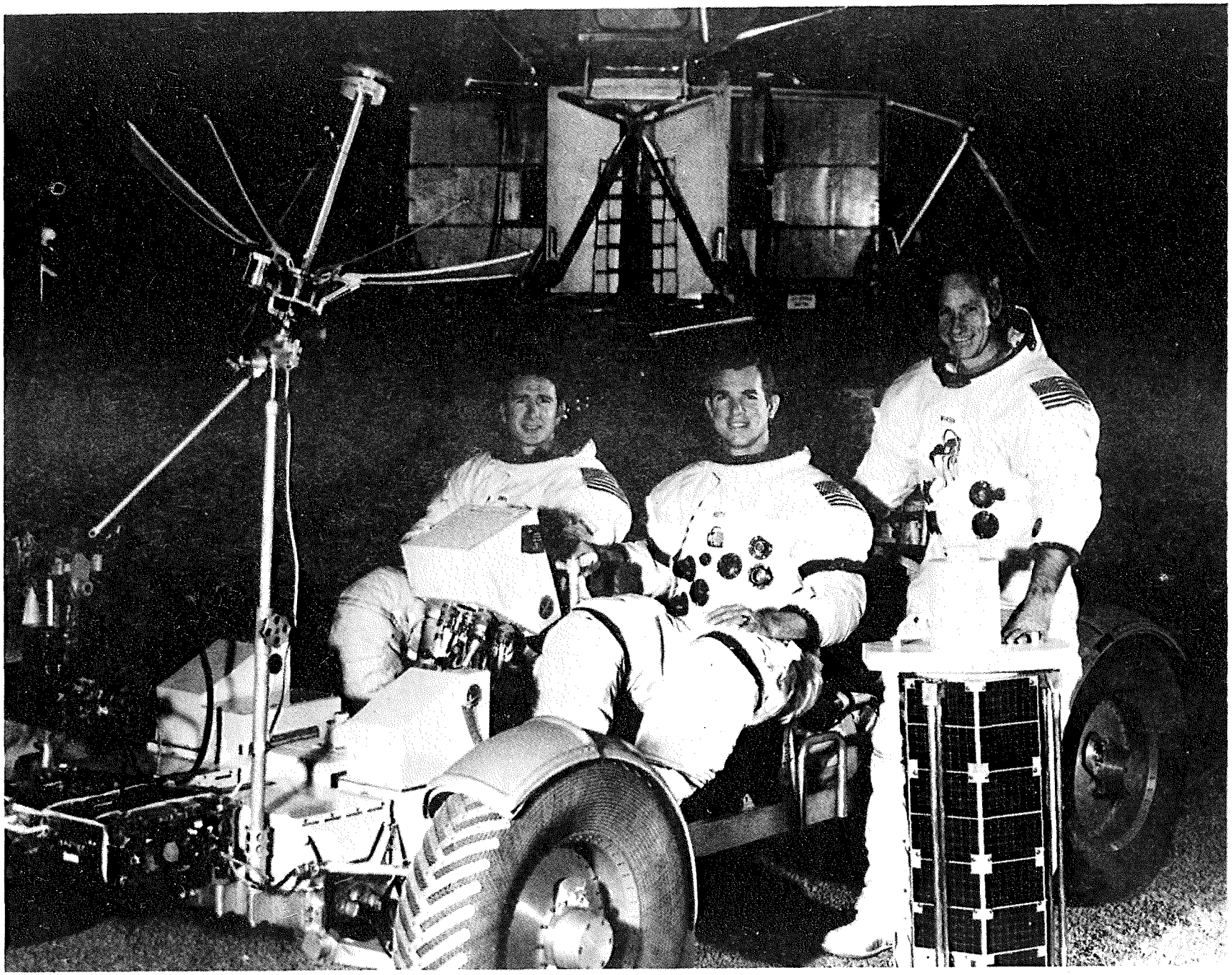
PRESENTATION TO

THE SCIENCE ADVISOR

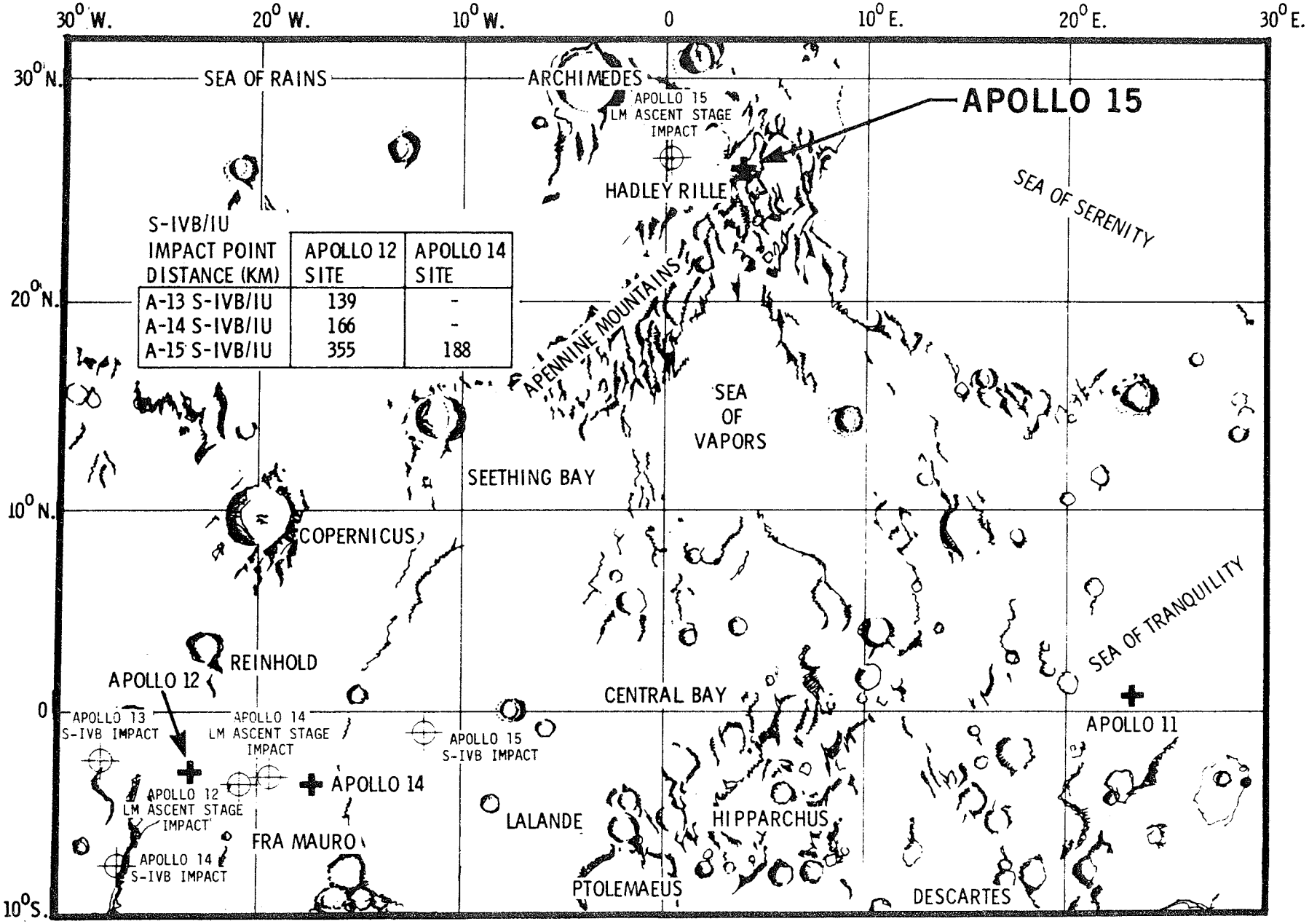
TO THE PRESIDENT

SEPTEMBER 3, 1971

NASA 71-HC-691



PASSIVE SEISMIC EXPERIMENT



S-IVB/IU IMPACT POINT DISTANCE (KM)

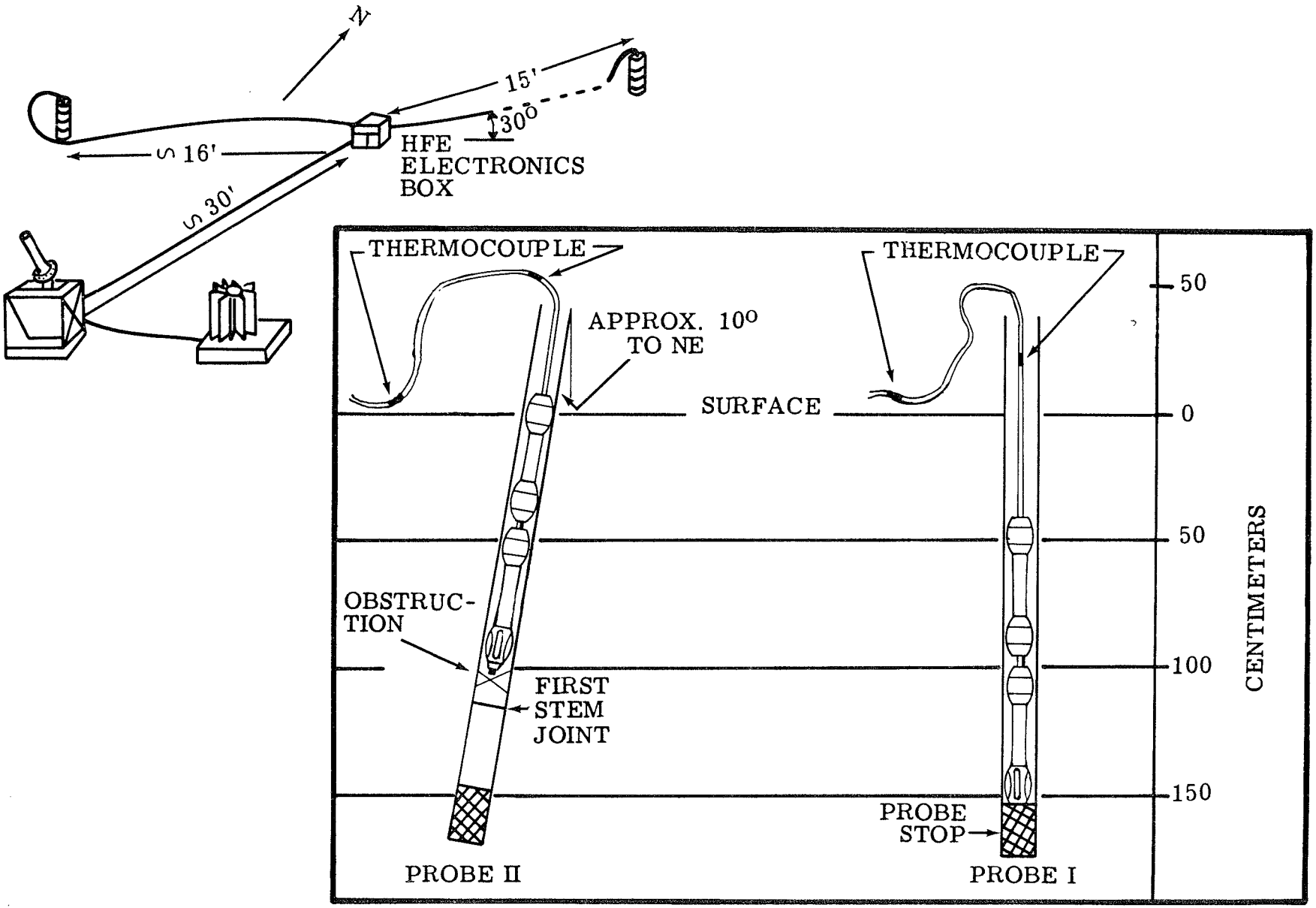
	APOLLO 12 SITE	APOLLO 14 SITE
A-13 S-IVB/IU	139	-
A-14 S-IVB/IU	166	-
A-15 S-IVB/IU	355	188

APOLLO 15

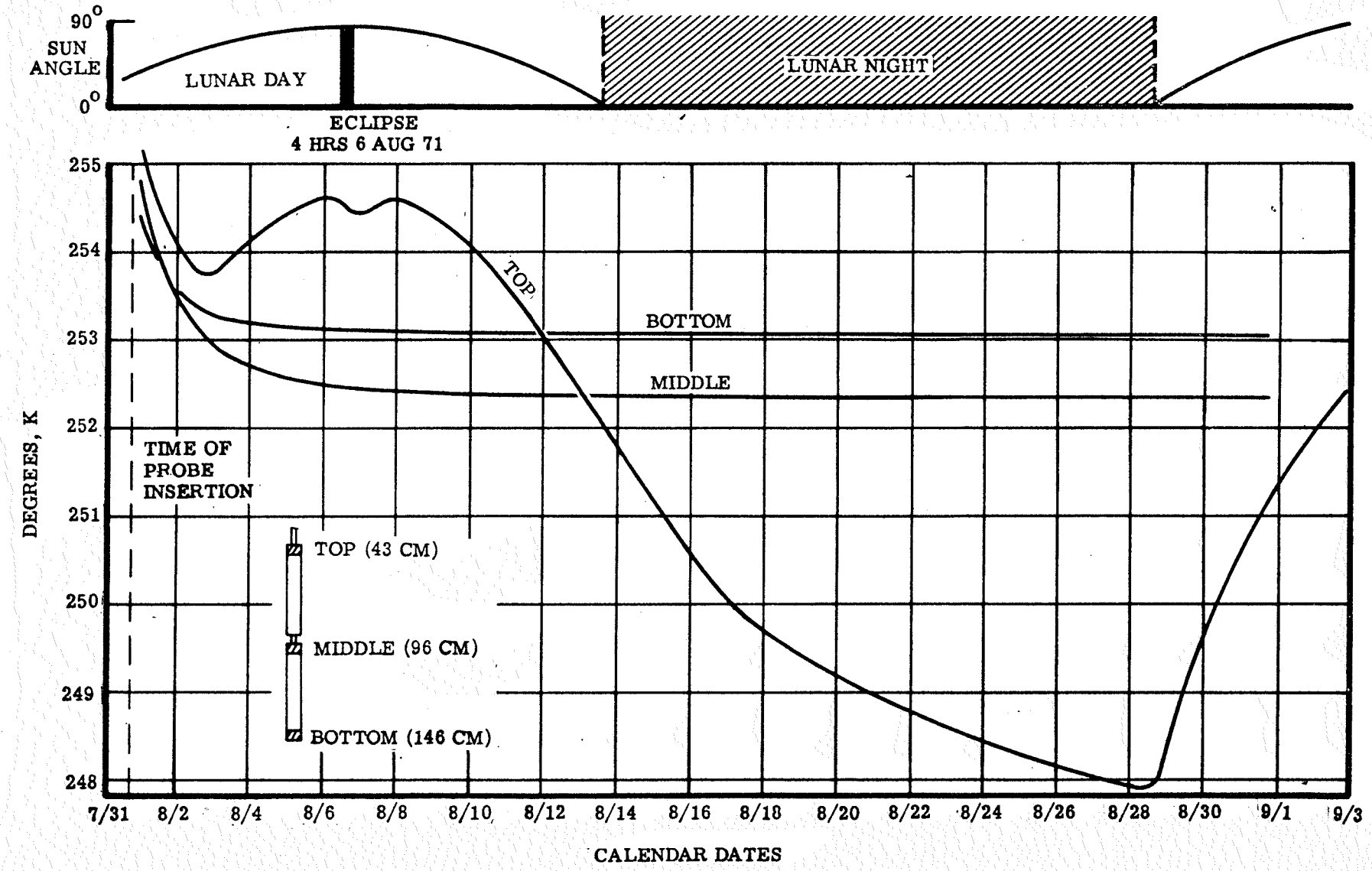
PASSIVE SEISMIC EXPERIMENT

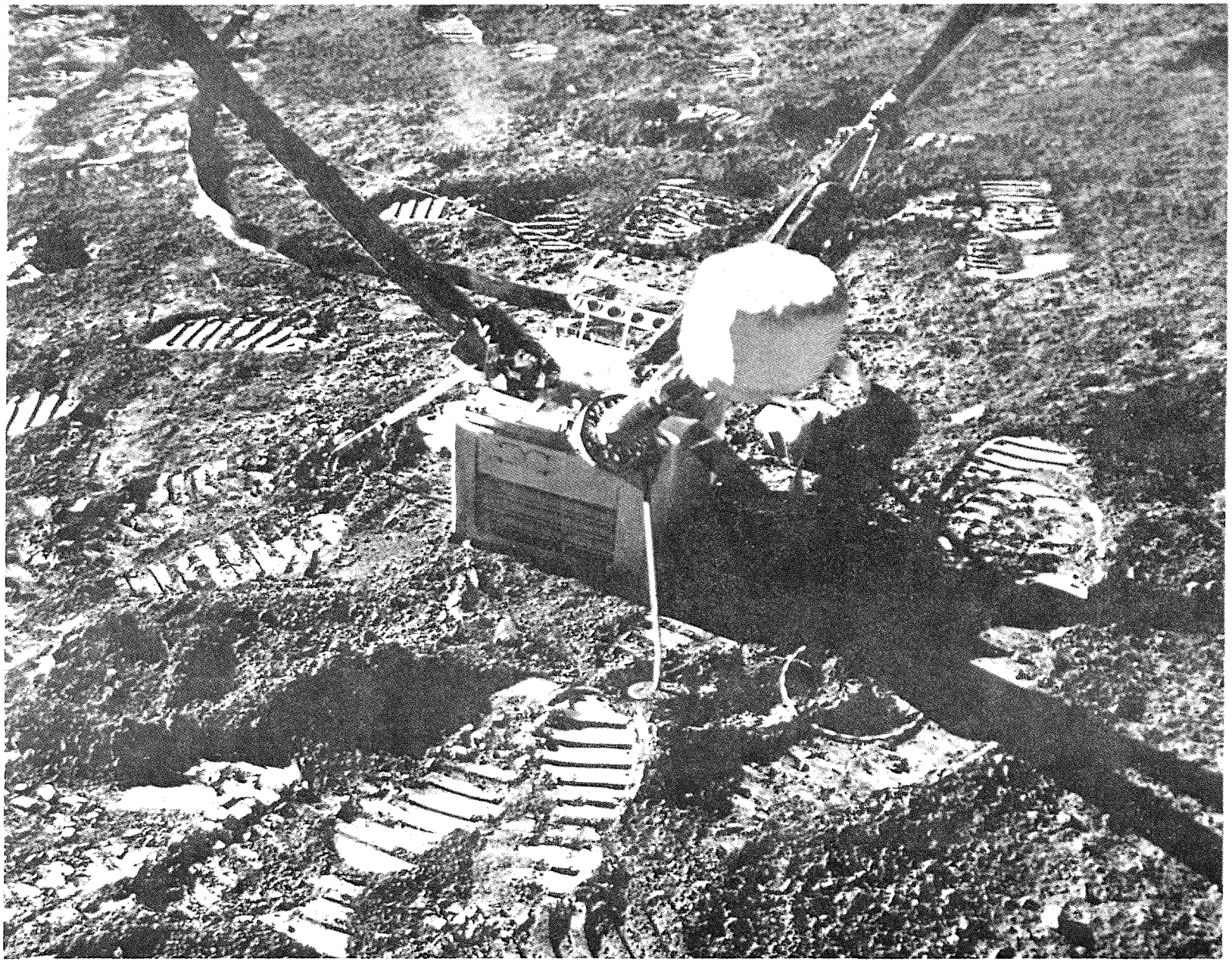
- ESTABLISHED THIRD STATION IN NETWORK
- MONITORED LRV - WILL PROVIDE DATA ON UPPER 1-2 KM
- PERIGEE EVENTS TENTATIVELY LOCATED
- LM IMPACT CONFIRMED LONG DISTANCE RECEPTION OF SMALL SEISMIC SOURCES
- S-IVB IMPACT PROVIDED DATA TO DEPTHS OF 50-100 KM VS 30 KM

