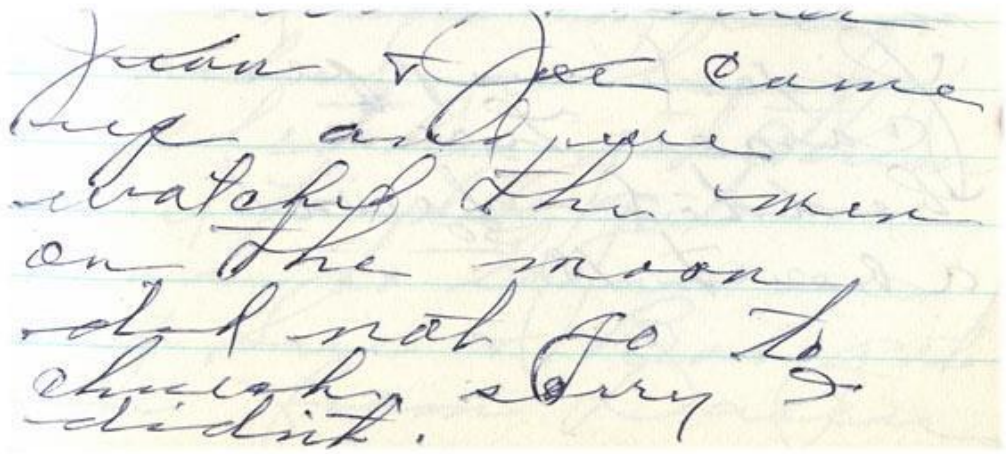


July 20, 1969

"Jean and Joe came up, and we watched the men on the Moon; did not go to church, sorry I didn't."

Note: Apollo 11 landed the first humans on the Moon, Americans Neil Armstrong and Buzz Aldrin, on July 20, 1969. Armstrong became the first to step onto the lunar surface.

Jean and Joe are Tom R. Chambers' parents; Jean is Mrs. Meekins' daughter.

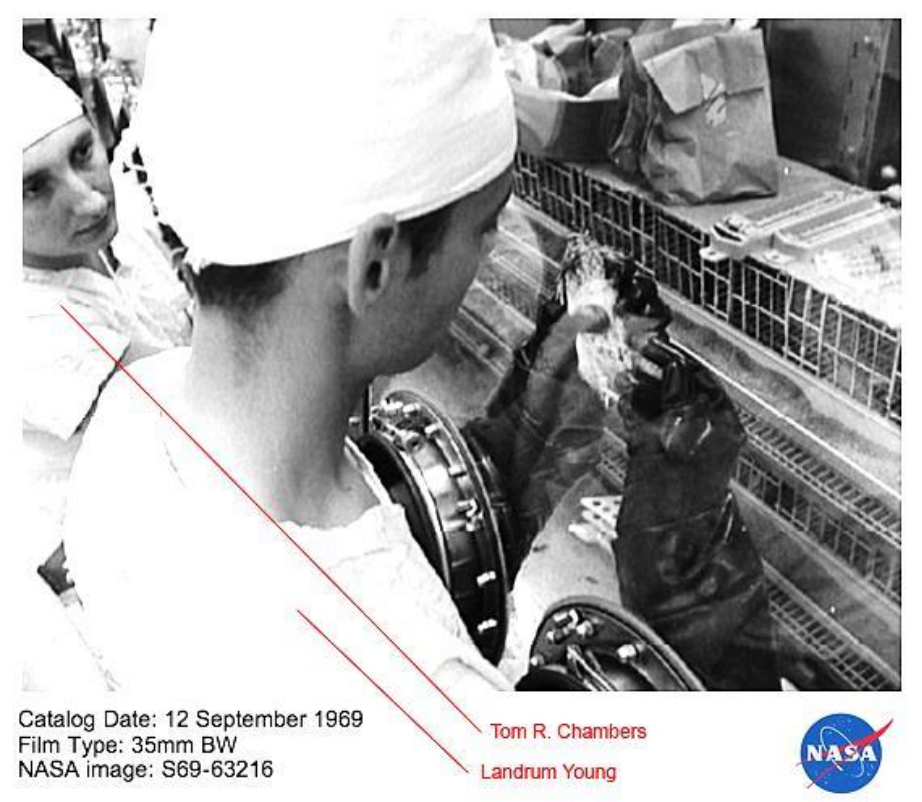
I thought I would begin with a diary entry made by my grandmother on July 20, 1969. She doesn't mention me, but I was there that evening with her and my parents watching the Apollo 11 astronauts land on the Moon, and Commander Neil Armstrong make that "one giant leap for mankind."

I had graduated from college two months earlier, and little did I realize that I would be working as a research analyst at the Lunar Receiving Laboratory two months later.

Fifty Years Ago at the Lunar Receiving Laboratory (Project Apollo)

Tom R. Chambers
Research Analyst
Biological Sciences Section
1969-1972

NASA



NASA

Team Leader, Landrum Young injects a quail as I assist him. A suspension of saline and Lunar soil … brought back from the Moon by the Apollo 11 astronauts … was prepared for the injection. Notice the containment cabinet that we were working in as a part of the Lunar quarantine program.

DM, 2016

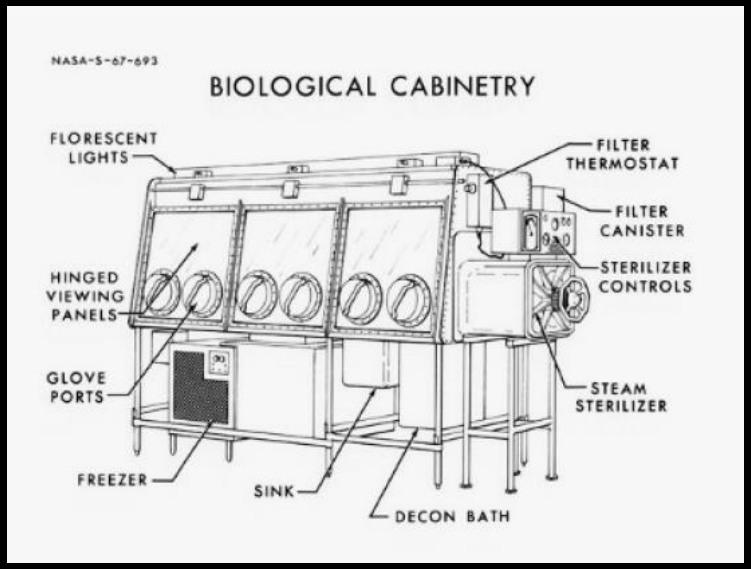
I am seen in front of the Lunar Receiving Laboratory (Building 37) in 2016. I visited my workplace after 44 years (1972-2016).

I joined the Biological Sciences research team near the end of the Apollo 11 process, because one of the team members breached the containment protocol, and was then quarantined with the astronauts. I had been working as a research analyst at the M.D. Anderson Cancer Center in Houston … first job out of college.

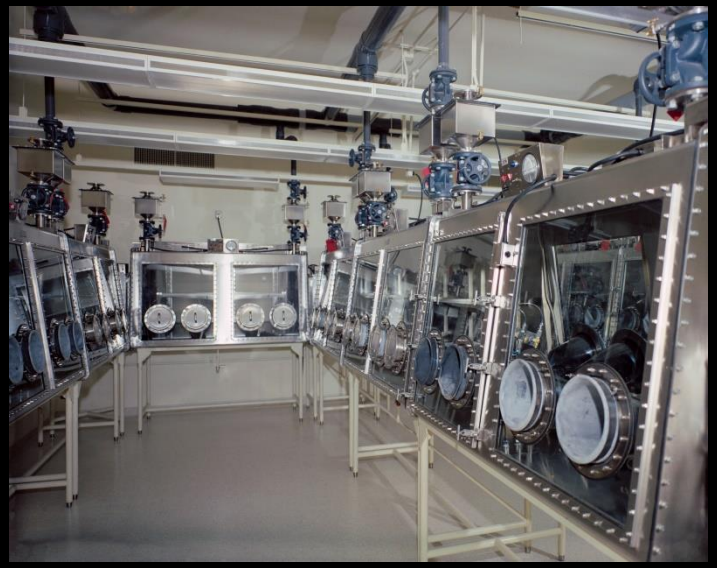
NASA

This NASA photograph shows again, the team leader, Landrum Young working with mice in the containment cabinet during Apollo 11. You'll notice the double barrier (isolator) that indicates the mice were germ-free. Germ-free mice lack all microorganisms, and they are housed in tightly controlled and monitored isolators to prevent contamination. They are microbiologically sterile; no living organisms can be cultured from germ-free mouse specimens.

The images below show examples of biological or containment cabinets. I spent a great deal of time working in these cabinets during missions 11, 12, and 14. This quarantine approach was to help prevent "forward contamination" (the transfer of life and other forms of contamination from Earth to another celestial body … in this case, the Lunar rocks and soil), and more importantly, "back contamination" (the introduction of extraterrestrial organisms and other forms of contamination into Earth's biosphere).



