



Figure 20-Nearly completed Center of Astrogeology Building (referred to as Building-One; and later, the G.K. Gilbert Building) atop McMillan Mesa in Flagstaff, Arizona. This building, constructed late in 1964, reverted to City property after 30 years in 1994, and was condemned by the City of Flagstaff as unsafe in 2000. Building-One was demolished in September 2002 to make room for the much larger and more appropriate Eugene M. Shoemaker Building (formal dedication 26 September 2002) constructed through the General Services Administration; (a) front north-facing view (from old Cedar Avenue); USGS photo

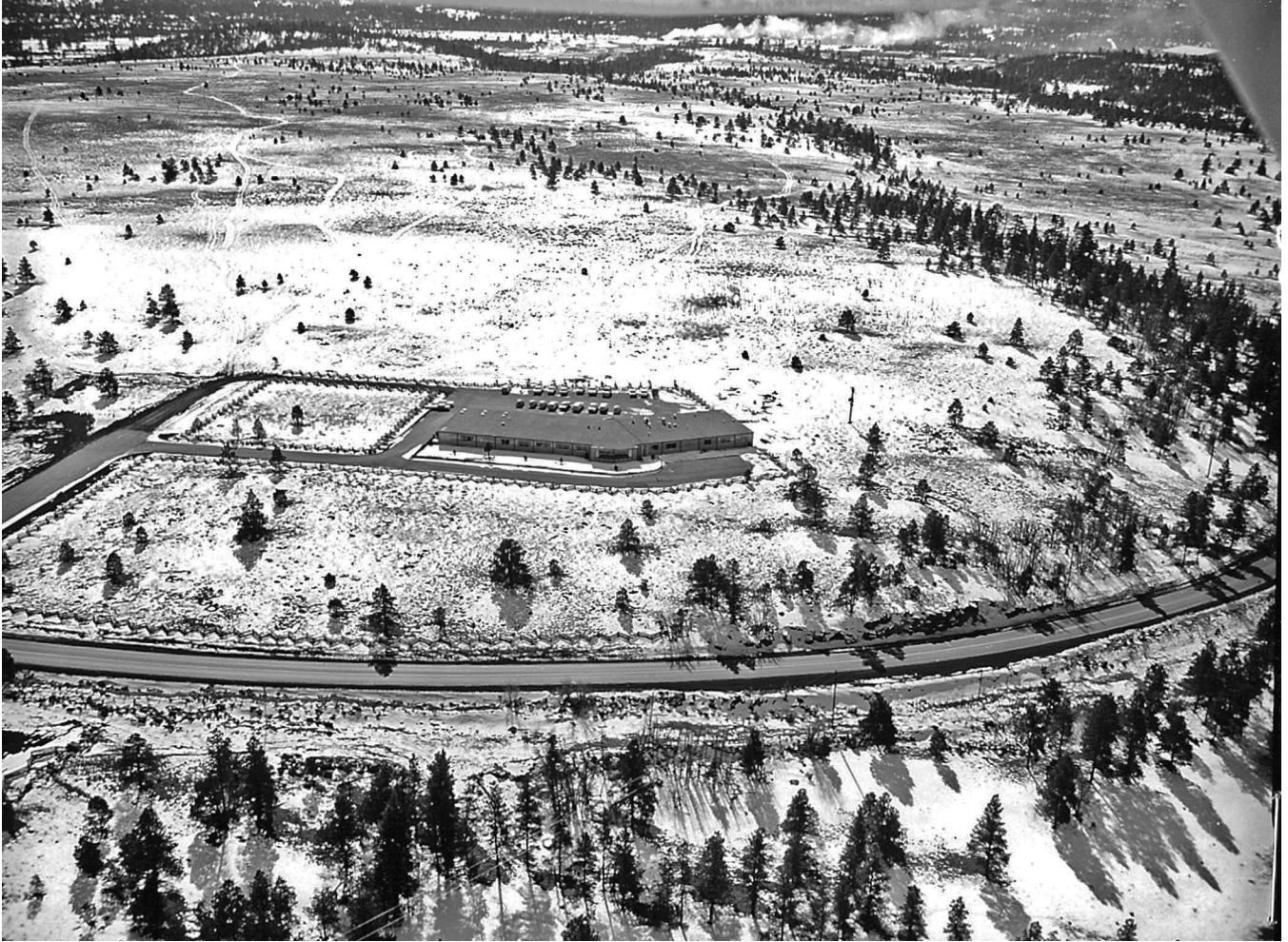


Figure 20-(b) aerial view with snow (winter 1965); USGS photo P879A, F1064



Figure 20-(c) view of San Francisco Peaks through north-facing foyer windows; USGS photo P879, F1015

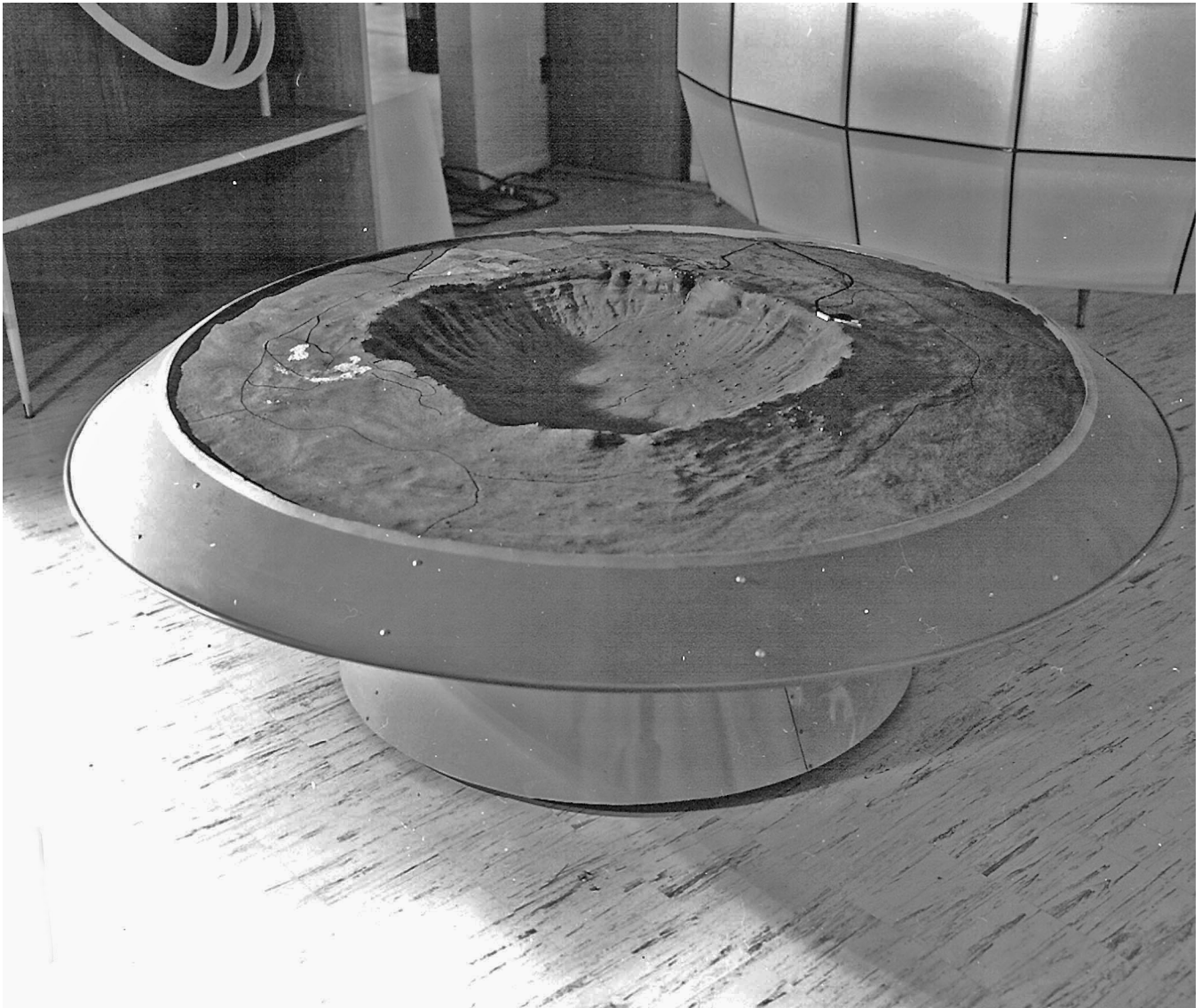


Figure 20-(d) Meteor Crater model in foyer (early 1965); USGS photo P879, F1011



Figure 20-(e) Tektite display in foyer (early 1965); USGS photo packet P879, F1014.



