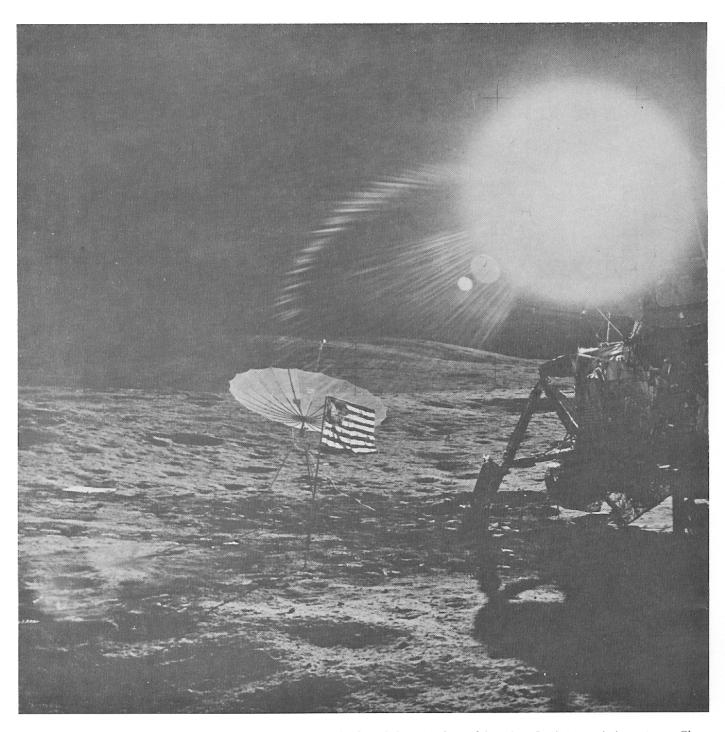
GEOLOGY OF THE APOLLO 14 LANDING SITE IN THE FRA MAURO HIGHLANDS



## CONTENTS

			Page		Page
Abstract			. 1	Geology of the Fra Mauro site—Continued	
Introduction	1		. 1	Fra Mauro Formation—Continued	
Geology				Boulders—Continued	
		erties		Turtle rock	
		idi fatti ama oʻqaftordir bulgi ugʻu segtiler isilo		Station G rock	
	,	ts		White rocks	
Geologic setting of the Fra Mauro site				Split rock	
Geology of the Fra Mauro site				Discussion	
		tures		Summary of conclusions	
Distribution of rock fragments				Sample documentation and environments	
				Introduction	
Α.		properties		Samples	
Geologi	c str	uctures	25	Catalog of 70-mm photographs taken on the lunar surface dur	·
Fra Ma	uro l	Formation	27	ing the Apollo 14 mission	_ 80
Bou		s		The Apollo 14 base map	
	We:	rd rock	. 31	Glossary	
	Sta	tion H cluster	. 32	Selected references	_ 10:
		11.1.11	STE	ATIONS	
		TEBO	OII	11110110	
				<del>i kan w</del> asan dan kabangan kabupatèn salah	
		[Pl	ates are	in pocket]	
FRONTISPIEC	E.	View of Cone crater ridge from near the Lun-	ar Mo	fule.	
PLATE	1.	Geologic map and schematic section of the A			
	2.	Map showing traverse line, stations, features	identi	fied in station panoramas, and samples collected at the Apollo 14	t
		landing site.		and the Company of the season was been as the first as the graph asset in	
3	3–6.	Apollo 14 panoramas showing sample collecti	on loc	alities and features identified:	
		3. (Panoramas 1-5, 15) from the lunar m			
		4. (Panoramas 6-8) at stations A, B, and	B1, a	nd shaded relief maps of stations A and B.	
		5. (Panoramas 9-11) at stations B2, B3,	and (	C', and shaded relief maps of stations B3 and C'.	
				and shaded relief maps of stations G, G1, and H.	
	7.	Map showing boulder density and distribution	n of ro	ck particles at the Apollo 14 landing site.	
		in a second for the constant of the constant o			
					Pag
FIGURE	1.	Telescopic photograph of 9-day Moon showing	g Apol	lo 11–17 landing sites	- 2
	2.	Regional geologic map of the Apollo 12 and 1	4 land	ling sites	- 8
	3.	Photograph of astronaut Shepard and the MI	ET at a	station A	- 4
	4.	Photograph of the Apollo 14 landing site from	n the	Apollo 12 Command Module	- 8
	5.	Photograph of areas in which craters were co	unted		. 9
	6.	Photograph of Orientale basin showing radia	l ridge	es of Hevelius Formation	_ 10
	7.	Area in which craters were counted		marked and the first of the second of the se	
	8.	Graphs showing size frequency distribution of	f crate	ers	- 15
	9.	Photographs of areas near stations A, F, B3, ar	nd C' s	howing variation in abundance of rock fragments on the surface-	- 14
	10.	Photograph of contact of Cone crater continu	ous eje	ecta 100 2000 2000 2020 2020 2020 2020 2020	15
7.1	11.				
	12.			ge of original surface at Apollo landing sites 11–17	
erië.	13.			ge of original surface at Apollo landing sites 11-17	
		Photograph of small crater in ejecta from Con	ne cra	ter	- 10
3:	15.	Man and photograph showing surface mornhe	ology	west of the LM	- 1
	16.	Man and photograph showing surface mornly	nlogy	near Cone crater	- 1
	17.	Photograph of "raindron" danraccione on the	curfac	e of the smooth unit west of the LM	- 1
	18.	Composite graph of size-frequency curves for	narti	les from 0.5 mm to 8 m	- 2
	19.			res from 0.5 mm to 6 m	
	10.	brewnes and photographs of types of fillets			- 4

