INTRODUCTION

The Catalog of Apollo 17 rocks is a set of volumes that characterize each of 334 individually numbered rock samples (79 larger than 100 g) in the Apollo 17 collection, showing what each sample is and what is known about it. Unconsolidated regolith samples are not included. The catalog is intended to be used by both researchers requiring sample allocations and a broad audience interested in Apollo 17 rocks. The volumes are arranged geographically, with separate volumes for the South Massif and Light Mantle; the North Massif; and two volumes for the mare plains. Within each volume, the samples are arranged in numerical order, closely corresponding with the sample collection stations. The present volume, for the South Massif and Light Mantle, describes the 55 individual rock fragments collected at Stations 2, 2A, 3, and LRV-5. Some were chipped from boulders, others collected as individual rocks, some by raking, and a few by picking from the soil in the processing laboratory.

Information on sample collection, petrography, chemistry, stable and radiogenic isotopes, rock surface characteristics, physical properties, and curatorial processing is summarized and referenced as far as it is known up to early 1992. The intention has been to be comprehensive-to include all published studies of any kind that provide information on the sample, as well as some unpublished information. References which are primarily bulk interpretations of existing data or mere lists of samples are not generally included. Foreign language journals were not scrutinized, but little data appears to have been published only in such journals. We have attempted to be consistent in format across all of the volumes, and have used a common reference list that appears in all volumes.

Much valuable information exists in the original Apollo 17 Lunar Sample Information Catalog (1973) based on the-intense and expert work of the Preliminary Examination Team. However, that catalog was compiled and published only four months after the mission itself, from rapid descriptions of usually dust-covered rocks, usually without anything other than macroscopic observations, and less often with thin sections and a little chemical data. In the nearly two decades since then, the rocks have been substantially subdivided, studied, and analyzed, with numerous published papers. These make the original Information Catalog inadequate, outmoded, and in some cases erroneous. However, that Catalog contains more information on macroscopic observations for most samples than does the present set of volumes. Considerably more detailed information on the dissection and allocations of the samples is preserved in the Data Packs in the Office of the Curator.

Where possible, ages based on Sr and Ar isotopes have been recalculated using the "new" decay constants recommended by Steiger and Jager (*Earth Planet. Sci.* Lett. **36**, 359-362); however, in many of the reproduced diagrams the ages correspond with the "old" decay constants. In this volume, mg' or Mg' = atomic Mg/ (Mg +Fe).

THE APOLLO 17 MISSION

On December 11, 1972, the Apollo 17 lunar excursion module "Challenger," descending from the Command Service Module "America," landed in a valley near the edge of Mare Serenitatis (Figures 1 and 2). It was the sixth and final landing in the Apollo program. Astronauts Eugene Cernan and Harrison Schmitt spent 72 hours at the site, named Taurus-Littrow from the mountains and a crater to the north. The site was geologically diverse, with the mountain ring of the Serenitatis basin and the lava fill in the valley. The main objectives of the mission were to sample very ancient material such as pre-Imbrian highlands distant from the Imbrium basin, and to sample pyroclastic materials believed

