

Transcript of the October 8th interview with Astronaut Harrison Schmitt. Interviewers are Susanne Caro, Mansfield Librarian and Rachael Dalton, student and staff member of the University of Montana.

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Official NASA Portrait of Harrison Schmitt.

Image Credit: NASA

SUSANNE

Ok, so, I guess one of my first questions for you is how did you end up working with NASA?

SCHMITT

I had become interested in space activities while I was a student, a Fulbright student in Norway and in 19, that was in 1957, 58 and in 1964 when I was looking for a job and after I completed my work on a PHD at Harvard I contacted Eugene Shoemaker? A famous planetologist who was in Flagstaff Arizona running a branch called the branch of Astrogeology of the United States Geological Survey and asked him if they had any positions that he was trying to fill and it turns out he was and so I went to work out there. And His activities were to help NASA on a variety of programs including the lunar surveyor landing program and the lunar orbiter program of that time but also had contracted to try to work out how astronauts would do field geology on the moon and that was the project that I was hired to help with and of course introduced me to NASA activities and when NASA asked for volunteers a couple months later I volunteered.

SUSANNE

Ok, and how did you prepare to go on your moon mission?

SCHMITT

Well there is there's the main thing... was to become very proficient in operating the spacecraft and that began with going to jet pilot training and then helicopter training. Jet pilot training with the Air force and helicopter training with the Navy and then I was assigned as a backup crewman to the Apollo 15 mission and learned most of what I needed to know in order to fly to the moon and get that assignment. And then was assigned as a flying crewman on the Apollo 17 mission and we went through another training cycle. Each of those training cycles was about fifteen months long so you can see we were spending an awful lot of time in training and learning procedures and particularly how to handle problems if they occurred. Fortunately our mission had no problems so it was good training but I did not use it.

SUSANNE

Well that's good. And just one more question sort of along the lines of when you first went to NASA you were also advising the astronauts on what to look for as far as collecting samples?

SCHMITT

Yes, but not so much advising as to putting together their [training program](#) that would make them at least observers of what they might see on the moon and then it was up to them to make the decision on what samples to collect. We actually put together a geo /geological training program that by the time the last three missions flew to the moon occupied about 25% of their training time. That was a program that I organized and at least got started but of course as soon as I entered the training cycle I was participating in the training and not managing it. That training worked very well, we had very intelligent observers and pilots and we just to put them out into the field so they got used to looking at rocks.



Image Credit: NASA

RACHEL (4:13)

I was wondering what was the most interesting geological discovery that was made about the moon during the Apollo program was?

SCHMITT

Well, the most interesting had to be the samples that were brought back by Neil Armstrong on the first mission, [Apollo 11](#). Because we had never collected any samples from the moon before and that was a real eye-opener to see not only what kinds of rocks we'd be dealing with on future missions but also to understand better the history, the age of those rocks, when were they formed. And that changed the thinking of almost everybody here on Earth ... in the geological field at least about what we would be dealing with and what some of the problems were, scientific problems were that we wanted to solve. That, that just because it was the first, gave us that first background information it had to be the most important sample that we would get. Later on though each mission added significantly to the understanding we were developing about the history of the moon and how it related to the early history of the Earth. The Moon is basically a place where the inner solar system has been recorded and is preserved- on earth that early history has been destroyed by geological activity and the moon represents an excisable place where we can further understand the time in our history when life was forming on this planet.

SUSANNE

So the mission for Apollo 17 you went to the Taurus-Littrow valley, correct?

SCHMITT (5.58)

That's correct, Taurus Littrow- the T is pronounced and it ah is a deep mountain valley about, actually deeper than the Grand Canyon, of the Colorado here in the United States, one which gave us a new perspective- dimensional perspective on the rocks of the moon.



Image Credit: NASA

SUSANNE

Did you get to choose that location or was it already chosen?

SCHMITT (6:22)

Well I participated in the selection of landing sites, it was a selection that resulted from the interaction of a large number of scientists who gradually whittled down the pros and cons of various landing sites where we might take Apollo 17 and it was a process that really took place in the selection of landing sites for all the later missions. The first two missions, Apollo 11 and Apollo 12 were mostly selected there because they were easy to get to- took less energy and also because we had developed a large amount of information slightly??? 7.12 and of course as you might imagine on those early missions we really did know everything that we would learn about how to land on the moon and we wanted as smooth a place as possible but later on then the sites were- from Apollo 13 on- the sites were selected with science in mind rather than the smoothness of the landing site- of course we didn't want to land someplace, try to land someplace where we couldn't but never the less science was the primary driver of that selection process.