Figure 21-(a) Current exterior view of the machine shop that was located at 1733 N. West Street in the Sunnyside area of East Flagstaff-after it was relocated from the Museum of Northern Arizona; digital photo-G. Schaber, 6 May 2002



Figure 21-(b) interior view of-the Branch of Astrogeology's well-equipped machine shop West Street as it appeared in 1968; USGS photo (1968) P698C F968294.



Figure 22-Oblique view of the four-by-six-foot plaster model of the lunar surface constructed by the Branch of Astrogeology following Ranger VII. The topographic relief model was derived from Ranger VII final frame 979; USGS photo.



Figure 23-Mobile Laboratory (MOLAB) or Mobile Geologic Laboratory (MGL) designed for NASA by General Motors in 1965 for NASA as a prototype, extended lunar mission vehicle; (a) (l to r) Hal Stephens, Ivo Lucchitta, Bill Tinnin, Bob Sutton and two others (unidentified) standing in front of MOLAB; USGS photo



Figure 23-(b) MOLAB in Hopi Buttes (1967), USGS photo P243, F26757c



Figure 23-(c) MOLAB at Merriam Crater (northeast of Flagstaff, Arizona) in 1966; USGS photo.



Figure 24-Gene Shoemaker and Don Elston participating in Apollo Extension Systems experiment simulations at the Marshall Spaceflight Center, Huntsville, Alabama on 26 April 1964; (a) Gene Shoemaker in suit



Figure 24-(b) Don Elston in suit

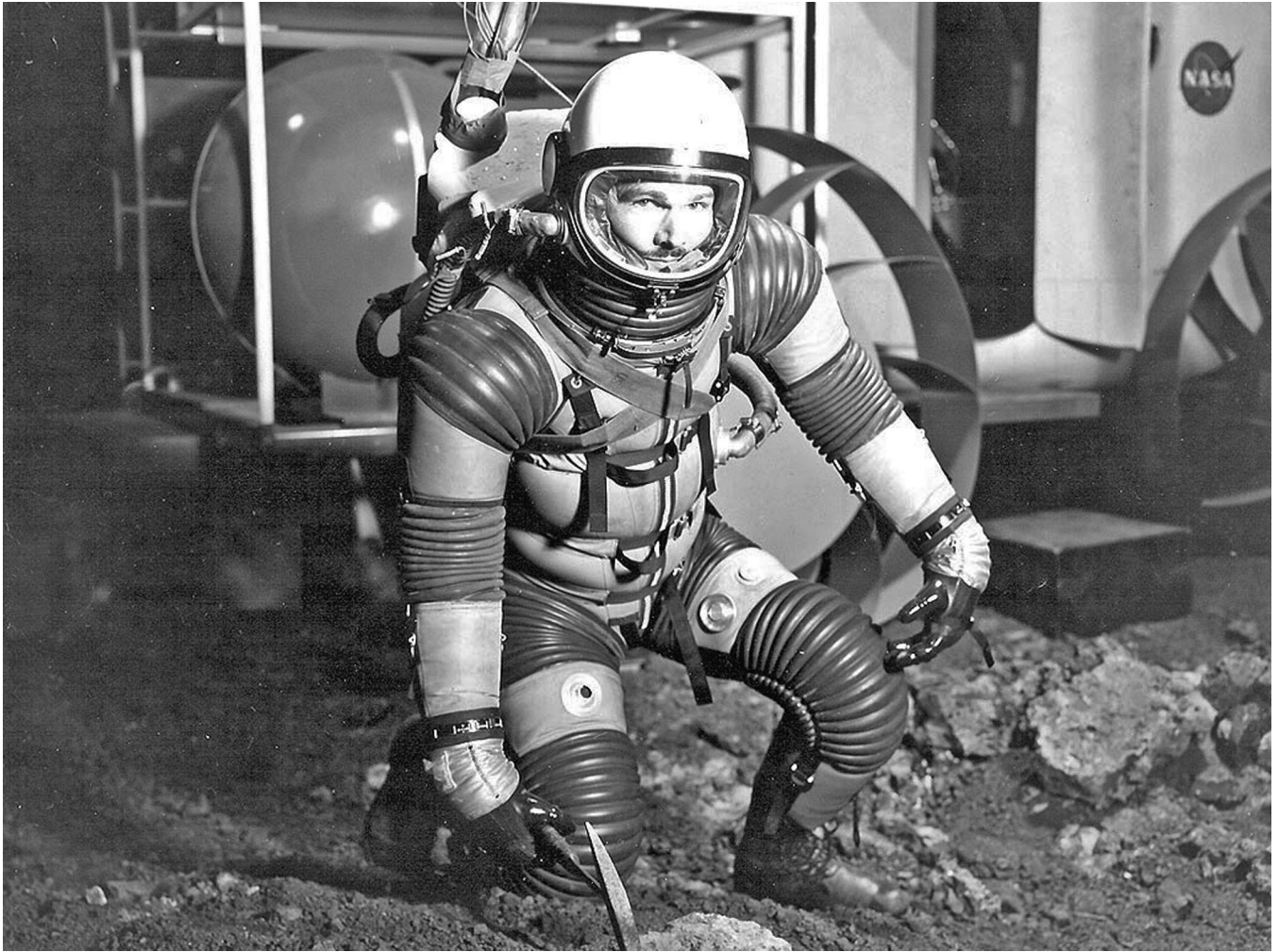


Figure 24-(c) Gene Shoemaker sampling rocks in suit)



Figure 24-(d) Don Elston sampling rocks in suit. Photo credit for all four photographs is unknown, but probably Marshall Space Flight Center.



Figure 25-NASA portrait photograph of Harrison "Jack" Schmitt in Apollo spacesuit

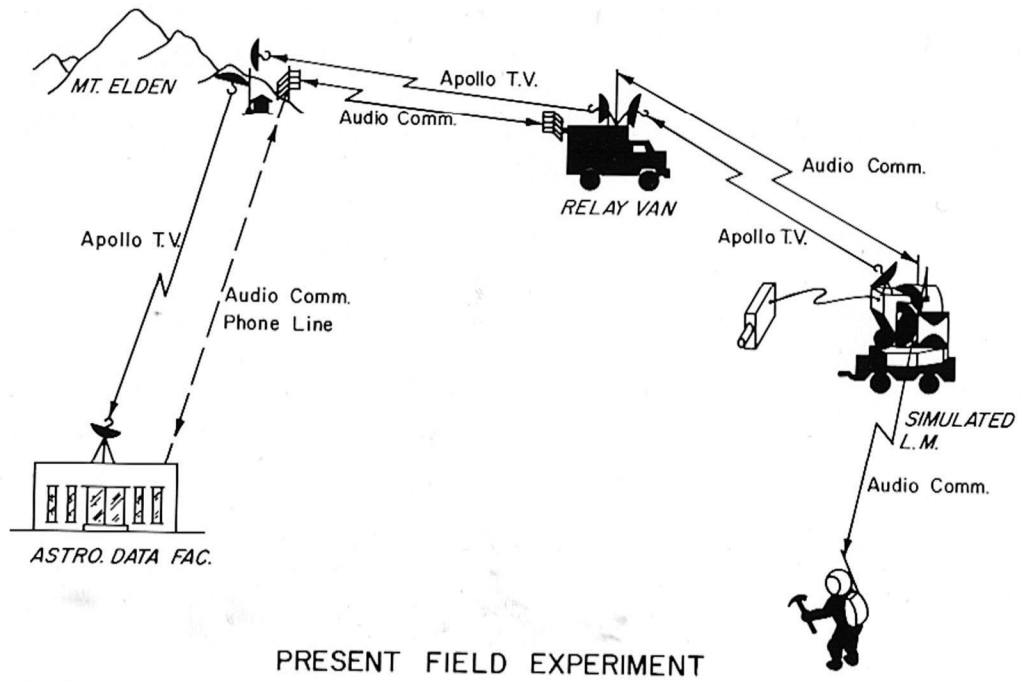


Figure 26-(a) Sketch showing the Branch of Astrogeology's Early Apollo radio/TV links from the field to the ADF in 1967; USGS photo P475, F1167319



Figure 26-(b) Photo of Branch of Astrogeology geologist Bob Sutton (l) and Harrison "Jack" Schmitt; taken January 1966 in Astrogeology's original Command Data, Reception and Analysis facility (CDRA) on fifth floor of the Arizona Bank Building, USGS photo P231 F16774.

