VIKING GCMS

RESTORATION PROJECT

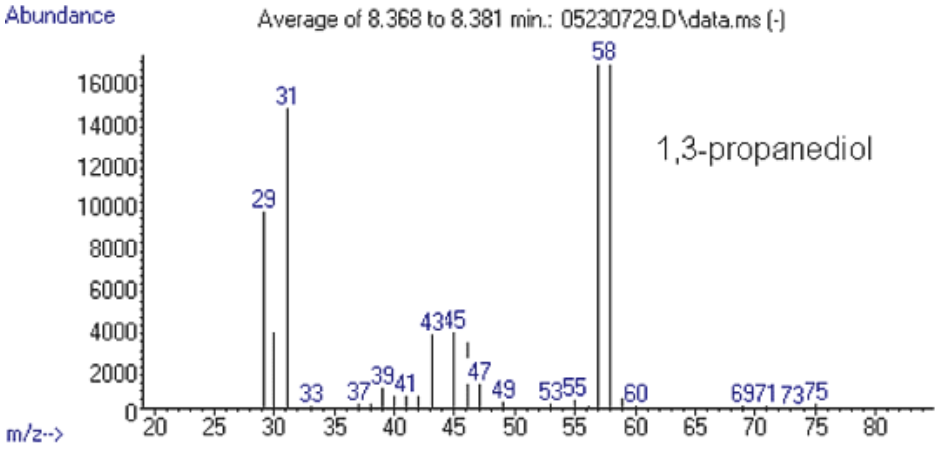
Pieces of Organics Puzzle

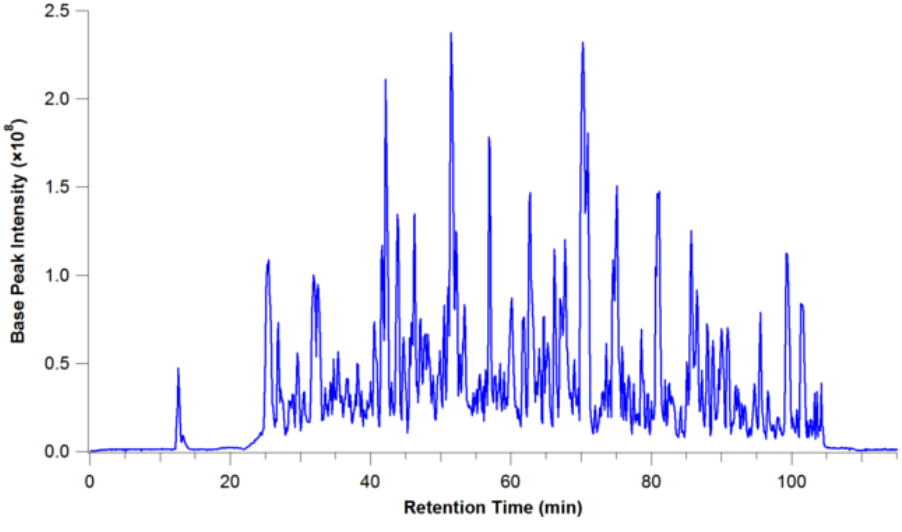
1970
Viking landers detect chloromethane and dichloromethane

2008
Phoenix detects perchlorate on Mars

2015
Curiosity's SAM detects chlorobenzene

Today
Did Viking detect chlorobenzene?





