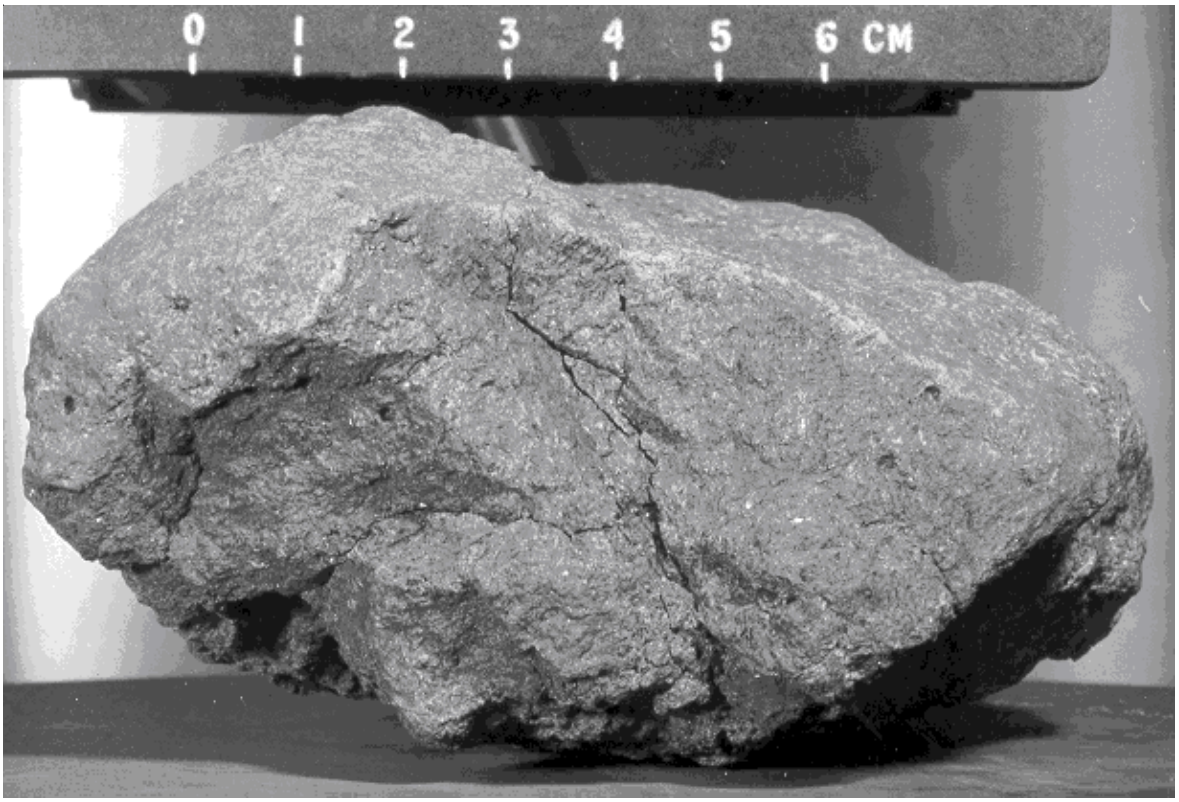



*Figure 1: Photo of broken surface of 12055. NASA # S69-61032*

## Introduction

This little potato has zap pits on all sides. The texture is very like that of 12052 and 12053.

## Petrography

Baldridge et al. (1979) briefly mention 12055 as a "porphyritic rock with a medium-grained, variolitic to subophitic groundmass". They mention that the width of plagioclase laths is 115 microns. Figures 2 a,b show random orientation of pyroxene phenocrysts in 12055.

## Chemistry

The chemical composition of 12055 is the same as that of 12052 and 12053 (table 1).

## Radiogenic age dating

The Rb/Sr age was determined by Nyquist et al. (1977) to be 3.19 ± 0.06 b.y. (figure 5).

## Cosmogenic isotopes and exposure ages

Burnett et al. (1975) determined an exposure age of 330 m.y. by $^{126}Xe/Ba$.

## Other Studies

Bogard et al. (1971) reported the content and isotopic composition of rare gases in 12055.

## Processing

12055,35 is on public display at the Cleveland Museum of Natural History (figure 7). Pieces of 12055 are also on public display in the Philippines and in Bonn, Germany. There are 4 thin sections.