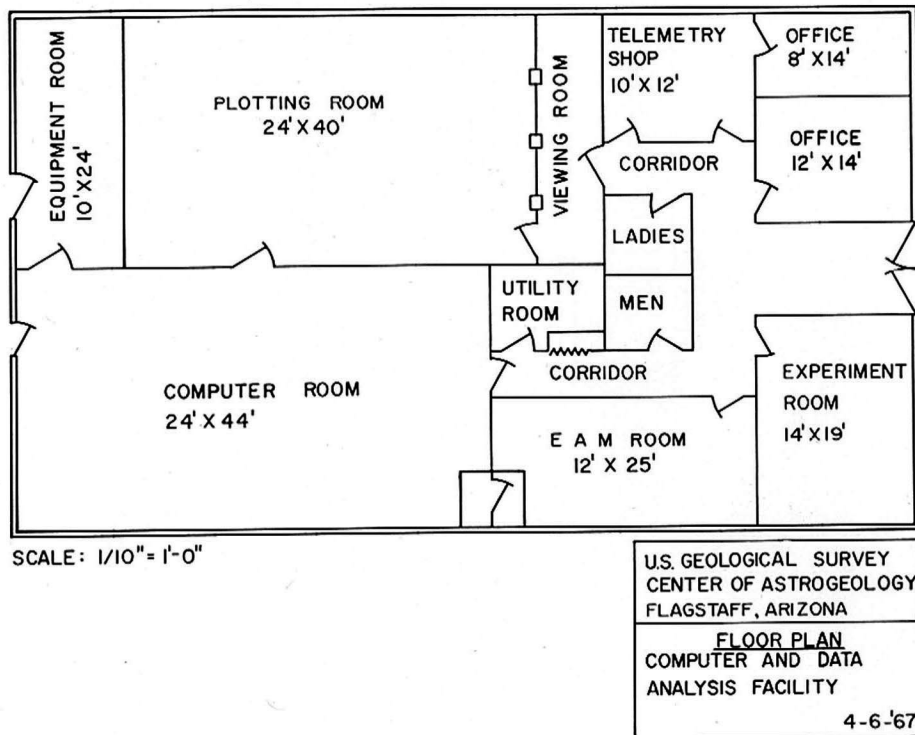


Figure 27-Floor plan of the planned interior of the Apollo Data Facility (ADF) that was built for the Branch of Astrogeology by the Flagstaff construction firm of Buttrum and Jamison (in January 1967) at 2720 N. Fourth Street in East Flagstaff, Arizona. This facility, conceived and developed by the USGS, Branch of Surface Planetary Exploration in Flagstaff, Arizona, was a working precursor to the Science Support Room-concept at the Manned Spacecraft Center, Mission Control Building, in Houston during the Apollo missions); USGS photo P475, F1167321 (see Fig. 44).



Figure 28-One of several mobile vans (simulating the proposed Houston “science backroom”) that were constructed by the Branch of Astrogeology in Flagstaff to be used during Apollo and Advanced (Apollo Applications Program) geologic field exercises in the mid-1960’s to early 1970’s; (a) outside view of mobile Apollo Data Facility trailer; USGS photo P609 F66894



Figure 28-(b) inside view of interior of ADF trailer (under construction); USGS photo P609, F66896.