Typical GCMS data

- Mass spectra
- Chromatograms

VIKING GCMS

ORIGINAL DATASET

TABLE 1. Acquisition Sites and Analysis Conditions for the Four Martian Samples

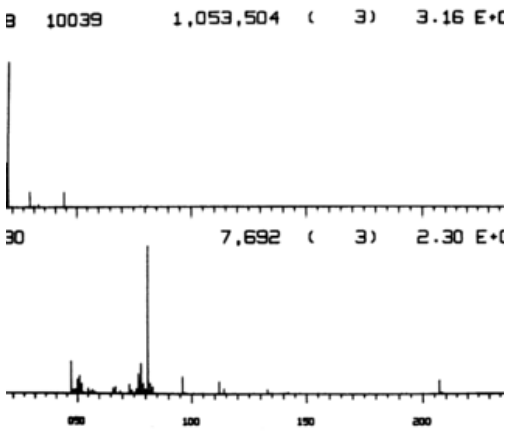
Identification Number*	Date of Analysis	Oven Temperature, °C	Mode	Oven Purge Gas	Time Column Held at 200°, min	Oven
VL-1 Sample 1 (Subsurface), Acquired on Sol 8						
10015	sol 17	200	hydrous	$^{13}CO_2$	18	1
10018	sol 23	500	anhydrous	$^{13}CO_2$	36	1
VL-1 Sample 2 (Surface), Acquired on Sol 31						
10023	sol 32	350	hydrous	$^{13}CO_2$	54	2
10024	sol 37	500	hydrous	$^{13}CO_2$	54	2
10025	sol 43	500	hydrous	$^{13}CO_2$	36	2
VL-2 Sample 1 (Bonneville Duracrust), Acquired on Sol 21						
10032	sol 24	200	hydrous	H_2	36	2
10033	sol 26	350	hydrous	H_2	36	2
10034	sol 35	500	hydrous	H_2	36	2
10035	sol 37	500	hydrous	$^{13}CO_2$	36	2
VL-2 Sample 2 (Under Badger Rock), Acquired on Sol 37						
10036	sol 41	50	hydrous	H_2	36	3
10037	sol 43	200	hydrous	H_2	36	3
10038	sol 45	350	hydrous	H_2	36	3
10039	sol 47	500	hydrous	H_2	36	3
10041	sol 61	500	hydrous	$^{13}CO_2$	36	3

VIKING GCMS DATASET TODAY

IMAGE NOT AVAILABLE

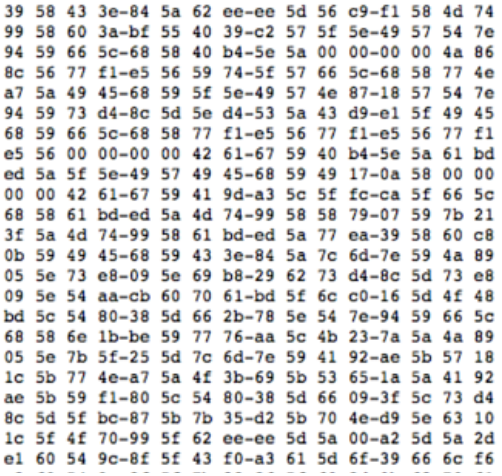
IBM-COMPATIBLE TAPES

Raw form, just as they were received by the Viking experimenters from the telemetry program output. Unlikely to be usable by anyone not very familiar with the mission operations and instrument design.