**Mineralogical Mode for 12055**

| | Neal et al. 1994 |
|---|---|
| Olivine | 1 |
| Pyroxene | 58.2 |
| Plagioclase | 33.8 |
| Ilmenite | 0.4 |
| Chromite +Usp | 3.3 |
| mesostasis | 1.4 |
| "silica" | 0.4 |

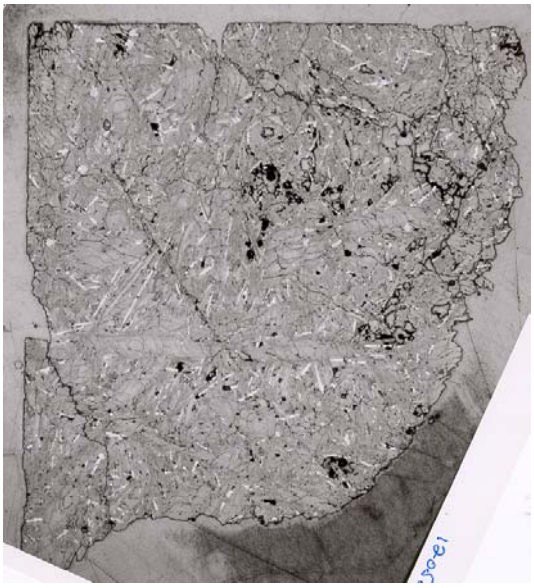


*Figure 2a: Reflected light photomicrograph of 12052,8 showing porosity and random ilmenite. Scale is 1 cm.*

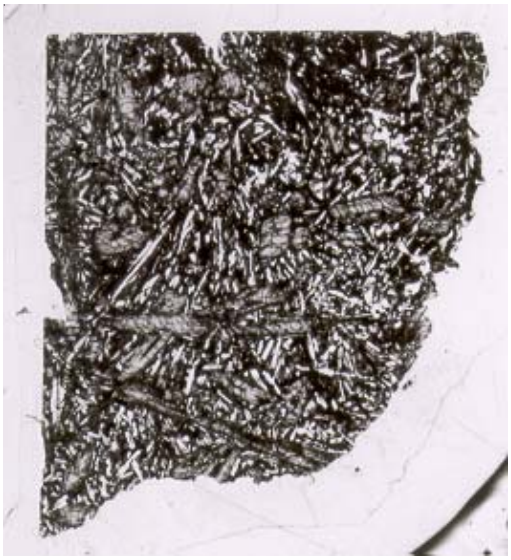


*Figure 2b: Transmitted light photomicrograph of 12052,8 showing random pyroxene and plagioclase. Scale 1 cm. NASA #S70-51003.*

**List of Photo #s for 15055**

| | |
|---|---|
| S69-61011 – 61034 | B & W mug |
| S69-62690 – 62698 | B & W mug |
| S69-63835 – 63838 | color mug |
| S70-22488 – 22491 | color mug |
| S70-29255 – 29259 | display |
| S86-38612 – 38615 | surface color |

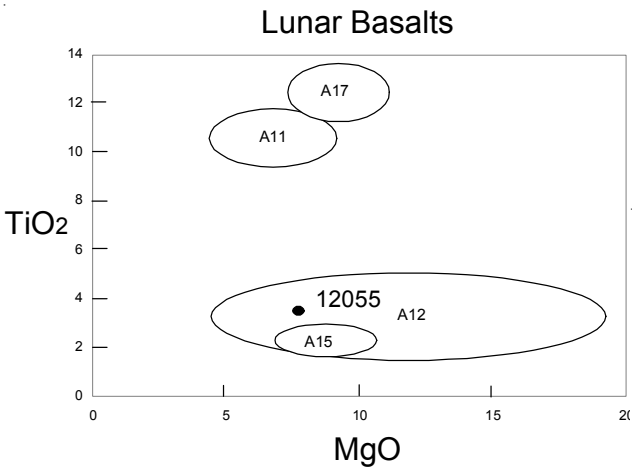



*Figure 3: Composition of 12055 compared with that of other lunar basalts.*

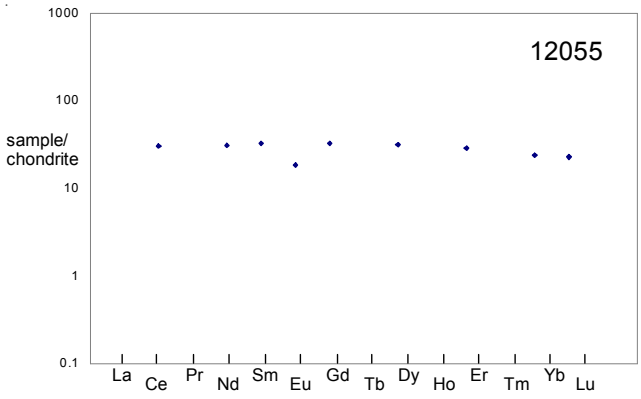



*Figure 4: Normalized rare-earth-element diagram for 12055 (Nyquist et al. 1977).*