Rachel

Kind of a random question but I was wondering what your favorite rock or mineral from Earth is?

SCHMITT (7:49)

Oh, from Earth? O, I have...I have a lot of favorites. The Earth has far more, far more varied mineral composition- rock composition than the moon is primarily because the action of water on Earth. Water, the Moon doesn't have much of it that is involved in the formation of minerals at least. Water really dictates a large number of the minerals we see on Earth that you would never see on the Moon but as far as a favorite rock or mineral is concerned I guess because of my work on my doctorate in the field of western Norway I would have to say I'm partial to very high pressure- high temperature rocks formed in that region along, long time ago. They're called eclogites that's the rock name and the minerals in them are highly unusual in terms of their chemical composition.

SUSANNE

Could you say the name again?

Schmitt

The name of that rock is eclogite [E-C-L-O-G-I-T-E](#)



SUSANNE

Ok, what was your favorite item that you actually picked up from the Moon.

SCHMITT (9:10)

Well I think the most important discovery I made on the moon and that we sampled was of a type of volcanic glass that we call pyroclastic glass. It formed in a fire mountain?(9:28), in this case about three and a half billion years ago and that material became known as the orange soil, it's actually orange volcanic glass and that material has .. is in the process of telling us a great deal about the formation and evolution of the moon because it has provided us with a sample from the deep interior of the moon- a rock sample that had started out life, rock life as volcanic magma that formed at least 500 kilometers deep in the moon and came to the surface and waited for us to arrive there in December of 1972 to sample it and it has become very, very important in the debate about the origin of the moon.



Image Credit: NASA

SUSANNE

And is that also the sample that I believe in 2008 they discovered actually had water in it? Encapsulated in the glass?

SCHMITT (10:30)

Just recently some investigators have used technology that wasn't available at the time that those samples were returned to Earth to determine that there is indeed [water inside](#) the individual glass beads. These are very, very small beads of glass and they have been able now to analyze the material inside those beads more precisely, much more accurately and it.. part.. some of that material is water. So the moon was putting water into its transient atmosphere billions of years ago – now some of that water may have ended up in the poles and may be the water that was recently discovered there as water ice.

SUSANNE

And how did you come up with that orange soil, did it really jump out to you on the surface or were you looking in the general area?

SCHMITT (11:26)

Well, I was, we were, the a crater rim where we found it was part, the objective of the mission, we were going to that crater for to investigate it because it looked very, very dark compared to other craters in the vicinity and when I walked up to the rim of the crater this orange cast ... tint to the debris that covers the moon was quite apparent and t I began immediately to dig a trench across it and it got below the amount, the soil, the debris that had been disturbed, disturbed by millions of years of meteor impact and got to this [pure orange volcanic glass](#). So yes, it was pretty obvious to someone at least had some experience in looking at the diversity of rock types here on Earth which is what a field geologist does.

RACHEL

How do you feel about privet space companies like [SpaceX](#) kind 'a replacing government run space exploration in the United States?

SCHMITT (12.39)

Well they're not replacing government exploration their just they're being contracted to do it for the government and we're going to have to wait and see wither that experiment in contracting is successful or not. It is a great tribute to the young men and women who are working for SpaceX and Orbital Sciences and a number of other companies that are trying to develop privately, privet rockets, but so far one could hardly call it commercial because it is really as I said another form of contracting and we'll see wither or not there really is a business case for these rockets outside that required by the government, I hope there is but I don't think we know that just yet. In general terms though I think the privet sector ought to take a very active role in space activities and indeed I've written a book on that subject called [Return to the Moon](#) which lays out the way in which the privet investors could develop the energy resources of the moon and bring that energy back to Earth in the form of a light isotope of helium called [helium 3](#). Helium three is a nearly ideal fuel for fusion systems and I see no reason why in the long term the privet sector shouldn't lead in the development of those resources.



Image Credit: NASA

Rachel

Do you think that we have the technology right now available to do this or is there more development to be done?

SCHMITT (14:14)

Well conceptually we know how to do that and I lay that case out in my book, that doesn't mean that there's not a lot of engineering that has to be done in order to put a whole launch landing, habitat, lighting, processing system together but it, individual technologies are pretty well understood. I don't think that it's hard to imagine at all how that would be done. Just has to be done and the biggest challenge is developing the investor community would be willing to risk what we call investment capital to see that it happens. And in order to make profits at the other end. That's what this business of capitalism is all about.

