
NASA EXPLORERS
MOON ROCKS

1
00:00:00,600 --> 00:00:03,770
(music throughout) So I do remember
the first time I held a Moon sample.

2
00:00:04,637 --> 00:00:08,408
It was in a course at undergraduate level.

3
00:00:08,408 --> 00:00:12,112
I remember being in school
and a scientist came

4
00:00:12,145 --> 00:00:15,849
and gave a talk
and he actually brought a lunar meteorite.

5
00:00:16,049 --> 00:00:19,986
And at this point
he put a what we call a thin section

6
00:00:19,986 --> 00:00:23,823
so we could look down
the microscope at them.

7
00:00:24,224 --> 00:00:28,028
A thin section is actually a piece of rock
that's been sliced about

8
00:00:28,028 --> 00:00:31,264
the same thickness as a piece of hair
and shine light through it.

9
00:00:31,264 --> 00:00:33,900
And you can look at all the different
minerals that are in the rock.

10
00:00:33,900 --> 00:00:35,568
So there are actual meteorites

11
00:00:35,568 --> 00:00:39,572

that fall on earth
that are made of pieces of the moon.

12
00:00:39,606 --> 00:00:43,376
I remember
holding this piece of a lunar meteorite.

13
00:00:43,610 --> 00:00:44,978
It was it was pretty small.

14
00:00:44,978 --> 00:00:47,147
And I remember thinking, wow,
this is so small.

15
00:00:47,180 --> 00:00:49,582
We really need more of this.

16
00:00:49,582 --> 00:00:53,653
I remember that was my number one
thought was we need more of this.

17
00:00:53,653 --> 00:00:55,922
We need a lot more.

18
00:00:55,922 --> 00:00:59,959
I went home and I think I rang
every single person I knew.

19
00:01:00,760 --> 00:01:04,597
I definitely told my family a million
times, I don't think they were sick of me,

20
00:01:04,597 --> 00:01:08,268
but like they would definitely go away
and tell us something different now.

21
00:01:08,301 --> 00:01:10,670
But no, they weren't. They were they were

22

00:01:11,971 --> 00:01:13,506
over the moon as me.

23
00:01:13,506 --> 00:01:14,340
Pun intended.

24
00:01:14,340 --> 00:01:30,690
For the past

25
00:01:30,690 --> 00:01:34,260
50 years and counting,
generations of scientists like Dr.

26
00:01:34,260 --> 00:01:38,398
Natalie Curran have been probing rocks
brought back by Apollo astronauts,

27
00:01:38,398 --> 00:01:41,167
using increasingly sophisticated
technologies.

28
00:01:42,268 --> 00:01:45,071
We've learned that our moon is so closely
related to Earth

29
00:01:45,538 --> 00:01:49,943
that the two must have formed
from some of the same material.

30
00:01:50,343 --> 00:01:53,613
Moon Rocks showed the first evidence
that the moon has water,

31
00:01:54,114 --> 00:01:56,883
and they've even helped
in studying the history of the sun,

32
00:01:57,283 --> 00:01:59,919
which influenced the evolution of life.

33
00:02:01,087 --> 00:02:03,223
I work in the Mid-Atlantic

34
00:02:03,223 --> 00:02:06,092
Noble Gas Research Lab or MNGRL.

35
00:02:06,392 --> 00:02:09,662
You know, we're called Moon Girl Lab
because we work with lunar samples.

36
00:02:09,662 --> 00:02:13,466
But it's actually a fun name
because we're actually

37
00:02:13,466 --> 00:02:15,902
predominantly female scientists
that work in that.

38
00:02:16,703 --> 00:02:21,541
We are looking at
basically the history of lunar samples

39
00:02:22,008 --> 00:02:26,179
and being in this lab
we're basically rock detectives.

40
00:02:26,513 --> 00:02:30,550
So we're looking at how old the sample is
and what the samples made of.

41
00:02:30,750 --> 00:02:33,553
The reason why we want to answer
these questions

42
00:02:33,920 --> 00:02:36,789
is because they can tell us a lot
about how the this

43
00:02:36,890 --> 00:02:39,993

not only this sample formed,
but also how the moon formed

44
00:02:40,360 --> 00:02:45,031
or what the geological processes are that
are occurring on the surface of the moon.

45
00:02:46,766 --> 00:02:48,468
So working with the Apollo samples,

46
00:02:48,468 --> 00:02:52,071
I honestly I try to take the emotion
out of my lab work.

47
00:02:52,105 --> 00:02:53,139
It's very humbling.

48
00:02:53,139 --> 00:02:57,810
It goes over my head, you know,
to have a piece of the moon in my hands.

49
00:02:58,244 --> 00:03:01,381
I study the origins

50
00:03:01,848 --> 00:03:04,651
of organic matter in space.

51
00:03:05,752 --> 00:03:08,454
Organic matter is
what makes up all life on earth.