NASA



NASA

Although the formal quarantine for the crew, spacecraft, and lunar samples was over after Apollo 14, procedures for handling Lunar material and protecting it from contamination remained in effect for the Apollo 15, 16, and 17 missions.

NASA

NASA

I remember the first day ... actually, night ... of work. When I joined the team, they were in the midst of processing the Lunar soil (core sample) by the Apollo 11 astronauts.

That first night was as surreal as it gets. I entered a change room, and put on a "bunny suit" ... similar to a surgical uniform ... walked through a UV wash (dry shower), and then ended up at the beginning of a long, corridor.

There were doors running to the left and right all the way to the end with autoclaves (sterilization units) interspersed on the walls.

The laboratory where I would be working was at the very end. The team leader entered a combination code to open the door, and then we entered.

When I entered, the first things to catch my eye were the large containment cabinets ... metallic, glassed, see-through working areas with glove ports. I had never seen anything like this before except for a hooded work area in a microbiology laboratory. I would spend the next several months with my arms inserted into those glove ports working with the Lunar soil from Apollo 11, 12, and 14 and various animal models (species). The team leader and other analysts would be at my side as we worked the samples for analyses.

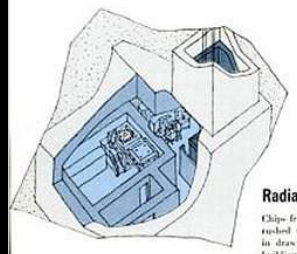
That first night on the job of a lifetime left me a bit "numb" after eight hours working in a surreal setting of "bunny suits", UV wash, containment cabinets, sterilization units, the tension of having to be very careful not to breach the containment protocol, and of course the Lunar soil sample on the other side of the glass.

NASA

This image shows the cabinets with positive pressure (gloves extended). For missions 11, 12, and 14, the cabinets were under negative pressure to prevent “back contamination”.

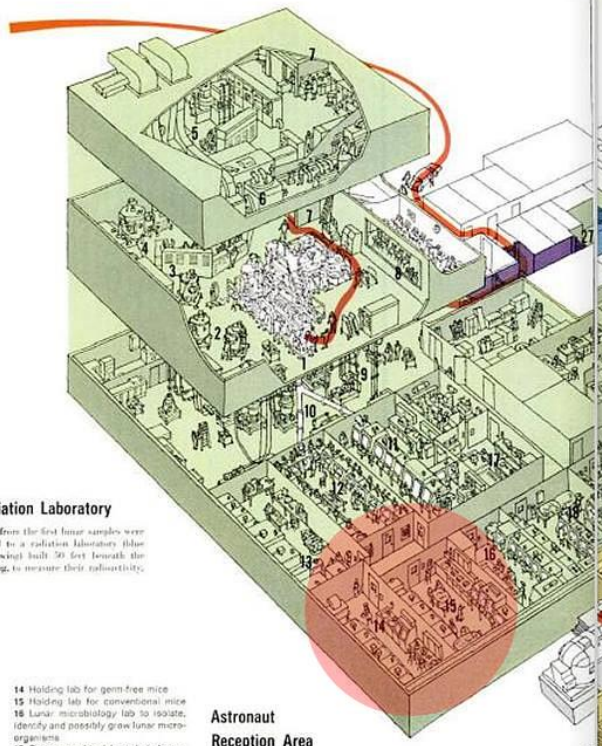
Anatomy of the Lunar Receiving Lab

Routes into biologically isolated sectors of the Lunar Receiving Lab are shown here by red lines. At upper left, lunar samples arrived and were taken to vacuum system and then down by elevator to radiation lab (blue). Other entrances indicated are for astronauts, for the command module, for food and laundry. Lines at far right show where personnel come and go through ultraviolet air locks (purple).



Radiation Laboratory

Chips from the first lunar samples were rushed to a radiation laboratory (blue in drawing) built 50 feet beneath the building, to measure their radioactivity.



Lunar Sample Laboratory

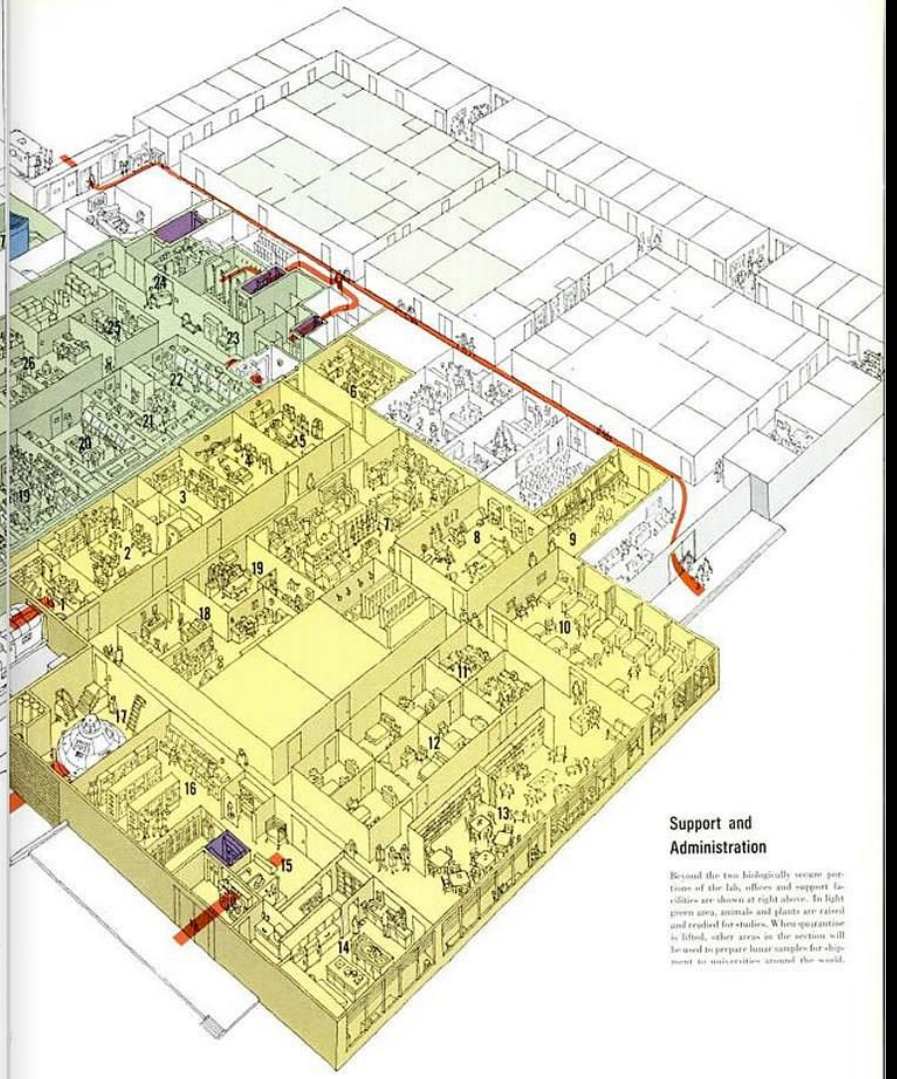
More than 100 scientists and technicians started performing tests with lunar materials in the lab area, shaded green.

1 Vacuum system where lunar material was received and processed
2 Carousels for storage and transfer of lunar material
3 Controls for vacuum system
4 Equipment for preflight tool sterilization
5 Gas analysis laboratory
6 Special air-conditioning system to sterilize air entering and leaving building
7 Elevator
8 Viewing room for participating scientists
9 Pump room and electrical support equipment for vacuum system
10 Transfer tubes for moving samples directly from vacuum system to labs
11 Physical-chemical test lab—mineralogy, petrology, geochemistry
12 Bio-prep lab to prepare and package lunar material for distribution
13 Bio-analysis lab for blood tests and other tests on mice
14 Holding lab for germ-free mice
15 Holding lab for conventional mice
16 Lunar microbiology lab to isolate, identify and possibly grow lunar microorganisms
17 Spectrographic lab and darkroom (connects to 11)
18 Bird, fish and invertebrate lab where shrimp, quail, cockroaches, oysters and other creatures are exposed to lunar material
19 Microbiology lab for test cultures of lunar and astronaut material
20 Egg and tissue culture lab (support and additional facilities for 21)
21 Crew virology lab for postflight virological analysis of astronauts
22 Plant lab where germ-free algae, spores, seeds and seedlings are exposed to lunar material
23 Entrance to lunar sample operations area; showers and facilities for all personnel passing in and out to change clothing
24 Autoclave for sterilizing all material entering or leaving area
25 Bio-safety lab to monitor all systems
26 Support offices
27 Entrance to radiation counting lab

Astronaut Reception Area

Quarantine area where astronauts live is shaded yellow. In an emergency, lab workers could also be quartered there.