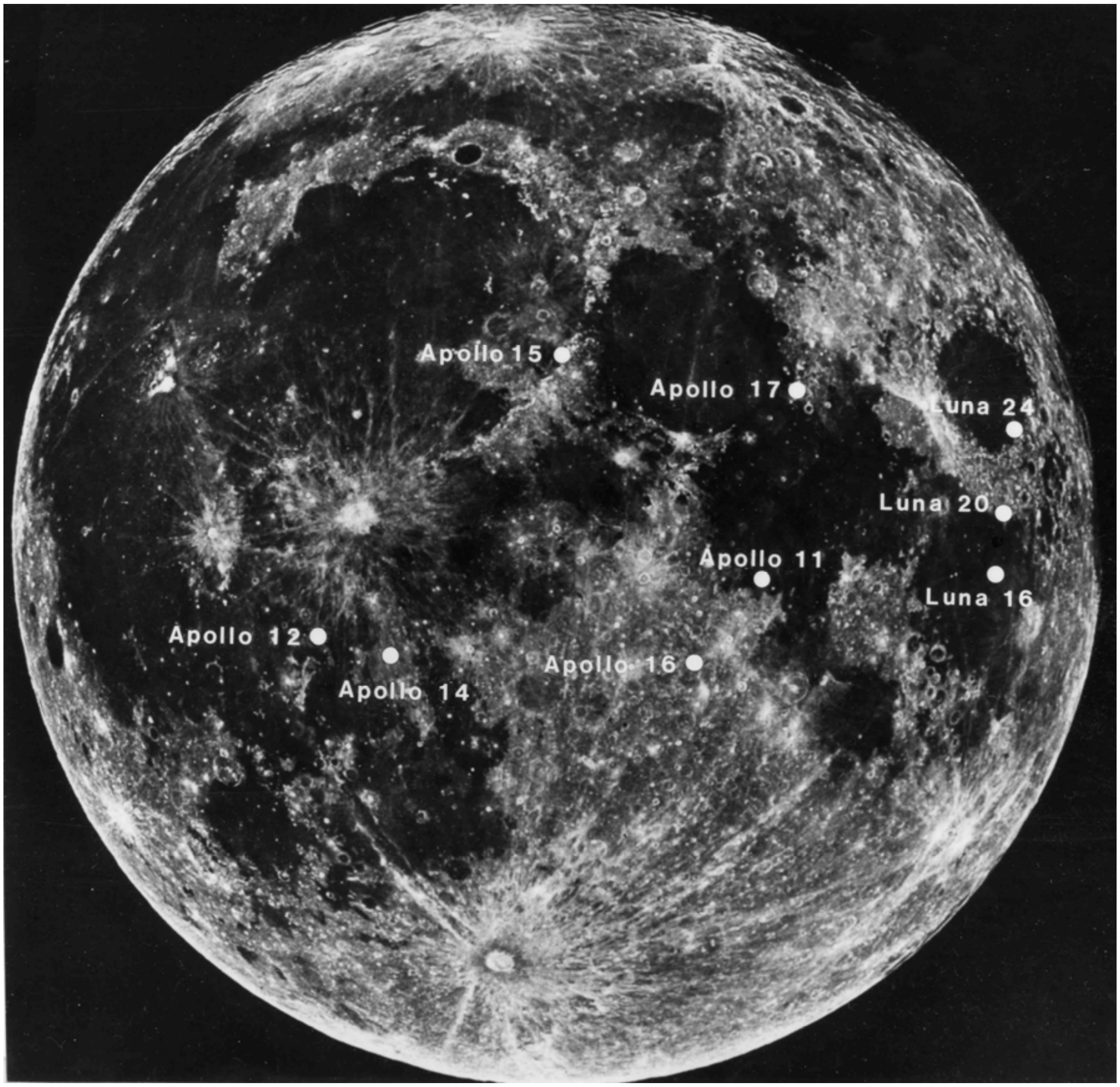


Figure 1: Apollo and Luna sampling sites on the near side of the Moon. S84-31673

pre-mission to be substantially younger than mare basalts collected on previous missions.

The crew spent more than 22 hours on the lunar surface, using the rover to traverse across the mare plains and to the lower slopes of the South and North Massifs, and over a light mantle in the valley that appeared to have resulted from a landslide from the South Massif. The traverses totalled more than 30 km, and nearly 120 kg of rock and soil were collected (Figure 3). This total sample mass was greater than on any previous mission. An Apollo Lunar Surface Experiments Package (ALSEP) was set up near the landing point. Other experiments and numerous photographs were used to characterize and document the site. Descriptions of the pre-mission work and objectives, the mission itself, and results are described in detail in the Apollo 17 Preliminary Science Report (1973; NASA SP-330) and the Geological Exploration of the Taurus-Littrow Valley (1980; USGS Prof. Paper 1080), and others listed in the bibliography at the end of this section. Many