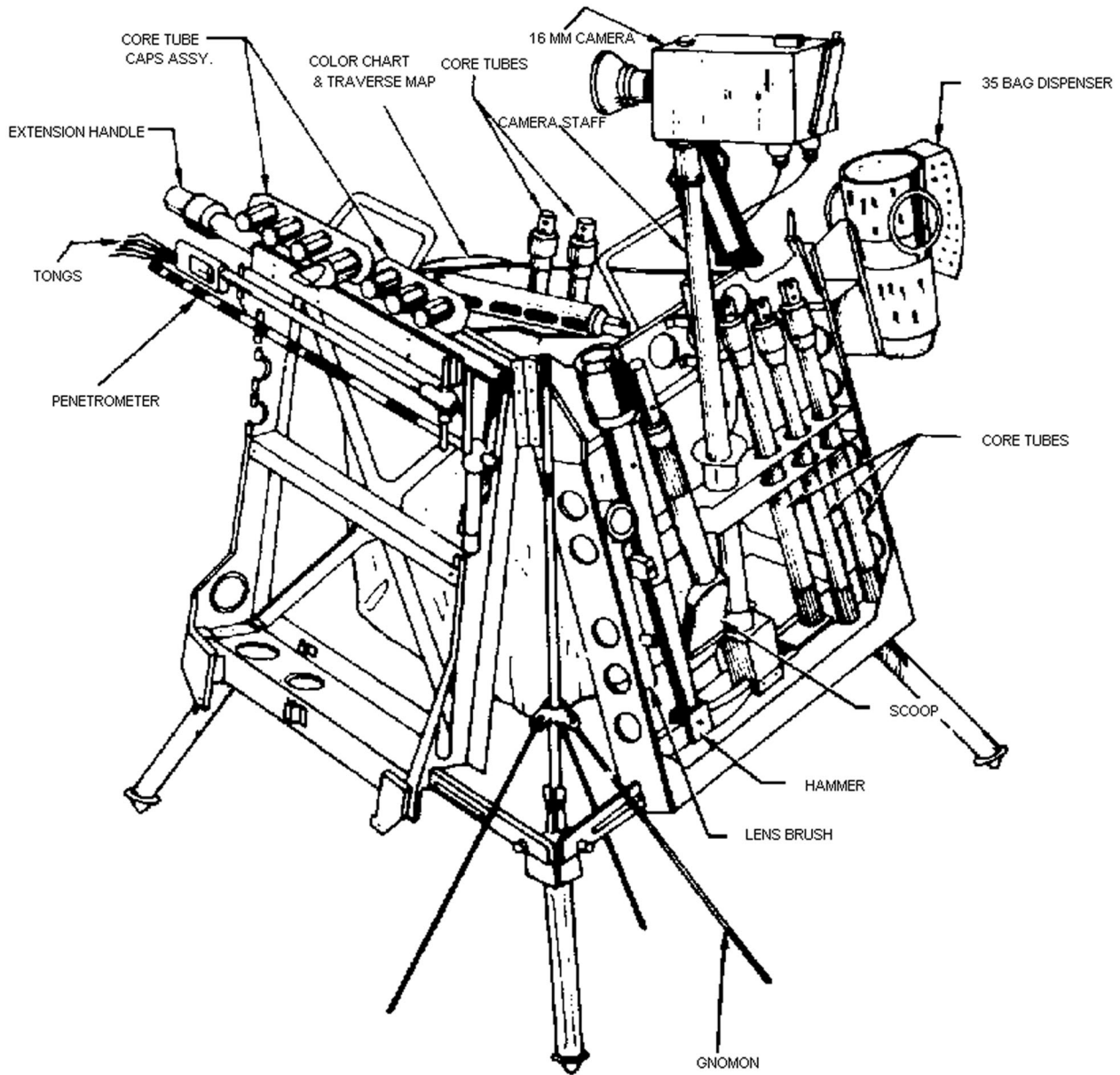


Figure 29-(a) Schematic diagram of the three-legged Apollo Tool Carrier

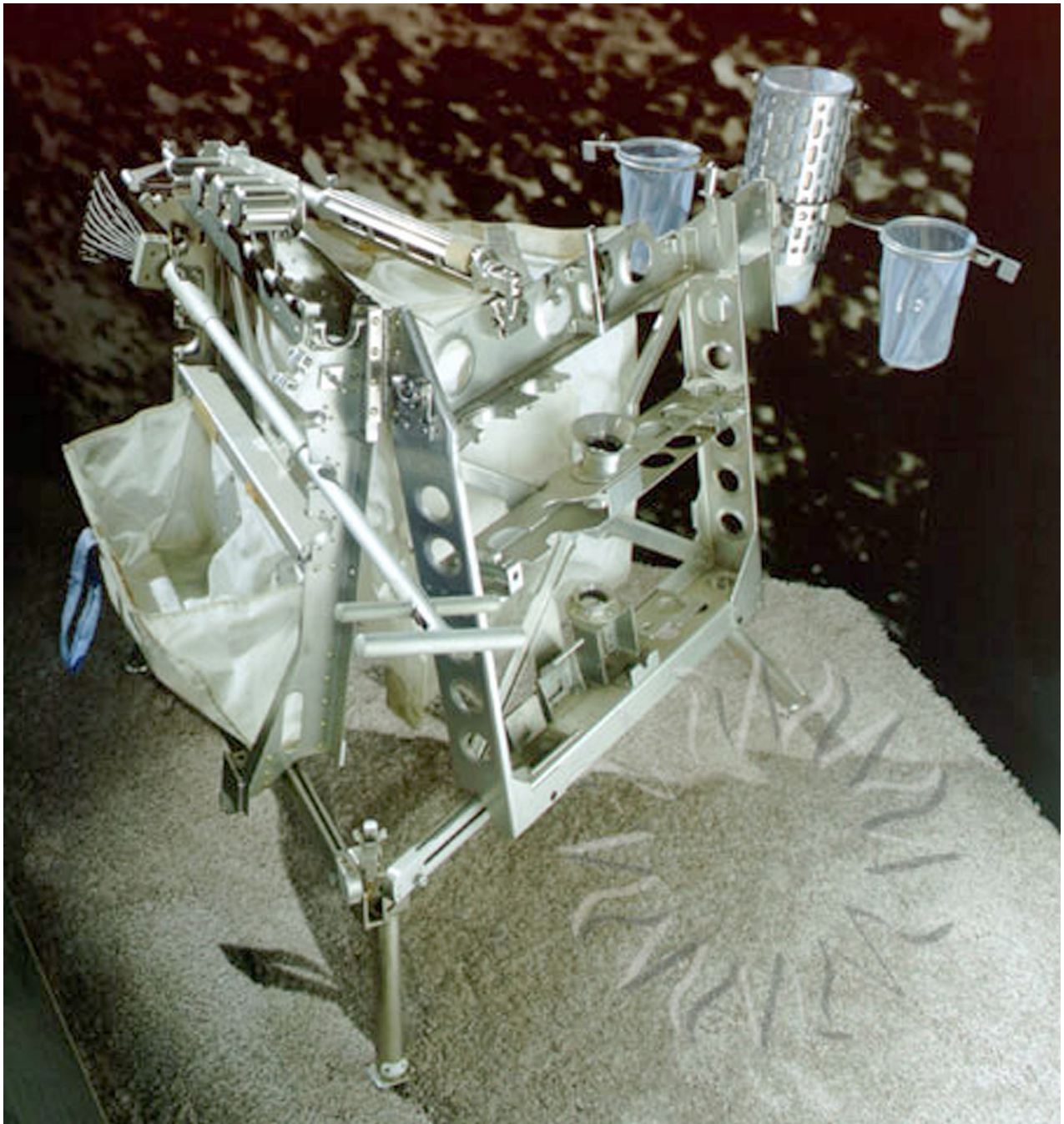


Figure 29-(b) an early NASA prototype of the three-legged Apollo Tool Carrier



Figure 29-(c) the Apollo 12 Tool Carrier prototype being carried by Apollo 12 astronaut Pete Conrad during field test at Flagstaff in October 1969.



Figure 30-(a) Aerial photograph showing the location of the Branch of Surface Planetary Exploration's petrology laboratory ("Rock Lab" at 16-18 Mike's Pike in downtown Flagstaff, Arizona); USGS photo P656 (1965)



Figure 30-(b) current appearance of the front of the old Rock Lab building at 16-18 Mike's Pike; now occupied (at the time of this writing) by Flag Tee Factory; digital photo G. Schaber 13 May 2002.



Figure 31-Apollo Extension Test 1 and Apollo Test 5, 20 Sept. to 1 Oct. 1965, at Apollo Mesa Dike in the Hopi Buttes Volcanic Field, Territory of the Navajo Nation, Arizona (south of Dilkon); (a) Joe O'Connor in early version of Apollo spacesuit; USGS photo P45, F96547c



Figure 31-(b) Gordon Swann in suit holding Apollo Lunar Staff prototype; tool carrier in front; USGS photo P45, F96565c



Figure 31-(c) Gordon Swann in Apollo suit with thermal outer garment carrying Luna staff and tool carrier; USGS photo P46, F96591c



Figure 31-(d) Gordon Swann kneeling down with tool carrier and Lunar staff; USGS photo P46, F965109c



Figure 31-(e) view of Chezhin Chotah Butte from inside the LM mockup through one of two triangular windows from which the crew described the “landing site” before egression onto the surface (see Fig. 19)



Figure 31-(f) microwave system used to send TV pictures from field to the ADF in the Arizona Bank Building in Flagstaff about 85 miles away; USGS photo P46, F96580c

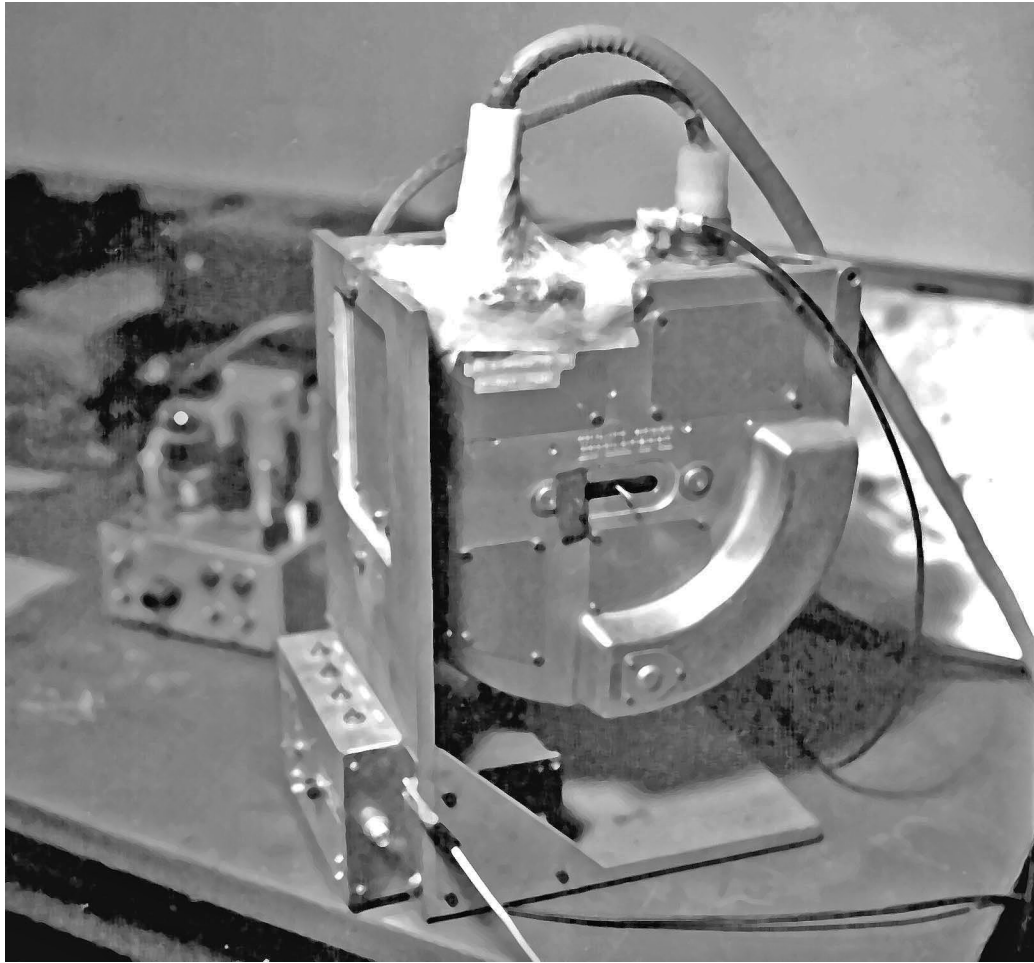


Figure 31-(g) Prototype miniaturized X-ray diffractometer that was originally designed and built by Phillips Electronics for use on NASA's Surveyor lunar lander spacecraft. It was never flown because of weight constraints. The diffractometer was loaned to the Branch of Astrogeology by JPL in 1966; USGS photo P103a F666457