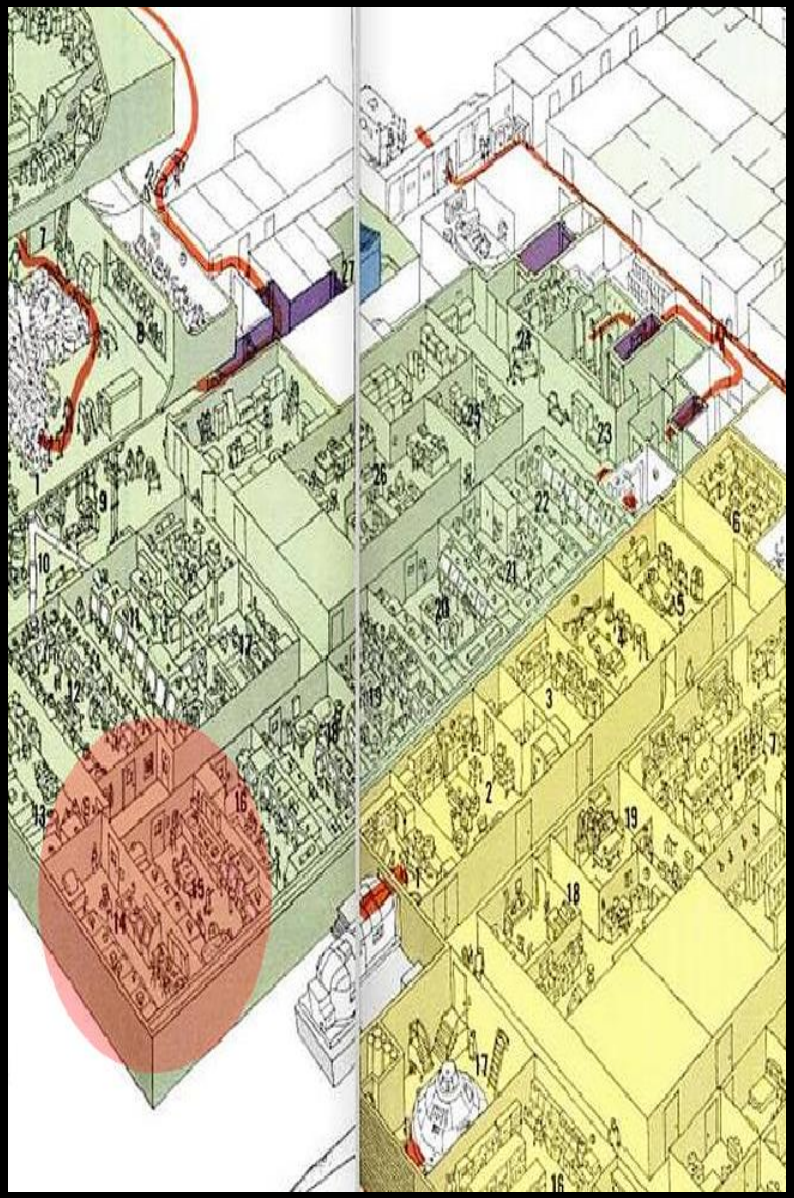
1 Crew reception area (connected to transfer van)
2 Medical and dental examination room
3 Medical examination room
4 Operating room
5 Tilt-table room for physiological testing
6 Taped-out room where data can be passed into nonquarantine area electronically
7 Biomedical lab—clinical chemistries and immunology of astronauts and support personnel
8 Exercise room
9 Astronaut debriefing room, separated by glass from family visiting room
10 Dormitory for support personnel
11 Offices for astronauts and doctors
12 Paired sleeping quarters for three astronauts and their three attendant doctors
13 Lounge and dining room
14 Kitchen
15 Receiving room where food and laundry are sterilized passing in and out
16 Computer room for data storage from biomedical lab (7)
17 Spacecraft storage, equipped with closed-circuit TV for inspection
18 Microbiology lab for clinical tests of quarantined personnel
19 X-ray room with fluoroscope and darkroom



Support and Administration

Beyond the two biologically secure portions of the lab, offices and support facilities are shown at right above. In light green area, animals and plants are raised and readied for studies. When quarantine is lifted, other areas in the section will be used to prepare lunar samples for shipment to universities around the world.

The circled area (red) indicates the labs where I spent three years working with the Lunar soil and various animal species (models).



As I have mentioned, the Lunar samples were tested within biological or containment cabinets. These cabinets were gastight enclosures through which all manipulations were performed using neoprene gloves. Air or nitrogen entered the cabinets through absolute biological filters, and was filtered again before being vented to the outside. All material entering the cabinets was sterilized. The cabinets were operated at a pressure negative with respect to the laboratory to ensure that any leak that developed would be directed into the cabinets rather than into the laboratory.

There was also a secondary biological barrier. The rooms (labs) in which the cabinets were housed were also maintained at a pressure negative with respect to the adjacent corridors. This guaranteed that any escaping Lunar material would be contained. This secondary biological barrier which surrounded the sample laboratory included facility systems and operational procedures. Tight building construction was used and all penetrations were sealed. All solid materials including waste, clothing, and trash were sterilized. The sample laboratory area received supplies during quarantine operations through ultraviolet-lighted (UV) airlocks (BIOMEDICAL RESULTS OF APOLLO - THE LUNAR QUARANTINE PROGRAM (Sec.5,Ch.1), NASA).

I remember these airlocks very well since I had to take a UV shower each time I entered and exited the building.

There were three main elements as part of the Biological Protocol: crew microbiology; in vitro attempts to culture microorganisms from the lunar sample; and the direct challenge of the Lunar sample in biological systems. I was involved in the third element. The group of hosts involved higher and lower vertebrates, invertebrates, unicellular organisms, and plants. (NASA)

NASA

NASA

GUIDELINES

1. The existence of hazardous, replicating microorganisms on the moon would be assumed.

2. Biological containment requirements should be based on the most stringent means used for containment of infectious terrestrial agents.

3. The sterilization requirement should be based on methods needed for the destruction of the most resistant terrestrial forms.

4. Hazard detection procedures should be based on an alteration of the ecology and classical pathogenicity.

5. The extent of the biological test protocol would be limited to facilities approved by the Congress, to well-defined systems, and to biological systems of known ecological importance. (NASA)

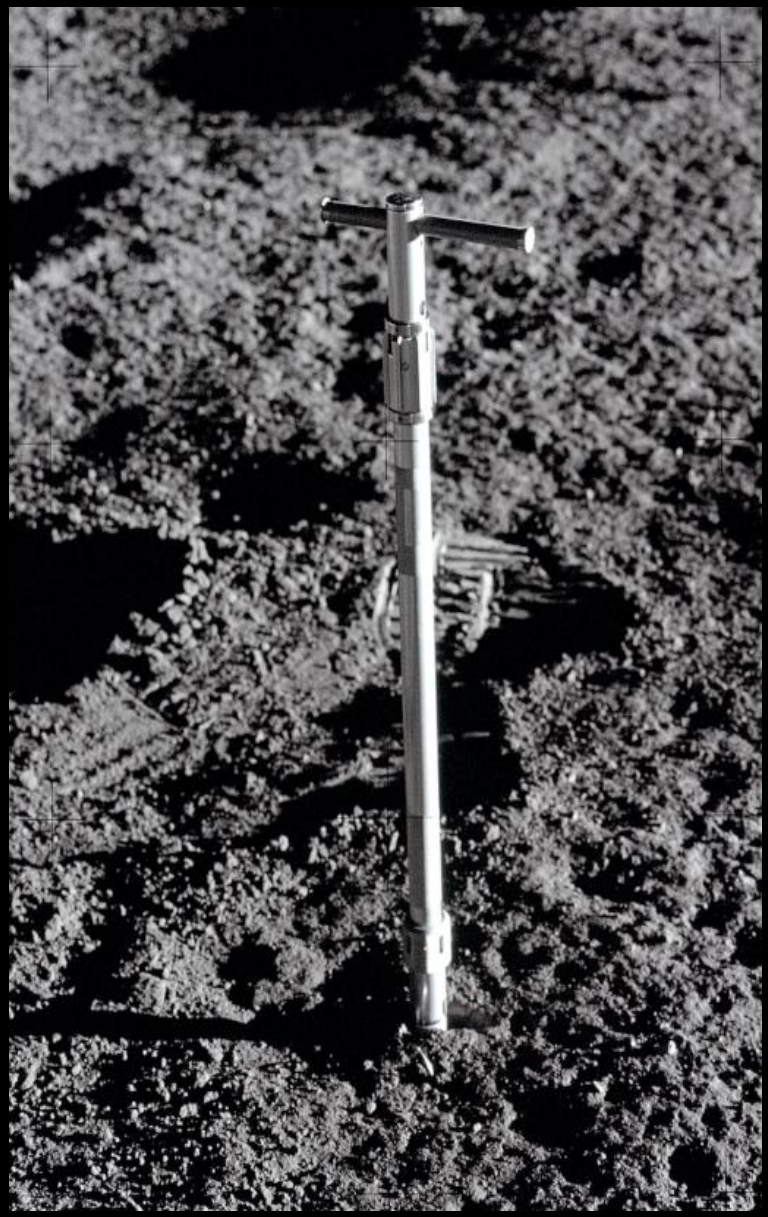
These guidelines provided the basis for the Lunar Quarantine Program. Although the probability that life existed on the Moon was extremely low, the risk was sufficiently high that a quarantine program was justified.