APOLLO 15
HEAT FLOW EXPERIMENT



APOLLO 15
HEAT FLOW EXPERIMENT
TEMPERATURE HISTORY OF PROBE 1





APOLLO 15
LUNAR SURFACE MAGNETOMETER

- VERY SMALL LOCAL FIELD: 5 ± 5 GAMMAS
  - APOLLO 12: 38 ± 3 GAMMAS
  - APOLLO 14: 43 ± 6 GAMMAS, 103 ± 5 GAMMAS
- SHOULD DETERMINE THEORETICAL MODEL OF MOON TO CENTER
- TWO STATIONS IN OPERATION
  - APOLLO 12 OPERATES 7 DAYS PER LUNATION (INTERMITTENT OPEN CIRCUIT WHEN COLD)

APOLLO 15

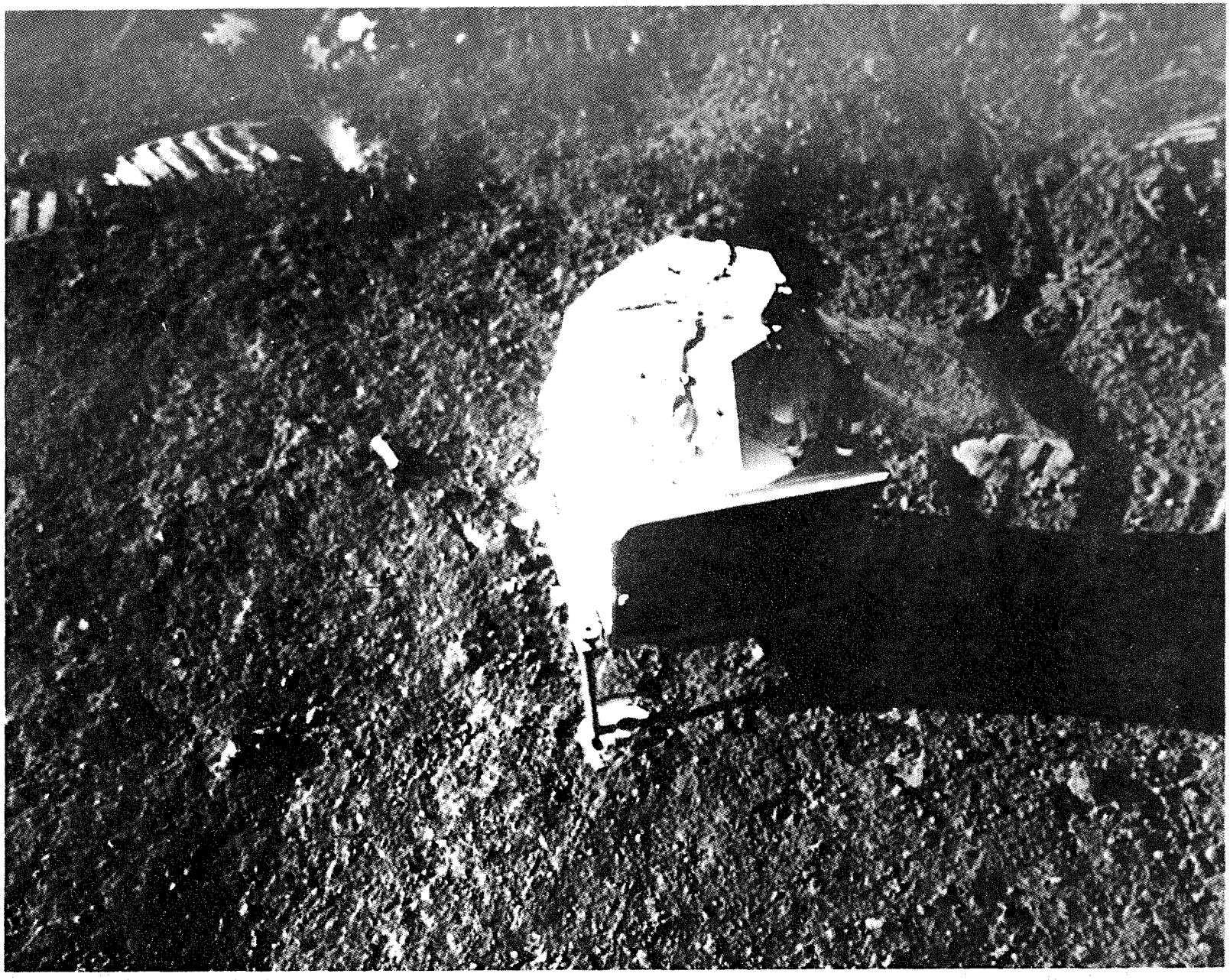
SUPRATHERMAL ION DETECTOR

- MONITORED LM DEPRESSURIZATIONS AND LM LIFT-OFF
- THREE INSTRUMENTS NOW IN OPERATION WITH DIFFERENT POINTING DIRECTIONS. WILL STUDY:
  - MOTION OF ION CLOUDS OVER MOON'S SURFACE
  - INTERACTION OF SOLAR WIND IONS WITH EARTH'S MAGNETIC FIELD
  - CHEMICAL COMPOSITION OF ION CLOUDS
- INSTRUMENT NOW ON THRU LUNAR NIGHT, WILL BE TURNED OFF WHEN INSTRUMENT TEMPERATURE REACHES APPROXIMATELY 50^{0} F.

COLD CATHODE GAUGE

- MONITORED LM DEPRESSURIZATIONS AND LM LIFT-OFF
- TWO INSTRUMENTS NOW IN OPERATION POINTED AT POLES. WILL STUDY:
  - ATMOSPHERIC PRESSURE
  - SOURCES OF TRANSIENT GAS CLOUDS
  - PHYSICAL CHARACTERISTICS OF CLOUDS
- INSTRUMENT HAS SAME OPERATING CYCLE AS SIDE. PRESENTLY READING AN ATMOSPHERIC PRESSURE IN LOW 10^{-12} TORR RANGE

APC 1547



APOLLO 15

SOLAR WIND SPECTROMETER

- MONITORED LM IMPACT
- TWO INSTRUMENTS NOW IN OPERATION. WILL STUDY:
  - SOLAR WIND PROTONS AND ELECTRONS AND DIRECTION OF IMPINGEMENT ON LUNAR SURFACE
  - DEFLECTION OF SOLAR WIND AROUND LUNAR LIMB
  - INTERACTION OF SOLAR WIND AND EARTH'S MAGNETIC FIELD

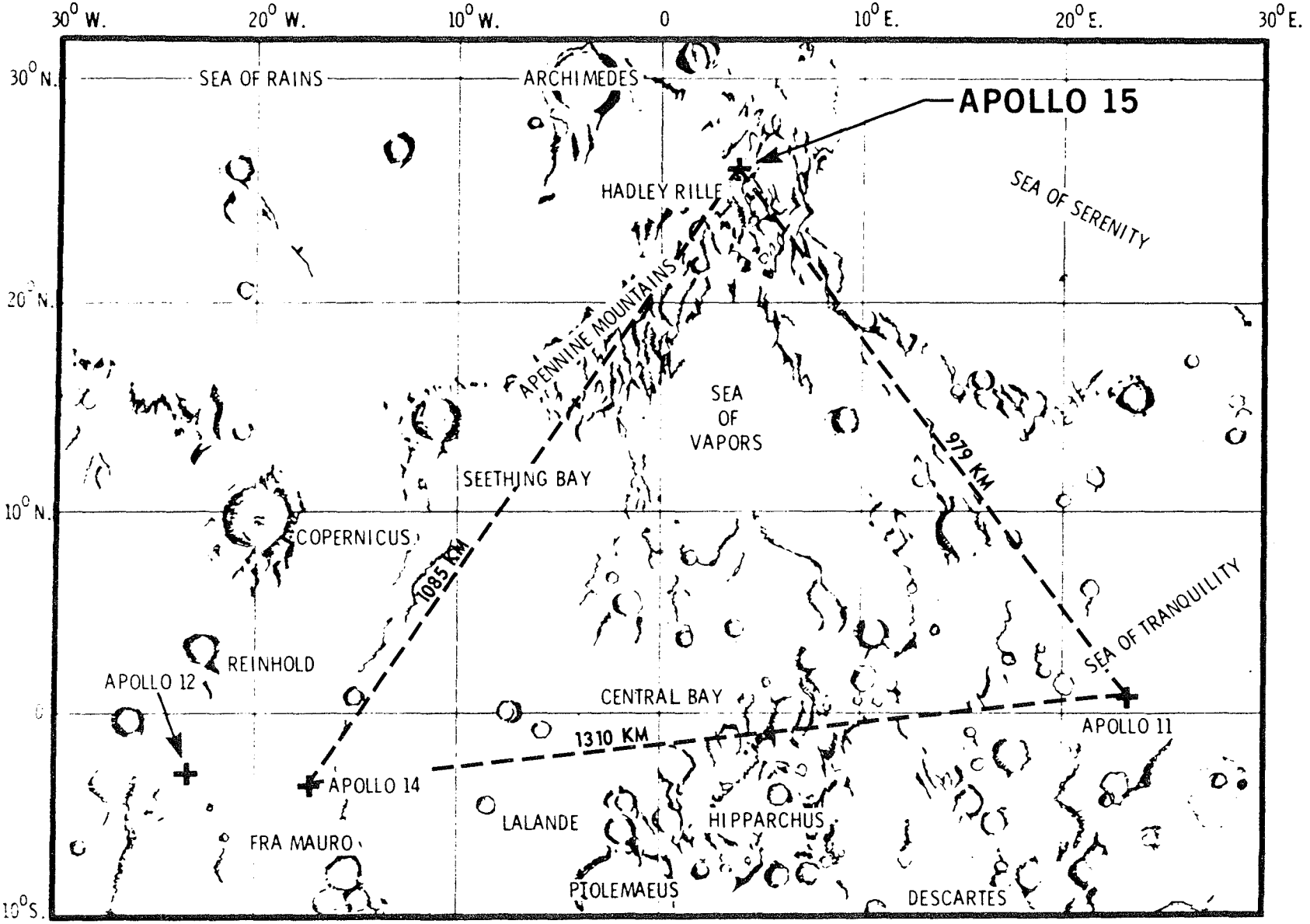
APOLLO 15
SOLAR WIND COMPOSITION

- DATA FROM PREVIOUS MISSIONS:
  - ABSOLUTE FLUX OF ^{4}He, ^{3}He, ^{20}Ne, ^{22}Ne
  - APPROXIMATE ABUNDANCES ^{21}Ne
  - CONCENTRATIONS OF ^{36}Ar, ^{38}Ar
- EXPECTED DATA FROM APOLLO 15:
  - PRECISE ABUNDANCES OF ^{21}Ne, ^{38}Ar
  - ACCELERATION AND FRACTIONATION PROCESSES IN SOLAR ATMOSPHERE

EXPOSURE DURATION

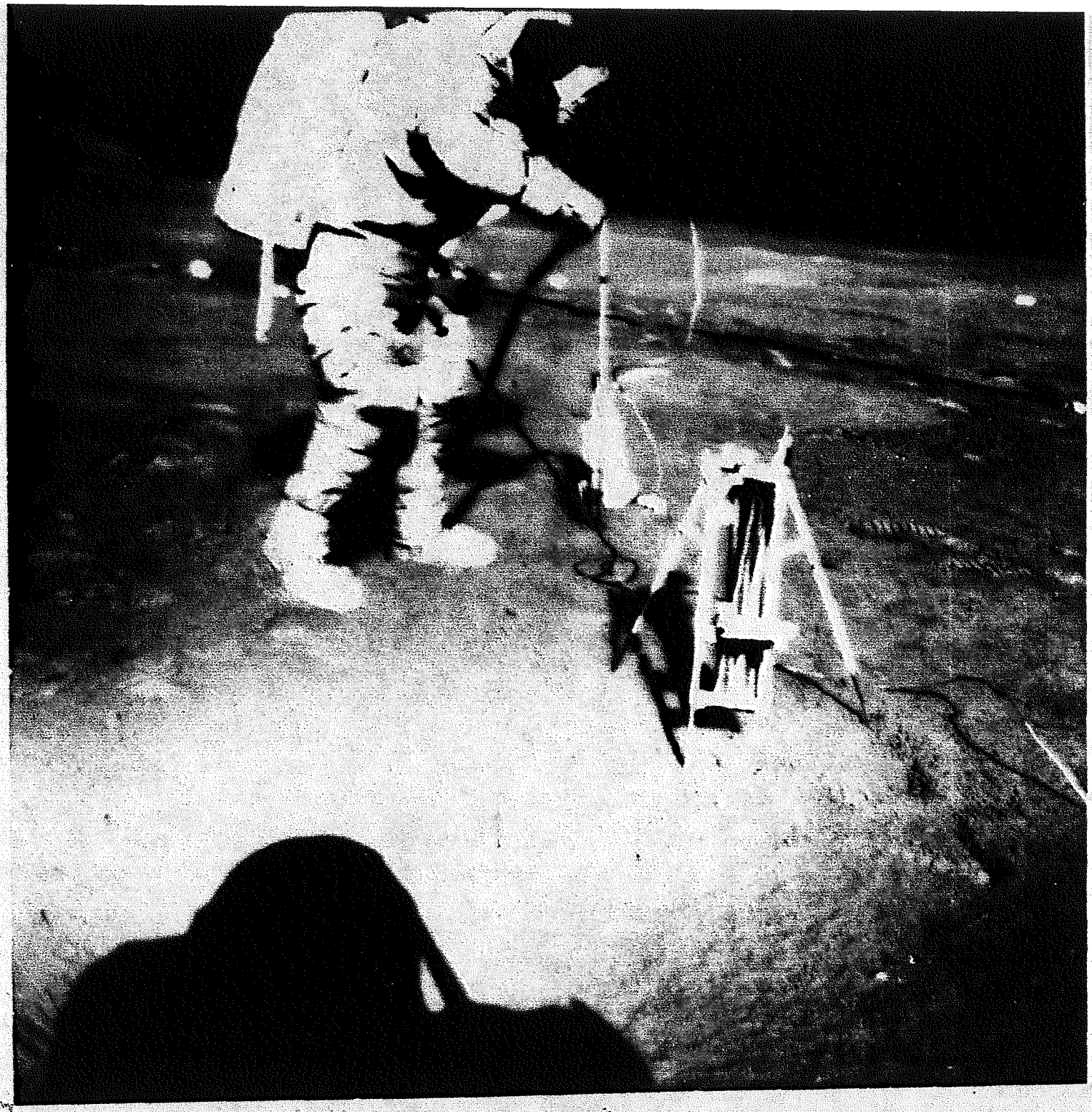
	HR:MIN
APOLLO 11	1:17
APOLLO 12	18:42
APOLLO 14	21:00
APOLLO 15	41:08

LASER RANGING RETRO-REFLECTOR LOCATIONS



APOLLO 15
LUNAR LASER RANGING EXPERIMENT

- PRESENT PRECISION OF ±30 CM
  EXPECTED PRECISION OF ±3.0 CM
- RANGING TO THREE ARRAYS IS LEADING TO:
  - BETTER MASS DISTRIBUTION INFORMATION
  - POINT LOCATION OF RETROREFLECTORS WITH RESPECT TO CENTER OF MASS OF THE MOON
  - LUNAR ELASTICITY INFORMATION
- RANGING TO 300 CUBE ARRAY IS EASIER AND MORE FREQUENT THAN THE OTHER TWO ARRAYS
  - ALL ATTEMPTS SINCE ACQUISITION HAVE BEEN SUCCESSFUL
- JAPAN AND FRANCE ARE PREPARING FOR LASER RANGING. OTHER COUNTRIES ARE EXPECTED TO FOLLOW



APOLLO 15
DRILL CORE

- TOTAL LENGTH - 2.4M (93.6")
- TOTAL WEIGHT - APPROXIMATELY 1332g
- RECOVERY - DRILL STEM FULL EXCEPT FOR BOTTOM 3"
- CORE DESCRIPTION:
  - 44 LAYERS OBSERVED BY X-RADIOGRAPH
  - LAYERS APPEAR UNDISTURBED
  - CORE CONSISTS OF RANDOMLY ALTERNATING LAYERS OF VERY FINE GRAINED TO COARSE GRAINED SOIL WITH INTERSPERSED ROCK FRAGMENTS UP TO 14MM LONG. SOME LAYERS ALMOST ENTIRELY OF VERY FINE SOIL, OTHERS HAVE LARGE PERCENTAGE ROCK FRAGMENTS COARSER THAN 1MM

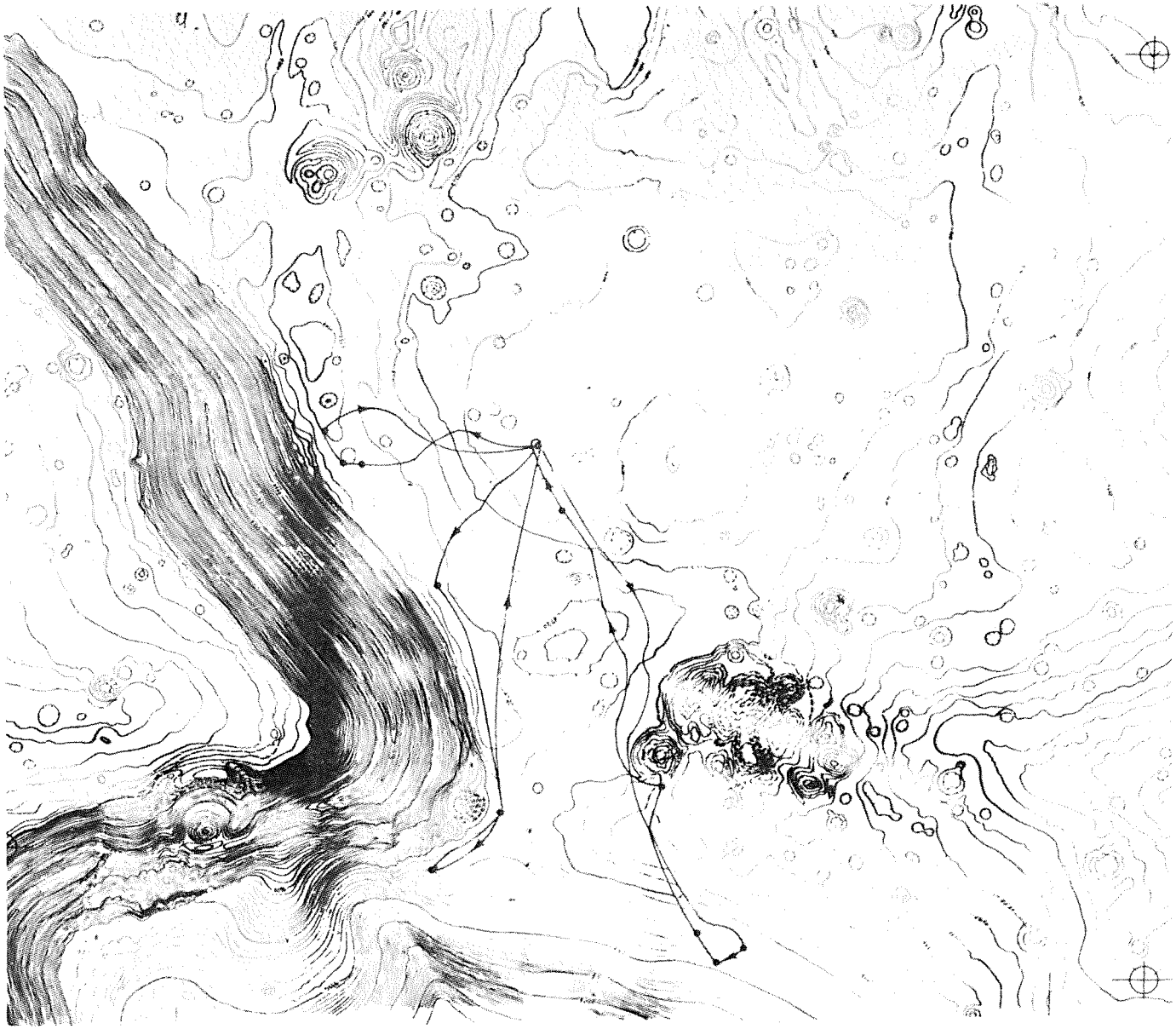
APOLLO 15
SURFACE GEOLOGY AND SAMPLES

- THREE TRAVERSES WITH LRV
  - FIRST TRAVERSE TO FRONT - 10.3 KM
  - SECOND TRAVERSE TO FRONT - 12.5 KM
  - THIRD TRAVERSE TO HADLEY RILLE - 5.1 KM