SUSANNE

So I believe you are the only astronaut to ever make any comments about the smell of the moon- could you talk about that?

SCHMITT (15:14)

Well I, everybody made comments about it in their debriefings I don't know if I'm the only one who said anything publicly but never the less the dust that we brought back into the cabin before it was filtered out of the cabin atmosphere to me and I think to everyone else smelt like gun powder. All of us had been around guns, were hunters at various times in our lives and it's a very distinctive smell as you probably know coming from Montana and that is what everyone agreed lunar dust smelled like.

SUSANNE

Do you have any idea or theories as to why it had that particular scent?

SCHMITT (16:07)

Well I think yes, I think – my hypothesis is... and nobody refuted it, is that the lunar dust having been formed in a vacuum – a very hard vacuum- has no gasses adhering to the individual, very small particles and it's what we call highly activated so it stimulates the response in your nostrils that is just like the highly activated carbon that comes out of spent gunpowder. So these two processes are very, very different in producing gunpowder- in producing lunar dust but the net result is that you have highly activated particles that stimulate the nose, the nostrils in the same way.

SUSANNE

There must have been other then you had to do a great deal of training before you went to the surface, were there things that you had to do while you were on the moon – and you were there for three days- where there certain things that you had to do make sure that you stayed safe, you know what kind of things that you had to do, that were part of your routine when you were on the surface?

SCHMITT (17:14)

The main thing was the development of procedures, [check lists](#) of procedures that you follow very, very closely to make sure you got everything right, in the right order, particularly for example in preparation for going out on the lunar surface, making sure that your suit was properly configured, there were no leaks, that your cooling water was functional and things like that. So all of those issues that involved risk were worked very, very hard before you ever go to the moon or go into space any time. And then you follow the procedures you worked out and tested through a [check list](#) and that's really the main thing we did to make sure we were safe.



NASA AS16-116-18649. USGS Open-File Report 2005-1190, Figure 095i.

SUSANNE

And I know the surface of the moon is very dry and there was a lot of powder and moon dust- how did you keep that from getting into your equipment and everywhere else in your module?

SCHMITT (18:25)

Well the critical equipment was protected, it was sealed or in various ways so the dust couldn't penetrate even though it's highly penetrating dust it could not penetrate the seals that we had so the critical material was never affected. Those tools that had open joints or open movement they were affected and some of them ceased to work after a while just because of the grinding and clogging of the lunar dust but the critical equipment was not affected because we anticipated that dust would be a problem and made sure they were sealed.

SUSANNE

And there were a number of experiments that you conducted while on the surface- were you able for most of those to look at the data while you were there and make adjustments or did you have to wait until you returned to Earth?

SCHMITT

We could not monitor that equipment but as soon as the transmitters were activated the mission control in Huston would monitor that equipment and they could see wither it was functioning or not. And if a piece of equipment looked like it needed to be adjusted in terms of the leveling or something else then they would tell us and we would go back by the experiment and spend a few minute to adjust it if that seemed to be necessary but that used up some time but not a great deal of time.



Image credit: NASA

SUSANNE

You also got to take a large number of pictures while you were on there and you got the Big Blue Marble photo. What was that view like?

SCHMITT (20:10)

Oh, that was a magnificent view. Actually it's a view we had just as we were leaving the Earth, it's not a view from the moon-at least while we were there. You can see a full Earth or a nearly full Earth from the Moon if you are there while the Moon is new, that is dark. But for us that full Earth Picture that I took was not a view that we had as we left the Earth soon after our launch from the Kennedy Space Center.



Credit: NASA

SUSANNE

And what did you have to do when you came back, physically, had being in that very low gravity environment affected you much?

SCHMITT (20:51)

It had affected us, it affects about everybody that I'm aware of but you start to recover fairly quickly once you back in gravity- Earth's gravity field. It took me about three days to feel comfortable with walking again, maybe like having been at sea for two weeks. It takes a while to get your land legs back. I think that is about the same for us.

SUSANNE

So did you expect to be one of the last people to walk on the moon?

SCHMITT

That Apollo 17 was going to be the last mission to the moon became fairly clear, oh, two or three years before it launched. Unfortunately the Nixon administration and the Congress had begun a process of canceling missions to the Moon long before Apollo 17 launched so we knew that was the last mission.