The term "hazard" had to be defined before a method of detection could be developed. Procedures were limited to those capable of detecting an agent that would exhibit classical pathogenicity to some terrestrial life form or that could establish itself in a terrestrial environment and thereby alter the ecology. This guideline limited the search to the detection of replicating microorganisms. (NASA)

As it related to my responsibilities in the Biological Sciences section, the methods used for the detection of replicating microorganisms that could cause disease or establish and replicate themselves in some terrestrial environment /organism were as follows:

Lunar soil (core sample) /saline suspensions were prepared for injections and administered;

the various animal species (models) were sampled at various time cycles: bled for blood analyses and chemistries; dissected for light and electron microscopy of various tissues to look for changes in morphology; and cultured for microbial procedures.



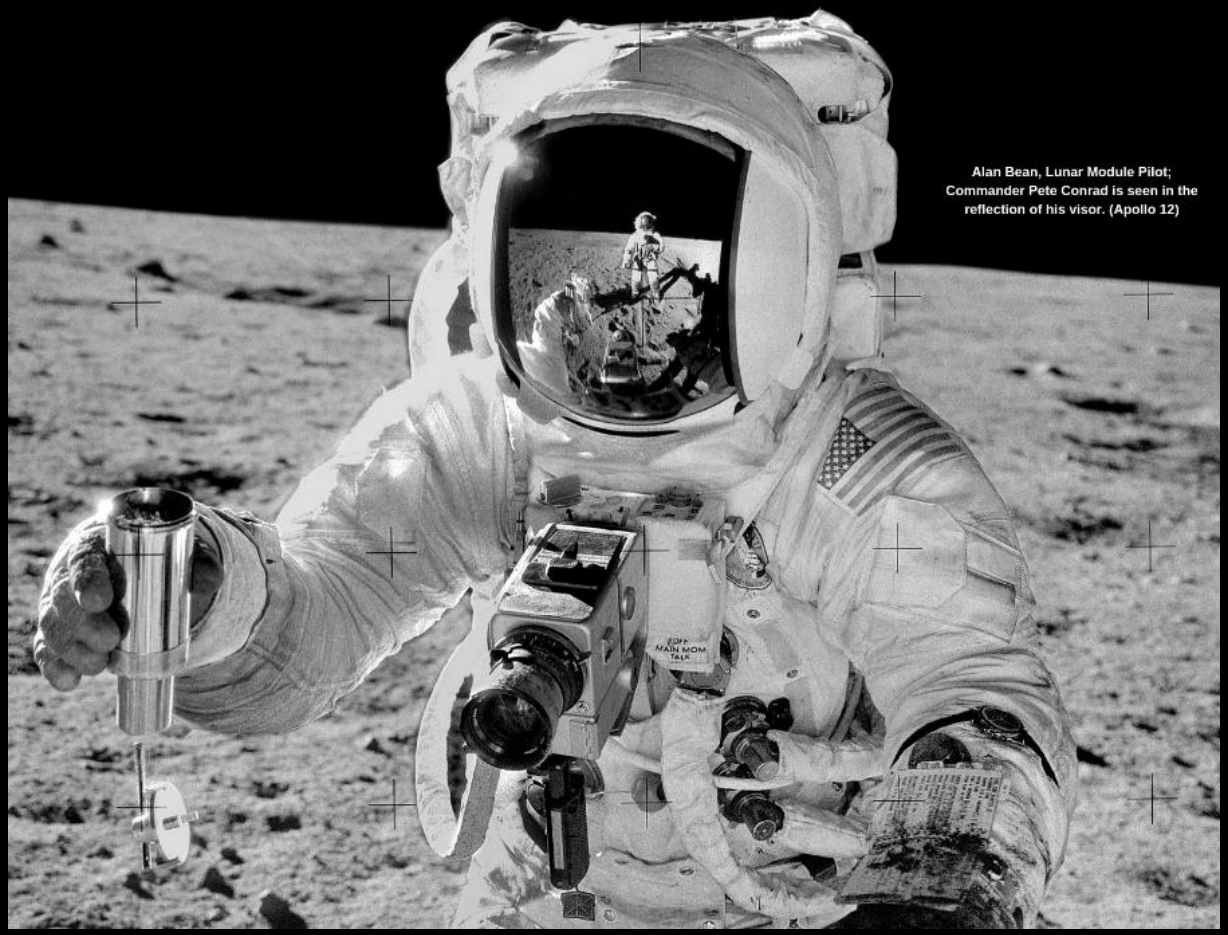
Core Tube Sample, Apollo 12, NASA

NASA

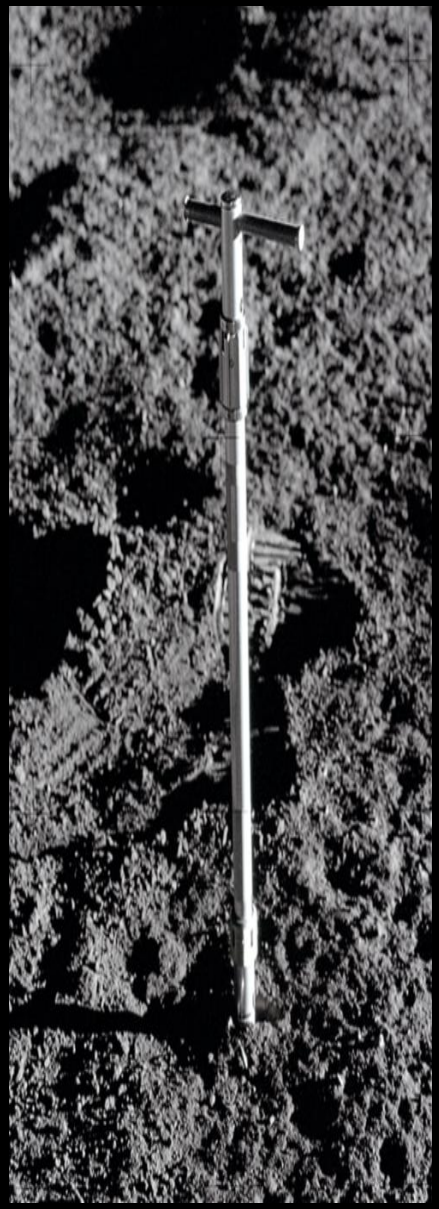
My main focus when we received the Apollo 12 sample was to prepare saline/Lunar soil suspensions for injection of groups of mice (other species) in staggered fashion for incubation and processing. At various time intervals, the mice (other species) would be bled for blood analyses and dissected for tissue sampling (light and electron microscopy and microbiology).

Keep in mind, all of these precise and tedious procedures were done through "bulky" gloves with restricted movement and viewing limitations in the sense that you had to be careful that you didn't bang your head on the glass window of the containment cabinet. And again, we had to be careful that we didn't "pin prick" our gloves, which would have shut down the entire system. As I have mentioned previously, an analyst in our area did indeed do this during the Apollo 11 procedures, and was quarantined with the astronauts.

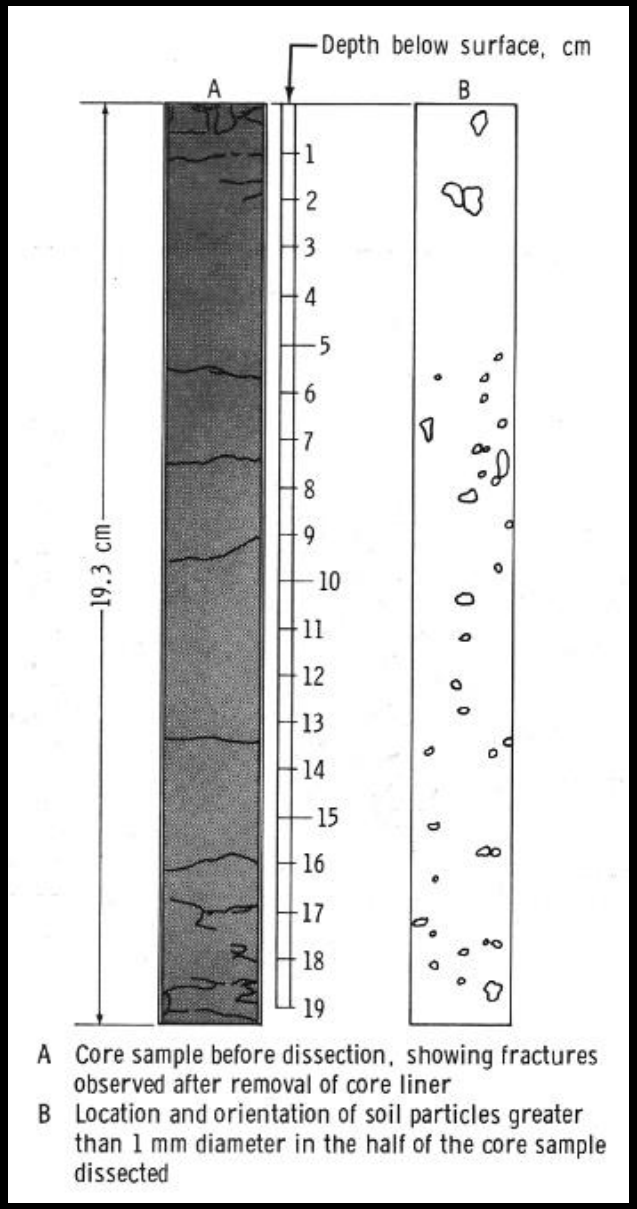
This work environment gave me a greater appreciation of the astronauts' work environment when they were on the Moon working with procedures in their "bulky" suits and gloves.