  TOTAL 27.9 KM
- SAMPLES COLLECTED 166# - 171# TOTAL
  - 60 DOCUMENTED SAMPLES
  - DRILL CORE - 2.4M
  - ONE SINGLE CORE - TWO DOUBLE CORES
  - TWO TRENCH SAMPLES
  - TWO SESC SAMPLES
  - THREE COMPREHENSIVE SAMPLES
- 1143 HASSELBLAD PHOTOGRAPHS

SOIL MECHANICS

- SIX PENETROMETER READINGS
- PHOTOGRAPHIC DOCUMENTATION
- CREW DESCRIPTION



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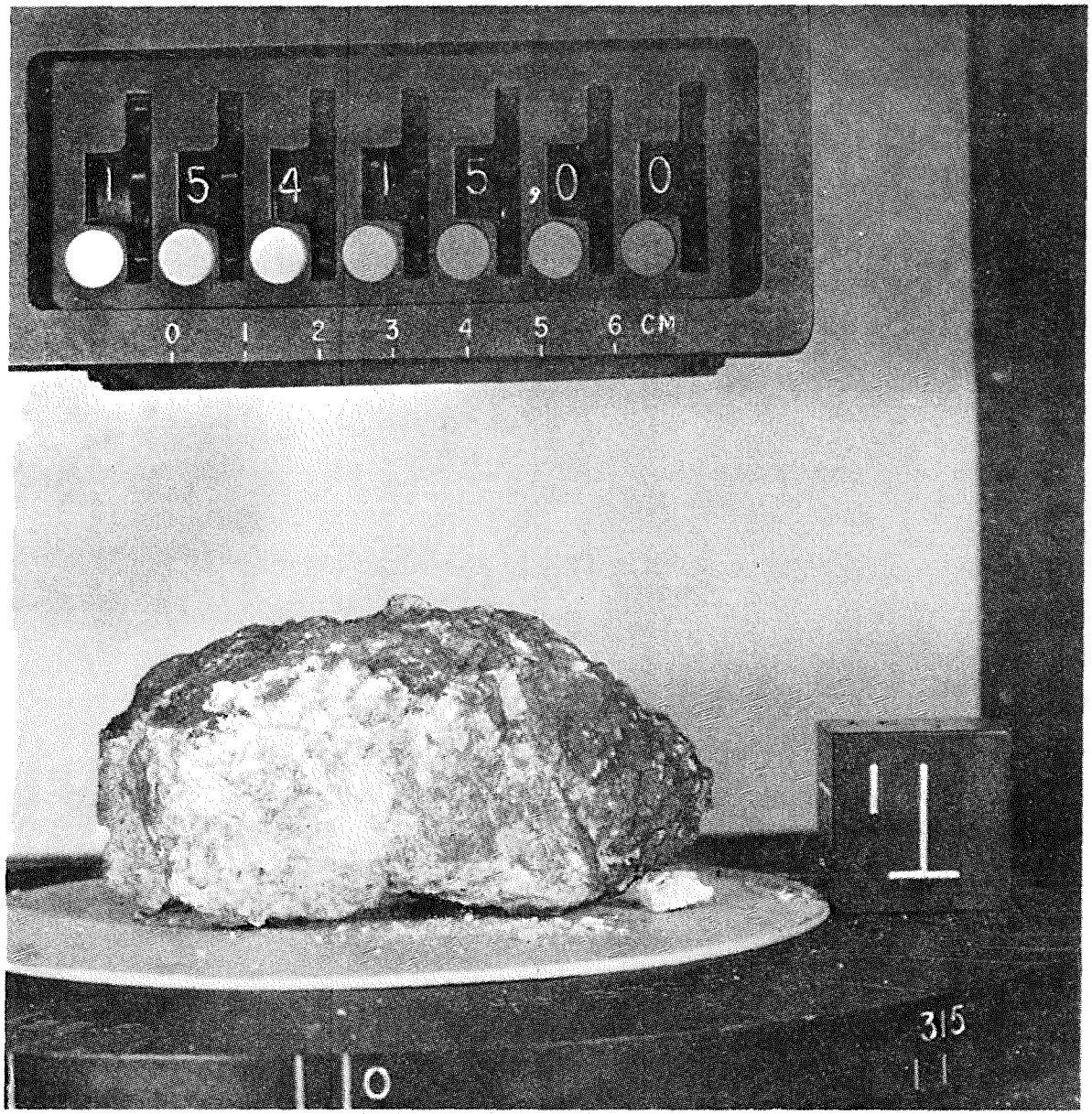
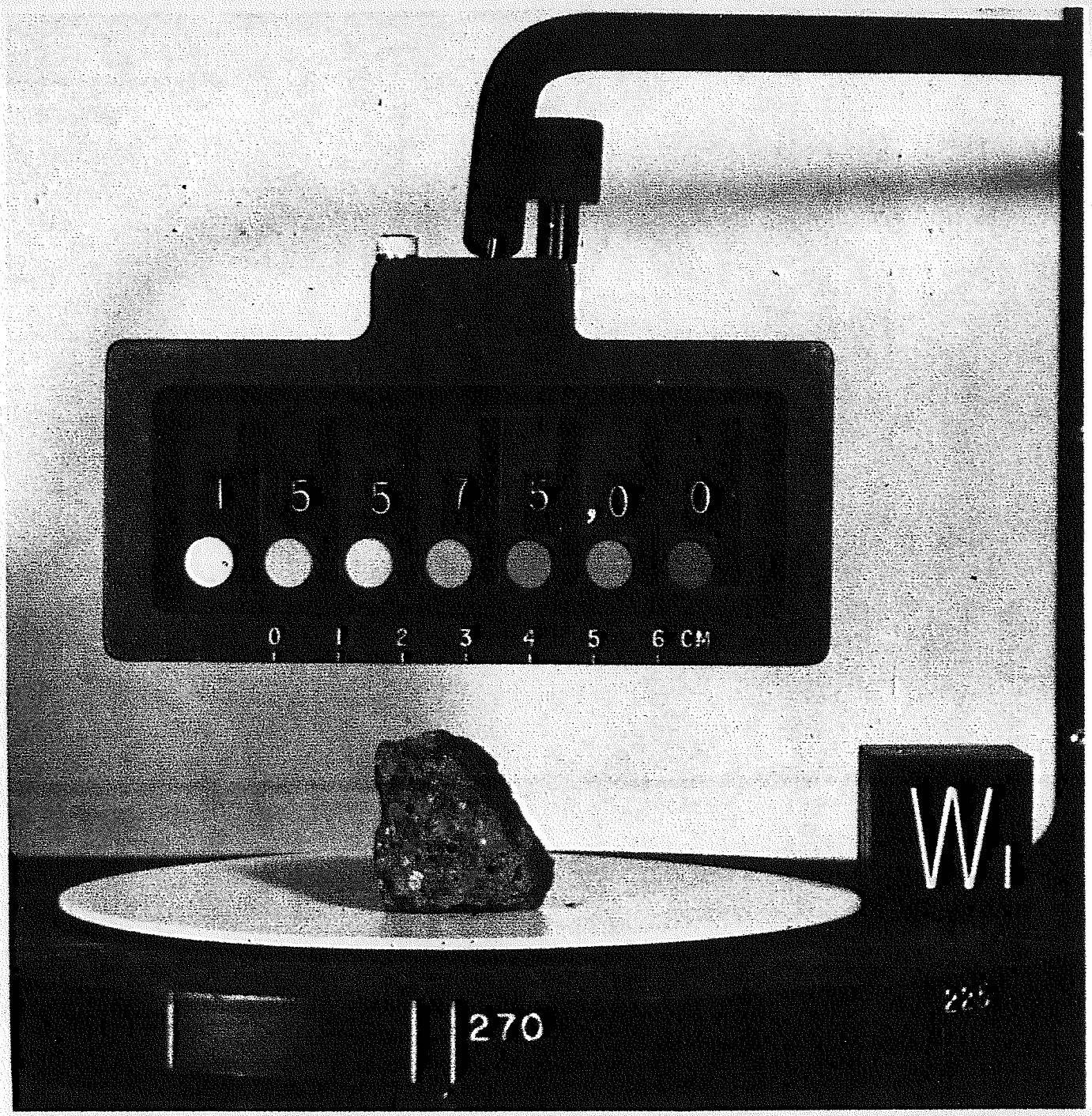
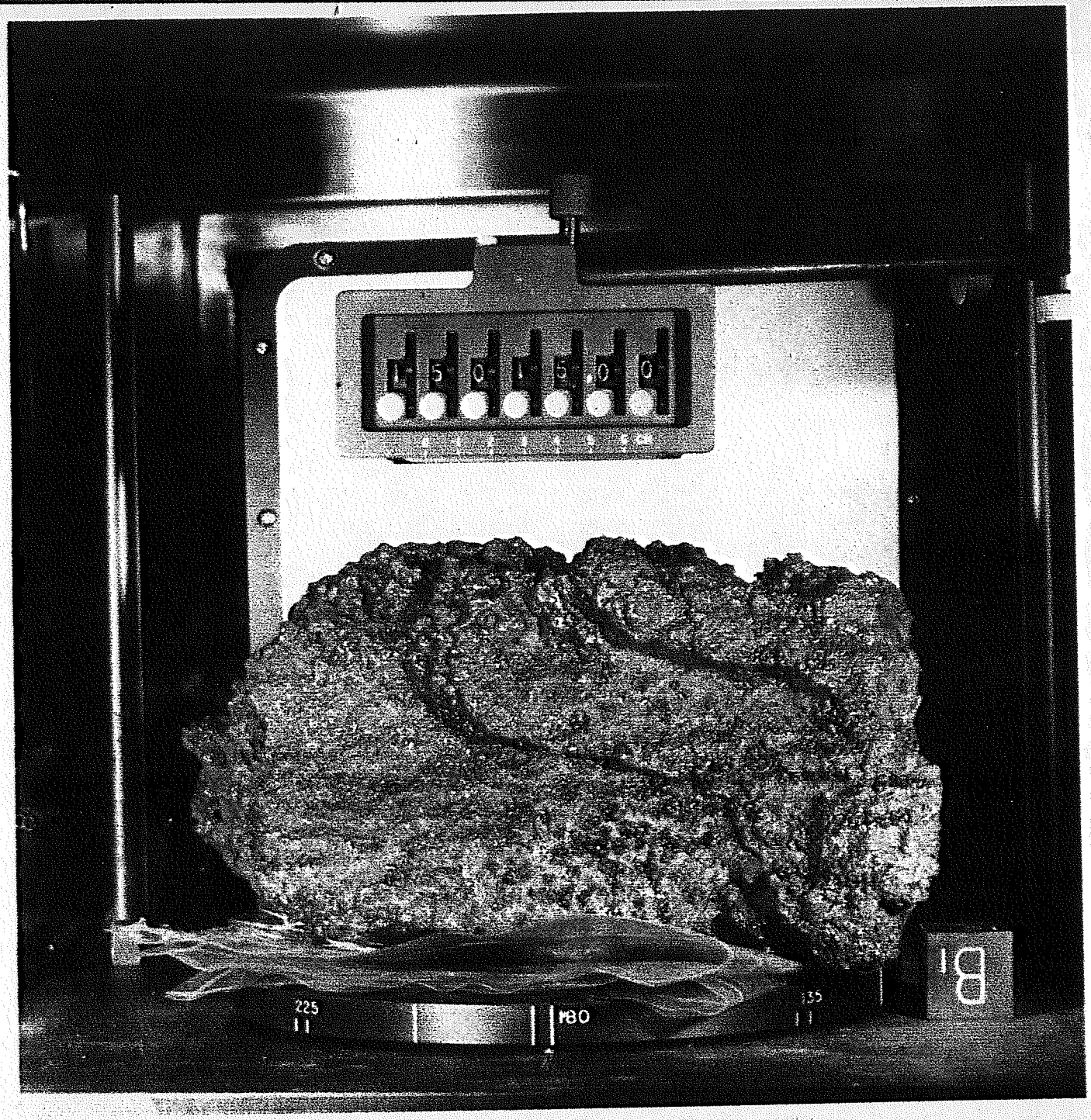
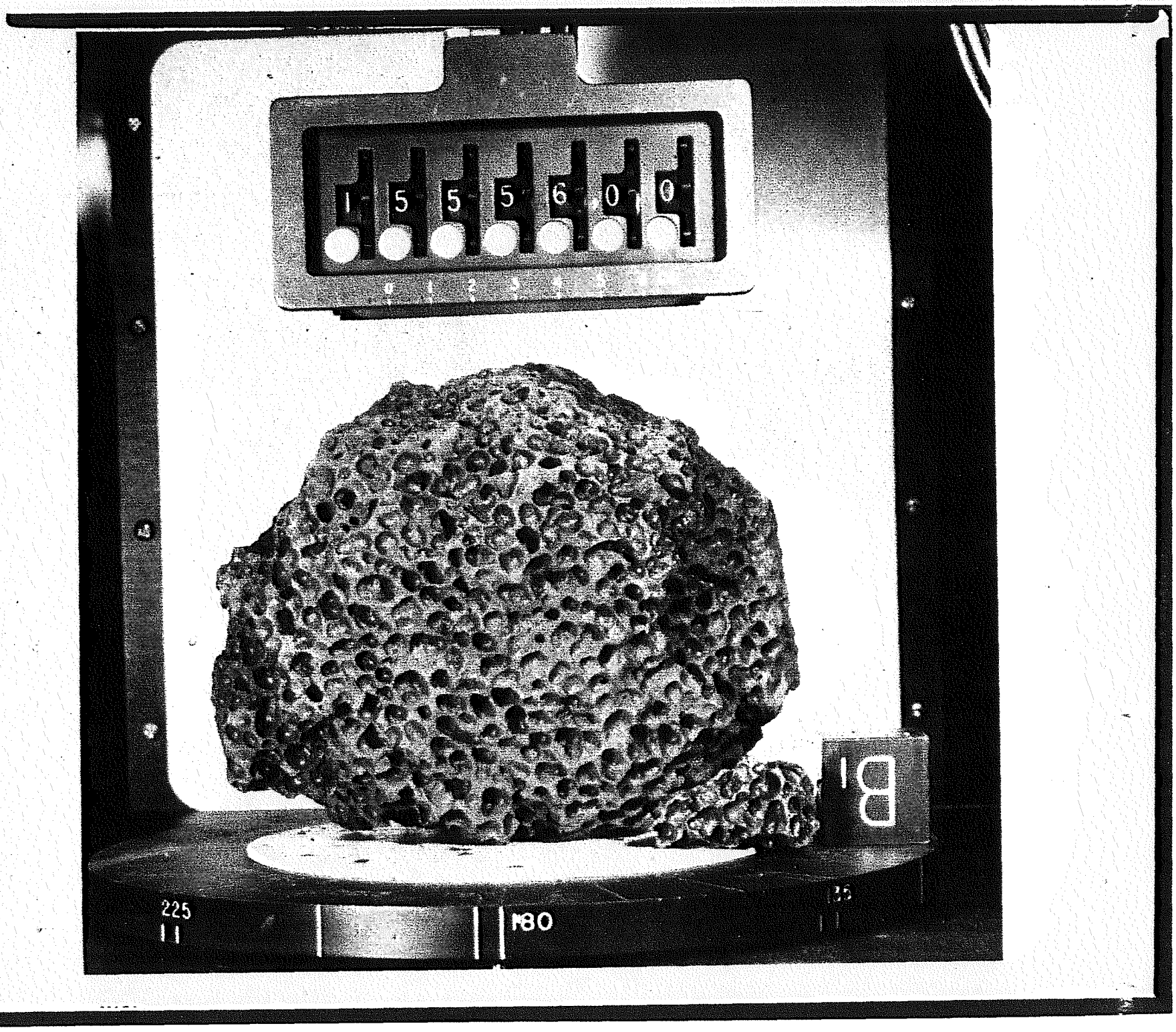
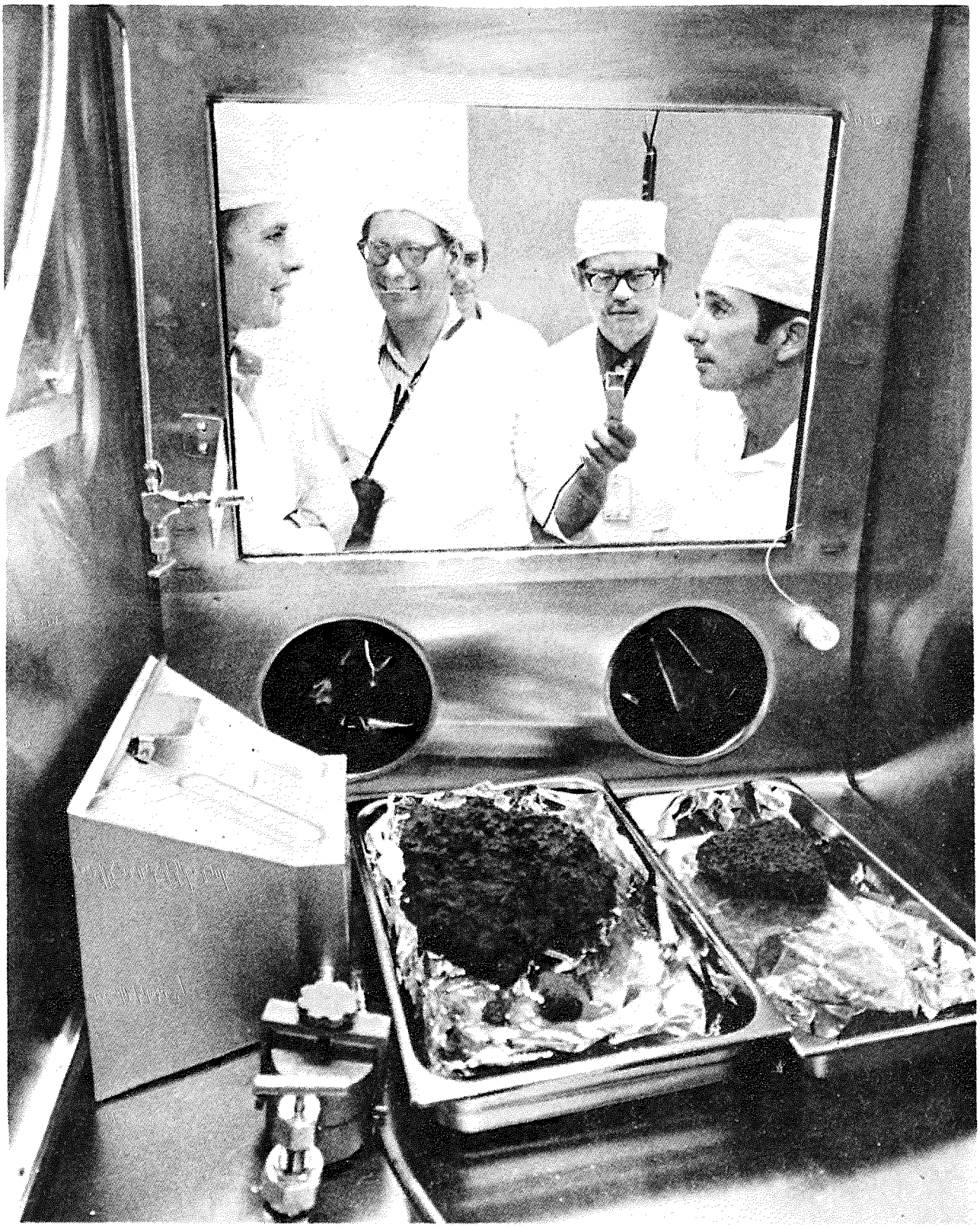



