
EPISODE ONE
GIANT LEAPS

1
00:00:04,700 --> 00:00:02,929
the moon is still got a lot of Secrets

2
00:00:06,470 --> 00:00:04,710
it's keeping there's still so many

3
00:00:08,900 --> 00:00:06,480
questions locked up in these rocks

4
00:00:10,600 --> 00:00:08,910
SEC sign-in times just to be studying

5
00:00:12,470 --> 00:00:10,610
them this is the only long-term

6
00:00:14,390 --> 00:00:12,480
information that we have from the

7
00:00:16,070 --> 00:00:14,400
surface of the Moon are these data

8
00:00:18,349 --> 00:00:16,080
there's there's just nothing else where

9
00:00:20,570 --> 00:00:18,359
did all of this stuff come from how did

10
00:00:22,099 --> 00:00:20,580
it form what was the process does it

11
00:00:24,859 --> 00:00:22,109
happen all the time

12
00:00:27,529 --> 00:00:24,869
across the universe or are we somehow

13
00:00:28,009 --> 00:00:27,539

unique or at least unusual what does it

14
00:00:30,560 --> 00:00:28,019
all mean

15
00:00:33,110 --> 00:00:30,570
I'm Katie Atkinson and this is NASA

16
00:00:34,850 --> 00:00:33,120
explorers Apollo where we tell stories

17
00:00:46,040 --> 00:00:34,860
about our Moon and the people who

18
00:00:47,510 --> 00:00:46,050
explore it in the 1960s and 70s twelve

19
00:00:51,100 --> 00:00:47,520
humans walked on the moon over the

20
00:00:53,420 --> 00:00:51,110
course of six Apollo missions about

21
00:00:56,270 --> 00:00:53,430
400,000 Americans worked behind the

22
00:00:58,279 --> 00:00:56,280
scenes to get them there there were also

23
00:01:00,380 --> 00:00:58,289
millions of people around the world who

24
00:01:04,119 --> 00:01:00,390
listened watched and celebrated

25
00:01:06,440 --> 00:01:04,129
alongside them they were all explorers a

26
00:01:09,320 --> 00:01:06,450
quick note on why we're telling these

27
00:01:12,080 --> 00:01:09,330
stories right now over 60 percent of

28
00:01:14,719 --> 00:01:12,090
Americans living today myself included

29
00:01:17,810 --> 00:01:14,729
weren't born yet or were too young to

30
00:01:18,980 --> 00:01:17,820
remember the first moon landings they've

31
00:01:28,490 --> 00:01:18,990
never known a world where people

32
00:01:32,030 --> 00:01:28,500
couldn't walk on the moon now there's a

33
00:01:34,100 --> 00:01:32,040
new generation of explorers explorers

34
00:01:35,690 --> 00:01:34,110
who will witness the first woman walk on

35
00:01:38,749 --> 00:01:35,700
the moon and see the first human mission

36
00:01:39,380 --> 00:01:38,759
to Mars some of us might even help get

37
00:01:42,440 --> 00:01:39,390
them there

38
00:01:43,999 --> 00:01:42,450

in the meantime stories about where

39
00:01:46,969 --> 00:01:44,009
we've been connect us to where we're

40
00:01:48,800 --> 00:01:46,979
going what we learn now and in the

41
00:01:50,929 --> 00:01:48,810
future builds on what we learned in the

42
00:01:52,070 --> 00:01:50,939
past especially when it comes to

43
00:01:55,100 --> 00:01:52,080
understanding our Moon

44
00:01:57,140 --> 00:01:55,110
[Music]