NASA



Core Tube Sample, Apollo 12, NASA



A Core sample before dissection, showing fractures observed after removal of core liner

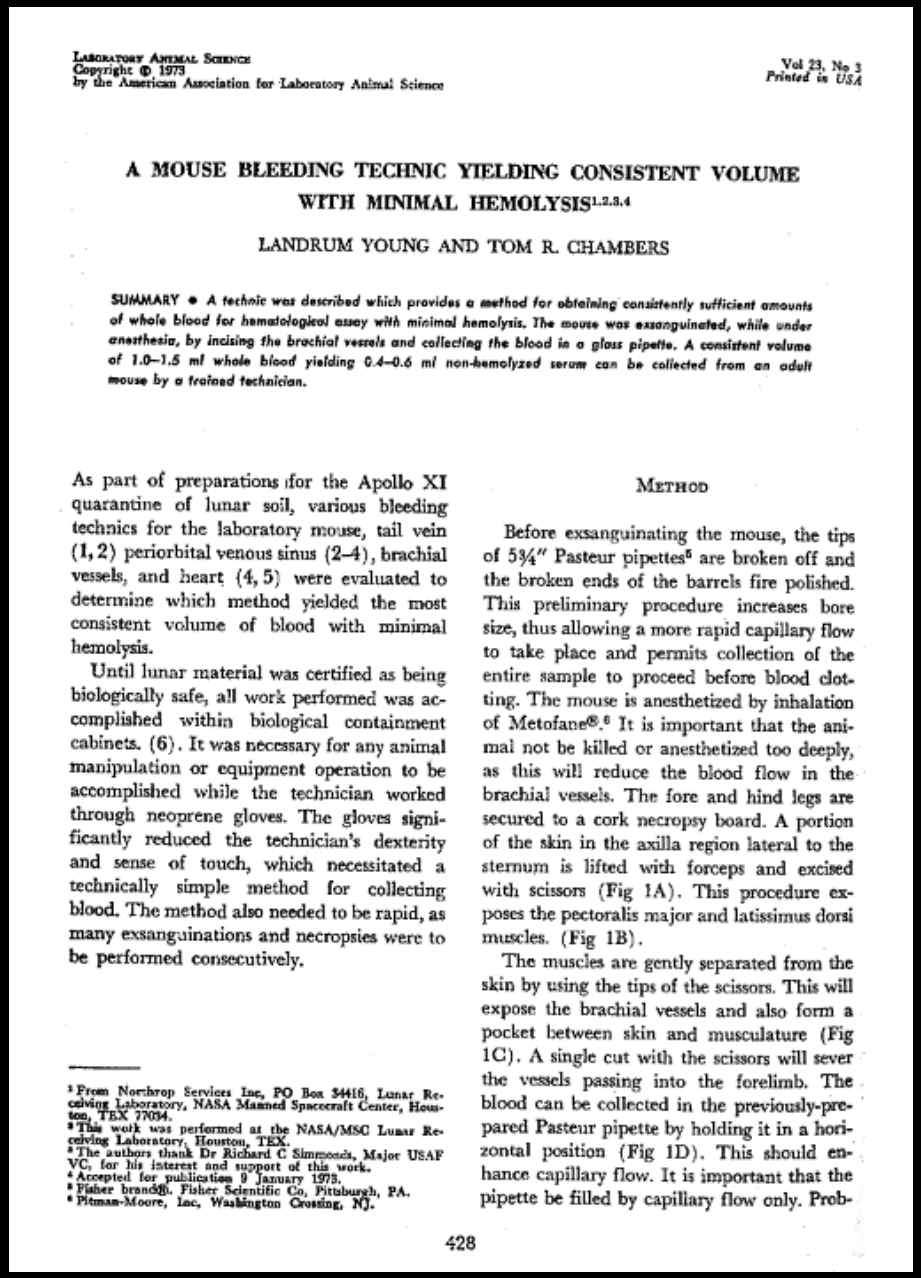
B Location and orientation of soil particles greater than 1 mm diameter in the half of the core sample dissected

NASA

If I am correct after 50 years, our prepared sample came from this Apollo 12 core tube … sample 12026. It was collected in drive tube 1 (S/N 2013) near the Lunar module (LM) at the end of the first EVA period on the northeast edge of Surveyor Crater. The core was 19. 3 centimeters long and contained 106.6 grams of soil. Three small samples were taken from near the top, middle, and bottom of the core for gas analyses; then the core was dissected and split longitudinally. The split was divided into three samples — the top, middle, and lower thirds. Each sample was sieved, then recombined to form part of the BIOPRIME sample (the sample used by us in the quarantine area) (DESCRIPTION OF CORE SAMPLES RETURNED BY APOLLO 12, NASA TECHNICAL MEMORANDUM, NASA TM X-58066, November 1971).

We then took this BIOPRIME sample and made saline suspensions for our injections of the mice (other species).

As I have mentioned, once the mice (other species) were subjected to the saline/Lunar soil suspension, it was an hourly process of macroscopic and microscopic observations with exsanguinations/dissections to be able to do blood and tissue analyses. Over time, I perfected a technique of obtaining optimal blood levels with minimal hemolysis during the exsanguination process, and suggested to the team leader that we publish a paper on this in a scientific journal. We did, and I'll never forget how we decided who should be first on the author credits … we flipped a coin, and he won, so his name precedes mine on the paper. The paper was not only accepted for publication, but also won first place for best technical paper published in the scientific journal, Laboratory Animal Science: http://tomrchambers.com/las.pdf



LABORATORY ANIMAL SCIENCE
Copyright © 1973
by the American Association for Laboratory Animal Science

Vol 23, No 3
Printed in USA

A MOUSE BLEEDING TECHNIC YIELDING CONSISTENT VOLUME WITH MINIMAL HEMOLYSIS[1,2,3,4]

LANDRUM YOUNG AND TOM R. CHAMBERS

SUMMARY • *A technic was described which provides a method for obtaining consistently sufficient amounts of whole blood for hematological assay with minimal hemolysis. The mouse was exsanguinated, while under anesthesia, by incising the brachial vessels and collecting the blood in a glass pipette. A consistent volume of 1.0–1.5 ml whole blood yielding 0.4–0.6 ml non-hemolyzed serum can be collected from an adult mouse by a trained technician.*

As part of preparations for the Apollo XI quarantine of lunar soil, various bleeding technics for the laboratory mouse, tail vein (1, 2) periorbital venous sinus (2–4), brachial vessels, and heart (4, 5) were evaluated to determine which method yielded the most consistent volume of blood with minimal hemolysis.

Until lunar material was certified as being biologically safe, all work performed was accomplished within biological containment cabinets. (6). It was necessary for any animal manipulation or equipment operation to be accomplished while the technician worked through neoprene gloves. The gloves significantly reduced the technician's dexterity and sense of touch, which necessitated a technically simple method for collecting blood. The method also needed to be rapid, as many exsanguinations and necropsies were to be performed consecutively.

METHOD

Before exsanguinating the mouse, the tips of 5¾" Pasteur pipettes[5] are broken off and the broken ends of the barrels fire polished. This preliminary procedure increases bore size, thus allowing a more rapid capillary flow to take place and permits collection of the entire sample to proceed before blood clotting. The mouse is anesthetized by inhalation of Metofane®.[6] It is important that the animal not be killed or anesthetized too deeply, as this will reduce the blood flow in the brachial vessels. The fore and hind legs are secured to a cork necropsy board. A portion of the skin in the axilla region lateral to the sternum is lifted with forceps and excised with scissors (Fig 1A). This procedure exposes the pectoralis major and latissimus dorsi muscles. (Fig 1B).

The muscles are gently separated from the skin by using the tips of the scissors. This will expose the brachial vessels and also form a pocket between skin and musculature (Fig 1C). A single cut with the scissors will sever the vessels passing into the forelimb. The blood can be collected in the previously-prepared Pasteur pipette by holding it in a horizontal position (Fig 1D). This should enhance capillary flow. It is important that the pipette be filled by capillary flow only. Prob-

[1] From Northrop Services Inc, PO Box 34416, Lunar Receiving Laboratory, NASA Manned Spacecraft Center, Houston, TEX 77034.
[2] This work was performed at the NASA/MSC Lunar Receiving Laboratory, Houston, TEX.
[3] The authors thank Dr Richard C Simmonds, Major USAF VC, for his interest and support of this work.
[4] Accepted for publication 9 January 1973.
[5] Fisher brand®, Fisher Scientific Co, Pittsburgh, PA.
[6] Pitman-Moore, Inc, Washington Crossing, NJ.

This is the second page of the article. I like this bit of literary/scientific accomplishment now for its historic nature.