1 5 5 7 5 ,0 0
0 1 2 3 4 5 6 CM
270


150150
225
180
135
B1


1 5 5 5 6 0 0
B1
225
11
M80



NASA
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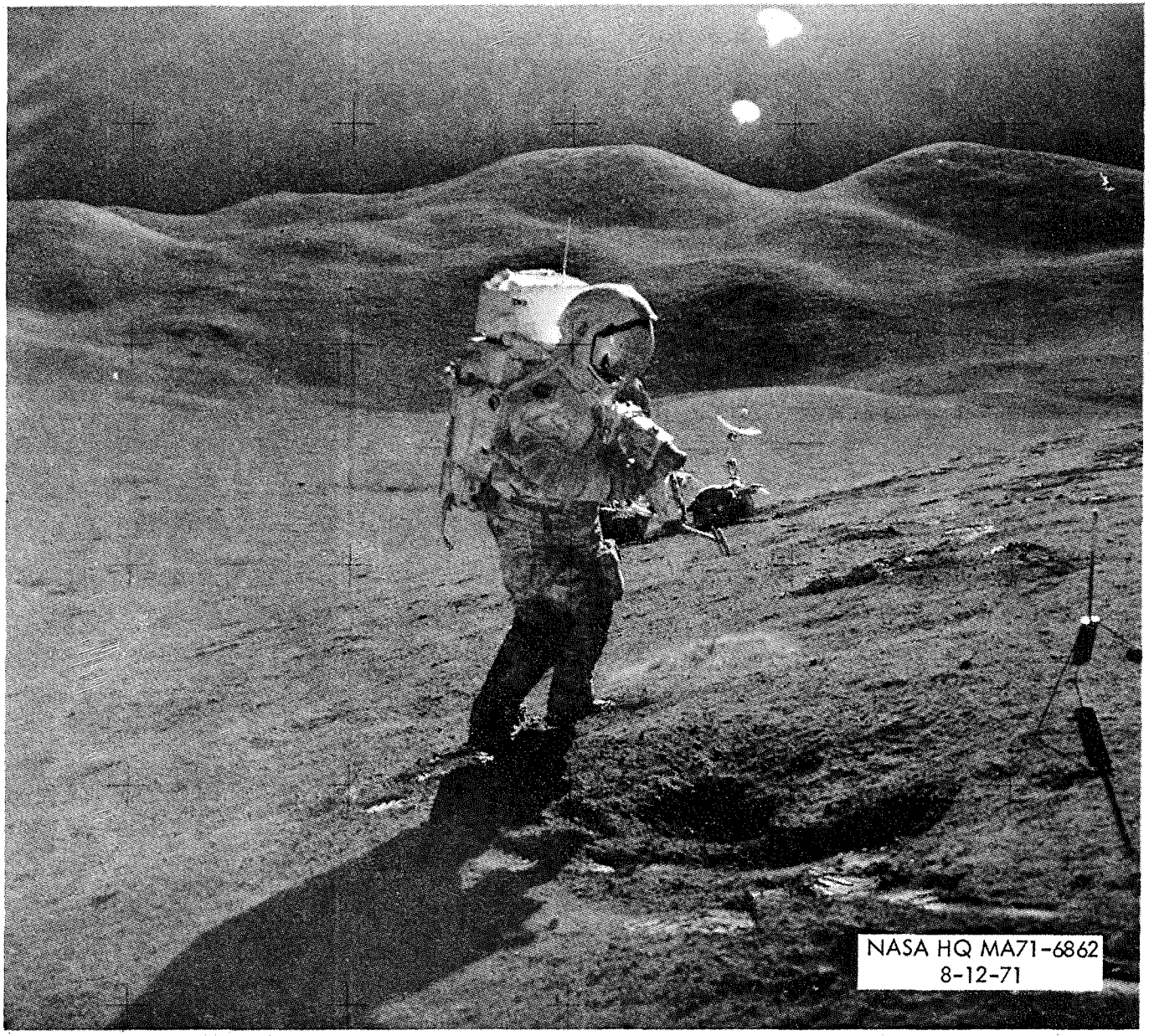

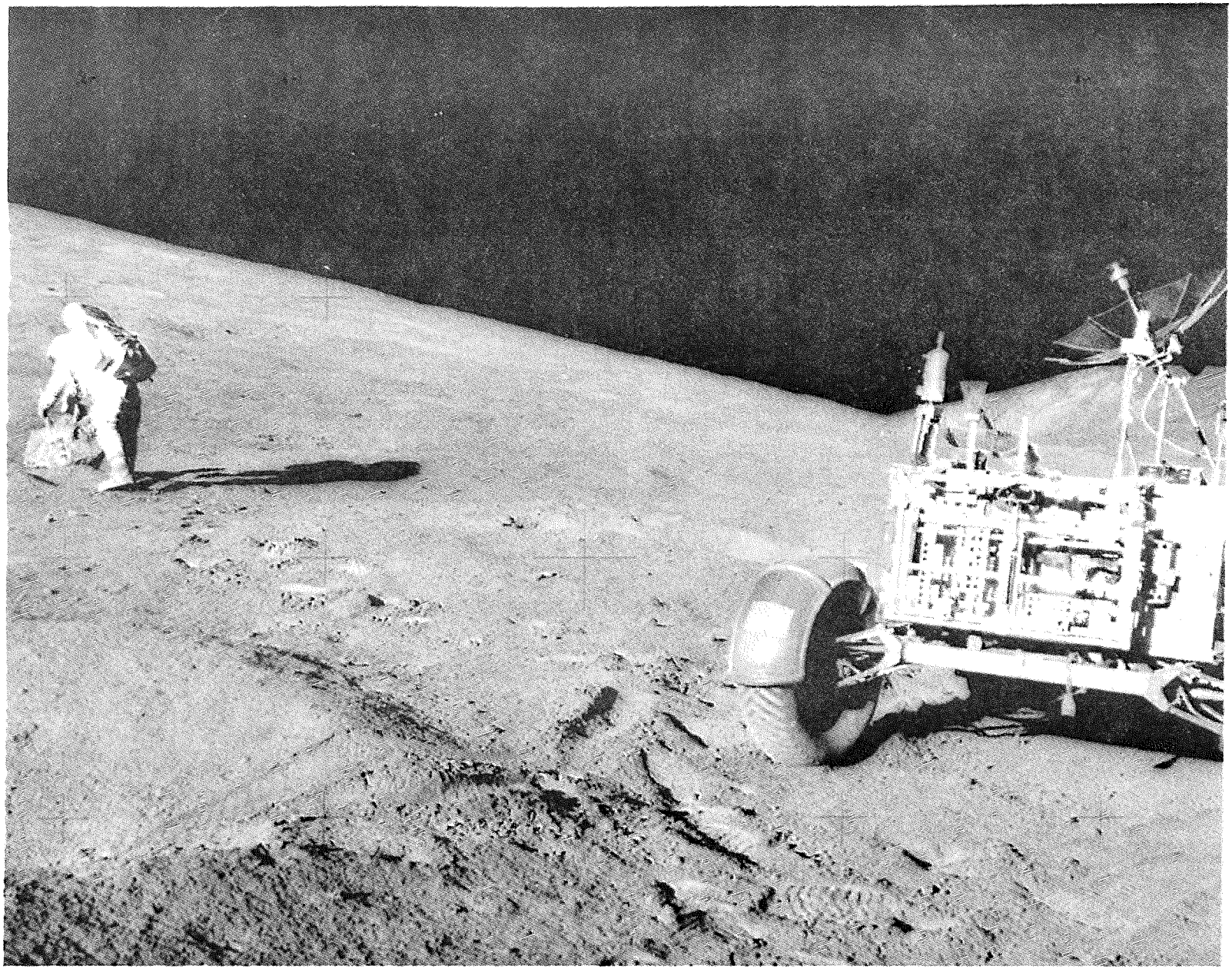

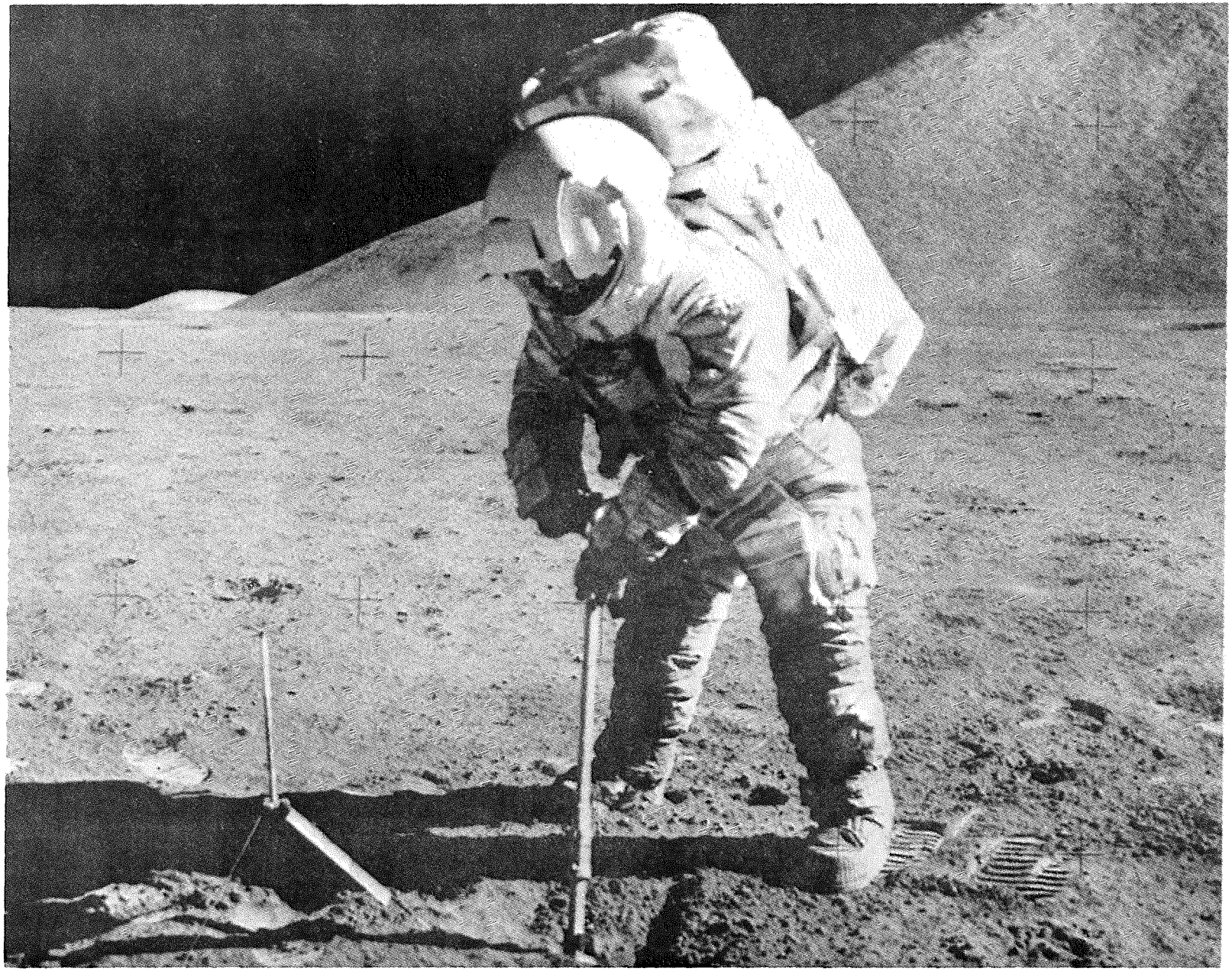

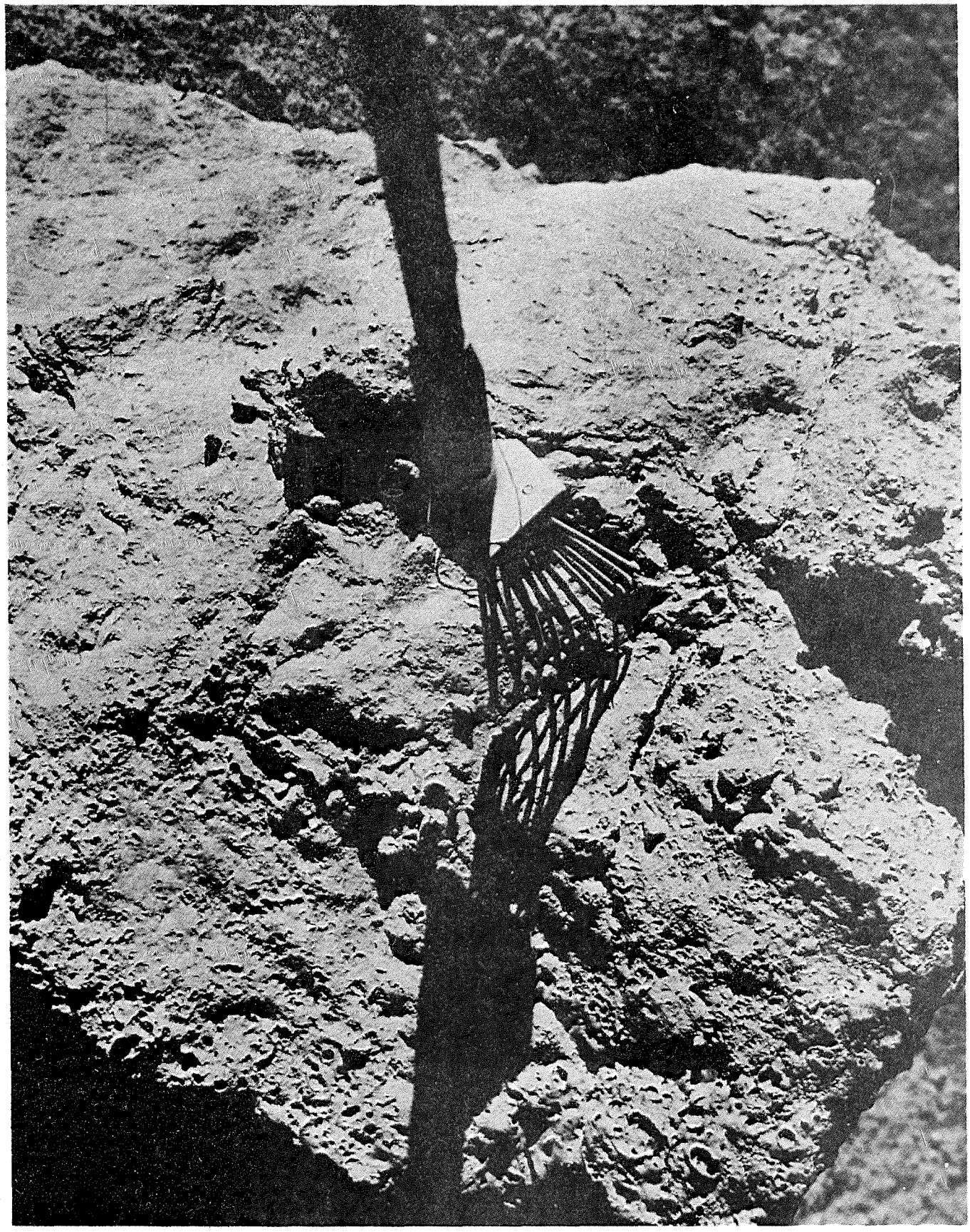

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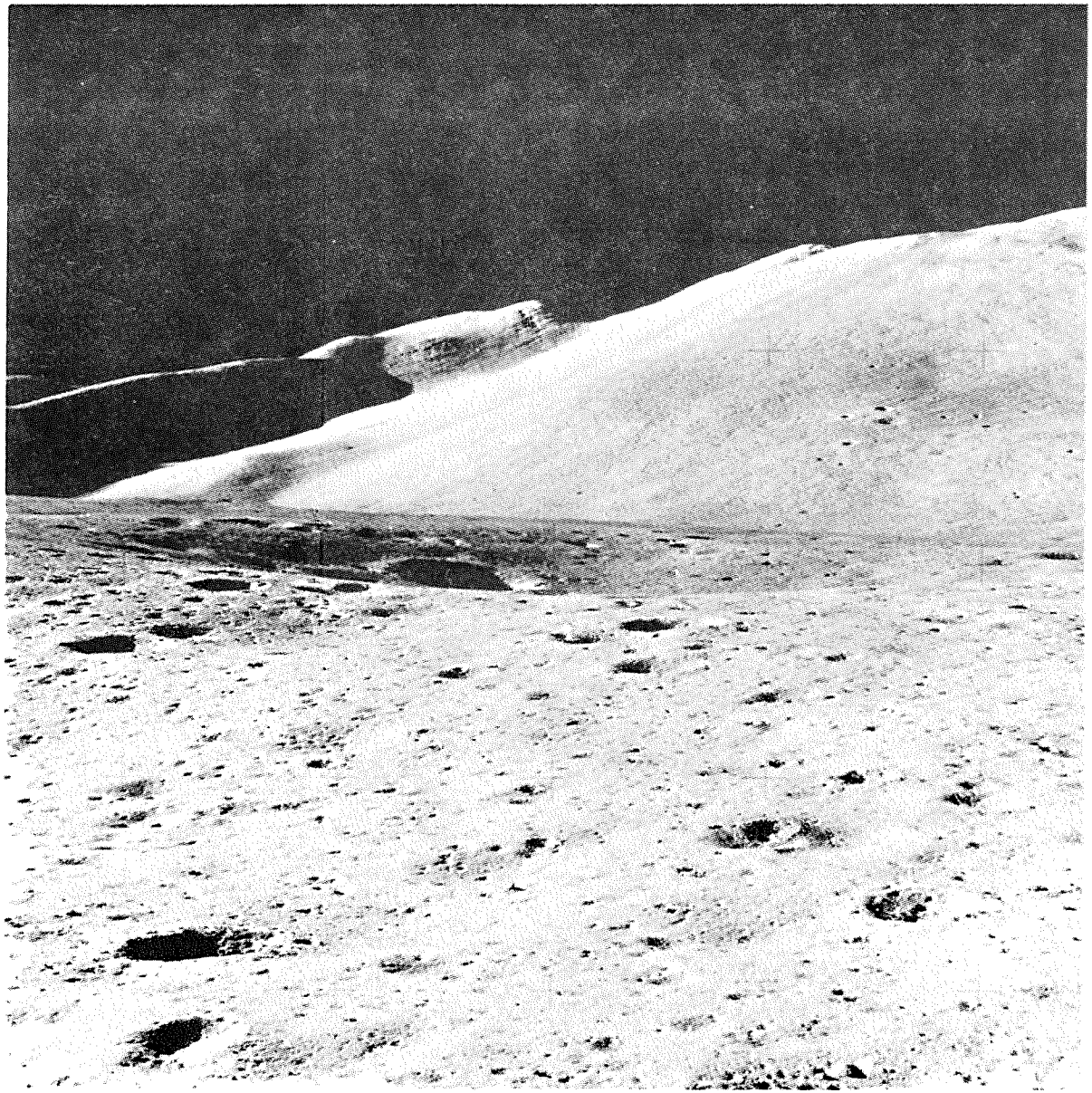
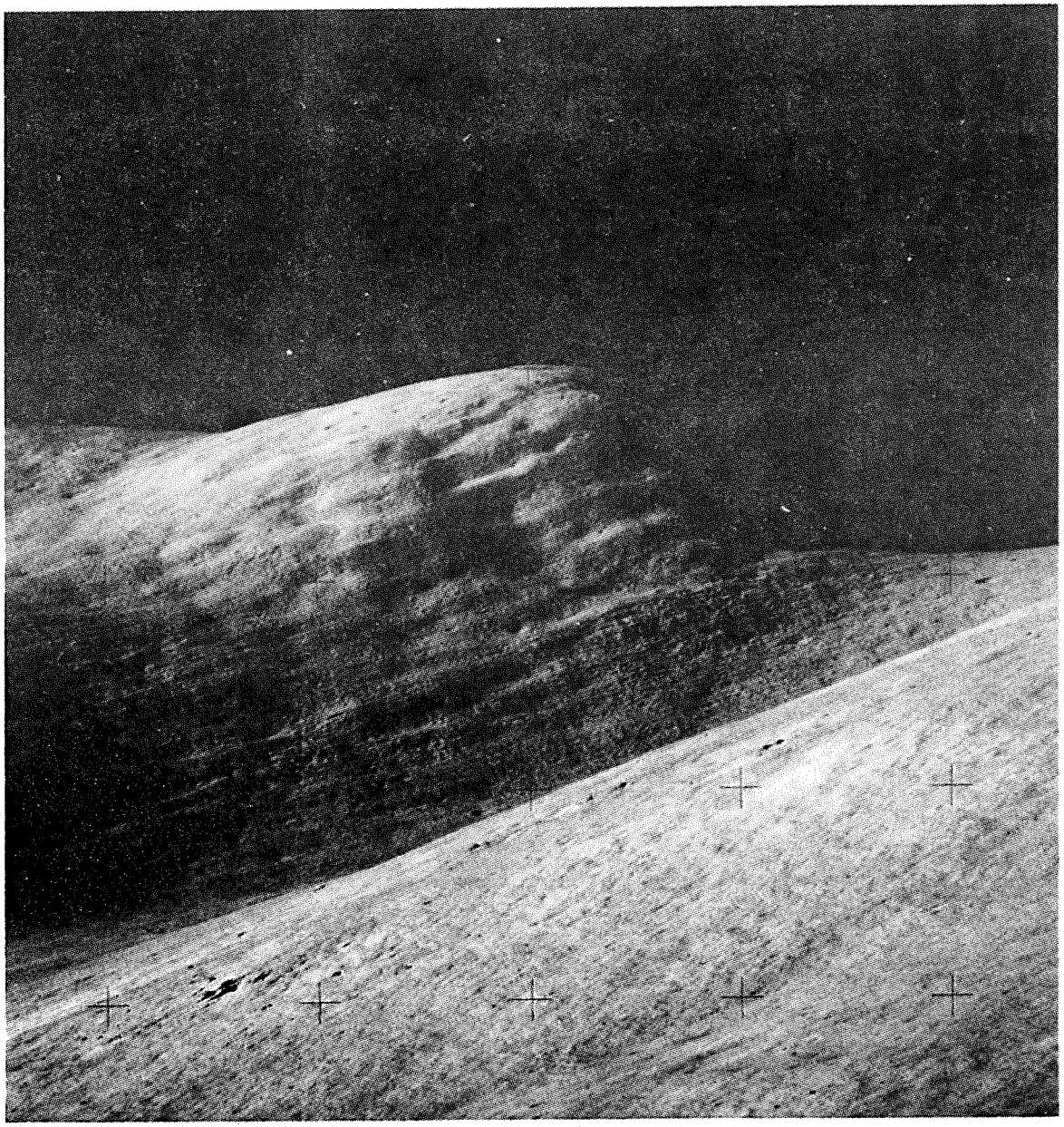