52
00:03:09,122 --> 00:03:12,192
Dr. Jose Aponte and his colleagues
are trying to figure out

53
00:03:12,192 --> 00:03:15,061
how the chemical ingredients for life
got to earth

54

00:03:15,461 --> 00:03:18,565
and whether they ended up
on any other planets or moons.

55
00:03:19,365 --> 00:03:22,802
Although there was never life on the moon,
it's an important place to study

56
00:03:22,802 --> 00:03:26,072
as a record of the events
such as asteroid collisions

57
00:03:26,439 --> 00:03:30,043
that shaped the solar system.

58
00:03:31,277 --> 00:03:33,079
Rocks on the moon are better preserved

59
00:03:33,079 --> 00:03:37,951
and far older than any rocks
we've found on earth.

60
00:03:38,418 --> 00:03:41,521
My job is integrating science
into human spaceflight.

61
00:03:41,521 --> 00:03:45,959
So how will we do science on the surface
of other planets with astronauts?

62
00:03:46,659 --> 00:03:50,897
We like to say that the moon is a witness
plate for the solar system.

63
00:03:50,897 --> 00:03:52,131
And it's it's really true.

64
00:03:52,131 --> 00:03:56,236
When you look at our planet here on Earth,
you see things that we all really like,

65
00:03:56,236 --> 00:04:00,673
a lot like vegetation and the oceans and,
you know, cities where people live.

66
00:04:00,840 --> 00:04:05,912
All of these things combined with the fact
that our planet is actually very active.

67
00:04:05,912 --> 00:04:09,349
Just look at plate tectonics,
which creates new crust,

68
00:04:09,349 --> 00:04:10,883
which destroys old crust.

69
00:04:10,883 --> 00:04:14,320
It's again what drives our planet
and the evolution of our planet.

70
00:04:14,354 --> 00:04:17,924
These are all things that we're
very appreciative of and see every day,

71
00:04:18,124 --> 00:04:21,060
but they're things that actually obscure
the geologic record.

72
00:04:21,361 --> 00:04:24,631
When you go to the surface of the moon,
however, you have four

73
00:04:24,631 --> 00:04:28,801
plus billion years of history
preserved on the surface of the moon

74
00:04:31,137 --> 00:04:32,372
by looking at one rock.

75

00:04:32,372 --> 00:04:35,475
You can learn a lot,
you know, just by using your own two eyes

76
00:04:35,475 --> 00:04:38,044
to interrogate
a rock and make descriptions about it.

77
00:04:38,044 --> 00:04:40,647
You can learn something
about how that rock got there,

78
00:04:40,813 --> 00:04:44,817
how the landscape around you got there,
and you can start to really make broad

79
00:04:44,817 --> 00:04:49,055
interpretations about the area around
you just by looking at literally one rock.

80
00:04:49,489 --> 00:04:52,592
Then imagine
taking that rock back to a lab,

81
00:04:52,592 --> 00:04:54,227
which you can use these really high

82
00:04:54,227 --> 00:04:58,031
resolution lab techniques
that we have to peer inside the rock

83
00:04:58,064 --> 00:05:01,301
to get a look at what you can't see
with the naked eye to start to understand

84
00:05:01,301 --> 00:05:05,138
how just how old that rock is, how long
it's been sitting there on the surface.

85
00:05:05,171 --> 00:05:09,175

So it's really exciting to think that this
some small little sample can tell us

86
00:05:09,175 --> 00:05:12,679
a lot about different processes
that are not just going on

87
00:05:13,112 --> 00:05:16,082
from the local region
where the sample was picked up

88
00:05:16,082 --> 00:05:19,886
but actually from the whole of the moon
as well by studying just one rock,

89
00:05:19,919 --> 00:05:24,090
you can learn about potentially billions
of years of solar system history.

90
00:05:25,558 --> 00:05:28,461
And so imagine the scientific discoveries
that we made with

91
00:05:28,494 --> 00:05:31,931
the couple hundred pounds of rocks
we brought back from the Apollo missions

92
00:05:33,933 --> 00:05:37,103
during six missions from 1969 to 1972.

93
00:05:37,637 --> 00:05:41,874
Apollo astronauts have brought back
842 pounds of rocks,

94
00:05:42,108 --> 00:05:44,610
pebbles, sand and dust from the moon.

95
00:05:45,611 --> 00:05:48,481
Today, those samples are carefully stored

96
00:05:48,481 --> 00:05:51,451
in a special facility
at the Johnson Space Center in Houston.

97
00:05:51,617 --> 00:05:56,055
The same facility will store the rocks
to be collected by Artemis astronauts.

98
00:05:56,923 --> 00:06:00,993
So I work in what's called the Astro
Materials Acquisition and Curation Office.

99
00:06:01,060 --> 00:06:03,029
We just call it
the curation office for short.

