ROCKET
RANCH

Episode 20:
Space Explorer
February 2020

@NASAKennedy
#NASARocketRanch

New episodes every month!

1
00:00:09,530 --> 00:00:04,579
Pluto is not a planet or is it next on

2
00:00:17,160 --> 00:00:09,540
the rocket Ranger EGS program chief

3
00:00:26,940 --> 00:00:22,940
[Music]

4
00:00:32,210 --> 00:00:28,830
now passing through max Q maximum

5
00:00:34,470 --> 00:00:32,220
dynamic pressure welcome to space

6
00:00:36,420 --> 00:00:34,480
alright so I am in the booth now with

7
00:00:38,070 --> 00:00:36,430
dr. Alan Stern dr. stern thank you for

8
00:00:39,060 --> 00:00:38,080
joining me today hey Joshua is great to

9
00:00:41,490 --> 00:00:39,070
be at Roger Roger

10
00:00:45,510 --> 00:00:41,500
yeah hey listen so your resume kind of

11
00:00:47,040 --> 00:00:45,520
reads like a I don't even know how to

12
00:00:50,010 --> 00:00:47,050
describe its impressive like everything

13
00:00:51,720 --> 00:00:50,020

from the your planetary scientist you

14
00:00:53,520 --> 00:00:51,730
were the principal investigator for a

15
00:00:55,229 --> 00:00:53,530
number of scientific instruments at a

16
00:00:57,090 --> 00:00:55,239
phone in space some aboard the Space

17
00:00:59,219 --> 00:00:57,100
Shuttle you are the principal

18
00:01:01,469 --> 00:00:59,229
investigator for New Horizons you were

19
00:01:02,640 --> 00:01:01,479
the associate administrator for NASA's

20
00:01:05,789 --> 00:01:02,650
science Mission Directorate for a while

21
00:01:07,140 --> 00:01:05,799
I think I saw you were like shortlisted

22
00:01:10,140 --> 00:01:07,150
to possibly be the administrator for

23
00:01:11,160 --> 00:01:10,150
NASA and for a while there you're

24
00:01:13,050 --> 00:01:11,170
working with some commercial companies

25
00:01:16,320 --> 00:01:13,060
including moon express one lifetime

26
00:01:18,240 --> 00:01:16,330
right you know it's it's good if you

27
00:01:22,260 --> 00:01:18,250
don't need as much sleep as some other

28
00:01:23,820 --> 00:01:22,270
people so and of the real question is

29
00:01:25,440 --> 00:01:23,830
when you were a kid what did you want to

30
00:01:27,990 --> 00:01:25,450
be when you grew up I wanted to be a

31
00:01:30,139 --> 00:01:28,000
space explorer like every other kid I

32
00:01:33,510 --> 00:01:30,149
grew up with it was just it was just

33
00:01:35,359 --> 00:01:33,520
what every kid wanted to do the United

34
00:01:37,560 --> 00:01:35,369
States was going to the moon and

35
00:01:40,260 --> 00:01:37,570
everybody wanted to be a part of it and

36
00:01:42,990 --> 00:01:40,270
I got to live my dream it's been awesome

37
00:01:44,340 --> 00:01:43,000
so obviously when people say I want to

38
00:01:46,200 --> 00:01:44,350

be a space explorer they often think

39
00:01:47,490 --> 00:01:46,210
about astronauts and I don't think

40
00:01:49,950 --> 00:01:47,500
you've been to space of all the things

41
00:01:53,849 --> 00:01:49,960
on your exhaustive resume like I didn't

42
00:01:55,319 --> 00:01:53,859
see space actual astronaut travel yet no

43
00:01:56,849 --> 00:01:55,329
that's right that's right I tried very

44
00:01:58,380 --> 00:01:56,859
hard to be an astronaut I was a finalist

45
00:01:59,940 --> 00:01:58,390
I went through physicals found it I'm

46
00:02:03,419 --> 00:01:59,950