NASA
AS15-84-11250



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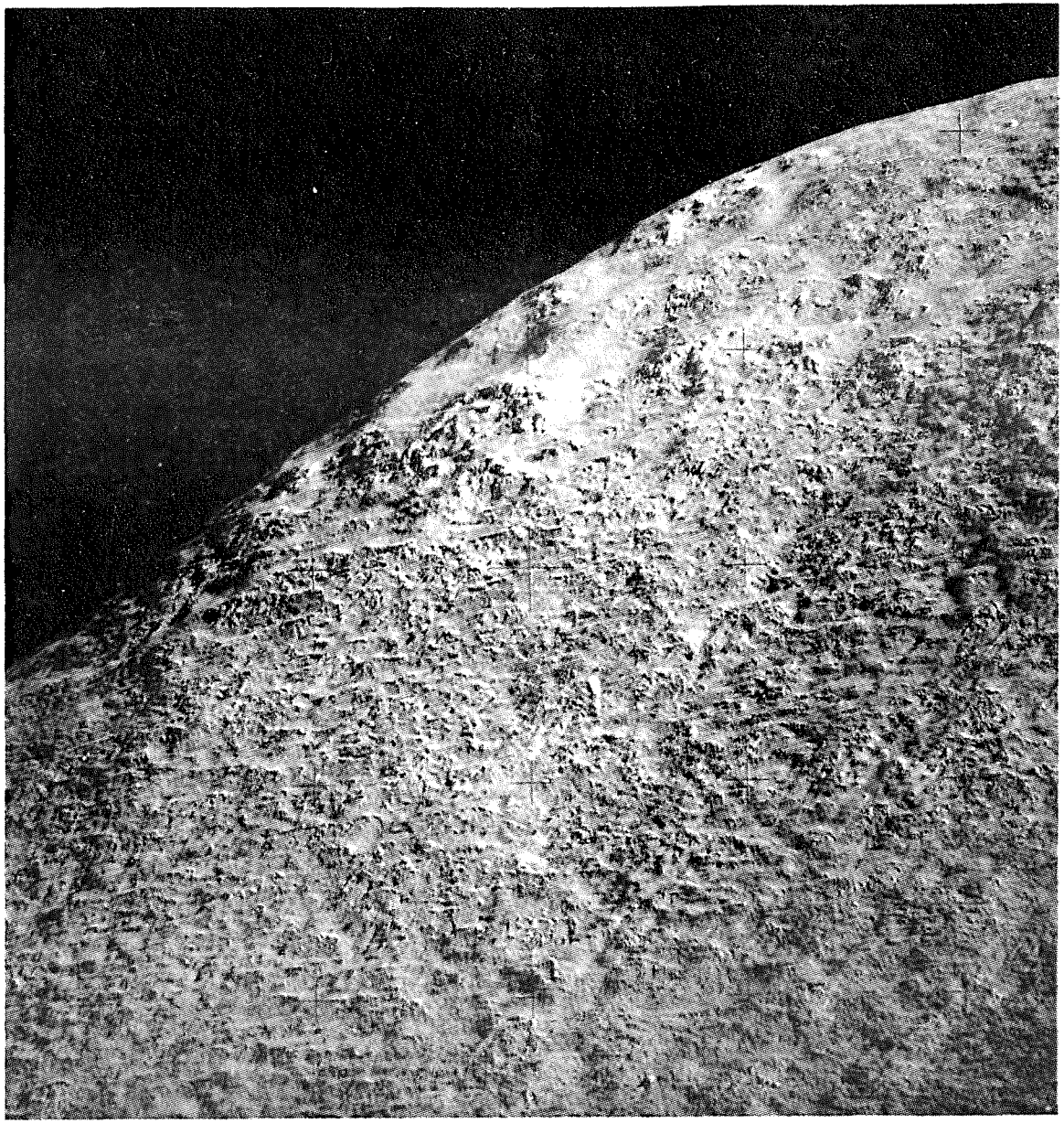
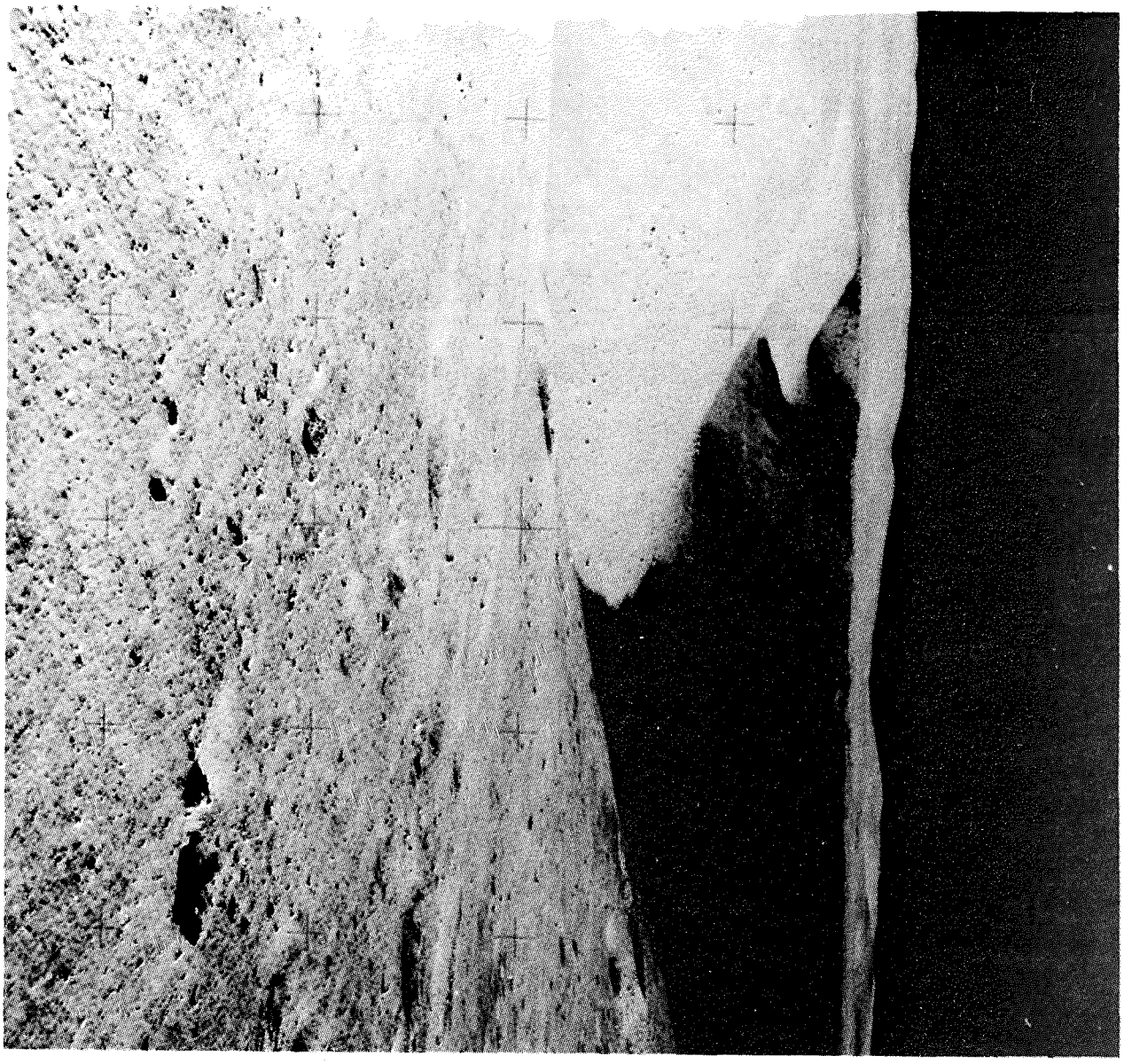
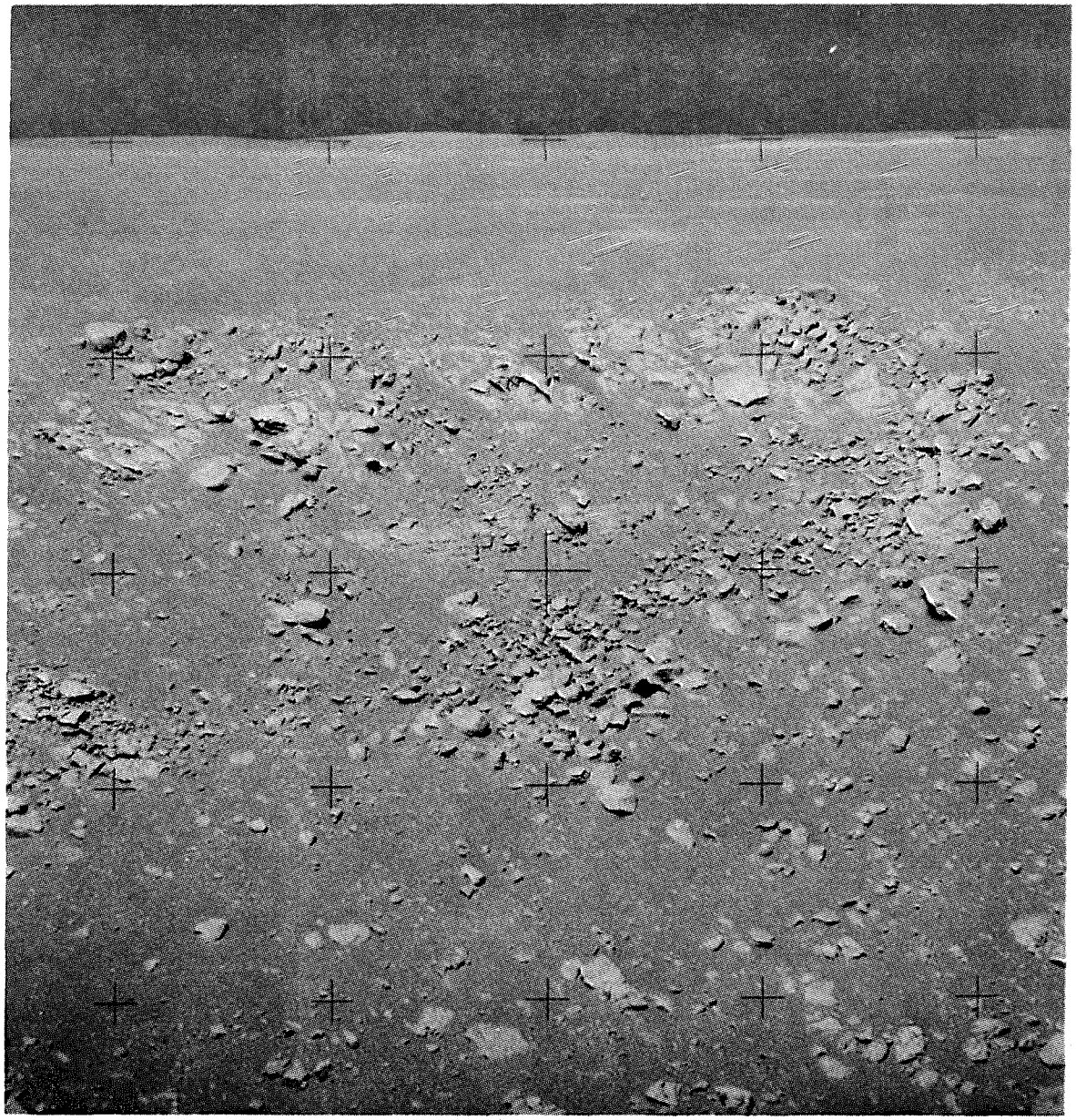