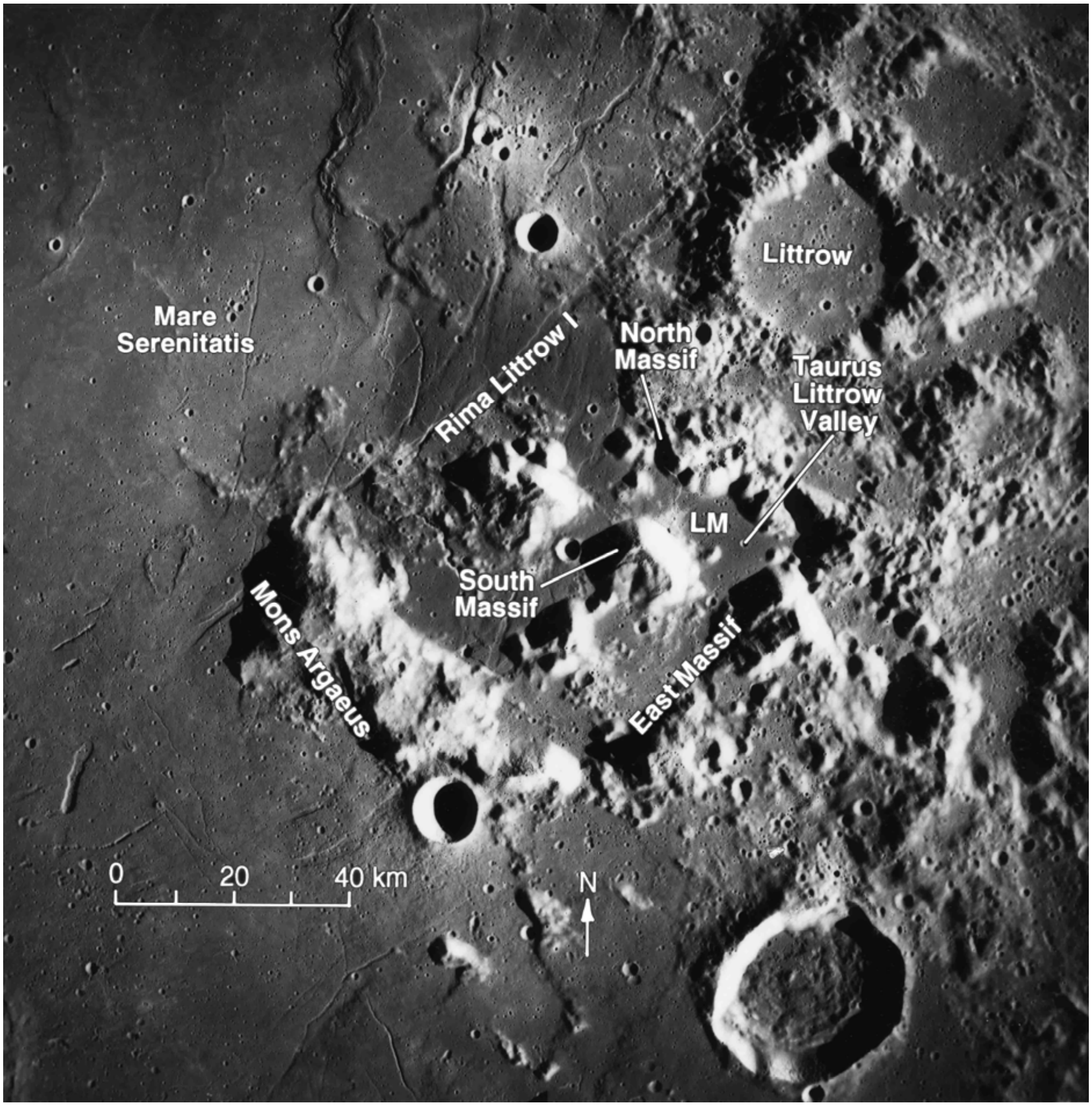


Figure 2: Apollo 17 landing site region showing major geographic features. AS17-M-447

of the rock samples have been studied in detail, and some, particularly massif boulders, have been studied in co-ordinated fashion in formal consortia.