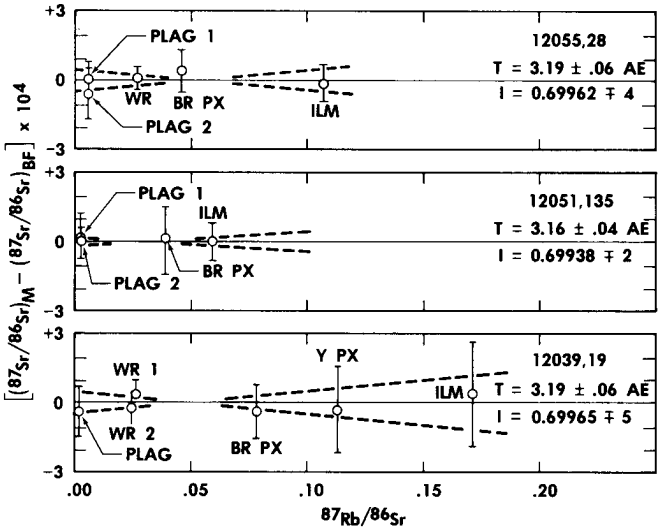



*Figure 5: Rb/Sr isochron for 12055 (Nyqusit et al. 1977).*

**Summary of Age Data for 12055**

| | Ar/Ar | Rb/Sr | Nd/Sm |
|---|---|---|---|
| Nyquist et al. 1977 | | 3.19 ± 0.06 b.y. | |

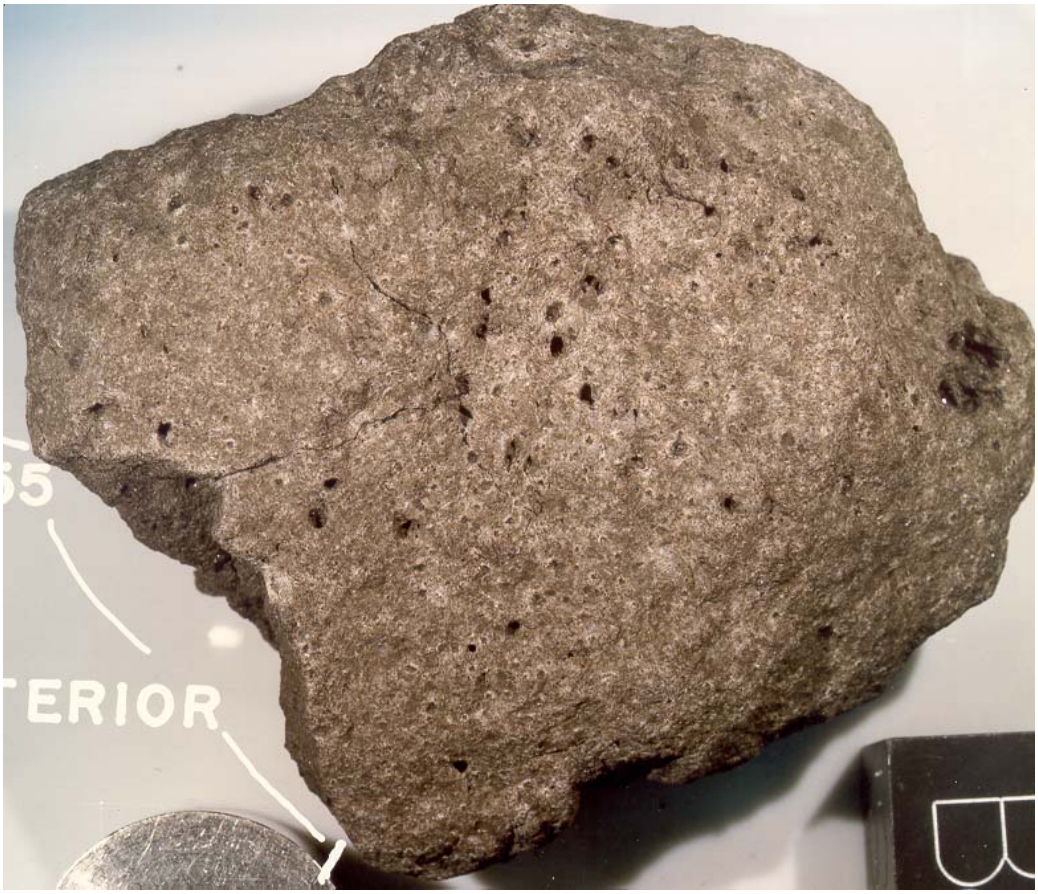



*Figure 6: Large portion of 12055,0 showing zap pitted surface with vesicles. Cube is 1 inch. NASA #S86-38615.*