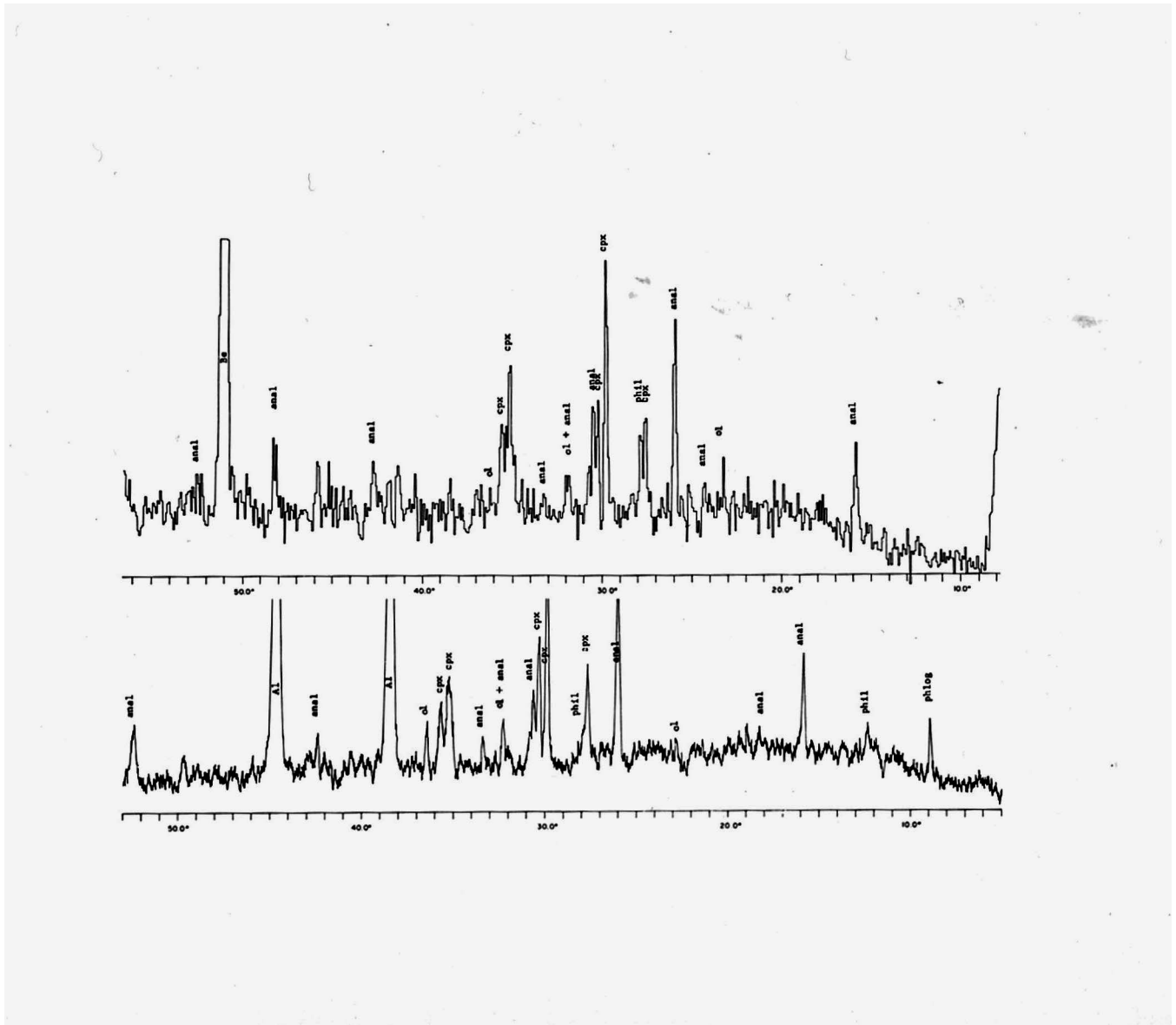


Figure 31-(h) X-ray diffraction pattern from Surveyor diffractometer shown above; USGS photo P477, F11663337.



Figure 32-Dedication of the Branch of Astrogeology headquarters Building of the Center of Astrogeology on McMillan Mesa, Flagstaff, Arizona on 18 October 1965; (a) gathering of USGS, NASA, and local City dignitaries on the south side of the new Headquarters for the Branch of Astrogeology; USGS photo P52, F106534



Figure 32-(b) David Schleicher in space suit demonstrating the use of the Lunar Staff for the dignitaries gathered at the dedication; USGS photo P5232, F106532

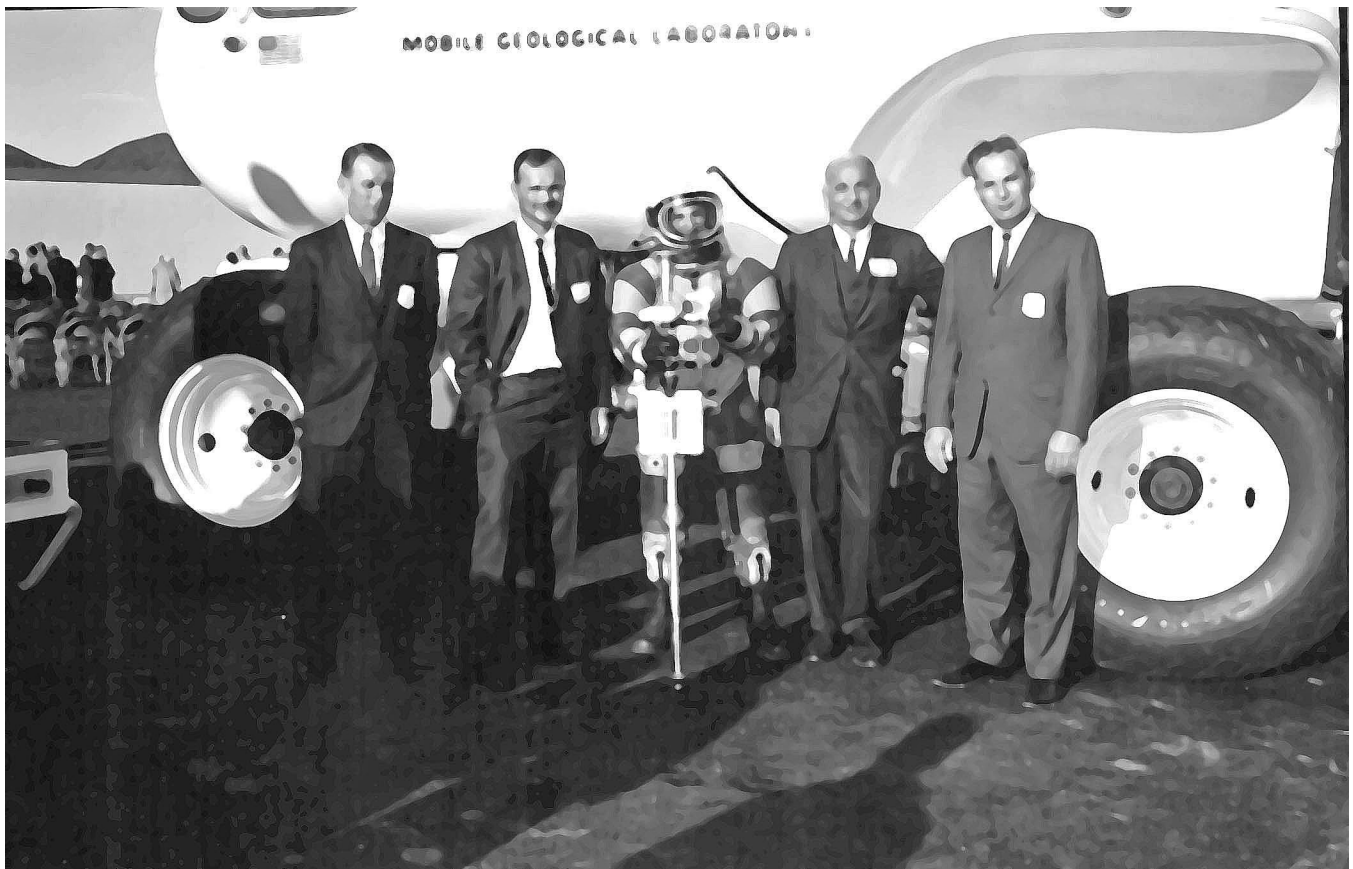


Figure 32-(c) Gene Shoemaker, William Pecora (USGS Director), Hal James (Chief Geologist), and two other dignitaries, standing in front of the MOLAB vehicle with David Schleicher in Pre-Apollo space suit and mockup of Lunar Staff concept; USGS photo P52, F106540



Figure 32-(d) David Schleicher (in spacesuit) with William Pecora in front of MOLAB vehicle; USGS photo P52, F106542.

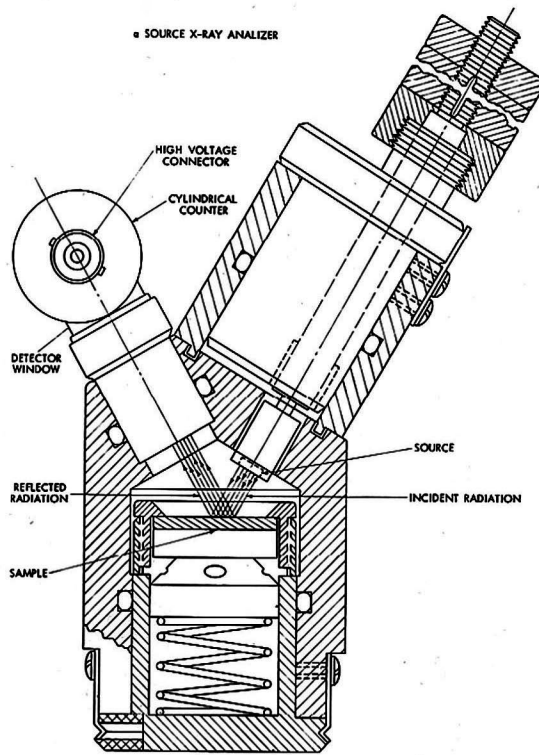


Figure 33- Schematic diagram of the alpha-source miniaturized x-ray analyzer designed by Dave Dahlem for testing by the Advanced Lunar Studies Group at the Branch of Astrogeology in Flagstaff; USGS photo P47, F116731 (also see Fig. 41d-f).