very healthy pretty well-adjusted

47
00:02:07,469 --> 00:02:03,429
mentally or at least I used to be but I

48
00:02:09,240 --> 00:02:07,479
was not selected but actually I spent

49
00:02:13,710 --> 00:02:09,250
five years flying high-performance jets

50
00:02:15,450 --> 00:02:13,720
NASA jets and and I have a research

51
00:02:18,000 --> 00:02:15,460
program that will be flowing on Virgin

52
00:02:19,590 --> 00:02:18,010
Galactic awesome as soon as they're

53
00:02:21,059 --> 00:02:19,600
ready for commercial service through my

54
00:02:23,790 --> 00:02:21,069
company the Southwest Research Institute

55
00:02:25,830 --> 00:02:23,800
which is a private nonprofit Research

56
00:02:28,040 --> 00:02:25,840
Institute with about 3,000 employees I

57
00:02:30,150 --> 00:02:28,050
run a program where we'll be doing

58
00:02:33,870 --> 00:02:30,160
astronomical and earth observation

59
00:02:36,000 --> 00:02:33,880
research from spaceship to so for those

60
00:02:38,670 --> 00:02:36,010
are familiar spaceship 2 is actually the

61
00:02:40,470 --> 00:02:38,680
Virgin Galactic spaceship it drops off

62
00:02:42,270 --> 00:02:40,480
of an airplane

63
00:02:44,070 --> 00:02:42,280

and so it's an airdrop spaceship that

64
00:02:46,229 --> 00:02:44,080
actually carries people for suborbital

65
00:02:48,930 --> 00:02:46,239
flight correct that's exactly right it's

66
00:02:50,490 --> 00:02:48,940
a it's a suborbital spacecraft built for

67
00:02:52,949 --> 00:02:50,500
space tourism but which we're applying

68
00:02:56,300 --> 00:02:52,959
to Space Research to do kind of

69
00:02:59,490 --> 00:02:56,310
breakthrough low price high-value return

70
00:03:00,839 --> 00:02:59,500
research and education missions and so

71
00:03:02,100 --> 00:03:00,849
obviously you're talking about sending

72
00:03:04,110 --> 00:03:02,110
some science up on board these

73
00:03:06,330 --> 00:03:04,120
suborbital flights looking at minutes

74
00:03:08,400 --> 00:03:06,340
worth of microgravity experimentation

75
00:03:09,449 --> 00:03:08,410
are you one of the experiments that gets

76
00:03:11,520 --> 00:03:09,459
to go at some point did you buy yourself

77
00:03:13,140 --> 00:03:11,530
a ticket yet oh I'll be flying several

78
00:03:15,680 --> 00:03:13,150
times we have three tickets that's

79
00:03:17,520 --> 00:03:15,690
awesome what I was referring to and

80
00:03:18,839 --> 00:03:17,530
we're gonna be looking at the Earth's

81
00:03:20,880 --> 00:03:18,849
atmosphere we're gonna be looking at

82
00:03:22,920 --> 00:03:20,890
deep space and we're also gonna be

83
00:03:26,220 --> 00:03:22,930
conducting biomedical experiments on

84
00:03:29,099 --> 00:03:26,230
ourselves by wearing a shuttle biomed

85
00:03:32,789 --> 00:03:29,109
harness measures blood pressure and

86
00:03:36,240 --> 00:03:32,799
respiration rates to study the

87
00:03:37,949 --> 00:03:36,250
transition from hyper G on ascent the

88
00:03:39,780 --> 00:03:37,959

high G's that you have to the

89
00:03:42,210 --> 00:03:39,790
microgravity and then back again an

90
00:03:43,890 --> 00:03:42,220
entry into high gravity Ken so I'm

91
00:03:47,039 --> 00:03:43,900
looking forward to flying in space maybe

92
00:03:48,210 --> 00:03:47,049
as soon as next year you're after so dr.