100
00:06:03,029 --> 00:06:07,300
So all of the Apollo moon, rocks,
meteorites, all of our sample return

101
00:06:07,300 --> 00:06:11,404
missions from asteroids, from comets,
all of those samples come here to Houston

102
00:06:11,404 --> 00:06:15,208
and it's our office job
to take care of those samples

103
00:06:15,208 --> 00:06:19,212
and make sure that they're available
to the scientific community to study.

104
00:06:19,412 --> 00:06:22,181
The Apollo astronauts
all landed near the moon's equator.

105
00:06:22,548 --> 00:06:24,984
Samples from
there have been instrumental to science.

106
00:06:25,284 --> 00:06:28,187
But scientists want to explore
other locations on the moon.

107
00:06:28,388 --> 00:06:31,824
Otherwise, it would be like landing
in the Arizona desert on Earth

108
00:06:32,225 --> 00:06:32,792
and assuming

109
00:06:32,792 --> 00:06:36,662
that the conditions discovered there
reflect those found on the entire planet.

110
00:06:37,830 --> 00:06:40,500
Compared with Apollo, Artemis astronauts
will carry out

111
00:06:40,500 --> 00:06:43,603
a very different mission
in a drastically different environment.

112
00:06:44,370 --> 00:06:47,006
They will venture to the South Pole,
a region

113
00:06:47,006 --> 00:06:49,909
that has water, ice,
and could be rich in other resources.

114
00:06:50,710 --> 00:06:52,912
The South Pole is a land of extremes.

115
00:06:53,379 --> 00:06:57,216
Temperatures
there can reach -400 degrees Fahrenheit.

116
00:06:58,518 --> 00:07:03,556

I would actually even say curation starts
as soon as the mission starts.

117
00:07:03,589 --> 00:07:07,927
So one of the things that I'm talking to,
the EVA engineers about a lot

118
00:07:07,927 --> 00:07:13,166
and the astronauts is how to prepare for
when they're going to go to the moon.

119
00:07:13,232 --> 00:07:15,968
For example, we know that we're going to
collect some rocks.

120
00:07:16,335 --> 00:07:17,837
What are we going to put?

121
00:07:17,837 --> 00:07:20,072
What container
are we going to put those rocks in?

122
00:07:20,072 --> 00:07:21,941
Are we going to put them in a can?

123
00:07:21,941 --> 00:07:23,943
Are we going to put them in a bag?

124
00:07:23,943 --> 00:07:27,847
And we need to understand that,
because for some of these samples,

125
00:07:28,281 --> 00:07:32,852
they are very sensitive to whether
they're exposed to metal or plastic.

126
00:07:33,019 --> 00:07:36,823
And those are designed decisions
that have to be made years

127
00:07:36,823 --> 00:07:38,558
before the mission even flies.

128
00:07:38,558 --> 00:07:40,259
They've got to be super strict.

129
00:07:40,259 --> 00:07:44,697
The astronauts on the surface, for me,
I'd be like, you know, I'd be like a kid

130
00:07:44,697 --> 00:07:49,735
in a candy store and just want to like
I want to take everything.

131
00:07:50,303 --> 00:07:53,039
And, you know,
you can only go a certain amount of time.

132
00:07:53,072 --> 00:07:57,410
I'd probably run out of oxygen me
when I'd be walking and forget.

133
00:07:57,410 --> 00:07:58,911
It's often said that, you know,

134
00:07:58,911 --> 00:08:02,381
exploration is part of human nature
and I definitely agree with that.

135
00:08:02,415 --> 00:08:06,152
I mean, even as a small kid,
you know, going out in my backyard and,

136
00:08:06,319 --> 00:08:08,921
you know, picking up dirt
and sticking my hands in the creek

137
00:08:08,921 --> 00:08:12,458
and understanding what the little animals

and plants were all around me

138
00:08:12,458 --> 00:08:15,495
was something that, you know,
I didn't have taught to me by that age.

139
00:08:15,495 --> 00:08:18,498
It's just something that really comes
naturally to, I think, most people.

140
00:08:18,498 --> 00:08:21,434
And the same is is true
on a much bigger scale.

141
00:08:21,434 --> 00:08:24,804
The desire to explore the solar system
and learn more about,

142
00:08:24,804 --> 00:08:27,940
you know, what we can look up at
in the night sky and see is really

143
00:08:27,940 --> 00:08:30,943
a fundamental part of human nature.

144
00:08:31,377 --> 00:08:35,081
If we want to visit Mars,
if we want to explore the solar system,

145
00:08:36,182 --> 00:08:39,051
or if
we think about going to other planets,

146
00:08:39,051 --> 00:08:42,121
we first must learn how to operate

147
00:08:42,355 --> 00:08:44,824
on the moon.

148

00:08:45,725 --> 00:08:49,195
Getting ready to conduct science
on the moon and to identify scientifically

149
00:08:49,195 --> 00:08:52,064
interesting surface
features takes a lot of practice.

150
00:08:52,565 --> 00:08:56,402
On the next NASA Explorers - Space School,
how is NASA