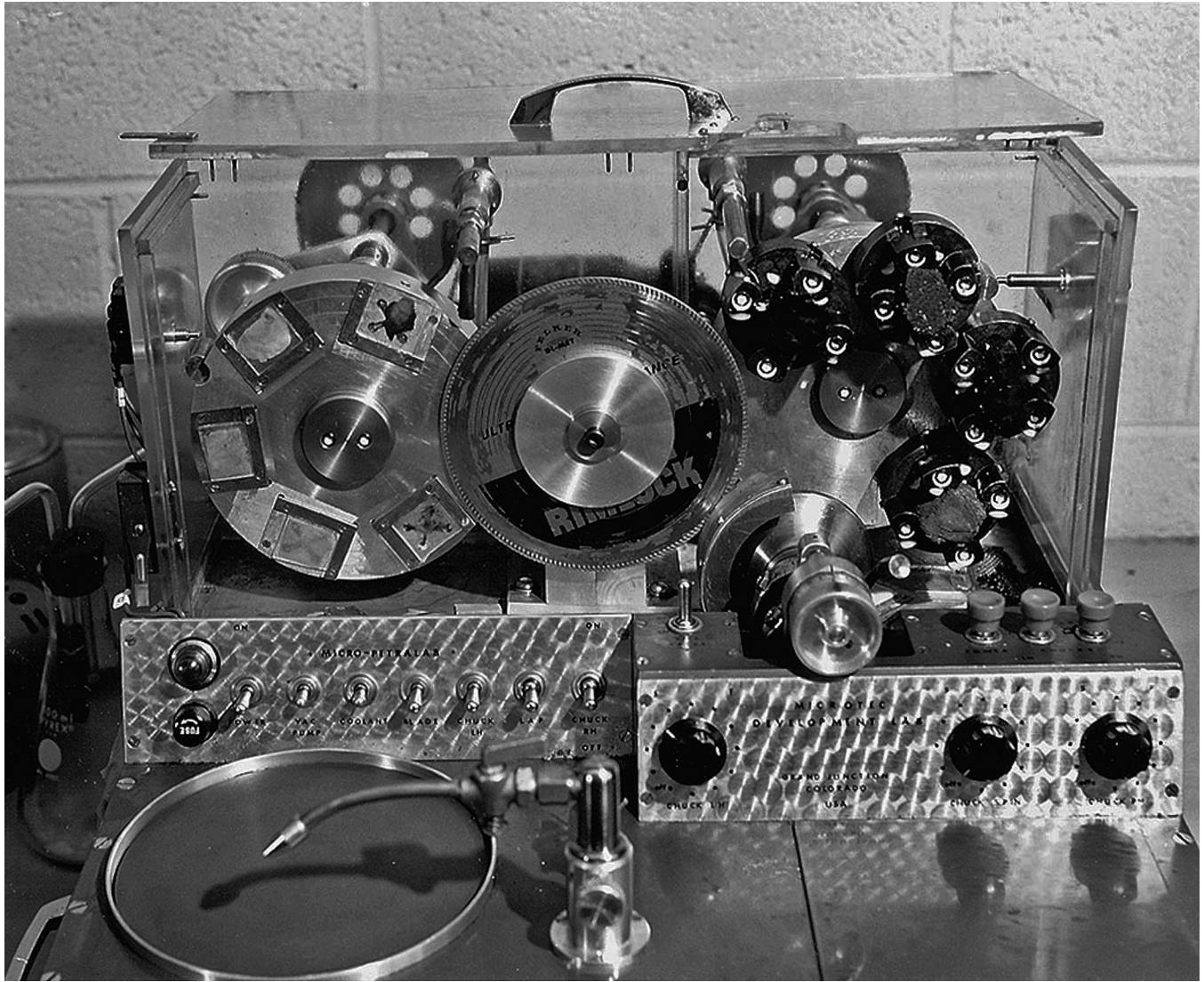


Figure 34- Prototype, semi-automatic rock cutting and thin-sectioning machine that was designed and built in 1965 for the Apollo Applications Program (AAP) and Advanced Lunar Programs Groups at the USGS in Flagstaff in 1965 by Paul Cary in Grand Junction, Colorado. Branch of Astrogeology personnel arranged for NASA to provide Paul with a \$6,000 grant to hand-build the prototype machine for used in geologic laboratory and field training of the astronauts. Paul later formed “Petrolab”, a very successful company that produced automatic, rock thin-section machines; USGS photo F12653.



Figure 35-Lunar Module (LM) simulator and various Astrogeology support vehicles located on the south side of Meteor Crater during AAP Test 2; 16-18 November 1965; USGS photo F11651.

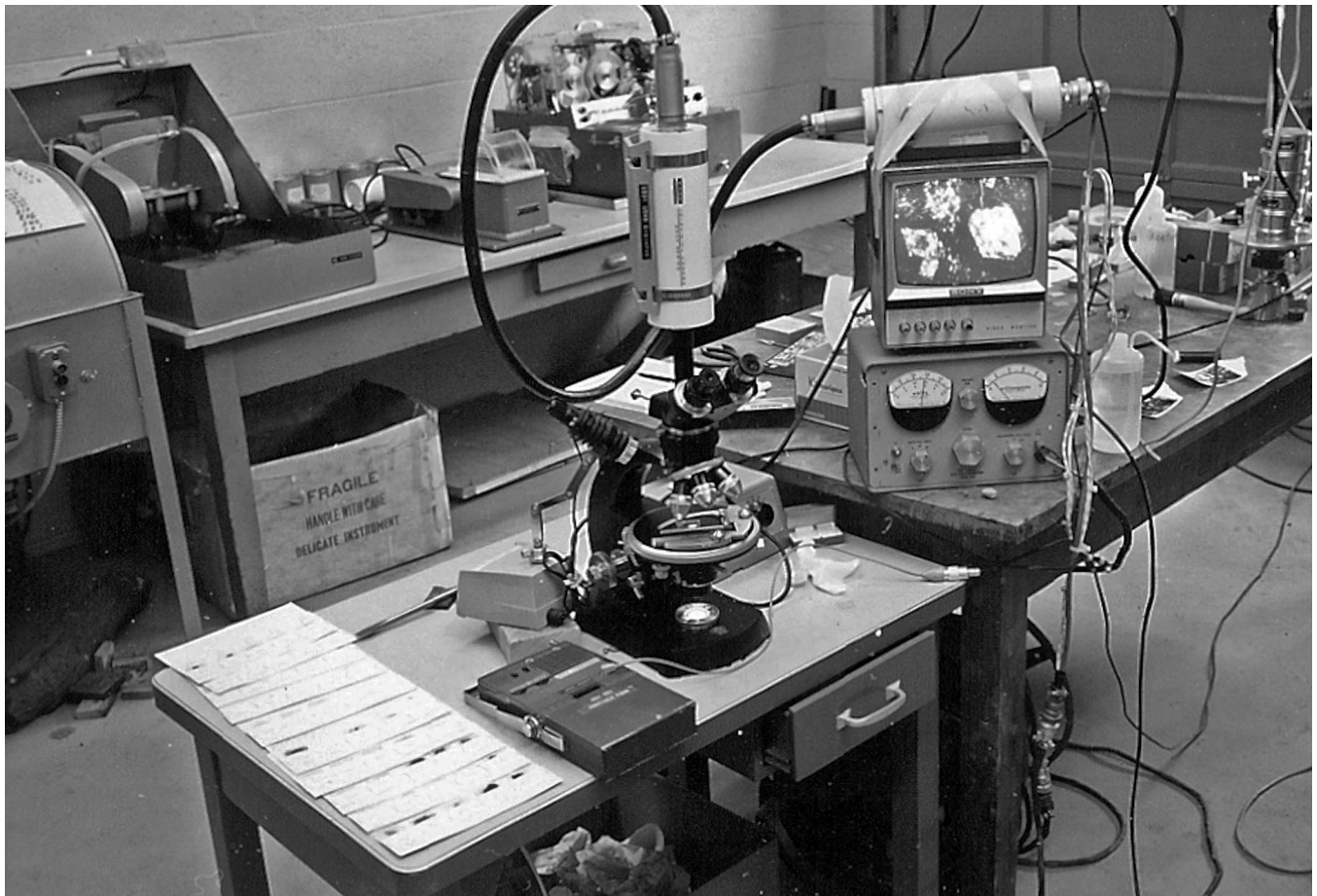


Figure 36-Apollo Applications Program (AAP) Test 3 between Rock Lab and ADF in Arizona Bank Building on 7-9 December 1965; (a) television camera set up over petrographic microscope in Mike's Pike Rock lab for remote thin section interpretation from ADF; USGS photo P54, F12659