*Figure 7: Lunar display case. NASA S70-29258.*

## Table 1. Chemical composition of 12055.

| *reference* | Rhodes77 | | Nyquist77 | |
|---|---|---|---|---|
| *weight* | | | | |
| SiO2 % | 47 | (c ) | | |
| TiO2 | 3.52 | (c ) | | |
| Al2O3 | 10.15 | (c ) | | |
| FeO | 19.54 | (c ) | | |
| MnO | 0.29 | (c ) | | |
| MgO | 7.46 | (c ) | | |
| CaO | 11.1 | (c ) | | |
| Na2O | 0.27 | (a) | | |
| K2O | 0.07 | (c ) | 0.062 | (b) |
| P2O5 | 0.07 | (c ) | | |
| S % | 0.07 | (c ) | | |
| *sum* | | | | |
| | | | | |
| Sc ppm | 54 | (a) | | |
| V | | | | |
| Cr | 3200 | (a) | | |
| Co | 38 | (a) | | |
| Ni | | | | |
| Cu | | | | |
| Zn | | | | |
| Ga | | | | |
| Ge ppb | | | | |
| As | | | | |
| Se | | | | |
| Rb | | | 1.14 | (b) |
| Sr | 121 | (c ) | 120 | (b) |
| Y | 43 | (c ) | | |
| Zr | 131 | (c ) | | |
| Nb | 8.5 | (c ) | | |
| Mo | | | | |
| Ru | | | | |
| Rh | | | | |
| Pd ppb | | | | |
| Ag ppb | | | | |
| Cd ppb | | | | |
| In ppb | | | | |
| Sn ppb | | | | |
| Sb ppb | | | | |
| Te ppb | | | | |
| Cs ppm | | | | |
| Ba | 69 | (b) | 68.8 | (b) |
| La | | | | |
| Ce | 18.2 | (a) | 18.4 | (b) |
| Pr | | | | |
| Nd | | | 14 | (b) |
| Sm | 5.25 | (a) | 4.8 | (b) |
| Eu | 0.95 | (a) | 1.05 | (b) |
| Gd | | | 6.44 | (b) |
| Tb | 1.02 | (a) | | |
| Dy | | | 7.8 | (b) |
| Ho | | | | |
| Er | | | 4.63 | (b) |
| Tm | | | | |
| Yb | 4.4 | (a) | 3.98 | (b) |
| Lu | 0.67 | (a) | 0.562 | (b) |
| Hf | 5.2 | (a) | | |
| Ta | | | | |
| W ppb | | | | |
| Re ppb | | | | |
| Os ppb | | | | |
| Ir ppb | | | | |
| Pt ppb | | | | |
| Au ppb | | | | |
| Th ppm | | | | |
| U ppm | | | | |
| *technique* | *(a) INAA, (b) IDMS, (c ) XRF* | | | |

## References for 12055


Baldridge W.S., Beaty D.W., Hill S.M.R. and Albee A.L. (1979) The petrology of the Apollo 12 pigeonite basalt suite. *Proc. 10th Lunar Planet. Sci. Conf.* 141-179.

Bogard D.D., Funkhouser J.G., Schaeffer O.A. and Zahringer J. (1971) Noble gas abundances in lunar material-cosmic ray spallation products and radiation ages from the Sea of Tranquillity and the Ocean of Storms. *J. Geophys. Res.* **76**, 2757-2779.

Burnett D.S., Huneke J.C., Podosek F.A., Russ G.P., Turner G. and Wasserburg G.J. (1972) The irradiation history of lunar samples (abs). *Lunar Sci.* **III**, 105-107. Lunar Planetary Institute, Houston.

James O.B. and Wright T.L. (1972) Apollo 11 and 12 mare basalts and gabbros: Classification, compositional variations and possible petrogenetic relations. *Geol. Soc. Am. Bull.* **83**, 2357-2382.

LSPET (1970) Preliminary examination of lunar samples from Apollo 12. *Science* **167**, 1325-1339.

Neal C.R., Hacker M.D., Snyder G.A., Taylor L.A., Liu Y.-G. and Schmitt R.A. (1994a) Basalt generation at the Apollo 12 site, Part 1: New data, classification and re-evaluation. *Meteoritics* **29**, 334-348.