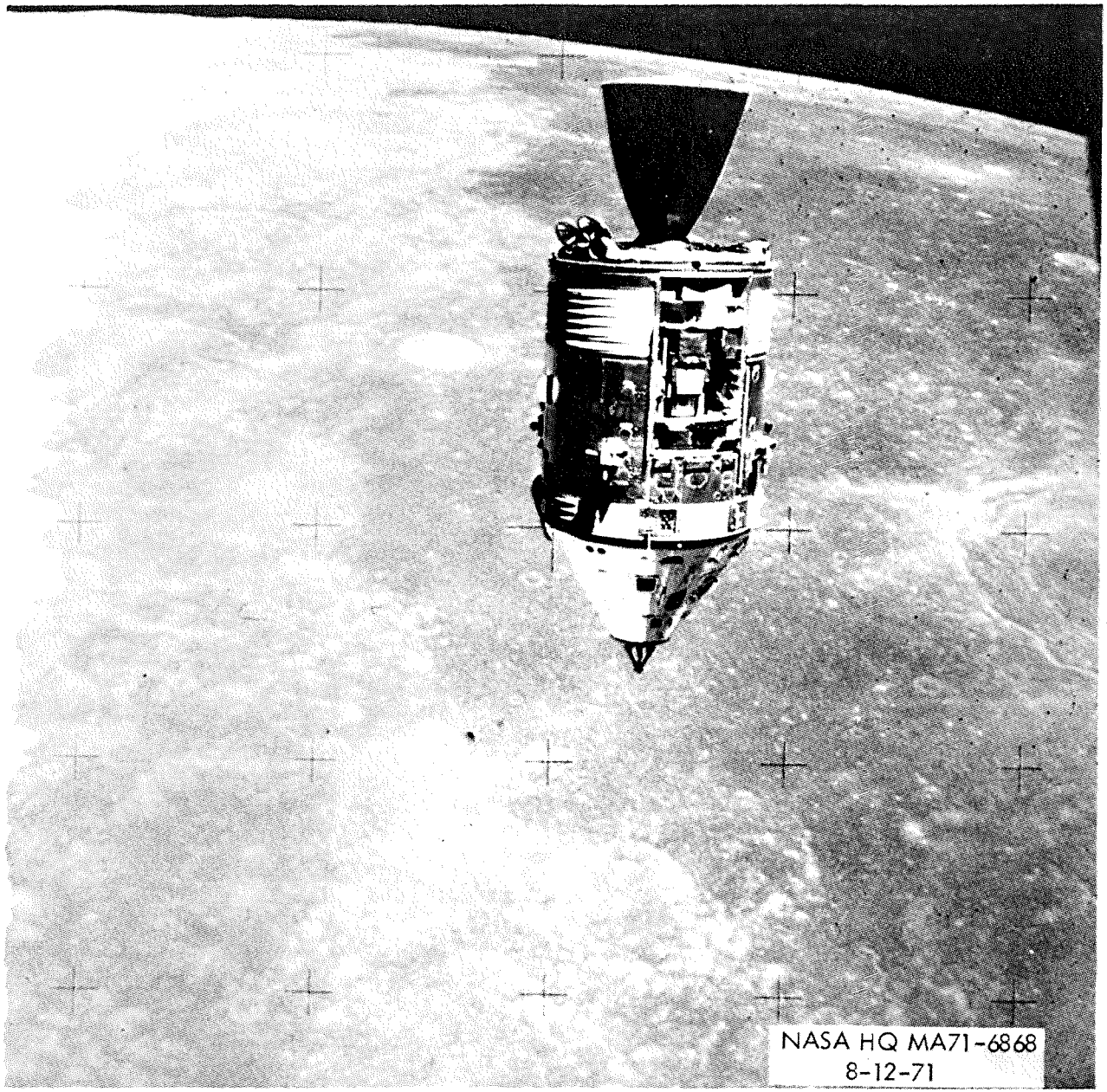
NASA
AS15-89-12157



APOLLO 15

ORBITAL SCIENCE
GEOCHEMICAL GROUP

- GAMMA RAY SPECTROMETER
  - ACQUIRED 62 HOURS OF PRIME DATA
  - BACKSIDE RADIOACTIVITY SLIGHTLY LOWER THAN FRONTSIDE
  - SOME PRELIMINARY EVIDENCE FOR LOCAL HIGH ACTIVITY AREAS
  - AVERAGE LUNAR RADIOACTIVITY LESS THAN APOLLO 14 FRA MAURO SAMPLES
- X-RAY SPECTROMETER
  - 100 HOURS OF LUNAR AND 50 HOURS OF GALACTIC DATA
  - HIGHLANDS ARE RICHER IN ALUMINUM THAN MARE
  - MARE ARE RICHER IN MAGNESIUM THAN HIGHLANDS
  - BACKSIDE HIGHLANDS ARE MORE ENRICHED IN ALUMINUM THAN APENNINE HIGHLANDS
  - SEVEN DISCRETE GALACTIC X-RAY SOURCES OBSERVED
- ALPHA PARTICLE SPECTROMETER
  - 100 HOURS OF LUNAR AND 50 HOURS OF DEEP SPACE DATA
  - DIFFUSION OF RADON 10^3 LESS THAN TERRESTRIAL RATES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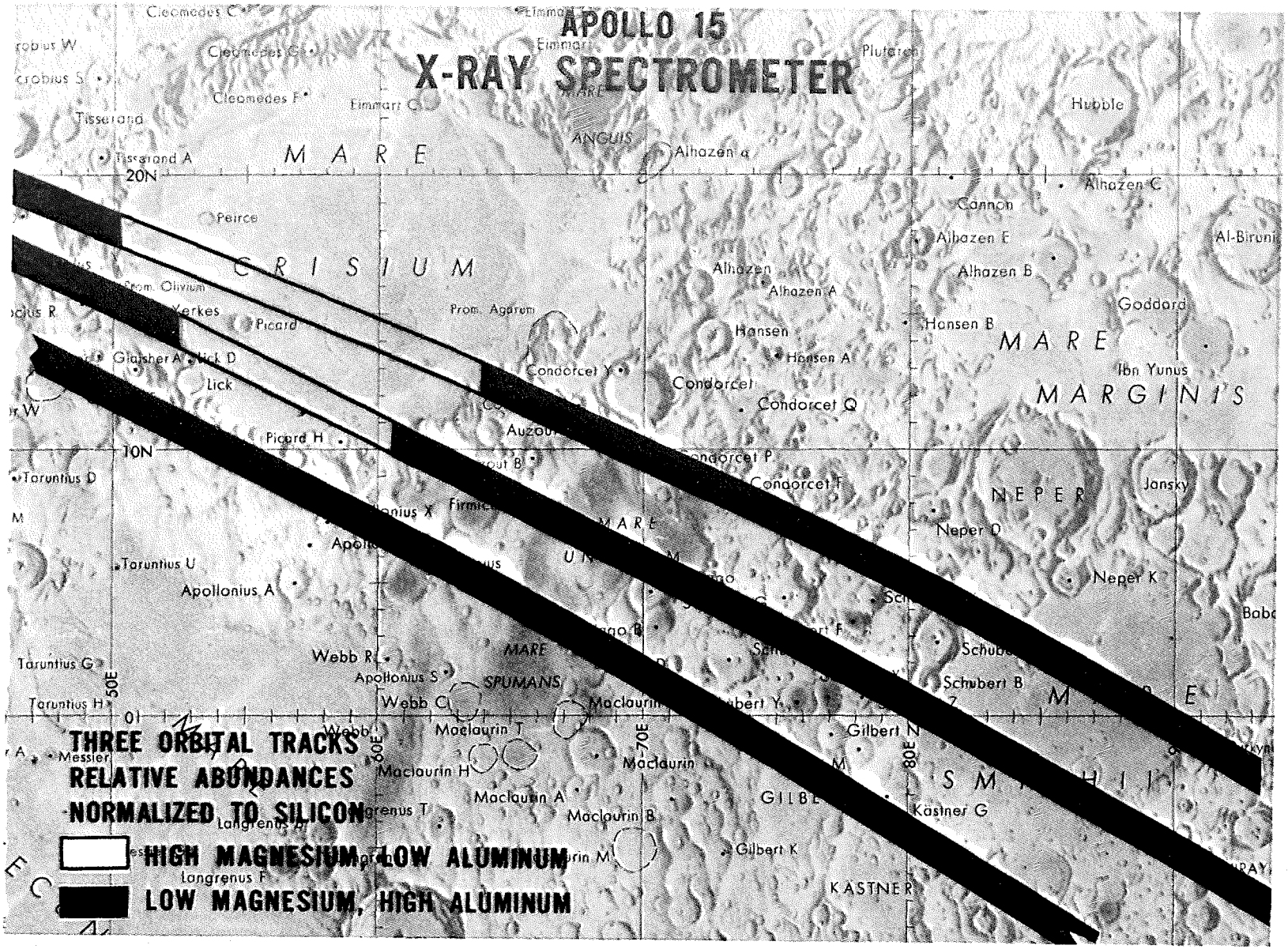
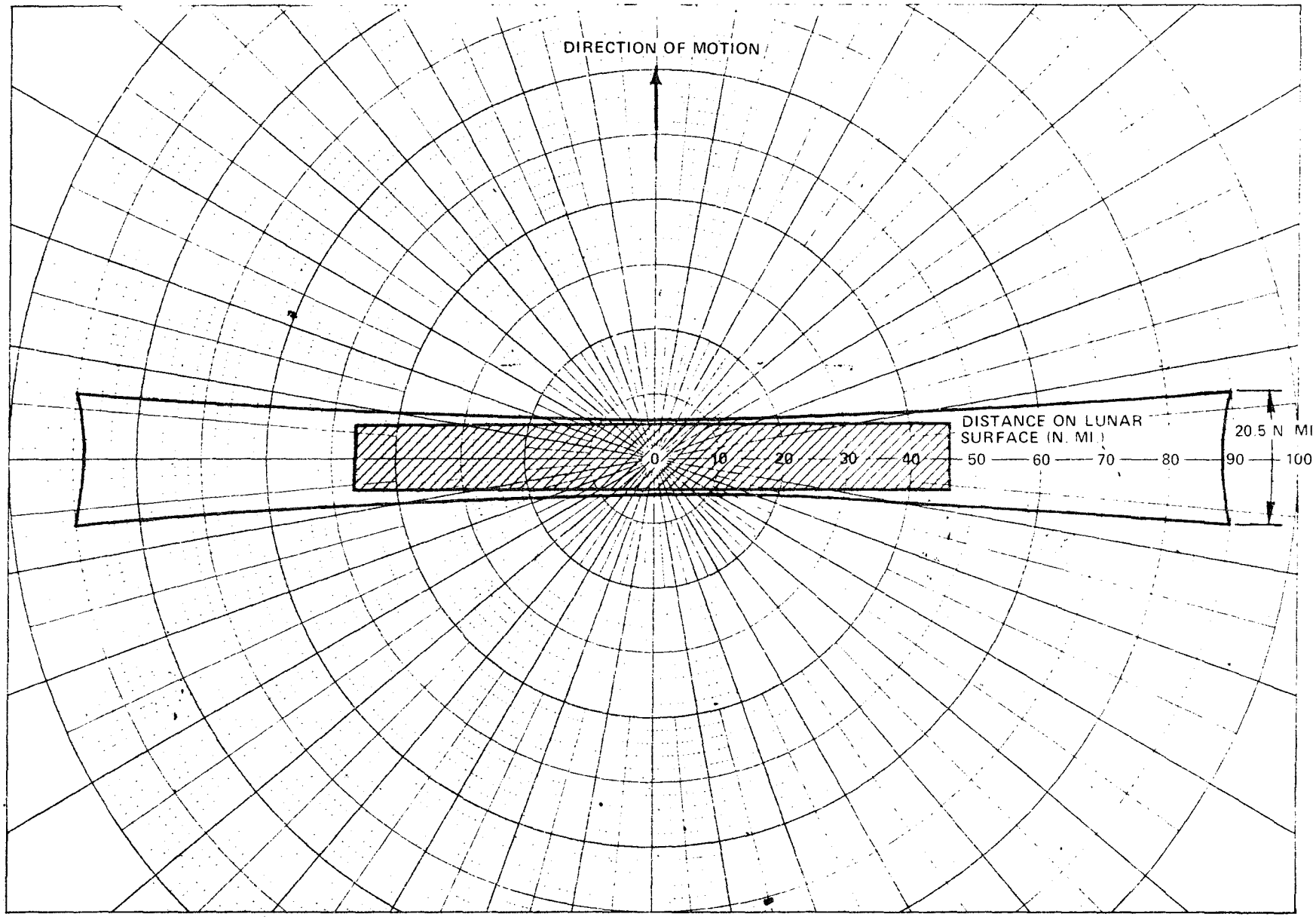

APOLLO 15
X-RAY SPECTROMETER
THREE ORBITAL TRACKS
RELATIVE ABUNDANCES
NORMALIZED TO SILICON
HIGH MAGNESIUM, LOW ALUMINUM
LOW MAGNESIUM, HIGH ALUMINUM
MARE
CRISIUM
MARGINIS
NEPER
SMYTH
KASTNER
GILBERT
SPUMANS
Cleomedes C
Cleomedes F
Tisserand A
Peirce
Picard
Lick
Glaisher A
Taruntius D
Taruntius U
Apollonius A
Taruntius G
Taruntius H
Messier
Webb R
Webb C
Apollonius S
Maclaurin T
Maclaurin H
Maclaurin A
Maclaurin B
Langrenus T
Langrenus F
Alhazen
Alhazen A
Alhazen B
Alhazen C
Alhazen E
Cannon
Hansen
Hansen A
Hansen B
Goddard
Condorcet
Condorcet Q
Condorcet P
Condorcet T
Condorcet Y
Auzout
Ibn Yunus
Jansky
Neper D
Neper K
Schubert B
Gilbert N
Gilbert K
Kästner G
Hubble
Plutarch
Al-Biruni
20N
10N
0
50E
70E
80E

APOLLO 15
ORBITAL SCIENCE

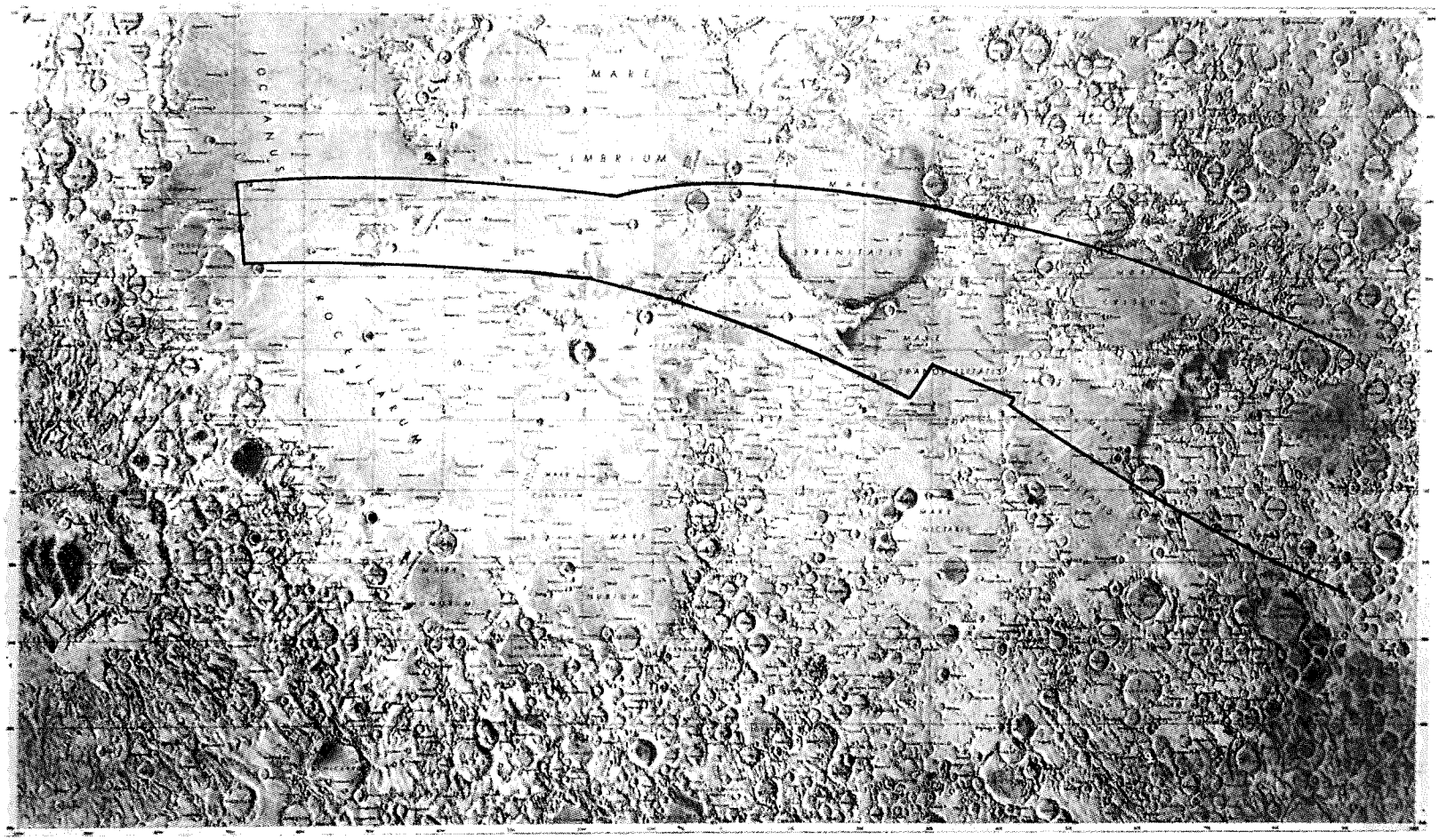
- MASS SPECTROMETER
  - 40 HOURS OF LUNAR AND 50 HOURS OF DEEP SPACE DATA
  - UNEXPECTED POPULATION OF MOLECULES IN LUNAR ORBIT
  - AN ORDER OF MAGNITUDE MORE GAS IN LUNAR ORBIT THAN DEEP SPACE
  - TWO UNEXPLAINED TRANSIENT PHENOMENA OBSERVED
- PANORAMIC CAMERA
  - V/H SENSOR MALFUNCTIONED
  - 80% OF PHOTOGRAPHY IS NOMINAL, MAXIMUM RESOLUTION - ALL FILM IS EXCELLENT
  - PRIMARY OBJECTIVES PHOTOGRAPHED IN HIGH RESOLUTION STEREO
    - APOLLO 15 LANDING SITE
    - APOLLO 15 LUNAR MODULE IMPACT POINT
    - POTENTIAL NEW LANDING SITES SOUTHWEST OF MARE CRISIUM
- MAPPING CAMERA
  - ALL PLANNED COVERAGE OBTAINED
  - FILM HAS BEEN DEVELOPED AND IS OF EXCELLENT QUALITY
- LASER ALTIMETER
  - NOMINAL PERFORMANCE ON REV 15
  - SHOWS SHAPE AND SLOPE OF MARE BASINS
  - REV 15 DATA SHOWS MOON'S CENTER OF MASS OFFSET FROM CENTER OF FIGURE

APOLLO PANORAMIC CAMERA FIELD-OF-VIEW (MONOSCOPIC MODE) ON LUNAR SURFACE

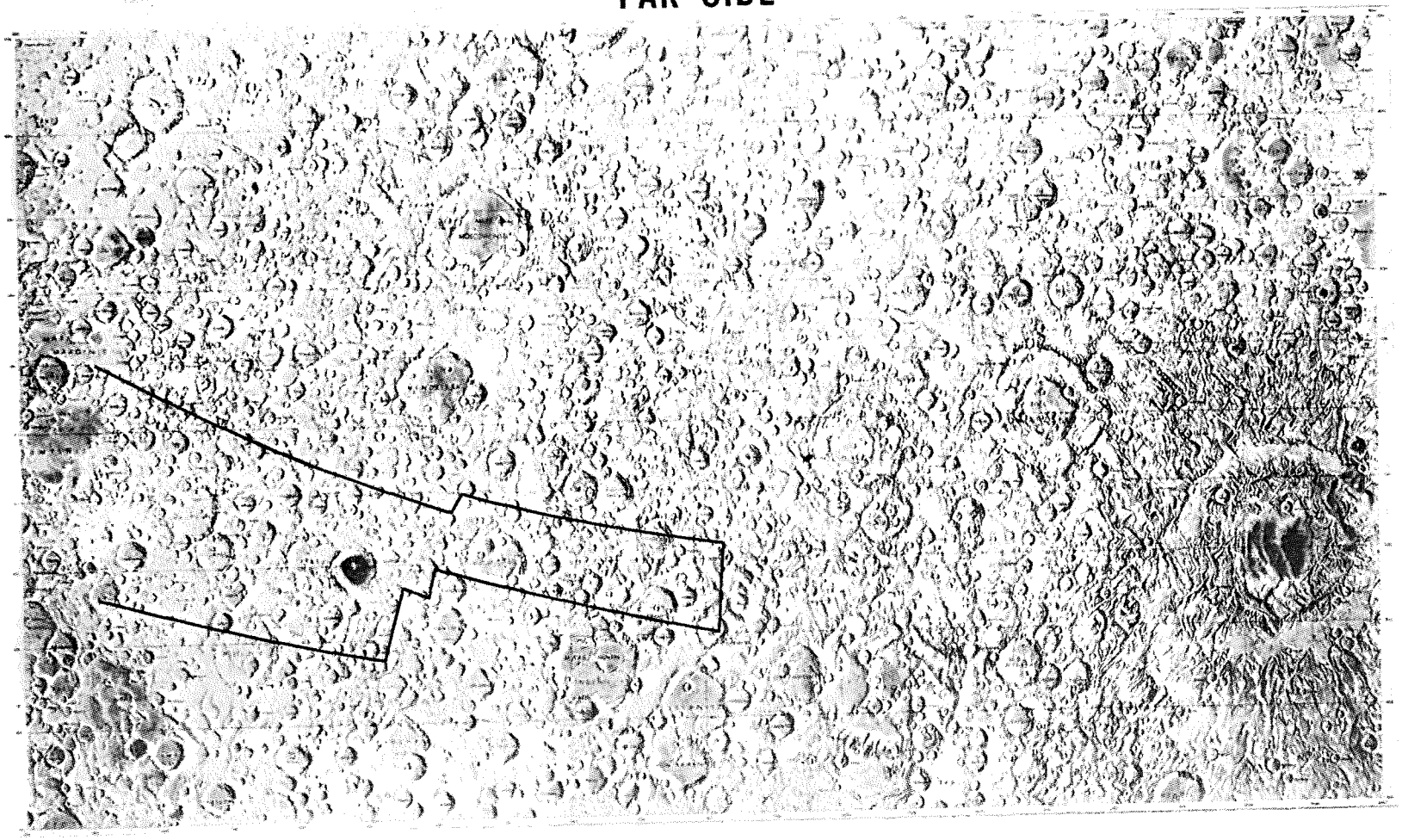


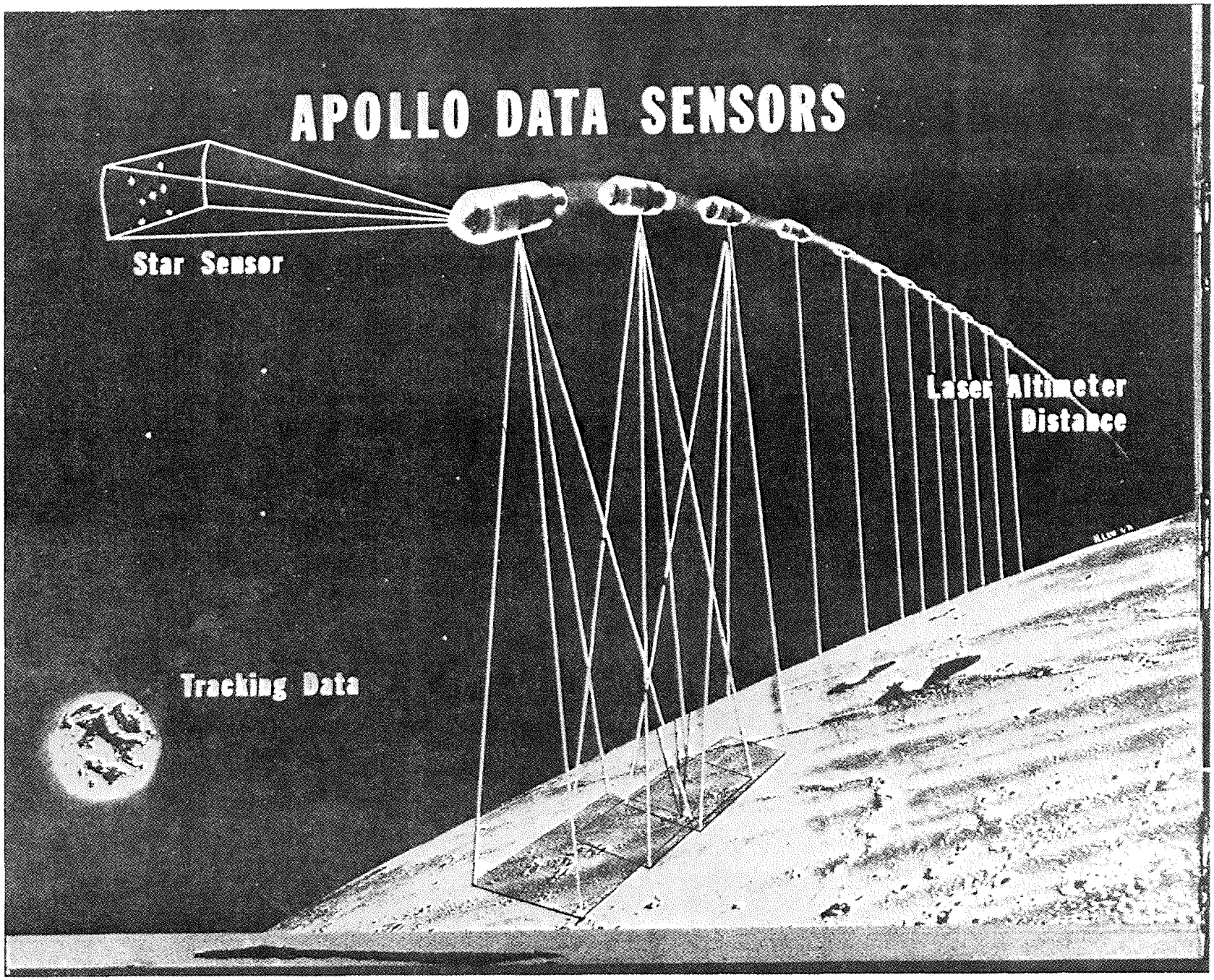
(NOTE: SHADED AREA CORRESPONDS TO RECTIFIED AREA)