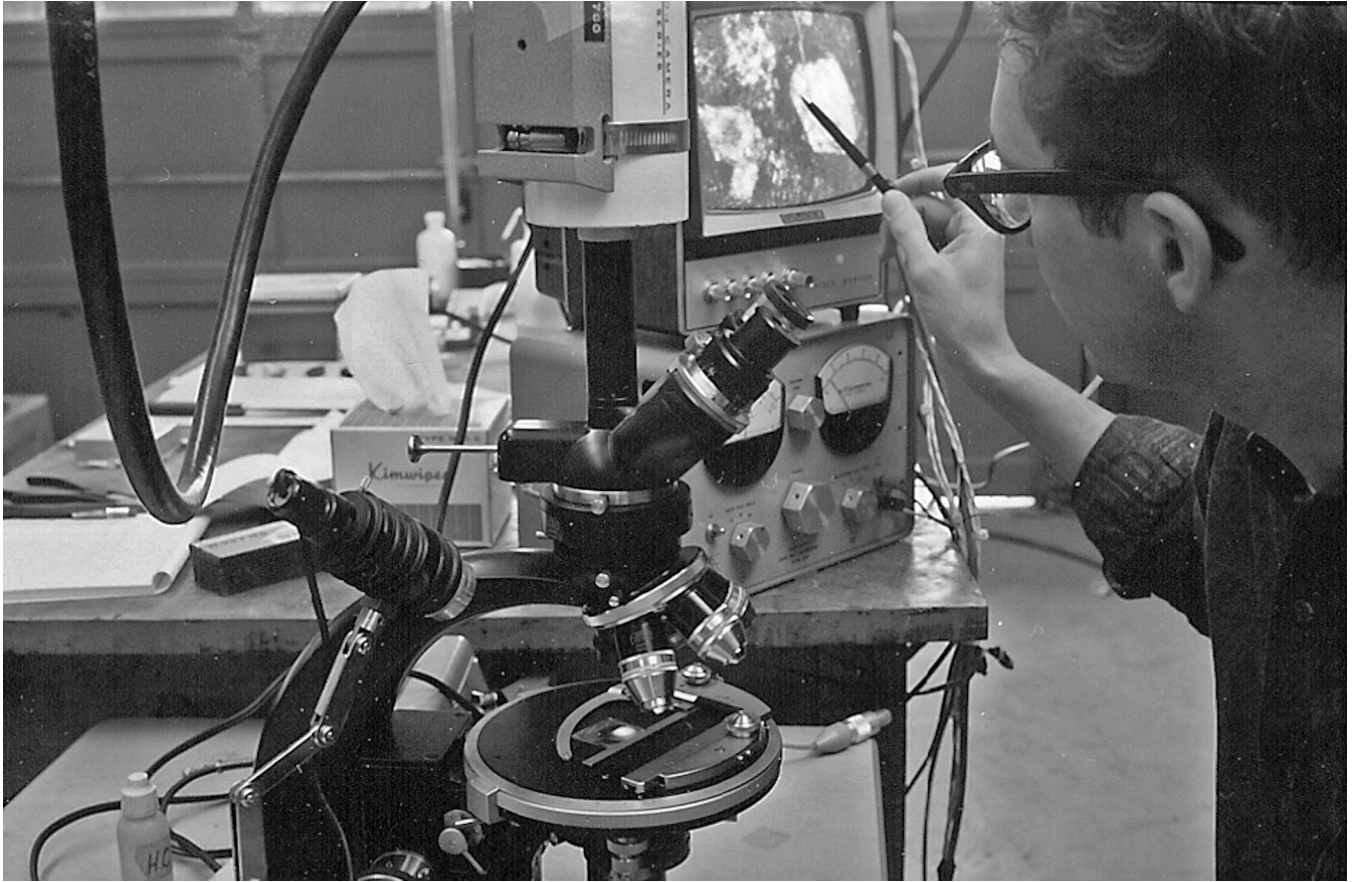


Figure 36-(b) Gerald G. Schaber in the Rock Lab during test; USGS photo P54, F126515



Figure 36 (c) Walt Roeder (Head of the Branch of Astrogeology's Film Documentation Unit) filming George Ulrich making thin sections using semi-automatic thin section machine (see Fig. 34); USGS photo P54, F12652.

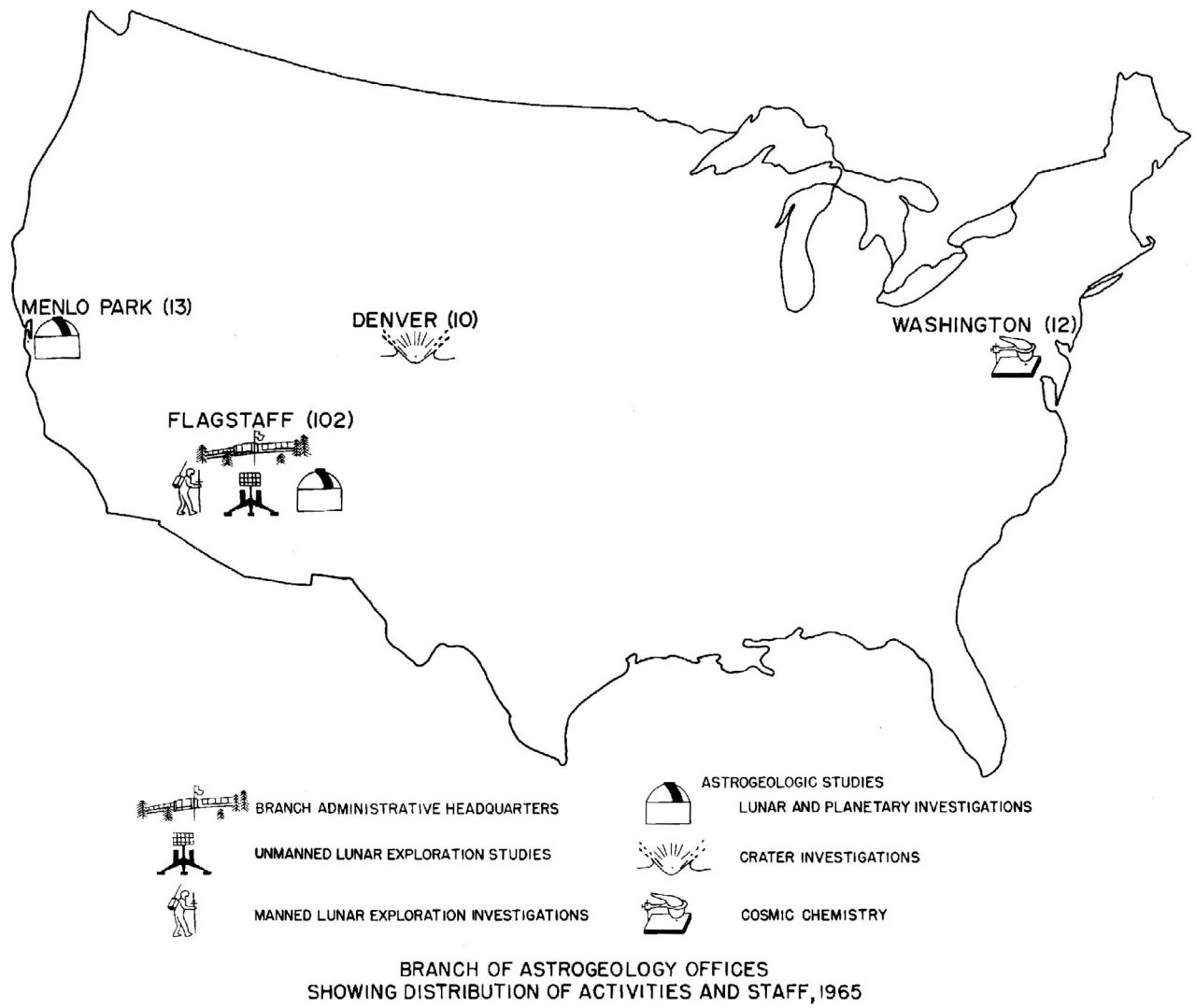


Figure 37-Diagram showing the nationwide distribution of Branch of Astrogeology offices and the number of staff personnel in 1965; USGS photo.



Figure 38-Early Apollo TV resolution test at Meteor Crater, Arizona 23 February 1966; (a) John M'Gonigle, USGS, Branch of Astrogeology (Flagstaff, Arizona) on rim of Meteor Crater by TV camera used for test; USGS photo P73, F266127



Figure 38-(b) Tim Hait (USGS, Branch of Astrogeology (Flagstaff, Arizona) holding resolution chart during Early Apollo TV camera-resolution test; USGS photo P73, F166115; (c) inside view of the electronics van used during the Early Apollo TV resolution test at Meteor Crater, February 1966; USGS photo P76, F266148; (d) Walt Roeder (left camera), Jim McCord (right camera) and John M'Gonigle from the Branch of Astrogeology's Film Documentation Unit making movie for NASA of Early Apollo TV resolution test at Meteor Crater; USGS photo P73, F266125.