Page

VI CONTENTS

			Page
FIGURE		Polarization scatter graphs of highland soil and mare soil	23
	21.	Polarization scatter graphs of highland rocks and mare rocks	$\frac{24}{25}$
	22.	Graph showing average reflectance of lunar surface compared with Apollo 14 soil sample 14163,188	25 25
	23. 24.	Photograph of layered rock at station C1 showing albedo differences between dark clast, matrix, and light layer Photograph of light clasts in Turtle rock	26
	$\frac{24}{25}$ .	Azimuth frequency diagrams of small-scale lineaments in the Apollo 11, 12, and 14 landing sites	
	26.	Photograph of two long lineaments in the Apollo 14 landing site	27
	27.	Azimuth frequency diagrams of regional-scale lineaments in the Apollo 11, 12, and 14 landing sites	27
	28.	Azimuth frequency diagram of lunar grid lineaments	
		Photograph of F <sub>4</sub> breccia rock types	29
		Photograph of F <sub>3</sub> breccia rock types	
	31.	Photograph of F <sub>2</sub> breccia rock type  Photograph of F <sub>2</sub> breccia rock type	
	32.		30
		Photograph of sample 14305 before collection and sketch showing how the sample may have reached the position in	
	00.	which it was found	31
	34.		
	35.	Photograph and topographic map of Weird rock	
	36.		
		Photograph and topographic map of Rock A in North Boulder Field cluster	
	38.		
	39.		38
	40.		
	41.		40
	42.		
	43.		41
	44.		44
	45.		
	46.		47
	47.		48
	48.		48
	49.		
	50.		
	51.	Photograph of sample 14047 and vicinity	64
	52.	Orthogonal photographs of sample 14047, shown in approximate lunar orientation	65
	53.		66
	54.		67
	55.		68
	56.	Orthogonal photographs of sample 14053	69
	57.	Photograph of samples 14068-14072 on lunar surface	
	58.	0 1	
	59.	Photograph of samples 14082 and 14083 after chipping	
	60.		
	61.	Photograph of samples 14301 and 14313 on lunar surface	74
		Orthogonal photographs of sample 14301, shown in approximate lunar orientation	
		Orthogonal photographs of sample 14313, shown in approximate lunar orientation	
	64.	Photograph of sample 14304 and vicinity	77
	65.		78
	66.	Photograph of sample 14305 on lunar surface	79
	67.	Orthogonal photograph of samples 14305 and 14302, shown in approximate lunar orientation	80
		Photograph of sample 14306 and vicinity at station G	81
	69.	Orthogonal photographs of sample 14306, shown in approximate lunar orientation	82
		Photograph of North Boulder Field cluster (station H) sample area	04
	71.		
	72.		
	73.		86
	74.	Photograph of samples 14315, 14318, 14320?, and one unidentified sample from the North Boulder Field cluster, station H	. 87
	75.		88
	76.		89
	77.	Photograph of sample 14321 and vicinity at station C1, and part of the blocky rim of Cone crater	90
	78.		
	79.	Diagram showing geometry of a tilted Lunar Orbiter photograph	. 97

## TABLES

			Pag	e
TABLE .	1.	Numbers of craters counted in each area, numbers of craters calculated per 10 <sup>6</sup> km <sup>2</sup> , and crater ratios between Fra Mauro Formation and adjacent Mare surfaces in outer ring of Sinus Aestuum	. 1	3
	2.	Albedo and polarimetric measurements from the Apollo 14, 11, and 12 sites and from the Surveyors 3, 5, 6 and 7 sites	i . 2:	
	3.	Summary of photogeologic rock-type characteristics	4	2
	4.	Sample locations and page references by sequential LRL number	4	9
	5.	Cross-reference of lunar samples with locations, lunar-surface photographs, status of determining sample location and orientation, megascopic sample description, and comments by the astronaut crew during sample collection		
	6.	Usage of film on the lunar surface during the Apollo 14 mission	. 6	5
	7.	Sequential listing within each magazine of 60 mm Apollo 14 lunar surface pictures	9	2
	8.	Chronological listing of 60 mm Apollo 14 lunar surface pictures	9	4
	9.	Apollo 14 lunar surface 70 mm film usage by camera number	9	
	10.	Elevations of points identified on plates 3 through 6 which are correlated with points on plate 2	9	8
	11.	Elevation of camera at panorama stations	- 9	