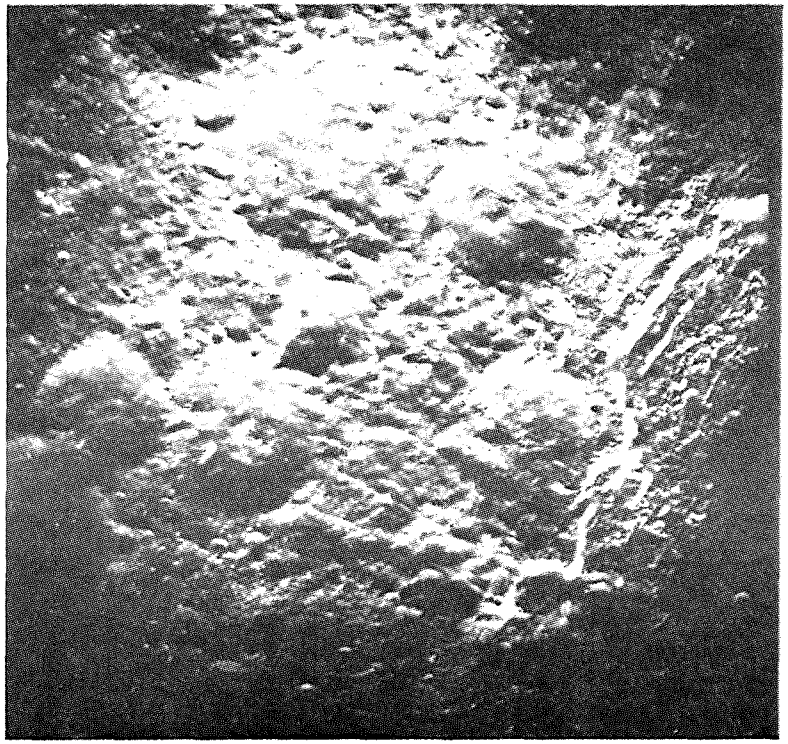
APOLLO 15
PAN CAMERA COVERAGE
NEAR SIDE

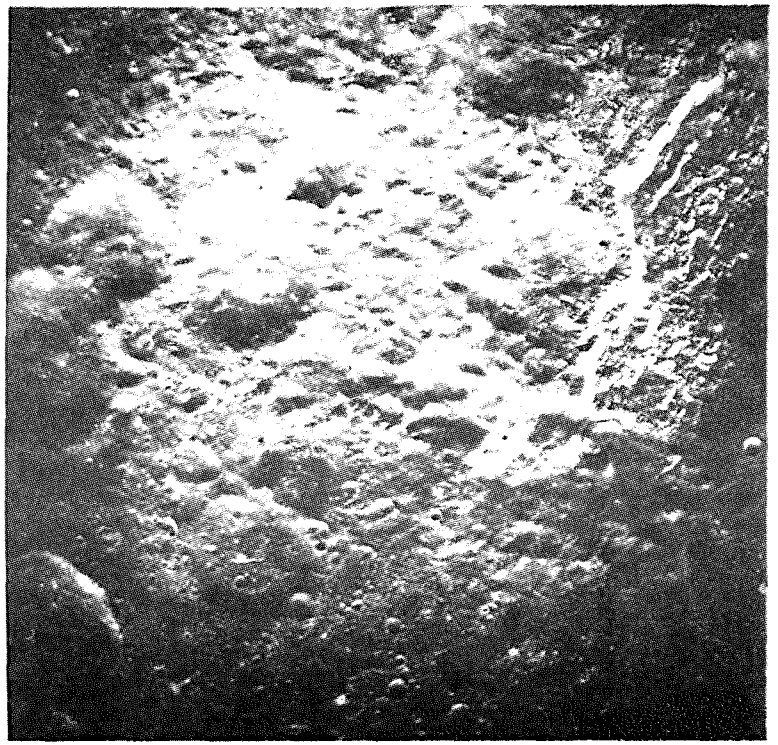


APOLLO 15
PAN CAMERA COVERAGE
FAR SIDE

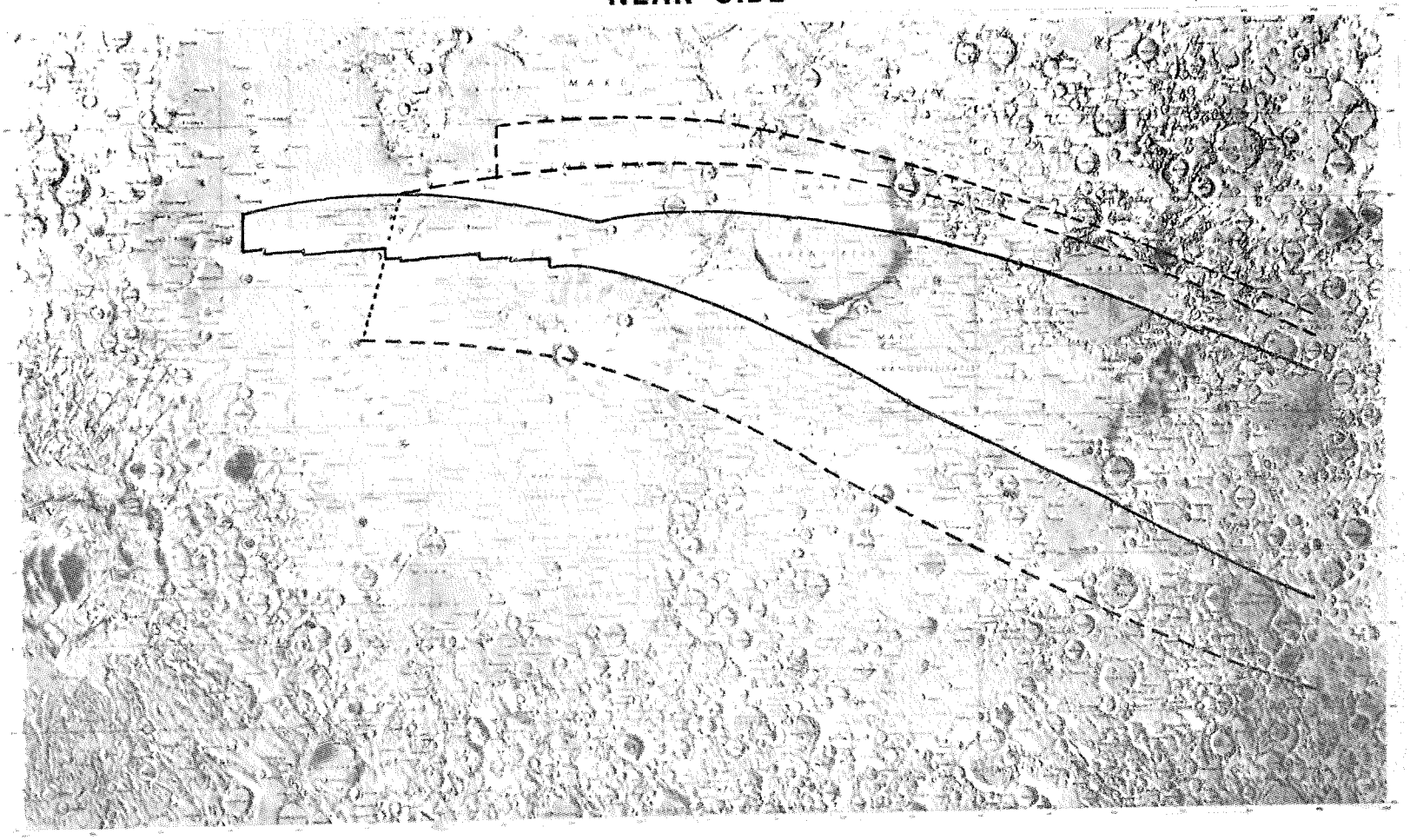



APOLLO DATA SENSORS
Star Sensor
Laser Altimeter
Distance
Tracking Data

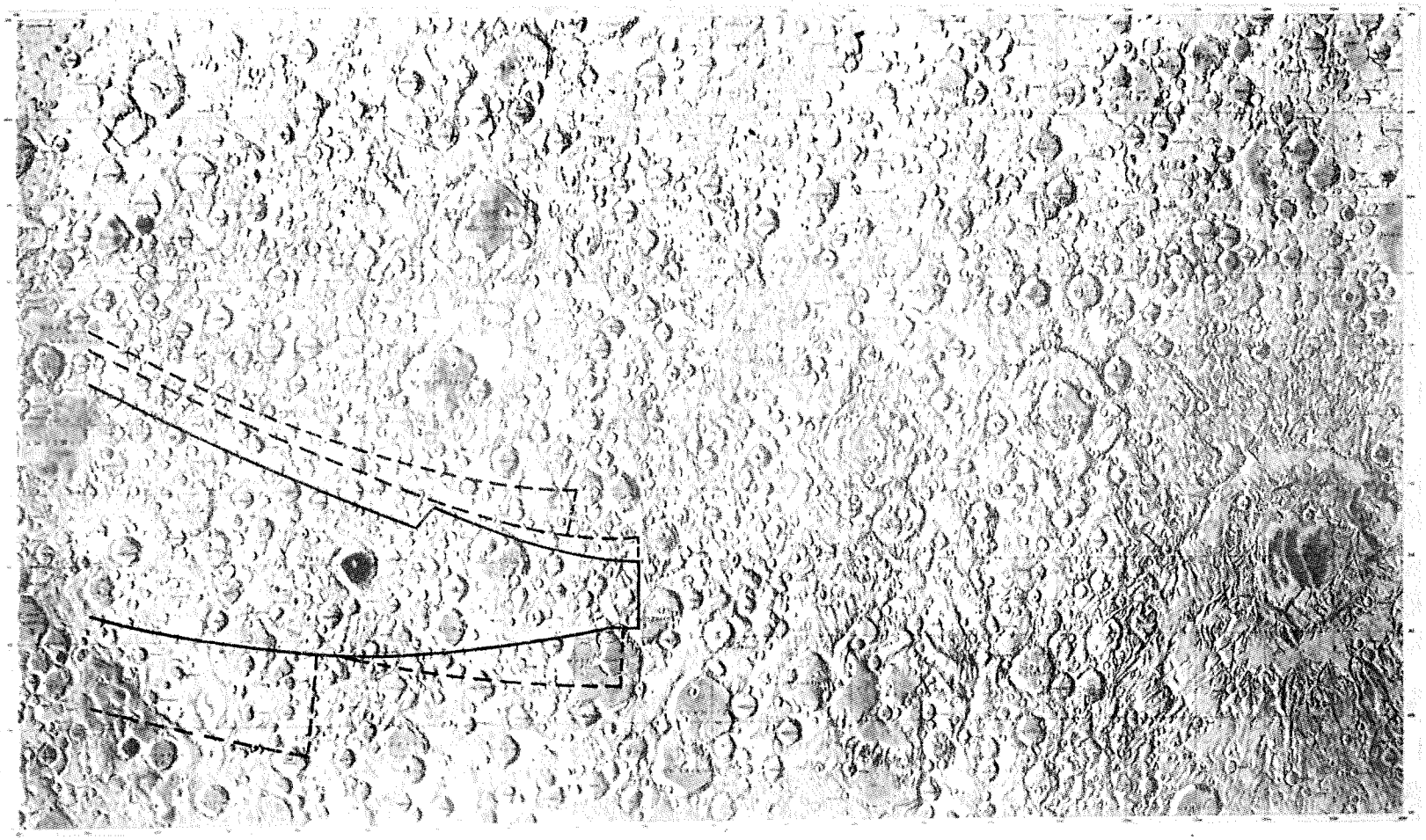




APOLLO 15
MAPPING CAMERA COVERAGE
NEAR SIDE



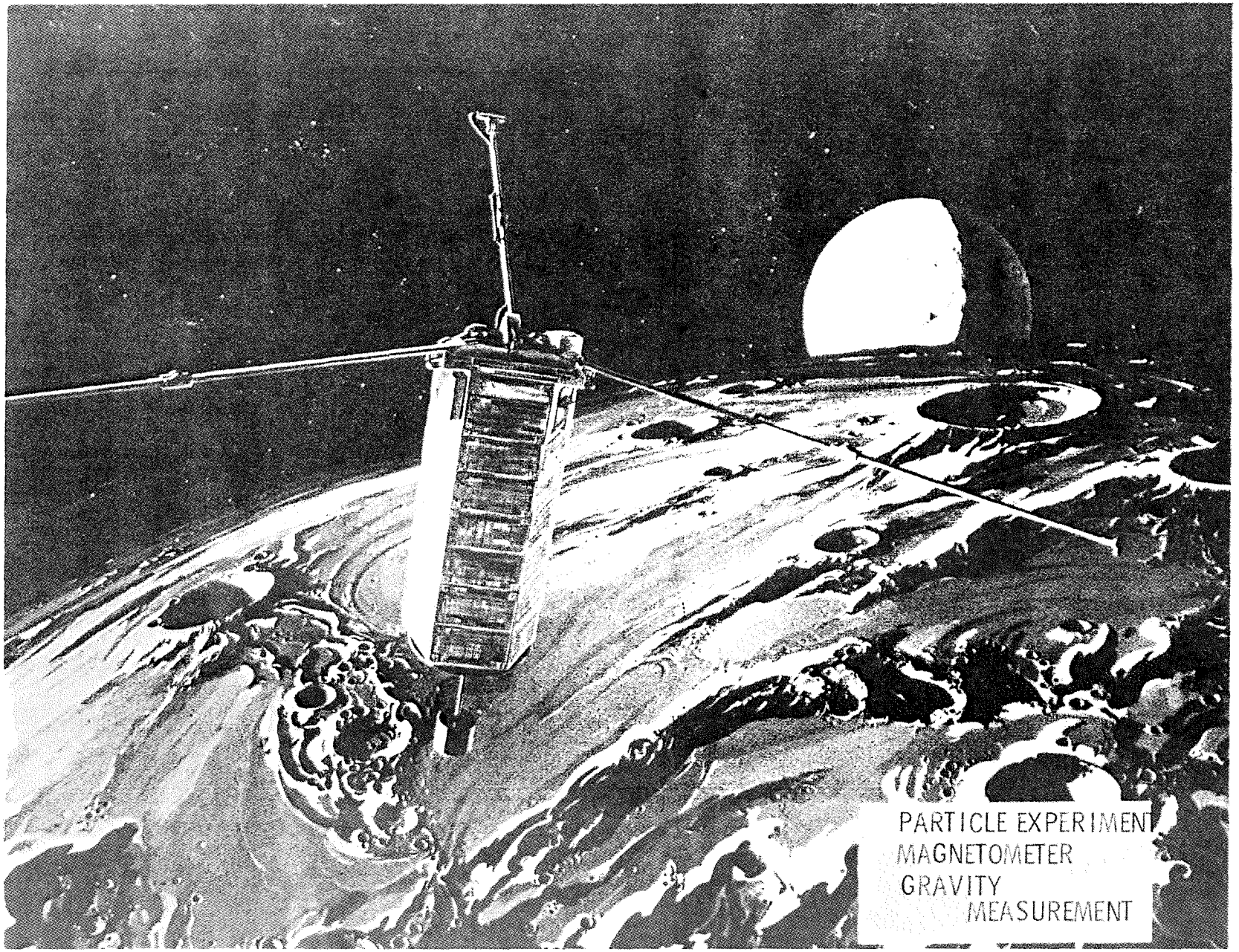
APOLLO 15
MAPPING CAMERA COVERAGE
FAR SIDE