[1] From Northrop Services Inc, PO Box 34416, Lunar Receiving Laboratory, NASA Manned Spacecraft Center, Houston, TEX 77034.
[2] This work was performed at the NASA/MSC Lunar Receiving Laboratory, Houston, TEX.
[3] The authors thank Dr Richard C Simmonds, Major USAF VC, for his interest and support of this work.
[4] Accepted for publication 9 January 1973.
[5] Fisher brand®. Fisher Scientific Co, Pittsburgh, PA.
[6] Pitman-Moore, Inc, Washington Crossing, NJ.

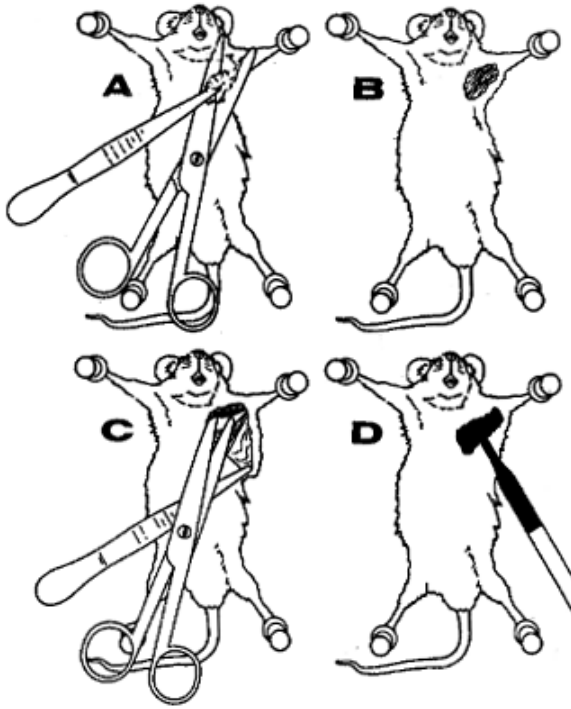


Fig 1. *Mouse bleeding technic A) skin in axillary region is lifted with forceps, excised with scissors; B) pectoralis major and latissimus dorsi muscles exposed; C) brachial vessels exposed; note pocket between skin and musculature; D) blood collected in Pasteur pipette.*

ing or gouging the axilla area with the tip of the pipette or using suction bulbs to draw the sample up the barrel only increases the degree of hemolysis.

If the mouse has not been killed by exsanguination, it is killed by cervical fracture.

During the actual collection process, samples for hematologic assay can also be directly taken from the site with hematocrit tubes, diluting pipettes, capillary tubes for slides, etc.

Results and Discussion

Collecting whole blood from the brachial vessels proved to be more successful than the other methods previously mentioned because of the technical simplicity and resulting yields. Whole blood volume averaged 1.0–1.5 ml and serum quality was good. This allowed for all hematologic and serologic assays to be performed easily and accurately. Now that quarantine is no longer required and the use of biological containment cabinets is not needed, this method of exsanguination has proved even more efficient.

References

1. Grice HC: Methods for obtaining blood and for intravenous injections in laboratory animals. *Lab Anim Care* 14: 485–495, 1964
2. Schermer S: *The Blood Morphology of Laboratory Animals*, 3rd ed, Philadelphia, FA Davis Co, 1967, pp 61–62
3. Cate CC: A successful method for exsanguinat-

By observation of plant and animal diseases, it was determined that most terrestrial disease agents were capable of invading a host and causing evident disease symptoms within 21 days after exposure of the host. Most disease agents capable of causing epidemic or rapidly spreading diseases were sufficiently virulent to be transmitted in less than 21 days. It was decided that a crew quarantine period of at leas 21 days should be required after each Apollo mission. Intensive medical examinations of the flight crewmembers during quarantine determined if any medical problems existed as a result of exposure to lunar material. (NASA)

Let me stop here and mention a member of the medical team, Rudy Landry. We became very good friends, and his enthusiasm for Project Apollo was infectious … no pun intended. He passed away several months ago, and I want to dedicate this presentation to him.

Our procedures in the Biological Sciences sectio followed similar guidelines with a repetitive approach to ensure that the release of the Lunar samples to other investigative teams did not represent a hazard.

RIP, RL.

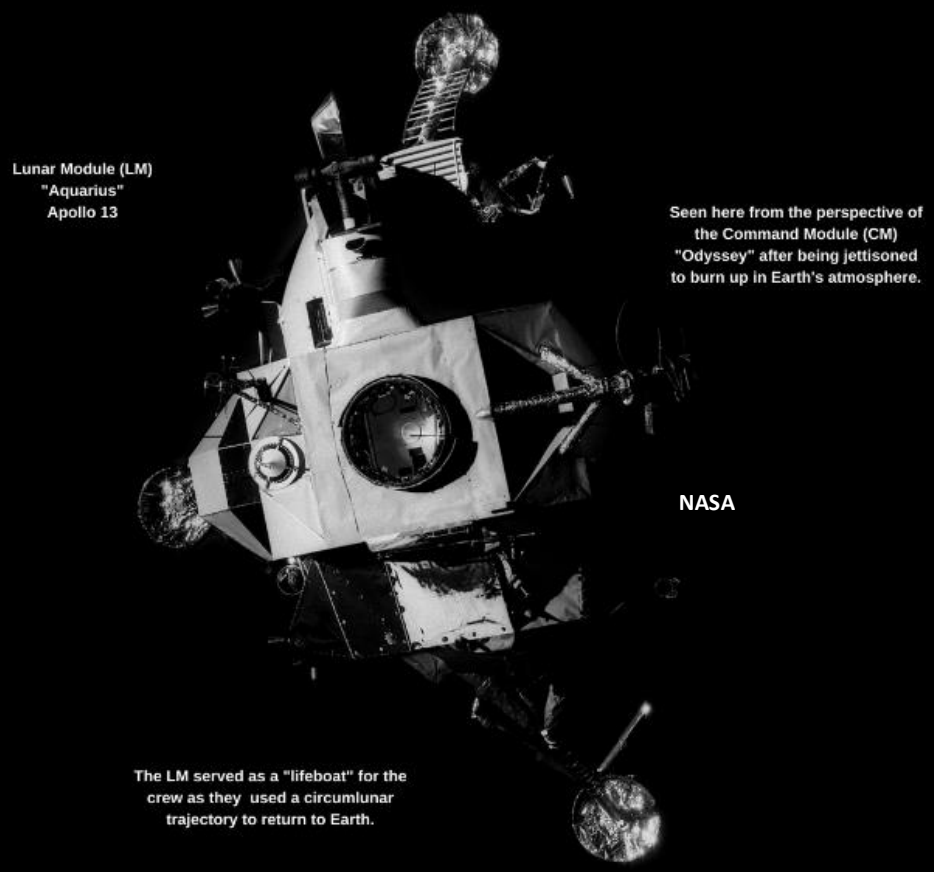
Image of Moon - Apollo 11, NASA

The hourly process of macroscopic and microscopic observations with exsanguinations to be able to do blood and tissue analyses was definitely a grind. We had to be punctual … right on … and deliver results at a fast pace to satisfy the "concerns of the day" … is the Moon safe? And we had to be careful not to contaminate the samples that were brought back.

As tests were progressing for the Apollo 12 Lunar soil, we also had to begin preparations for the return of the Apollo 13 samples. We set up procedures and modifications based on prior techniques with missions 11 and 12, and practiced the various approaches so they would become routine. Little did we realize that these projected routines would be broken.

NASA

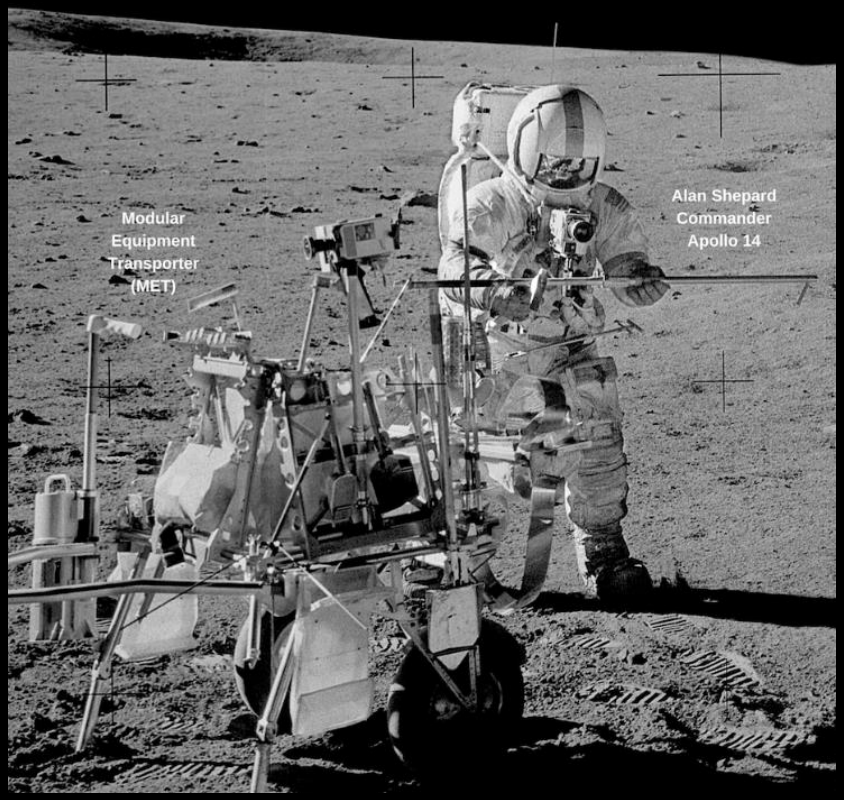
As usual … like the previous missions … we were anticipating the launch of Apollo 13, their journey to the surface of the Moon to collect "OUR" sample, and their return to Earth. But, the accident that happened to them along the way changed everything, and a "doom and gloom cloud hung over" the Lunar Receiving Laboratory. We had to be conscious of our ongoing procedures and tests with the mission 11 and 12 samples, but it was a difficult task to get our head around the fact that we might lose our Apollo 13 astronauts over a bunch of rocks. Of course, I remember this distinctly, and I walked into work those few days with nothing else on my mind except concern for Lovell, Haise, and Swigert.



