MARTIAN SAMPLE SITES: EXAMPLES BASED ON A GLOBAL GEOLOGIC PERSPECTIVE; D. H. Scott and K. L. Tanaka, U.S. Geological Survey, 2255 N. Gemini Dr., Flagstaff, AZ 86001

We have selected ten areas that each include several rock units of varying lithology and age (Table 1); these area were chosen to optimize the geologic and chronologic data return from Mars. Geologic mapping and stratigraphic studies [1-5] identify stratigraphic ages, rock types, and information on Martian geologic history that samples of a given site may yield (Table 2). Volcanic rocks occur over much of the planet and in virtually all stratigraphic positions, and they are amenable to radioisotopic dating. Therefore, a reasonable and essential goal for a sample-return mission is to return datable rocks from widely varying strata.

Generally, about three or four major geologic units can be sampled at any of the sites in Table 1, most of which can probably be dated (Table 2). The Mars Observer mission will aid greatly in interpreting lithology and defining contacts at the high resolution required to actually pinpoint fruitful sample-acquisition sites within these areas.

Table 1. Locations and Rock Units of Proposed Sample Areas

Site No.	Name	Location (lat, long)	Rock Units
1	Tharsis-Olympus	12°, 125°	Aop, flows of Olympus plains Aoa_1, lowermost aureole of Olympus Mons Hf, fractured flows of Ulysses Fossae
2	Chasma Boreale	82°, 57°	Apl, polar layered material Hvg, grooved plains material c, crater material unmapped, thick deposit
3	Memnonia	-10°, 172°	Amm, middle member of Medusae Fossae Fm Hr, ridged plains material Nplh, hilly unit of plateau sequence
4	Labeatis north	31°, 83°	Ht_2, member 2 of Tharsis Montes Fm Hr, ridged plains material Nf, highly deformed (faulted) material
5	Labeatis south	24°, 80°	At_4, member 4 of Tharsis Montes Fm Ht_2, member 2 of Tharsis Montes Fm Hr, ridged plains material
6	Solis	-27°, 100°	Hsl, lower member of Syria Planum Fm Hf, older fractured flows Nb, basement material
7	Hadriaca	-29°, 269°	Hhp, shield material of Hadriaca Patera Hpl_3, smooth unit of plateau sequence Hr, ridged plains material Nm, mountains of Hellas rim material
8	Elysium	27°, 185°	Ael_1, plains flows of Elysium Mons Hr, ridged plains material HNu, knobby remnants of plateau materials

9	Amazonis	22°, 165°	Aa_3, flows of Amazonis Planitia Hr, ridged plains material HNu, knobby remnants of plateau materials
10	Promethei	-81°, 315°	Apl, polar layered terrain Hdu, upper flows of Dorsa Argentea c, rim material of south polar basin

Note: Sites 1 and 2 described in [6]; geologic units described in [1-3]

Table 2. Stratigraphic Positions, Lithologies, and Ages of Geologic Events at Proposed Sample Sites

Objective	Sites									
	1	2	3	4	5	6	7	8	9	10
a. Stratigraphic position										
Upper Amazonian	L	R*								R*
Middle Amazonian			R*						R	
Lower Amazonian	L				R			R		
Upper Hesperian	R	R*		R	R	R				R
Lower Hesperian			G	G	G	L	L,G	G	G	
Upper Noachian										
Middle Noachian				G				G	G	
Lower Noachian			G			G	R			R
Poorly defined or uncertain		L*								
b. Lithologies										
Lava flows	X		X	X	X	X	X	X	X	X
Polar layered material		X								X
Olympus Mons aureoles	X									
Impact crater material		X								X
Other materials		X	X			X	X	X	X	
c. Ages of geologic events										
Channeling					X					
Tectonism	X			X	X	X				
Impact		X				X				X

Note: Extent of units to be sampled at individual sites indicated by G=global, R=regional, and L=local; asterisk indicates that unit may be undatable. Stratigraphic positions defined by [4, 5].

References

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[6] Scott, D.H. (this volume).