APO 1547

APOLLO 15
ORBITAL SCIENCE

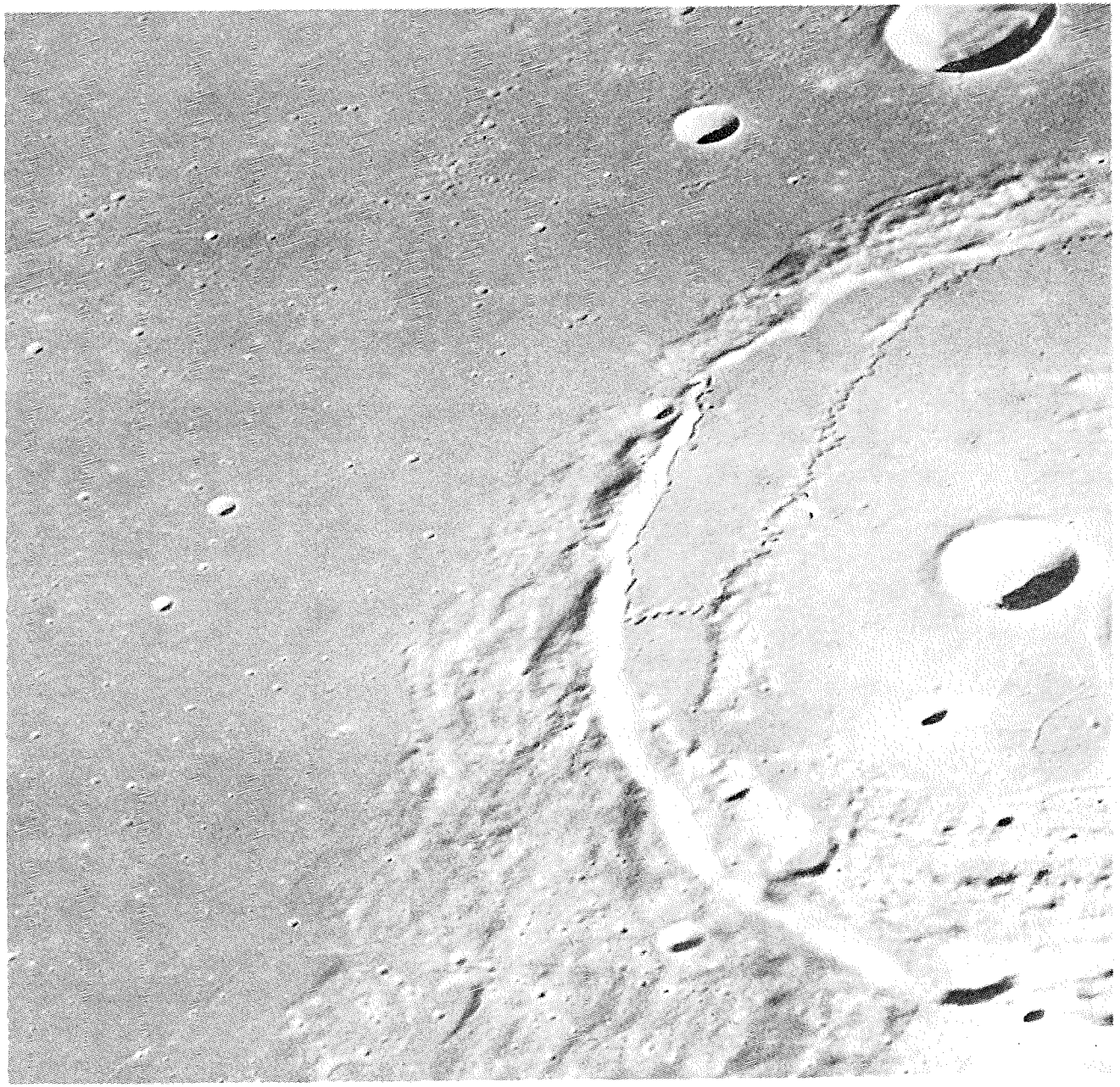
- SUBSATELLITE
  - DEPLOYED IN 76 X 54 NAUTICAL MILE ORBIT
  - ORBIT INCLINATION 28^{0}
  - S-BAND TRACKING FOR GRAVITY DOPPLER EVERY TWELFTH ORBIT
  - BATTERY CHARGING PASS FOLLOWING S-BAND TRACKING PASS
- PARTICLE DETECTOR EXPERIMENT
  - PARTICLE TELESCOPES DETECTED LARGE PROTON FLUX IN MAGNETOPAUSE
  - GOOD PARTICLE COUNTS IN PLASMA SHEATH
  - EXCELLENT DIRECTIONAL INDICATION OF PARTICLE FLUXES
- MAGNETOMETER
  - MAGNETIC FLUX VARIATIONS DETECTED IN AGREEMENT WITH LSM
  - DETECTS LUNAR SURFACE ANOMALIES WHILE IN EARTH'S MAGNETOTAIL
    - VAN DE GRAAF
    - GAGARIN
    - KOROLEV
- S-BAND DOPPLER GRAVITY EXPERIMENT
  - EXCELLENT DOPPLER DATA
  - NEW MASCON LOCATED NEAR EASTERN LIMB
  - GRAVITY DATA WITH LASER ALTIMETRY ALLOWS COMPARISON OF SHAPE OF BASINS WITH SHAPE OF MASCONS
  - ALL MASCONS DO NOT HAVE SAME SHAPE

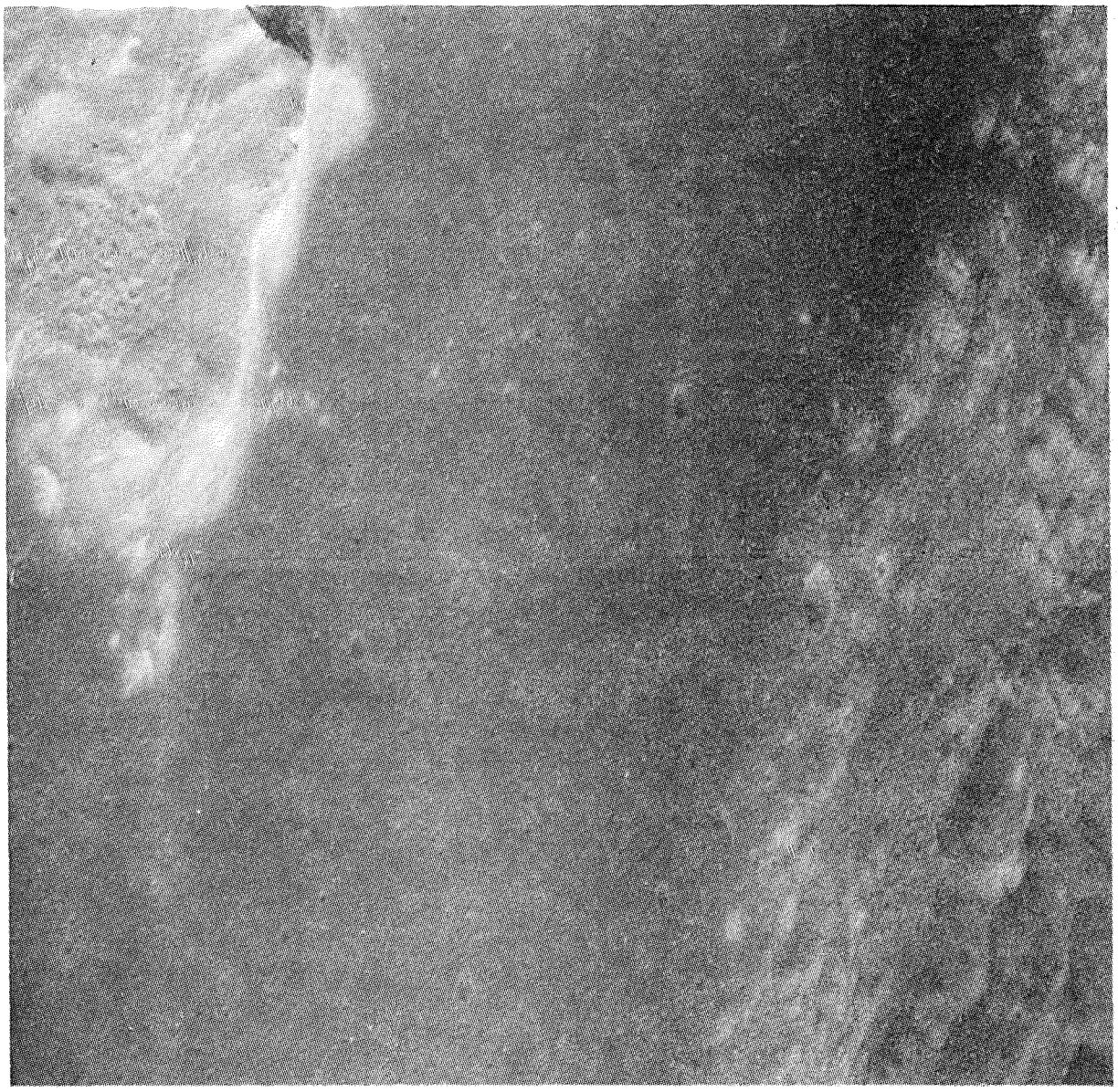

PARTICLE EXPERIMENT
MAGNETOMETER
GRAVITY
MEASUREMENT

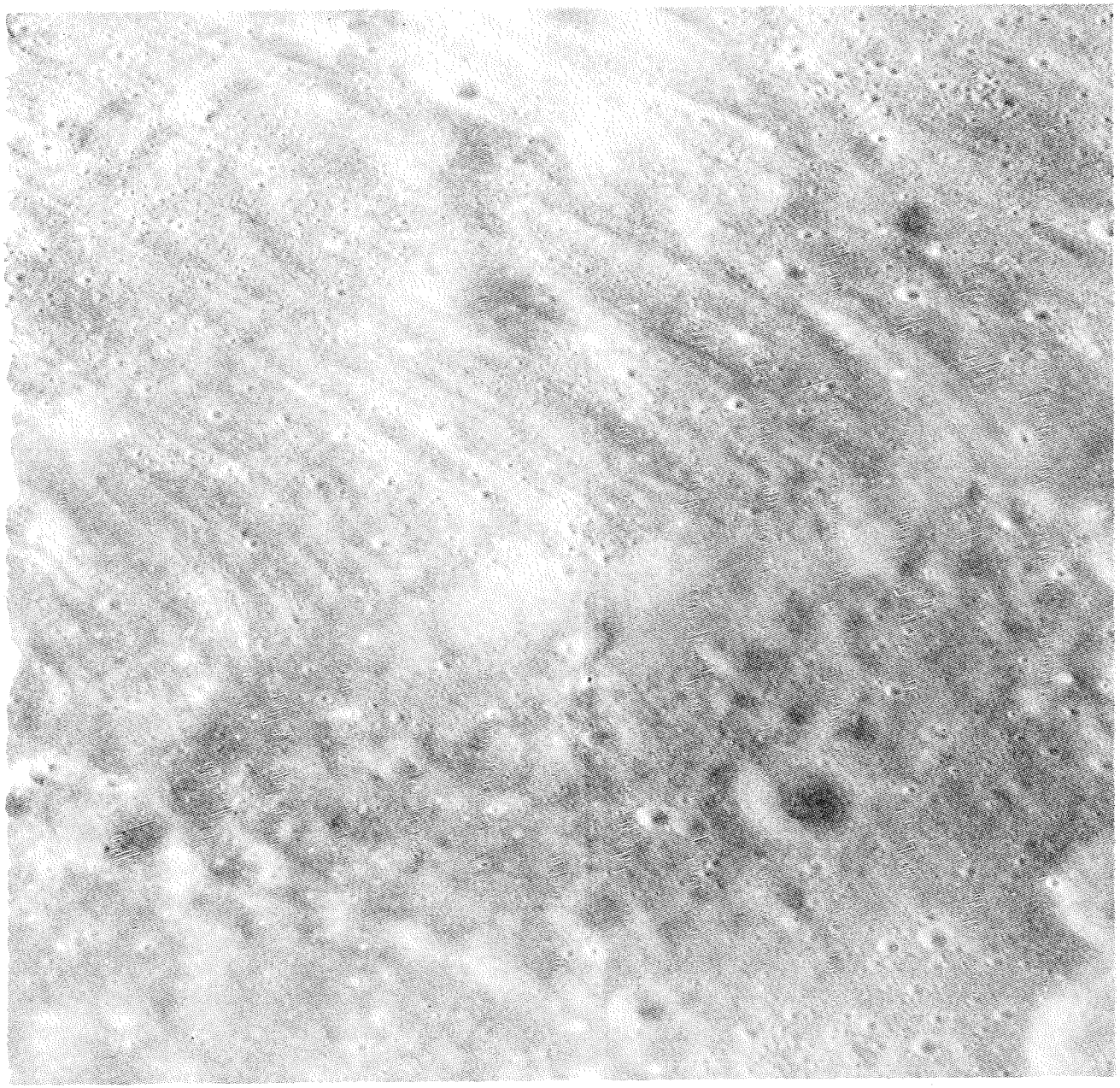
APOLLO 15

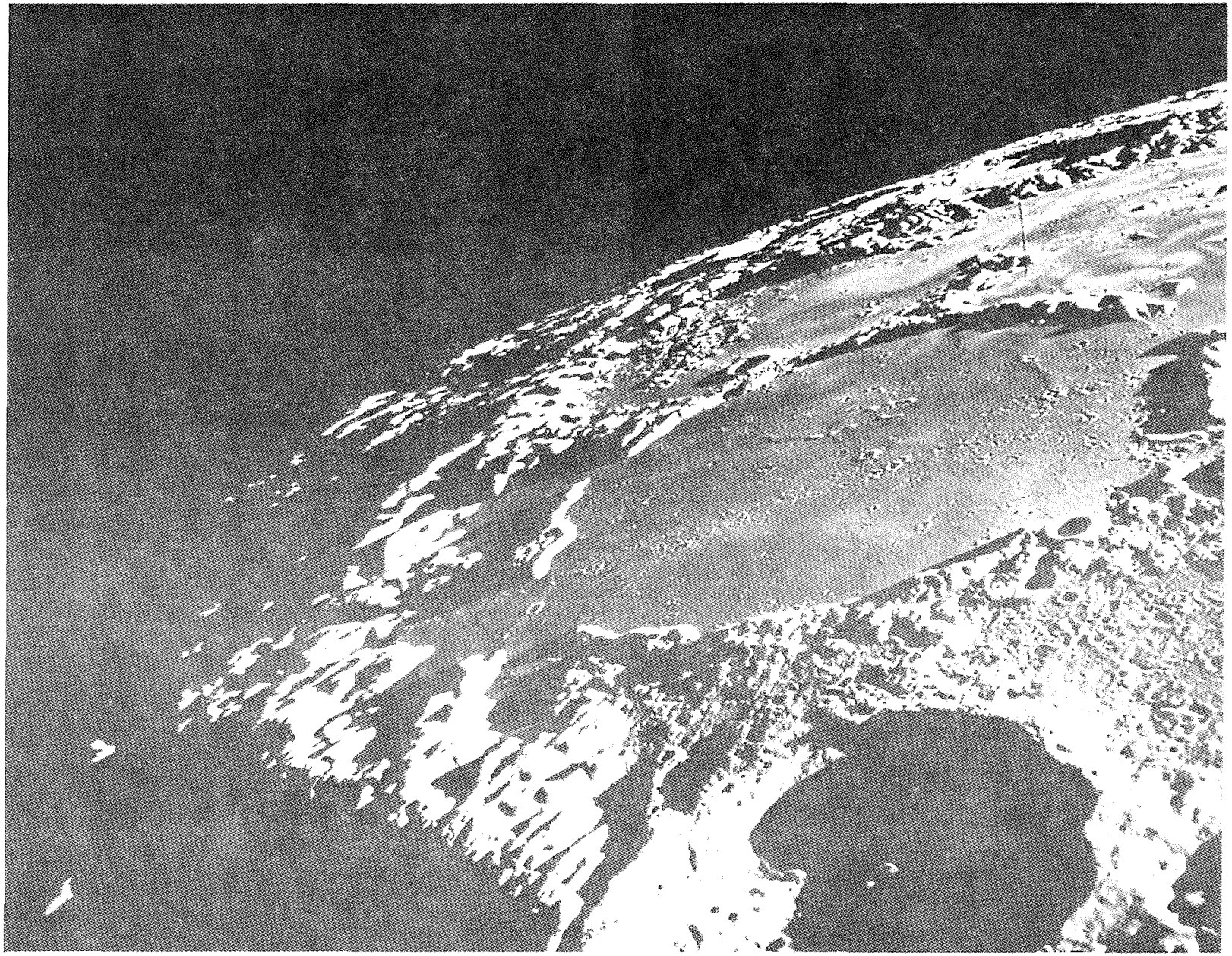
ORBITAL SCIENCE

- DIM LIGHT PHOTOGRAPHY
  - GEGENSCHEIN
  - ZODIACAL LIGHT
  - SOLAR CORONA
  - LUNAR LIBRATION REGIONS
  - LUNAR SURFACE TERMINATOR
- UV PHOTOGRAPHY - EARTH AND MOON
  - FIRST UV PHOTOGRAPHY OF EARTH FROM SPACE
- DOWNLINK BISTATIC RADAR
  - S-BAND AND VHF BISTATIC WILL DETERMINE ROUGHNESS AND DIELECTRIC CONSTANT
- APOLLO WINDOW MICROMETEOROID
- COMMAND MODULE PHOTOGRAPHY AND VISUAL OBSERVATIONS

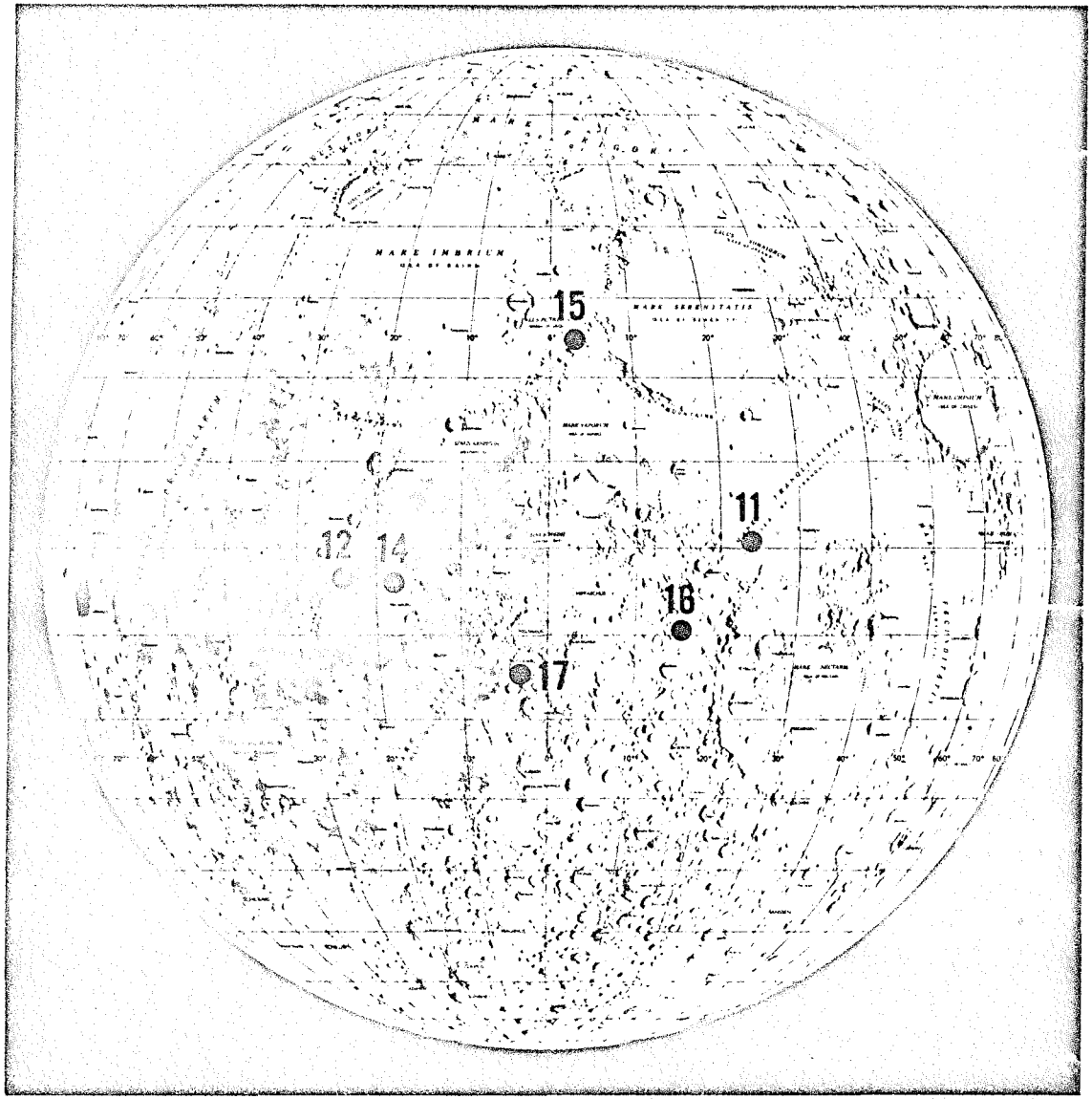








LUNAR LANDING SITES



LANDING SITES

APOLLO

- 11 SEA OF TRANQUILITY
- 12 OCEAN OF STORMS
- 14 FRA MAURO
- 15 HADLEY-APENNINE
- 16 DESCARTES
- 17 ALPHONSUS (TENTATIVE)