45
00:01:58,190 --> 00:01:57,150
if you want to know what the moon looks

46
00:02:00,200 --> 00:01:58,200
like up close

47
00:02:03,770 --> 00:02:00,210
Ernie Wright is the person to talk to

48
00:02:06,410 --> 00:02:03,780
you even though he's never been there

49
00:02:08,139 --> 00:02:06,420
he's visualized just about every nook

50
00:02:11,140 --> 00:02:08,149
and cranny on the lunar surface

51
00:02:14,060 --> 00:02:11,150
sometimes down to a few feet

52
00:02:16,760 --> 00:02:14,070
he's one of NASA's resident experts on

53
00:02:18,980 --> 00:02:16,770
moon data I work at the scientific

54
00:02:22,910 --> 00:02:18,990
visualization studio at Goddard Space

55
00:02:25,760 --> 00:02:22,920
Flight Center the studio uses data from

56
00:02:28,640 --> 00:02:25,770
NASA missions to create animations and

57
00:02:31,070 --> 00:02:28,650
illustrations that explain that data

58
00:02:33,460 --> 00:02:31,080
data sonification is the sound

59
00:02:36,890 --> 00:02:33,470
equivalent of what Ernie does visually a

60
00:02:40,160 --> 00:02:36,900
chart lets you see data a sonification

61
00:02:42,170 --> 00:02:40,170
lets you hear it you can listen to a

62
00:02:45,080 --> 00:02:42,180
data sonification over and over again

63
00:02:47,750 --> 00:02:45,090

and hear something new each time every

64
00:02:50,680 --> 00:02:47,760
instrument every sound means something

65
00:02:53,360 --> 00:02:50,690
it's music and it's all based on data

66
00:02:55,610 --> 00:02:53,370
what you're about to hear is a musical

67
00:02:57,410 --> 00:02:55,620
representation of lunar science past to

68
00:02:59,570 --> 00:02:57,420
present what you'll hear in the

69
00:03:01,670 --> 00:02:59,580
sonification is the amount of scientific

70
00:03:04,759 --> 00:03:01,680
activity associated with the moon over

71
00:03:09,110 --> 00:03:04,769
time Ernie will walk you through it the

72
00:03:11,660 --> 00:03:09,120
pitch of the melody is telling you sort

73
00:03:13,040 --> 00:03:11,670
of the amount of data that was returned

74
00:03:14,630 --> 00:03:13,050
about the moon over time

75
00:03:17,210 --> 00:03:14,640
there are several instruments that are

76
00:03:19,250 --> 00:03:17,220
establishing tempo there's a clocks out

77
00:03:21,770 --> 00:03:19,260
that that tells you about the progress

78
00:03:28,220 --> 00:03:21,780
of the months and there are symbols that

79
00:03:33,089 --> 00:03:31,229
during the Apollo era the pitch rises as

80
00:03:38,070 --> 00:03:33,099
we learn more and more about the moon

81
00:03:38,080 --> 00:04:02,640
[Music]

82
00:04:07,960 --> 00:04:05,319
and then there's this period in the

83
00:04:10,509 --> 00:04:07,970
middle where it kind of falls when we

84
00:04:13,089 --> 00:04:10,519
weren't sending people and we weren't

85
00:04:23,470 --> 00:04:13,099
sending robotic missions it falls off a

86
00:04:32,100 --> 00:04:27,170
and then it starts to rise again to a

87
00:04:47,839 --> 00:04:44,889
[Music]

88
00:04:49,819 --> 00:04:47,849

in the sonification there are these two

89
00:04:52,719 --> 00:04:49,829
peaks in the valley but wait the other

90
00:04:57,499 --> 00:04:52,729
thing to take from it is that there is a

91
00:05:00,440 --> 00:04:57,509
continuous note of exploration but the

92
00:05:28,170 --> 00:05:00,450
sound doesn't really go away

93
00:05:31,090 --> 00:05:28,180
[Music]