Neal C.R., Hacker M.D., Snyder G.A., Taylor L.A., Liu Y.-G. and Schmitt R.A. (1994b) Basalt generation at the Apollo 12 site, Part 2: Source heterogeneity, multiple melts and crustal contamination. *Meteoritics* **29,** 349-361.

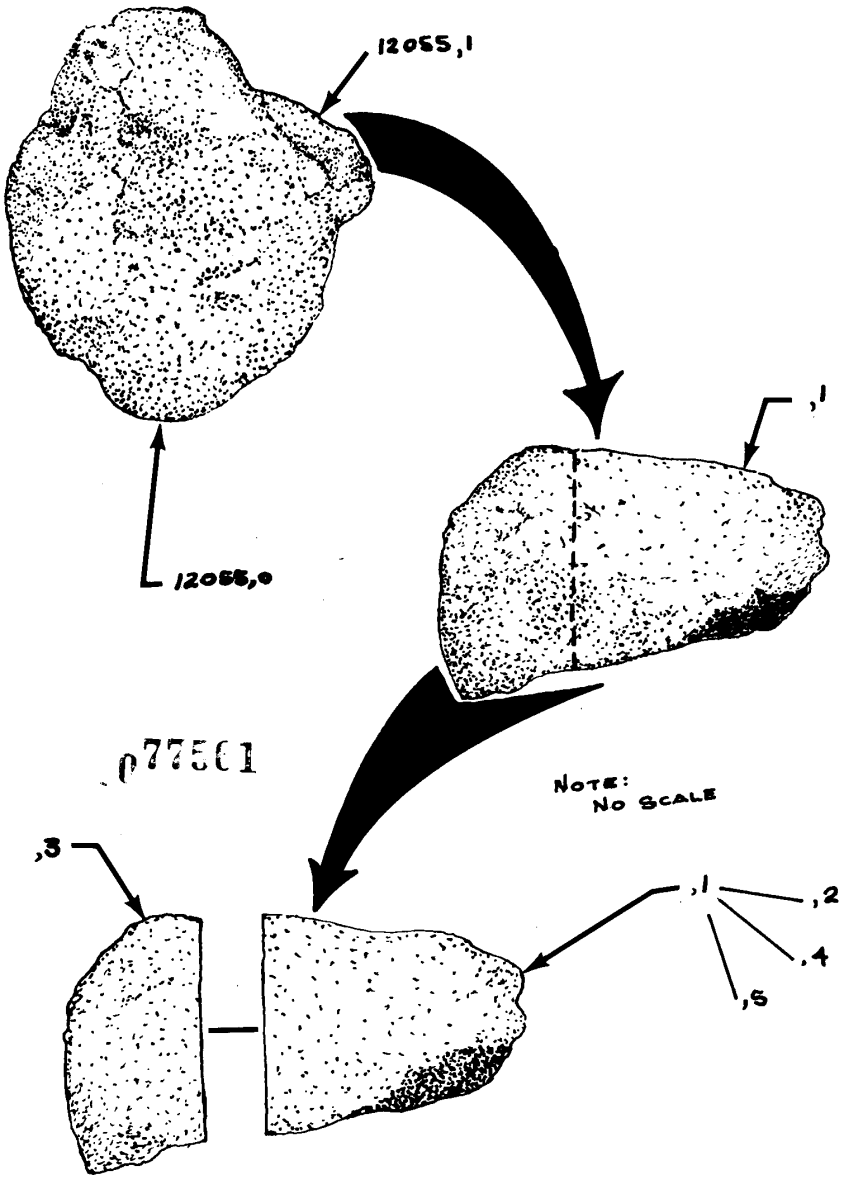
Nyquist L.E., Bansal B.M., Wooden J. and Wiesmann H. (1977) Sr-isotopic constraints on the peterogenesis of Apollo 12 mare basalts. *Proc. 8th Lunar Sci. Conf.* 1383-1415.

Nyquist L.E., Shih C.-Y., Wooden J.L., Bansal B.M. and Wiesmann H. (1979) The Sr and Nd isotopic record of Apollo 12 basalts: Implications for lunar geochemical evolution. *Proc. 10th Lunar Planet. Sci.* Conf. 77-114.

Warner J. (1970) Apollo 12 Lunar Sample Information. NASA TR R-353. JSC (catalog)

# THE CUTTING AND CHIPPING OF LUNAR ROCK

12055 DRAWING COMPLETED SEPT 29, 1971

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