Figure 38-(c) inside view of the electronics van used during the Early Apollo TV resolution test at Meteor Crater, February 1966; USGS photo P76, F266148



Figure 38-(d) Walt Roeder (left camera), Jim McCord (right camera) and John M'Gonigle from the Branch of Astrogeology's Film Documentation Unit making movie for NASA of Early Apollo TV resolution test at Meteor Crater; USGS photo P73, F266125.

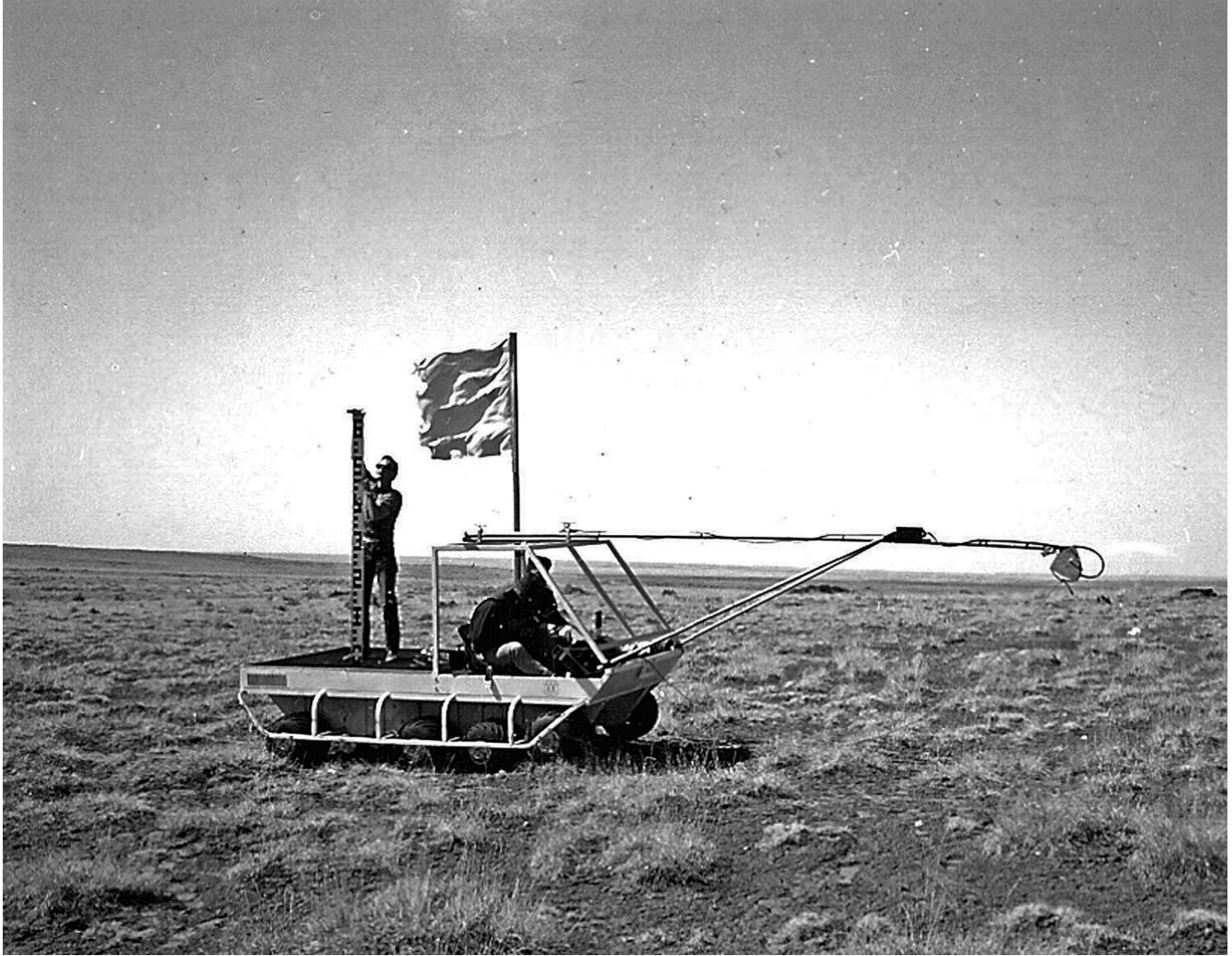


Figure 39-AAP Test-5 at French Butte (Hopi Buttes; Navajo Nation) on 14-18 March 1966 utilized ADF trailer, Trespasser, LEM TV, Magnetometer, Rock Lab Trailer in field; (a) Astrogeology's eight-wheeled "Trespasser" Vehicle with magnetometer boom; USGS photo P82, F36644



Figure 39-(b) James Crossan, surveyor for the USGS, Branch of Astrogeology (Flagstaff) shown plane-table surveying Trespasser stations during test; USGS photo P82, F33639

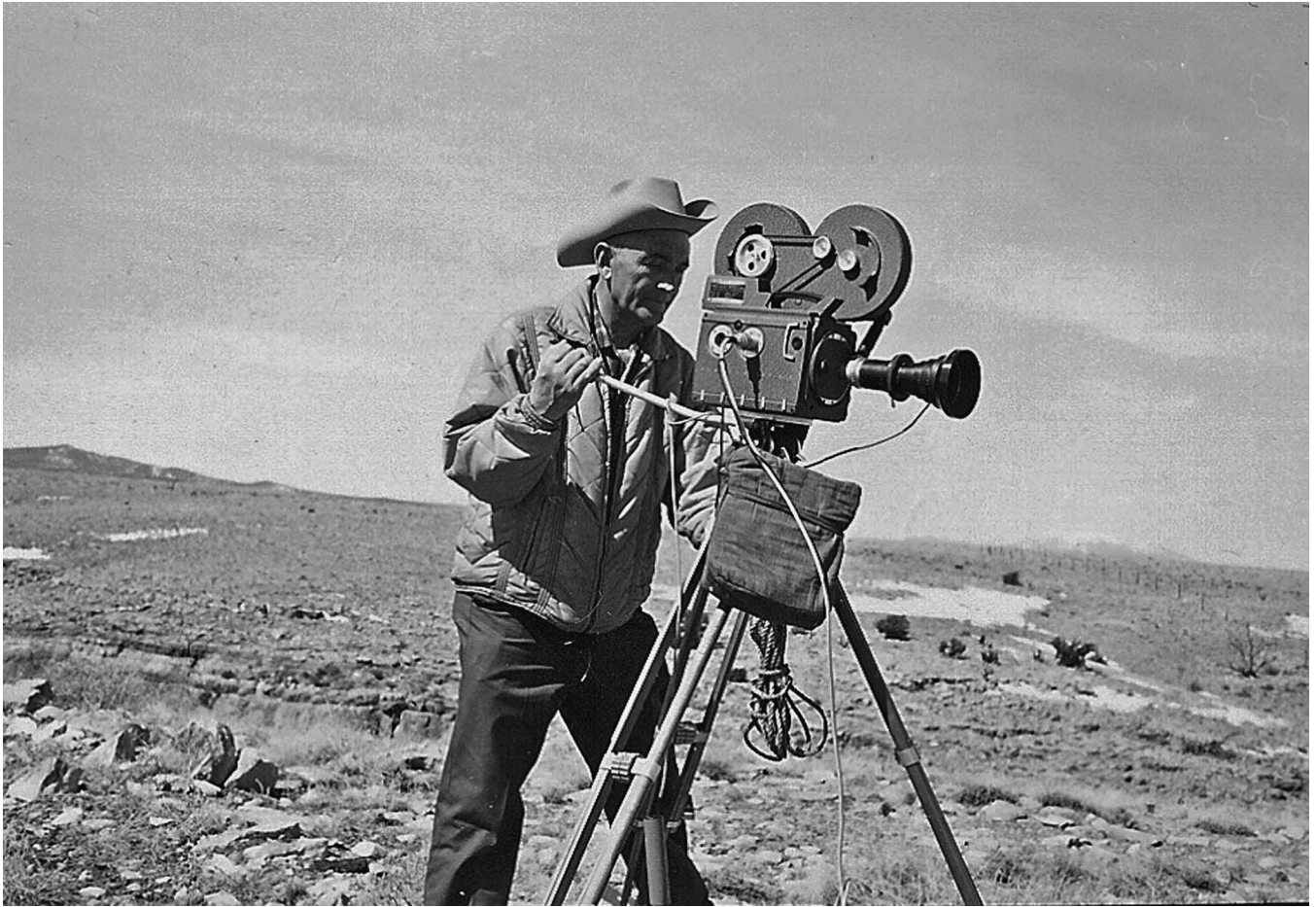


Figure 39-(c) Walt Roeder, cinematographer with the USGS, Branch of Astrogeology, shown film-documenting the test at French Butte for NASA; USGS photo P82, F36636.