94
00:05:33,280 --> 00:05:31,100
the past and the present and the future

95
00:05:35,380 --> 00:05:33,290
are all connected and get that sense

96
00:05:37,720 --> 00:05:35,390
when you're listening to it that why old

97
00:05:39,970 --> 00:05:37,730
there are variations in our level of

98
00:05:41,830 --> 00:05:39,980
interest and in the amount of data that

99
00:05:45,160 --> 00:05:41,840
were gathering at any particular time

100
00:05:51,270 --> 00:05:45,170
there's also a continuity that once we

101
00:05:55,540 --> 00:05:54,070
think what motivates us to answer you

102
00:05:58,450 --> 00:05:55,550
know the question of the moon's origin

103
00:06:00,430 --> 00:05:58,460
or how it formed is very basic because

104
00:06:02,260 --> 00:06:00,440
once we understand how the moon was

105
00:06:03,880 --> 00:06:02,270
formed we know a lot more about how the

106
00:06:06,160 --> 00:06:03,890
earth was formed we know about how the

107
00:06:07,390 --> 00:06:06,170
solar system was formed it's all to do

108
00:06:09,550 --> 00:06:07,400
with this question of where did we come

109
00:06:11,620 --> 00:06:09,560
from how did this happen

110
00:06:13,420 --> 00:06:11,630
where did all of this stuff come from

111
00:06:16,600 --> 00:06:13,430
how did it form what was the process

112
00:06:19,930 --> 00:06:16,610
does it happen all the time across the

113
00:06:21,900 --> 00:06:19,940

universe or are we somehow unique or at

114
00:06:24,220 --> 00:06:21,910
least unusual what does it all mean

115
00:06:25,840 --> 00:06:24,230
answers to those big questions are

116
00:06:28,660 --> 00:06:25,850
within reach thanks in part to

117
00:06:29,920 --> 00:06:28,670
modern-day exploration of our Moon the

118
00:06:32,950 --> 00:06:29,930
rising pitch at the end of that

119
00:06:36,750 --> 00:06:32,960
sonification the crescendo is a sign

120
00:06:39,400 --> 00:06:36,760
that we're learning we're exploring more

121
00:06:43,420 --> 00:06:39,410
we're driving the pitch up into the

122
00:06:45,700 --> 00:06:43,430
future before the Apollo missions we

123
00:06:47,530 --> 00:06:45,710
knew almost nothing about the moon the

124
00:06:52,030 --> 00:06:47,540
state of our knowledge before Apollo was

125
00:06:53,500 --> 00:06:52,040
almost utter ignorance we knew where it

126
00:06:57,700 --> 00:06:53,510
would be in the sky but only

127
00:07:00,460 --> 00:06:57,710
approximately we didn't even know if it

128
00:07:03,250 --> 00:07:00,470
was wet or dry we didn't know what it

129
00:07:06,670 --> 00:07:03,260
was made of or how it related to the

130
00:07:08,230 --> 00:07:06,680
earth how it formed we had no idea we

131
00:07:10,990 --> 00:07:08,240
didn't know what the craters were and

132
00:07:13,180 --> 00:07:11,000