There was about a four-month delay for Project Apollo because of the mission 13 problems, so we did some maneuvering as well, which meant I worked on other research activities. I remember walking into the medical laboratory area to utilize their electrophoresis equipment to do some enzyme work on mice that had been subjected to Lunar soil. I began utilizing their equipment to establish enzyme baselines. I got pretty good at this, too, and ended up publishing my results in another scientific journal.

Apollo 14 made it through the process ... everyone on "pins and needles" because of the Apollo 13 mishap ... and we received our Lunar soil sample. We were excited as ever as we opened the lid, and witnessed the Moon ... again, but a different part of this celestial body. The Apollo 12 sample was from the southeastern portion of the Ocean of Storms, and our new sample (mission 14) was from the Fra Mauro formation.

NASA



NASA

We essentially performed the same procedures subjecting animal species (models) to the Lunar soil. The crews of Apollo 11, 12, and 14 experienced no health problems as a result of their exposure to Lunar material. The test species, plant and animal, which were exposed to and injected with Lunar material showed no adverse alterations or ill effects from exposure. Since exhaustive studies of the astronauts and returned lunar samples indicated there was no hazard to Earth's biosphere, the Interagency Committee on Back-Contamination, in January of 1970, concurred in NASA's recommendation that stringent quarantine rules be abandoned for future Apollo missions to the Moon (BIOMEDICAL RESULTS OF APOLLO - THE LUNAR QUARANTINE PROGRAM (Sec.5,Ch.1), NASA).

And as I have mentioned, although the formal quarantine for the crew, spacecraft, and lunar samples was over after Apollo 14, procedures for handling Lunar material and protecting it from contamination remained in effect for the Apollo 15, 16, and 17 missions.

NASA

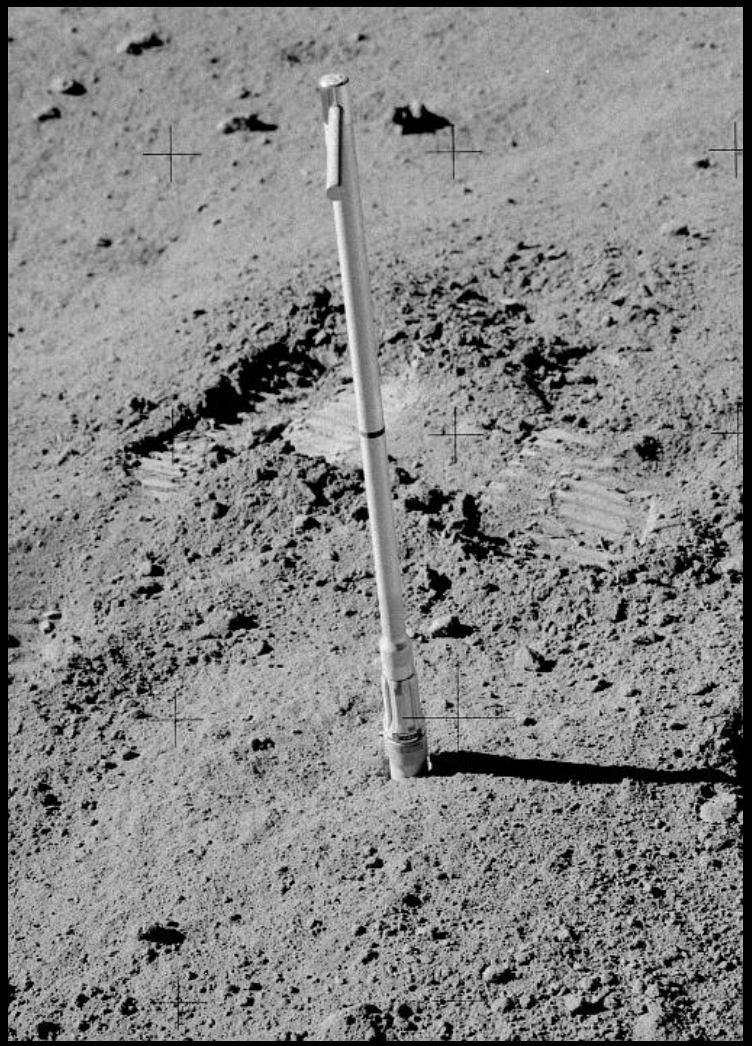
NASA

NASA

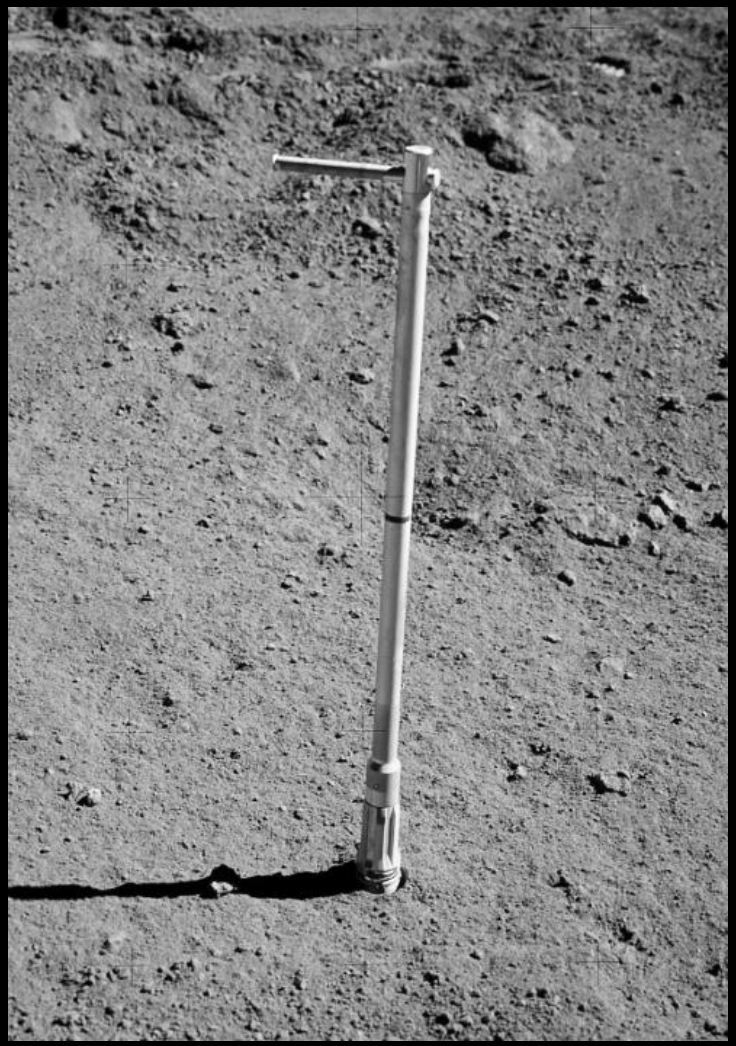
For missions 15, 16, and 17, I moved my focus a bit to also include macrophage studies after Lunar soil exposure. The macrophage is an important component of the innate immune system that plays a strong regulatory role as a vital link with adaptive immunity. The procedures involved peritoneal lavages (washes) of mice (other species) after Lunar soil/saline injections and incubation.

I also conducted extensive still /cine-film photomicrography of macrophage behavior (ingestion/reaction) to the soil particulates. This exposure to the documentation aspects of the research is probably the main reason that I later moved into medical/scientific media.

Jim Irwin, Lunar Module Pilot, pushes the core tube in by hand before hammering it the rest of the way. (Apollo 15, NASA)



Charlie Duke, Lunar Module Pilot made this photograph of the core tube after hammering it into the ground. (Apollo 16, NASA)



Gene Cernan, Commander made this photograph of the core tube after hammering it into the ground. (Apollo 17, NASA)

I refined the peritoneal lavage technique at the Lunar Receiving Laboratory, and published this technical paper in Laboratory Animal Science (Vol. 25, No. 5, 1975) later when I was a Research Associate at the University of Texas Medical Branch at Galveston (Texas), 1975.