93
00:03:51,659 --> 00:03:48,220
stern obviously you mentioned you grew

94
00:03:53,640 --> 00:03:51,669
up watching the Apollo program so you

95
00:03:54,900 --> 00:03:53,650
weren't born yesterday but it seems like

96
00:03:56,580 --> 00:03:54,910
you're not letting that slow you down

97
00:03:58,379 --> 00:03:56,590
that your career is even accelerating at

98
00:04:03,690 --> 00:03:58,389
this point to new heights very literally

99
00:04:07,680 --> 00:04:03,700
well you know space is such a and

100
00:04:09,839 --> 00:04:07,690
blooming field at the same time and you

101
00:04:11,670 --> 00:04:09,849
know the opportunities are just

102
00:04:13,949 --> 00:04:11,680
mushrooming why quit now

103
00:04:16,680 --> 00:04:13,959
so you mentioned the suborbital flights

104
00:04:18,509 --> 00:04:16,690
are you are you involved or kind of

105
00:04:20,400 --> 00:04:18,519
what's your perspective on this idea of

106
00:04:22,980 --> 00:04:20,410
the commercial space market right now

107
00:04:25,560 --> 00:04:22,990
because suborbital we have Blue Origin

108
00:04:27,450 --> 00:04:25,570
and Virgin Galactic are two of the big

109
00:04:29,190 --> 00:04:27,460
names right now getting into that kind

110
00:04:31,260 --> 00:04:29,200
of suborbital opportunities for tourism

111
00:04:32,490 --> 00:04:31,270
as well as science research we have the

112
00:04:34,200 --> 00:04:32,500
Commercial Crew program here at NASA

113
00:04:36,150 --> 00:04:34,210

we're getting to flow getting humans

114
00:04:38,159 --> 00:04:36,160
onboard commercial spacecraft for the

115
00:04:41,040 --> 00:04:38,169
first time to space station we have

116
00:04:43,050 --> 00:04:41,050
other companies like Bigelow and we have

117
00:04:45,750 --> 00:04:43,060
companies like who just launched out of

118
00:04:46,920 --> 00:04:45,760
New Zealand that's a rocket lab rocket

119
00:04:48,089 --> 00:04:46,930
lab thank you yes I think I think they

120
00:04:49,350 --> 00:04:48,099
said that I was like a ninth flight this

121
00:04:51,390 --> 00:04:49,360
year or something since their ninth

122
00:04:52,940 --> 00:04:51,400
orbital flight orbital flight so like an

123
00:04:55,190 --> 00:04:52,950
eighth successful one they

124
00:04:56,360 --> 00:04:55,200
really up-and-coming so what's your

125
00:04:57,410 --> 00:04:56,370
perspective on like this market

126
00:04:59,420 --> 00:04:57,420
obviously you mentioned like the booming

127
00:05:00,710 --> 00:04:59,430
and blooming and like I don't think

128
00:05:01,970 --> 00:05:00,720
anybody would argue with that but kind

129
00:05:03,260 --> 00:05:01,980
of where do you see this going and

130
00:05:05,840 --> 00:05:03,270
what's the rate at which this is gonna

131
00:05:07,310 --> 00:05:05,850
move it's it's going at an accelerating

132
00:05:10,130 --> 00:05:07,320
rate and you know truth in advertising

133
00:05:12,200 --> 00:05:10,140
is I worked as a consultant for both

134
00:05:15,140 --> 00:05:12,210
Branson and Bezos at their companies

135
00:05:17,680 --> 00:05:15,150
that had Virgin Galactic and at Blue

136
00:05:19,970 --> 00:05:17,690
Origin in the early part of this decade

137
00:05:22,780 --> 00:05:19,980
when I was associate administrator for

138
00:05:24,710 --> 00:05:22,790

the science Mission Directorate I

139
00:05:26,870 --> 00:05:24,720
started a program for using these

140
00:05:28,610 --> 00:05:26,880
commercial vehicles it's now essentially

141
00:05:30,910 --> 00:05:28,620
morphed its way into the science into

142
00:05:33,470 --> 00:05:30,920
the space technology Mission Directorate

143
00:05:37,130 --> 00:05:33,480
program called flight Opportunities and

144
00:05:39,050 --> 00:05:37,140
and then as I said at Southwest Research

145
00:05:41,510 --> 00:05:39,060
Institute I'm the principal investigator

146
00:05:43,700 --> 00:05:41,520
for a suborbital research program that

147
00:05:46,490 --> 00:05:43,710
will be flying scientists on these

148
00:05:48,620 --> 00:05:46,500
vehicles to conduct these experiments at

149
00:05:52,100 --> 00:05:48,630
much higher reliability and lower cost

150
00:05:54,560 --> 00:05:52,110
than we could with automation super

151
00:05:57,110 --> 00:05:54,570