The valley floor samples demonstrate that the valley consists of a sequence of high-Ti mare basalts that were mainly extruded 3.7 to 3.8 Ga ago. The sequence is perhaps of the order of 1400m thick. The sequence consists of several different types of basalt that cannot easily be related to each other (or Apollo 11 high-Ti mare basalts) by simple igneous processes, but instead reflect varied mantle sources, mixing, and assimilation. Orange glass pyroclastics were conspicuous, and is the unit that mantles both the valley fill and part of the nearby highlands. However, they were found to be not considerably younger than other Apollo volcanics, but only slightly younger than the valley fill. These glasses too are high-Ti basalt in composition. The orange glasses occur in the rocks only as components of some regolith breccias.

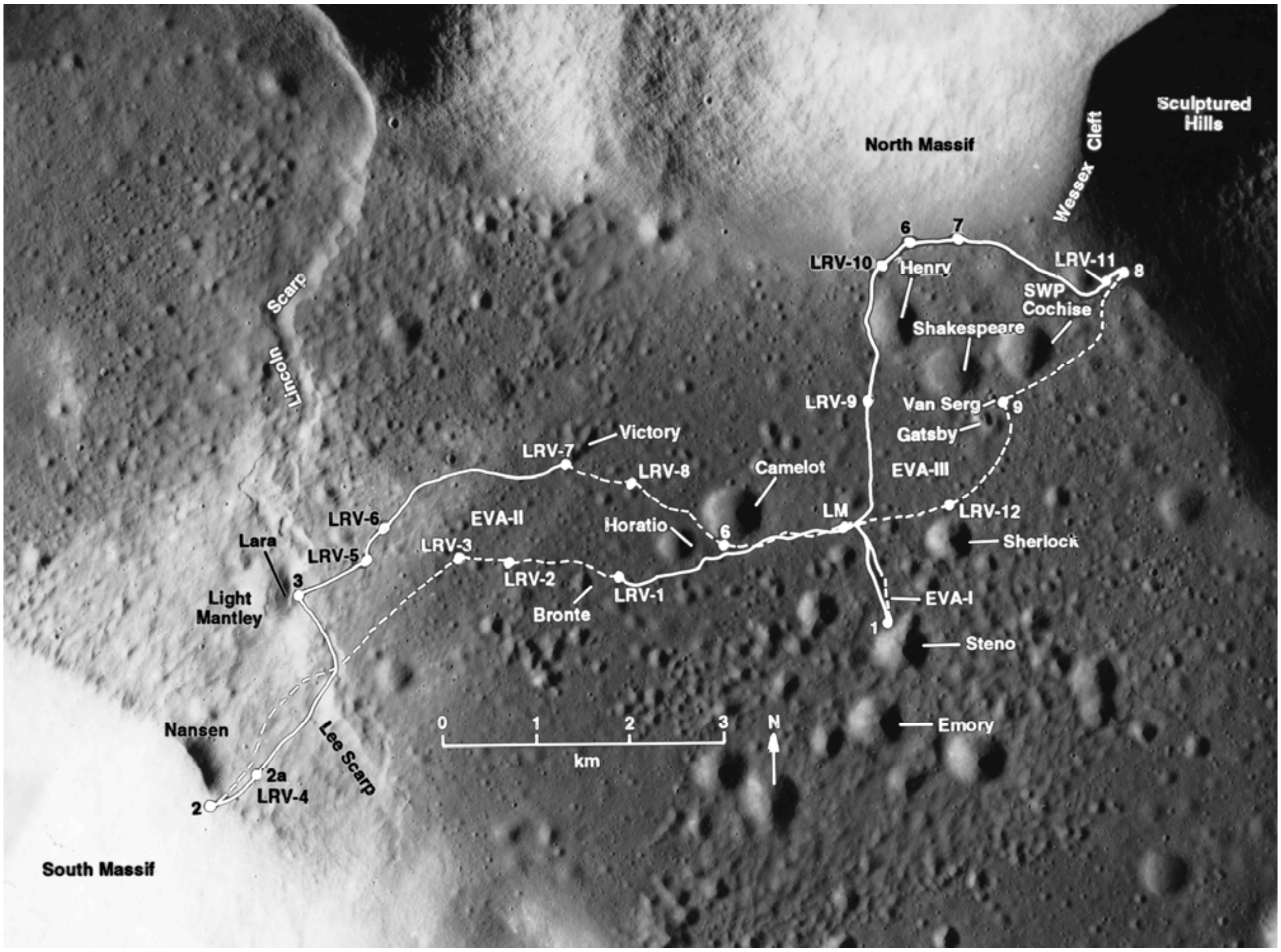
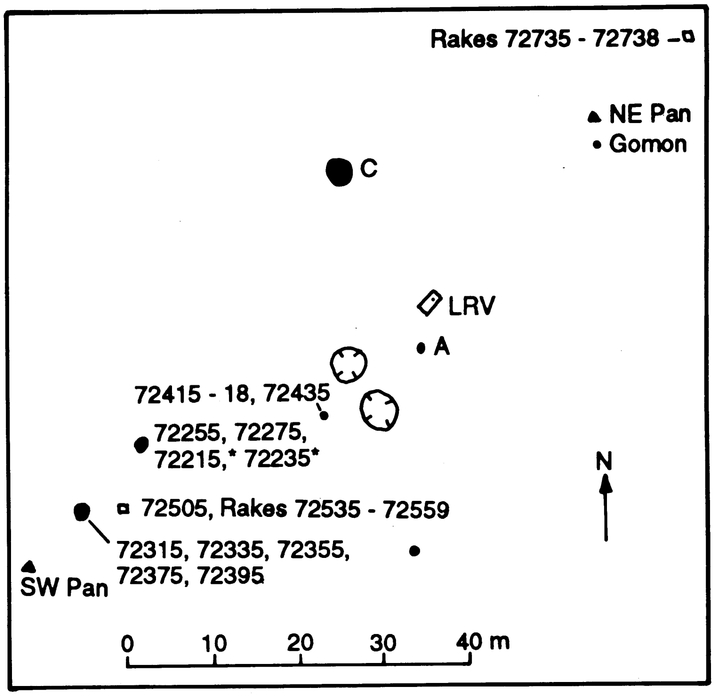