there was really no way to know until we

133
00:07:15,090 --> 00:07:13,190
went there and sampled the surface and

134
00:07:16,670 --> 00:07:15,100
saw it up close

135
00:07:18,620 --> 00:07:16,680
during the Apollo

136
00:07:21,680 --> 00:07:18,630
era we learned so much about the moon

137
00:07:24,290 --> 00:07:21,690
but astronauts only visited a few spots

138
00:07:26,450 --> 00:07:24,300

if you were exploring the earth and you

139
00:07:28,820 --> 00:07:26,460
landed in six places near the equator

140
00:07:33,080 --> 00:07:28,830
you would know not a whole lot about the

141
00:07:35,600 --> 00:07:33,090
earth so even after Apollo there was a

142
00:07:37,490 --> 00:07:35,610
great deal to learn but we knew so much

143
00:07:40,730 --> 00:07:37,500
more we knew the right questions to ask

144
00:07:42,260 --> 00:07:40,740
and so one of the motivations for Lunar

145
00:07:44,060 --> 00:07:42,270
Reconnaissance Orbiter I think was to

146
00:07:46,909 --> 00:07:44,070
answer some of those questions which had

147
00:07:49,939 --> 00:07:46,919
been lingering since the Apollo era the

148
00:07:51,980 --> 00:07:49,949
Lunar Reconnaissance Orbiter or LRO is a

149
00:07:55,370 --> 00:07:51,990
NASA spacecraft that's been orbiting our

150
00:07:56,629 --> 00:07:55,380
moon since 2009 LRO has mapped the moon

151
00:08:00,499 --> 00:07:56,639
like never before

152
00:08:02,900 --> 00:08:00,509
LRO is writing the lunar encyclopedia of

153
00:08:05,510 --> 00:08:02,910
the lunar atlas it's the it's the thing

154
00:08:07,760 --> 00:08:05,520
that you go to first to look up all

155
00:08:10,640 --> 00:08:07,770
kinds of information about the moon

156
00:08:13,760 --> 00:08:10,650
thanks to LRO we've learned so much more

157
00:08:15,890 --> 00:08:13,770
about our moon in 2017 scientists

158
00:08:17,930 --> 00:08:15,900
discovered that there's frost frozen

159
00:08:19,909 --> 00:08:17,940
water at the moon's poles

160
00:08:22,700 --> 00:08:19,919
we've also observed that the moon is

161
00:08:25,040 --> 00:08:22,710
shrinking over time a result of it

162
00:08:28,010 --> 00:08:25,050
cooling since its formation billions of

163
00:08:30,230 --> 00:08:28,020

years ago our knowledge of the moon is

164
00:08:33,130 --> 00:08:30,240
now so much more nuanced than it was 50

165
00:08:35,659 --> 00:08:33,140
years ago but NASA never stops learning

166
00:08:38,600 --> 00:08:35,669
that really comes across in the data

167
00:08:40,459 --> 00:08:38,610
sonification let's listen to it again

168
00:08:54,400 --> 00:08:40,469
now the Ernie has broken down what each

169
00:08:54,410 --> 00:09:05,860
but why some say the moon

170
00:10:51,570 --> 00:09:18,460
[Music]

171
00:10:58,550 --> 00:10:51,580
[Applause]

172
00:11:15,510 --> 00:11:10,340
[Music]