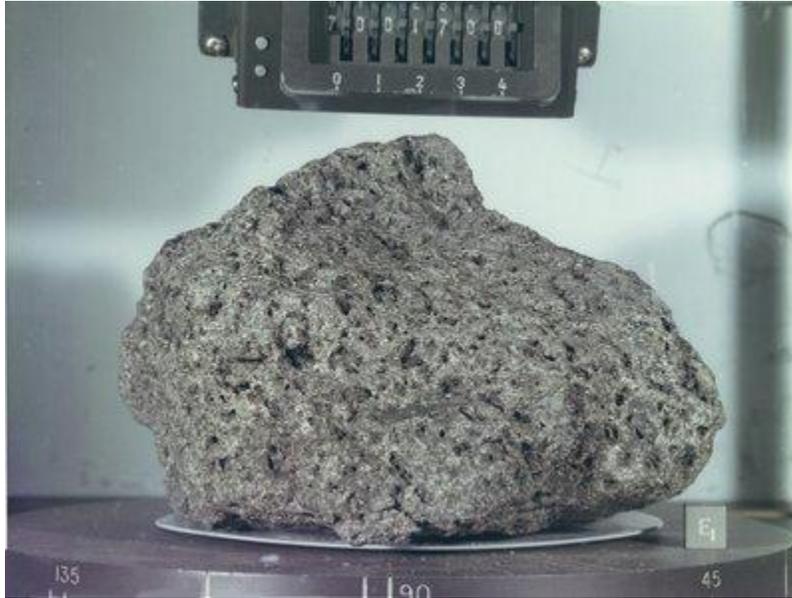
SUSANNE

Well one of the items that we are getting for our moon event here is we are getting to borrow one of the [Goodwill Moon Rocks](#) from the Apollo 17 mission that came from one of the rocks that you found. That rock- was it a particularly noticeable piece or was that decided much after the return.

SCHMITT

Well I'm not sure what specific rock it would be... if you had the number, the sample number I could maybe be a little more explicit, but the ah, NASA has had several programs by which rocks, moon rocks have been both given to museums around the world and also put together for at least temporary display at museums and at other locations. So it depends on what rocks are thought to be important for

scientific investigation and rocks that we have a lot of... to my knowledge except for the program that distributed Apollo 11, Apollo 17 samples to museums around the world those rocks are really thought of as being given temporarily just in case some time in the future better equipment or something like that makes it possible to do... learn new things from those rocks.



[Lunar Sample 70017](#)

SUSANNE

Ok, I do know that the number for that one was [70017](#).

SCHMITT

Well the seven of course applies to Apollo 17, the 00 means that it was a sample taken near the lunar module, and it's a soil sample so I don't know how big the rock is but it was probably a piece of rock that was part of a larger sample of the soil. I would have to look it up specially in the soil catalog to tell you more than that.

SUSANNE

I know it was a large conglomerate that little pieces were chipped off of it.

SCHMITT (24:13)

That's what sometimes called a regolith breccia probably and conglomerate is a type of breccia but it's not, it's a term used on Earth usually whereas breccia is a more general term with an indication the case of the moon the "Global wheat production rose 6 percent in 2011. Wheat production increased in Canada, the United Kingdom, Spain, Romania, Turkey, Morocco, Russia, Ukraine, Kazakhstan, China, India, and Australia. Production declined in the United States, France, Germany, Iran, and Argentina."

breccia are rocks that had formed in the compaction of the debris layer that covers the moon, most of it, bonding and compaction that occurs because of a meteor impact.

SUSANNE

And this is sort of an odd question- did you see the movie [Apollo 18](#)?

SCHMITT (24:53)

I have not seen that movie, I just haven't had that opportunity. I have not heard very many reports about it, as I understand it, it gets a little crazy at the end.

SUSANNE

It does get a bit silly, some of the rock samples spiders that eat people.

SCHMITT
(Laughter)

SUSANNE

I don't suppose you saw anything like that.

SCHMITT

[No we didn't](#). The only alien I saw was the... my partner, commander Cernan.

SUSANNE

Ok, well that's all the questions that we have. Thank you so much for talking with us. This has been very, very interesting.

SCHMITT

Well it's been delightful for me and I wish you well.



In this image, Schmitt, Evans and Cernan, pose in the moon rover during the rollout of the Apollo 17 rocket. This, the last of the Apollo/Saturn missions launched Dec. 7, 1972. *Image Credit: NASA*