LABORATORY ANIMAL SCIENCE
Copyright © 1975
by the American Association for Laboratory Animal Science

Vol 25, No 5
Printed in USA

AN ASEPTIC PERITONEAL CELL COLLECTION TECHNIC FOR SMALL LABORATORY ANIMALS[1,2,3]

TOM R. CHAMBERS[4]

SUMMARY • *Peritoneal exudate was collected by introducing a lavage medium (sterile saline or an equivalent) via syringe and needle into the peritoneal cavity of the anesthetized animal. The lavage medium was recovered by allowing it to flow through the needle into a sterile container. This method guards against contamination. Eighty to 90% of the initial lavage volume is retrieved.*

KEY WORDS • *Peritoneal lavage—Peritoneal exudate—Irrigation—Intraperitoneal*

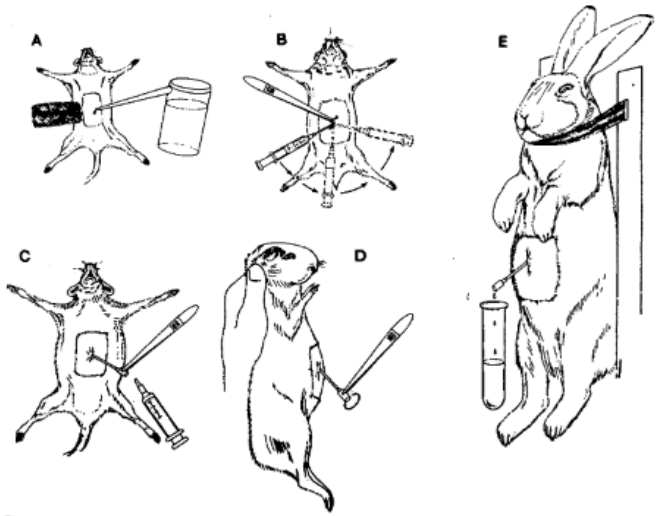


Fig 1. *Peritoneal lavage technic: A) Abdomen shaved and thoroughly cleansed with alcohol and sterile gauze; B) needle inserted into peritoneal cavity and lavage medium introduced; C) syringe barrel removed, leaving needle in place; D) needle manipulated to initiate flow; E) exudate flows into sterile container.*

[1] From the Division of Infectious Disease, Department of Internal Medicine, University of Texas Medical Branch, Galveston, TX 77550.
[2] The author thanks Ms Linda Swickheimer of the Medical Illustrations Dept, University of Texas, for art work.
[3] Accepted for publication 6 June 1975.
[4] Present address (reprint requests): Serafy Laboratories, 205 W Levee St, Brownsville, TX 78520.

In procedures requiring the *in vitro* culturing of cells collected from the peritoneal cavity of laboratory animals, the method of collecting cells must avoid microbic contamination

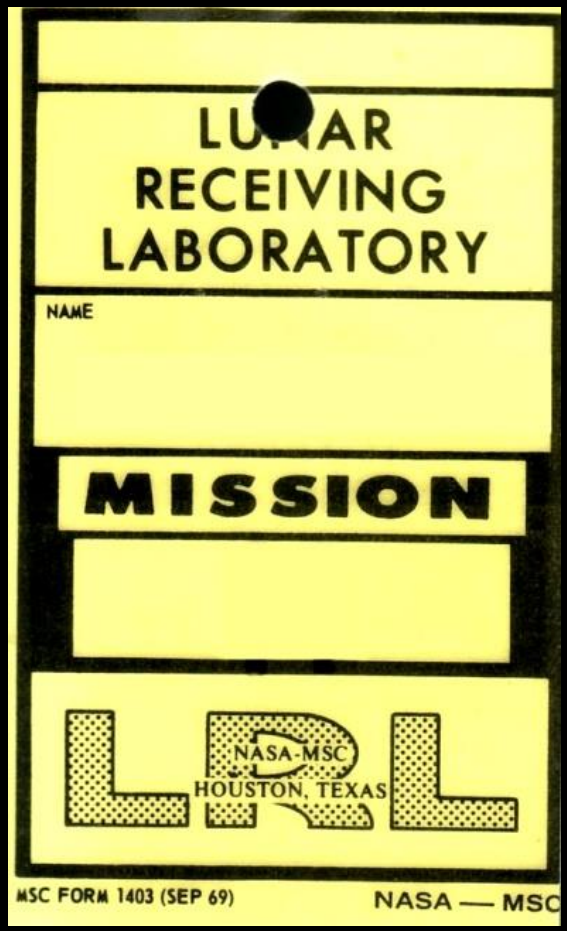
of both the animal and the peritoneal sample.

MATERIALS AND METHODS

A syringe is filled with sterile saline or an equivalent, and a needle is attached. A 6cc syringe with 19-ga needle is used for the mouse; 12cc syringe with 19-ga needle for the hamster; 35cc syringe with 19-ga needle for the rat; 60cc syringe with 16-ga needle for the guinea pig; and 2 60cc syringes with 13-ga needle for the rabbit.

The animal is anesthetized and the abdomen shaved and cleansed thoroughly with alcohol (Fig 1a). The skin is carefully lifted and held with sterile forceps, and the needle is inserted into the lower portion of the peritoneal cavity. The lavage medium is then introduced by forcefully pushing the syringe plunger while moving the syringe from side to side (Fig 1b). The syringe barrel is then removed from the hub with sterile forceps. It is important that the needle remain in the peritoneal cavity (Fig 1c). The animal is held by the nape of the neck (rabbits are placed in a rack), and the needle is manipulated with sterile forceps to initiate flow (Fig 1d). The lavage medium then flows through the needle into a sterile container (Fig 1e). Eighty to 90% of the initial lavage volume is retrieved.

http://tomrchambers.com/las2.pdf



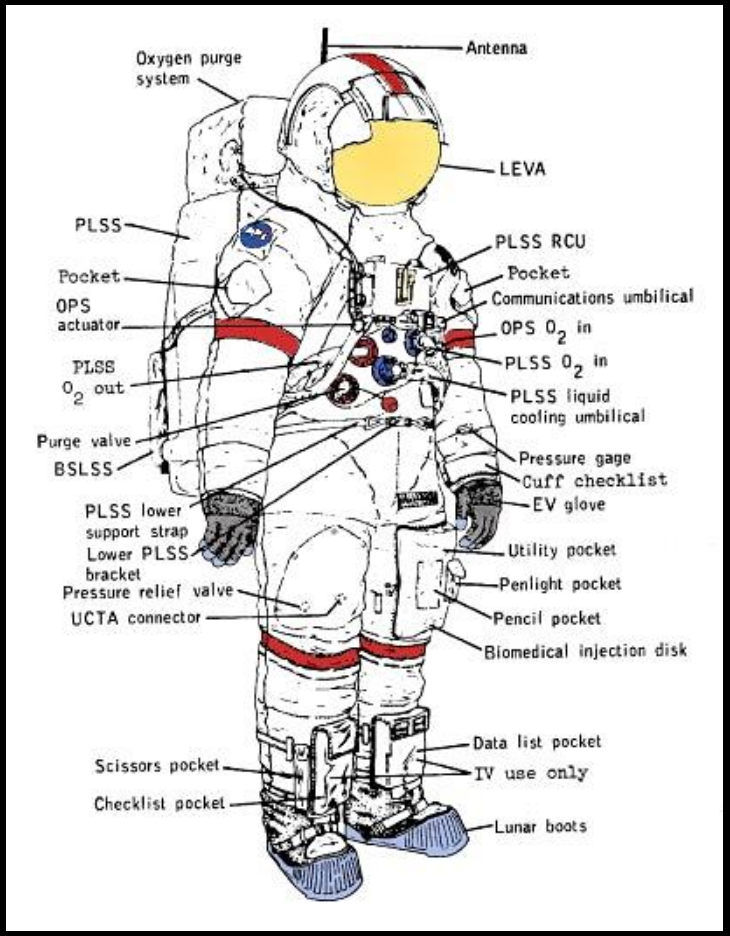
NASA

The Lunar Receiving Laboratory badge that was worn for all missions. Unfortunately, I have lost all of my memorabilia over the years.

NASA

This photograph shows Phil, research analyst in Botany working with plants in the containment cabinet . Our labs were in close proximity. You'll notice his "bunny suit" that we all wore.

NASA



NASA

Phil was small in stature, and he was frequently called over to the spacesuit training area to put on and test the suit for functionality and maneuverability. He asked me to go with him on a couple of occasions to take photographs of him and the process. I did this, and then handed him the camera. I wish I had those photographs today.

TRC, 2016

TRC, 2016

TRC, 2016

EC, 2016

On my return to the Lunar Receiving Laboratory (Building 37) in 2016, the interior configuration had changed so much that I couldn't find my way. I eventually figured out the location of my laboratories, crew reception area, etc. I also made it over to the Lunar Sample Laboratory Facility (Building 31) where Andrea Mosie, Lab Manager showed me one of the Lunar rocks.

Thank You.

Tom R. Chambers
tom@tomrchambers.com