173
00:11:22,150 --> 00:11:19,750
in that version of the sonification you

174
00:11:24,130 --> 00:11:22,160
heard tape from the archives like

175
00:11:27,340 --> 00:11:24,140
selections from JFK speaking and

176
00:11:29,380 --> 00:11:27,350
excerpts from Apollo mission audio this

177
00:11:31,390 --> 00:11:29,390
kind of historical data helps us

178
00:11:32,470 --> 00:11:31,400
understand the full impact of our

179
00:11:35,860 --> 00:11:32,480
journey to the moon

180
00:11:37,330 --> 00:11:35,870
Holly McEntire agrees she's a NASA

181
00:11:39,430 --> 00:11:37,340
archivist who believes that these

182
00:11:42,480 --> 00:11:39,440
stories remind us where we came from and

183
00:11:46,620 --> 00:11:42,490
inspire us to keep looking forward I

184
00:11:49,900 --> 00:11:46,630
think probably what I love most about

185
00:11:52,720 --> 00:11:49,910
being an archivist is just being able to

186
00:11:54,880 --> 00:11:52,730
capture the human experience within

187
00:11:56,860 --> 00:11:54,890
those records so sometimes we have

188
00:11:59,560 --> 00:11:56,870

records that are very black and white

189
00:12:01,750 --> 00:11:59,570
this is evidence of what happened but my

190
00:12:04,090 --> 00:12:01,760
favorite part are the records that kind

191
00:12:06,190 --> 00:12:04,100
of tell more of the human experience so

192
00:12:09,010 --> 00:12:06,200
maybe there a memo from one specific

193
00:12:11,200 --> 00:12:09,020
person to another person or maybe

194
00:12:13,180 --> 00:12:11,210
there's someone's personal photographs

195
00:12:15,970 --> 00:12:13,190
that they took or maybe it's an oral

196
00:12:18,160 --> 00:12:15,980
history those are the types of records

197
00:12:21,160 --> 00:12:18,170
that really drive me because I really

198
00:12:24,430 --> 00:12:21,170
just love to hear the human take on what

199
00:12:26,380 --> 00:12:24,440
happened so in that spirit we're asking

200
00:12:28,540 --> 00:12:26,390
you to help NASA tell the Apollo story

201
00:12:30,880 --> 00:12:28,550
what do you remember about the first

202
00:12:33,010 --> 00:12:30,890
moon landing or what are you looking

203
00:12:34,390 --> 00:12:33,020
forward to as NASA prepares to return to

204
00:12:36,940 --> 00:12:34,400
the moon by 2024

205
00:12:38,620 --> 00:12:36,950
so far we've received hundreds of

206
00:12:41,170 --> 00:12:38,630
submissions from people all over the

207
00:12:44,380 --> 00:12:41,180
world this first memory comes to us from

208
00:12:47,350 --> 00:12:44,390
France here's what Alena remembers hello

209
00:12:50,830 --> 00:12:47,360
NASA I'm a retired American wildlife

210
00:12:53,200 --> 00:12:50,840
biologist living in France I was 23

211
00:12:55,570 --> 00:12:53,210
years old when the first people walked

212
00:12:57,790 --> 00:12:55,580
on the moon I was living in Seattle

213
00:13:00,970 --> 00:12:57,800

Washington and working as a legal

214
00:13:03,310 --> 00:13:00,980
secretary at that time I was an avid fan

215
00:13:06,910 --> 00:13:03,320
of the Star Trek series on television

216
00:13:09,940 --> 00:13:06,920
and I still am I really wanted to see

217
00:13:11,890 --> 00:13:09,950
this historic event I couldn't quite

218
00:13:15,790 --> 00:13:11,900
believe that it wasn't a national

219
00:13:18,680 --> 00:13:15,800
holiday but it wasn't so I called in

220
00:13:21,110 --> 00:13:18,690
sick at my law firm to be able to see it

221
00:13:23,900 --> 00:13:21,120
at the time I didn't have a television

222
00:13:26,420 --> 00:13:23,910
so my boyfriend John and I had to go to

223
00:13:28,850 --> 00:13:26,430
a friend's house to watch it the friend

224
00:13:31,040 --> 00:13:28,860
only had a small black and white TV and

225
00:13:31,519 --> 00:13:31,050
he wasn't interested in watching it at

226
00:13:34,970 --> 00:13:31,529
all

227
00:13:37,759 --> 00:13:34,980
he was just John and I but we got to

228
00:13:40,129 --> 00:13:37,769
watch it and it was thrilling I'm a firm

229
00:13:42,230 --> 00:13:40,139
supporter of the space program and I

230
00:13:44,480 --> 00:13:42,240
hope that we continue to peacefully

231
00:13:48,050 --> 00:13:44,490
explore the universe to learn more about

232
00:13:50,569 --> 00:13:48,060
life the universe and everything Thank

233
00:13:55,660 --> 00:13:50,579
You NASA for the opportunity to share in

234
00:14:01,100 --> 00:13:58,369
Thank You Elena for sharing the story

235
00:14:04,340 --> 00:14:01,110
with us we want you to send us your

236
00:14:12,139 --> 00:14:04,350
apollo memory visit nasa.gov slash

237
00:14:13,879 --> 00:14:12,149
apollo stories to learn more you helped

238
00:14:15,110 --> 00:14:13,889

design how ash not to stay alive and

239
00:14:17,449 --> 00:14:15,120
comfortable while working on the moon

240
00:14:21,559 --> 00:14:17,459
science is something you test the

241
00:14:23,329 --> 00:14:21,569
experiments you get results and that you

242
00:14:26,090 --> 00:14:23,339
know modifies the way we look at the

243
00:14:27,679 --> 00:14:26,100
world where did all of this stuff come

244
00:14:30,379 --> 00:14:27,689
from how did it form what was the

245
00:14:32,990 --> 00:14:30,389
process does it happen all the time

246
00:14:35,809 --> 00:14:33,000
across the universe or are we somehow

247
00:14:37,269 --> 00:14:35,819
unique or at least unusual what does it

248
00:14:38,210 --> 00:14:37,279
all mean