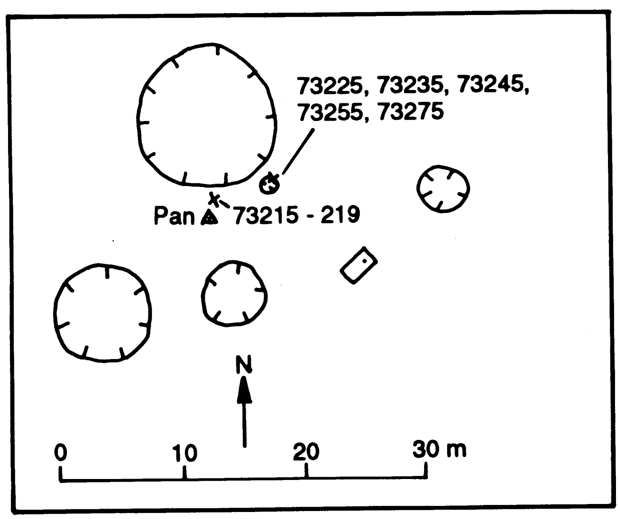
Figure 3: Apollo 17 traverse and sample collection map.

The sampling of the massifs was directed at coherent boulders and some rocks, and are dominated by a particular type of crystalline impact melt breccia. This is found on both massifs, and is characterized by an aluminous basalt composition and a poikilitic groundmass. The samples are widely interpreted as part of the impact melt produced by the Serenitatis basin event itself. A second type of impact melt, dark and aphanitic, is represented only by samples from the South Massif stations. It is similar in chemistry to first type, but is more aluminous and much poorer in Ti02. It contains a much greater abundance and variety of clast types. Opinion still differs as to whether these aphanites are a variant of the Serenitatis melt or represent something distinct. Both aphanitic and poikilitic melts seem to be most consistent with an age of close to 3.87 (+/- 0.02) Ga. A few rare samples of impact melt have distinct chemistry. Other rock and clasts are pristine igneous rocks, including dunite, troctolite, and norite (some of which formed riveter-sized clasts or individual boulders), as well as more evolved types including gabbros and felsic/granitic fragments. Feldspathic granulites are common as clasts in the melt matrices (both aphanitic and poikilitic) and occur as a few small individual rocks. Geochronology shows that many of these granulites and pristine igneous rocks date back as far as 4.2 and even 4.5 Ga. The purer soils of the South Massif contain more alumina and only half of the incompatible element budget

ROCK SAMPLE COLLECTION SITES



Planimetric Map of Station 2



Planimetric Map of Station 3

Not Shown: 2A (LRV-4) 73145, 73146, 73155, 73156
LRV-5 74115 - 74119

of the dominant impact melt rocks, demonstrating that the massifs, representing pre-Serenitatis material, have a component not well represented in the larger collected samples. Conspicuously absent, and not the "missing" component in the soil, is ferroan anorthosite, common at the Apollo 16 site and widely believed to have formed an early lunar crust.

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NUMBERING OF APOLLO 17 SAMPLES

As in previous missions, five digit sample numbers are assigned each rock (coherent material greater than about 1 cm), the unsieved portion and each sieve fraction of scooped <1 cm material, the drill bit and each drill stem and drive tube section and each sample of special characteristics.

The first digit (7) is the mission designation for Apollo 17 (missions prior to Apollo 16 used the first two digits). As with Apollo 15 and 16 numbers, the Apollo 17 numbers are grouped by sampling site. Each group of one thousand numbers applies to an area as follows:

The first numbers for each area were used for drill stems, drive tubes, and the SESC. Drill stem sections and double drive tubes are numbered from the lowermost section upward.

The last digit is used to code sample type, in conformity with the conventions used for Apollo 15 and Apollo 16. Fines from a given documented bag are ascribed numbers according to:

Sampling Site	Initial Number
LM, ALSEP, SEP, and samples collected between Station 5 and the LM	70000
Station IA	71000
Station 2 and between it and the LM	72000
Station 3 and between it and Station 2	73000
Station 4 and between it and Station 3	74000
Station 5 and between it and Station 4	75000
Station 6 and between it and the LM	76000
Station 7 and between it and Station 6	77000
Station 8 and between it and Station 7	78000
Station 9 and between it and Station 8	79000

7WXYO	Unsieved material (usually <1 cm)
7WXY1	<1 mm
7WXY2	1-2 mm
7WXY3	2-4 mm
7WXY4	4-10 mm

Rocks from a documented bag are numbered 7WXY5 - 7WXY9, usually in order of decreasing size.

Sample number decades were reserved for the contents of each documented bag. In the cases where the number of samples overflowed a decade, the next available decade was used for the overflow. For example DB 455 contained soil, numbered 71040-71044, and 6 small rocks numbered 71045-71049 and 71075.

Paired soil and rake samples for each sampling area are assigned by centuries starting with 7W500. The soil sample documented bag has the first decade or decades of the century, in conformity with the last digit coding for rocks and fines (as explained above), and the rake sample documented bag uses the following decades. For example, 71500-71509, 71515 were used for the sieve fractions and six rocks from the soil sample in DB 459. Then for the companion rake sample in DB's 457 and 458, 71520 was used for the soil, which was not sieved, and the 38 >1 cm rake fragments were numbered 71535-71539, 71545-71549, etc., to 71595-71597.

In as much as possible all samples returned loose in a sample collection bag or an ALSRC were numbered in a decade. In the cases in which rocks from several stations were put into a single collection bag however, the soil and rock fragments were assigned a decade number that conforms to the site for the largest or most friable rock. The other rocks in the same bag have numbers for their own site, generally in the second or third decade of the thousand numbers for that site