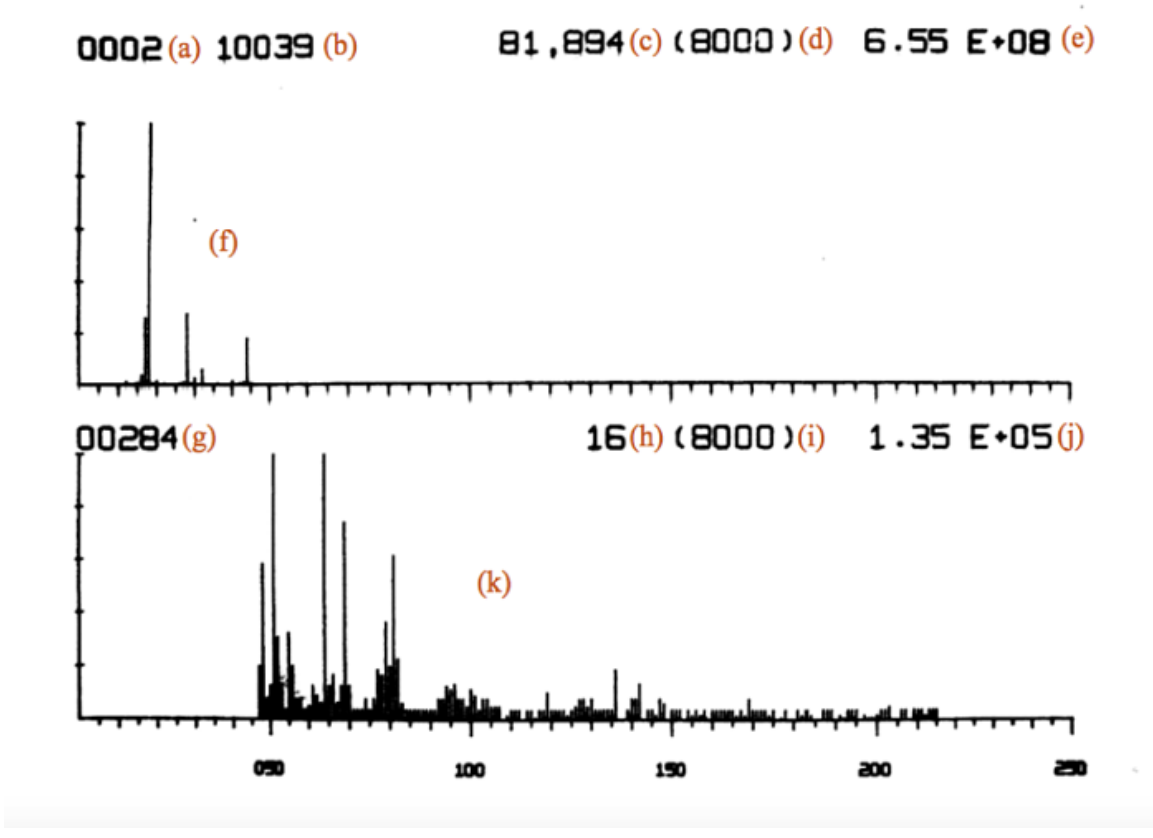
MICROFILM

Data presented as bar graphs on 16-mm microfilm. Each frame contains one complete graph of all masses detected. A second graph starting at about mass 45 showing heavier elements at a more appropriate scale.