excited about this and the advent of

152
00:05:58,880 --> 00:05:57,120
commercial orbital spaceflight it's

153
00:06:01,430 --> 00:05:58,890
really you know I think the late teens

154
00:06:04,490 --> 00:06:01,440
and the 20s are the breakout moment I'm

155
00:06:05,930 --> 00:06:04,500
gonna give public talks I tell people I

156
00:06:08,150 --> 00:06:05,940
said you know this is the best time to

157
00:06:10,130 --> 00:06:08,160
be alive to be in space ever because

158
00:06:12,320 --> 00:06:10,140
people will look back in 200 years and

159
00:06:14,600 --> 00:06:12,330
say back then in the teens and 20s the

160
00:06:18,860 --> 00:06:14,610
beginning of 21st century that's where

161
00:06:21,620 --> 00:06:18,870
Star Trek began yeah I mean it's tough

162
00:06:23,210 --> 00:06:21,630
to take again like assuming that the

163
00:06:24,680 --> 00:06:23,220

rate is accelerating like you like you

164
00:06:27,050 --> 00:06:24,690
say it isn't I'm not one to disagree

165
00:06:30,260 --> 00:06:27,060
with you well that seems inevitable just

166
00:06:31,850 --> 00:06:30,270
think about it let's reel back 10 years

167
00:06:35,900 --> 00:06:31,860
let's do it okay he's not very far back

168
00:06:39,050 --> 00:06:35,910
2009 no no we had a space shuttle was

169
00:06:41,390 --> 00:06:39,060
fantastic flying machine taking people

170
00:06:43,900 --> 00:06:41,400
in payloads up to the ISS and in terms

171
00:06:46,880 --> 00:06:43,910
of human spaceflight the Russians had

172
00:06:49,700 --> 00:06:46,890
their vehicles flying Soyuz up to ISS

173
00:06:51,590 --> 00:06:49,710
that was it now let's go forward not ten

174
00:06:55,280 --> 00:06:51,600
years but half as far five years from

175
00:06:57,560 --> 00:06:55,290
now Blue Origin and Virgin Galactic will

176
00:07:00,430 --> 00:06:57,570
be flying suborbital space flights with

177
00:07:03,680 --> 00:07:00,440
paying tourists researchers educators

178
00:07:05,510 --> 00:07:03,690
maybe even NASA astronauts at the rate

179
00:07:09,230 --> 00:07:05,520
of one or more times per week

180
00:07:11,150 --> 00:07:09,240
Wow maybe daily then on top of it we're

181
00:07:14,240 --> 00:07:11,160
gonna have a Ryan flying we're gonna

182
00:07:15,860 --> 00:07:14,250
have boots on the moon men and women

183
00:07:17,480 --> 00:07:15,870
exploring the lunar surface for the

184
00:07:20,510 --> 00:07:17,490
first time in half a century

185
00:07:23,450 --> 00:07:20,520
in person doing what robots still can't

186
00:07:26,089 --> 00:07:23,460
do which is the fieldwork that really

187
00:07:27,529 --> 00:07:26,099
requires humans on the spot sure we're

188
00:07:29,270 --> 00:07:27,539

gonna be turning our attention to Mars

189
00:07:32,450 --> 00:07:29,280
and at the same time we're gonna have

190
00:07:34,430 --> 00:07:32,460
Commercial Crew vehicles from Boeing and

191
00:07:37,809 --> 00:07:34,440
SpaceX that are regularly shuttling

192
00:07:39,770 --> 00:07:37,819
astronauts and researchers

193
00:07:41,839 --> 00:07:39,780
non-professional astronauts maybe people

194
00:07:43,700 --> 00:07:41,849
like myself back and forth to the ISS

195
00:07:45,800 --> 00:07:43,710
and even commercial space stations

196
00:07:47,870 --> 00:07:45,810
compare that to what was going on ten

197
00:07:49,969 --> 00:07:47,880
years ago yeah how could you say

198
00:07:52,249 --> 00:07:49,979
anything except its booming and blooming

199
00:07:54,260 --> 00:07:52,259
yeah yeah you mentioned obviously you're

200
00:07:57,320 --> 00:07:54,270
a planetary scientist so your expertise

201
00:07:58,909 --> 00:07:57,330
really one of your expertise is lies in

202
00:08:01,059 --> 00:07:58,919
that field so thinking about kind of the

203
00:08:06,439 --> 00:08:01,069
exploration and expansion to the moon

204
00:08:07,430 --> 00:08:06,449
certainly most kind of we'll call them

205
00:08:09,080 --> 00:08:07,440
Joe on the street

206
00:08:10,100 --> 00:08:09,090
most of them kind of think of unless

207
00:08:11,600 --> 00:08:10,110
you're getting to somewhere like the

208
00:08:14,240 --> 00:08:11,610
moon we aren't doing anything different

209
00:08:17,270 --> 00:08:14,250
or new so how do you kind of look at

210
00:08:19,189 --> 00:08:17,280