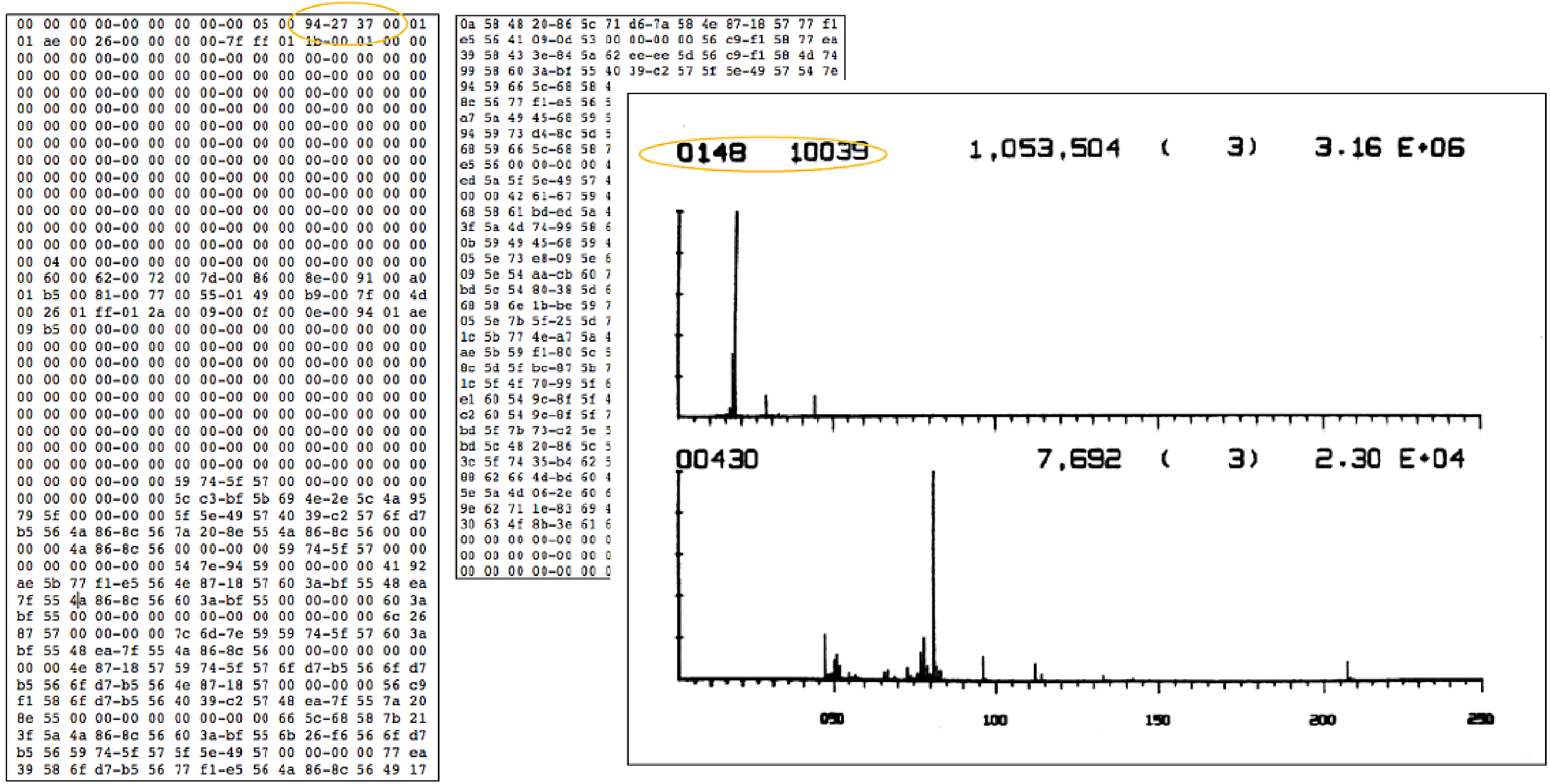
DIGITAL DATA IN BINARY

Data is stored in 32 files in binary form. The data is split between four folders: two folders include all sampling data while two folders include reduced versions of that same data.



Microfilm

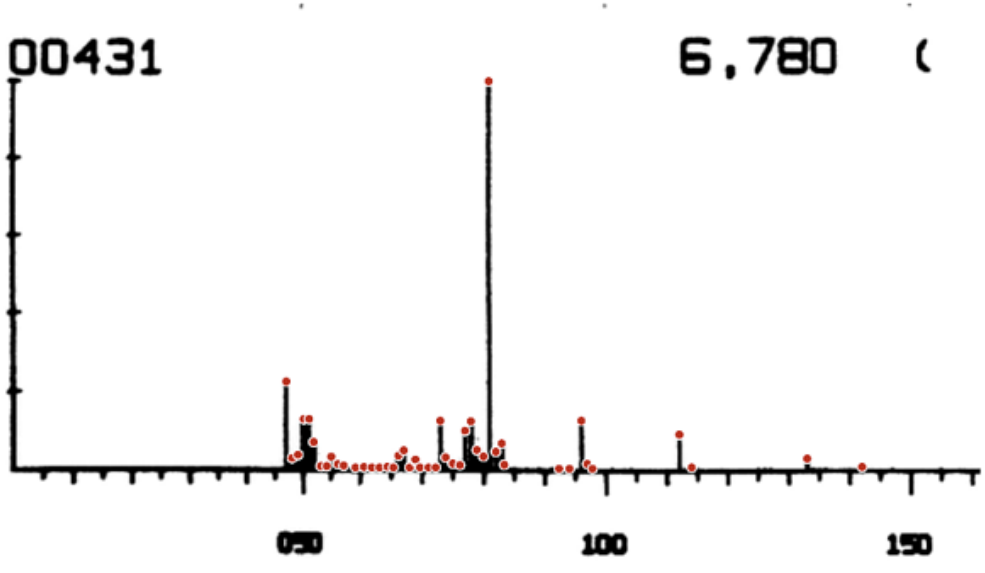
- (a), (b), (g) ID numbers
- (c), (e), (h), (j) ion intensity
- (d), (i) effluent divider status
- (f), (k) spectra peaks



Digital data decoding

- We have linked "MIT ID number" in microfilm and digital data
- 94-2737 in HEX is equal to 148-10039 in DECIMAL

Digitization of microfilm



m/z	ion intensity (arb/u.)
47	58.95380432
48	8.296565231
49	10.46864835
50	34.14775061
51	18.91677034
52	2.989858967
53	2.996805928
54	9.281103972
55	4.453352069
56	3.305559747
58	2.164714386
60	2.463433706
61	2.184011499
62	2.193274114
63	2.63556396
64	2.20948369