this move towards a colony on the moon

211
00:08:21,439 --> 00:08:19,199
or Mars or even farther I know like you

212
00:08:23,269 --> 00:08:21,449
said you mentioned earlier to me you are

213
00:08:25,550 --> 00:08:23,279

working on a mission for Europa headed

214
00:08:27,140 --> 00:08:25,560
to Europa so what is what does this all

215
00:08:29,510 --> 00:08:27,150
kind of look like moving forward in

216
00:08:31,790 --> 00:08:29,520
exploring our solar system well it's

217
00:08:35,089 --> 00:08:31,800
some it's amazing you know we have the

218
00:08:36,980 --> 00:08:35,099
robotic fleet of spacecraft like Europa

219
00:08:40,279 --> 00:08:36,990
clipper that's going to be studying the

220
00:08:42,800 --> 00:08:40,289
ocean beneath Europa's surface we have

221
00:08:44,569 --> 00:08:42,810
Mars sample return coming up go ahead do

222
00:08:45,740 --> 00:08:44,579
you do do you do that with a giant drill

223
00:08:48,530 --> 00:08:45,750
like are we descending like a giant

224
00:08:49,850 --> 00:08:48,540
drill to Europa to just like carve a

225
00:08:51,920 --> 00:08:49,860
hole in the ice is that really the goal

226
00:08:54,019 --> 00:08:51,930
that'll be some future mission which

227
00:08:55,699 --> 00:08:54,029
will go down beneath the ice okay rope a

228
00:08:58,910 --> 00:08:55,709
clipper is actually a mission that

229
00:09:01,579 --> 00:08:58,920
orbits Jupiter and makes dozens of close

230
00:09:05,720 --> 00:09:01,589
flybys to Europa which is this planet

231
00:09:08,780 --> 00:09:05,730
sized moon of Jupiter which has an ocean

232
00:09:11,870 --> 00:09:08,790
on the inside beneath the ice and which

233
00:09:14,870 --> 00:09:11,880
is very likely spewing ocean material

234
00:09:16,579 --> 00:09:14,880
out through geysers into space and this

235
00:09:18,480 --> 00:09:16,589
very sophisticated robotic spacecraft

236
00:09:21,930 --> 00:09:18,490
called Europa clipper

237
00:09:25,800 --> 00:09:21,940
be studying the geology the geophysics

238
00:09:27,750 --> 00:09:25,810

the geysers and maybe even sampling

239
00:09:30,360 --> 00:09:27,760
material coming out of those geysers as

240
00:09:32,970 --> 00:09:30,370
the spacecraft flies through it to make

241
00:09:35,820 --> 00:09:32,980
a precursor set of observations to lead

242
00:09:37,740 --> 00:09:35,830
us to a future surface mission when you

243
00:09:40,110 --> 00:09:37,750
say we're gonna gather these resources

244
00:09:42,000 --> 00:09:40,120
hopefully that are kind of flying off of

245
00:09:43,440 --> 00:09:42,010
Europa how close are we talking about

246
00:09:45,269 --> 00:09:43,450
getting to this thing you're hoping to

247
00:09:48,090 --> 00:09:45,279
capture some of those yeah so we're

248
00:09:50,100 --> 00:09:48,100
gonna go right down on the deck the you

249
00:09:51,900 --> 00:09:50,110
know if you could if you made Europa

250
00:09:54,840 --> 00:09:51,910
beach ball some of the flybys would be

251
00:09:56,250 --> 00:09:54,850
as close as just just a fraction of an

252
00:09:58,590 --> 00:09:56,260
inch above the surface of that beach

253
00:09:59,880 --> 00:09:58,600
wall Wow other fly buzzes be further

254
00:10:01,560 --> 00:09:59,890
back because we want to get the global

255
00:10:03,269 --> 00:10:01,570
view sure and those are both good types

256
00:10:05,310 --> 00:10:03,279
of science so it's not always about how

257
00:10:07,350 --> 00:10:05,320
close you go but we're gonna get right

258
00:10:08,430 --> 00:10:07,360
down there on the deck that's awesome

259
00:10:09,870 --> 00:10:08,440
sorry and I want to go back you were

260
00:10:11,329 --> 00:10:09,880
mentioning Mars and kind of our

261
00:10:14,820 --> 00:10:11,339
exploration towards Mars well you know

262
00:10:18,540 --> 00:10:14,830
for Mars for the moon and for asteroids

263
00:10:21,480 --> 00:10:18,550

in between the the the big next thing

264
00:10:24,930 --> 00:10:21,490
after more sample return is gonna be

265
00:10:27,690 --> 00:10:24,940
humans human bases on the moon on on

266
00:10:30,360 --> 00:10:27,700
Mars probably on asteroids as well I

267
00:10:32,579 --> 00:10:30,370
spent a month down at South Pole early

268
00:10:35,850 --> 00:10:32,589
in my career doing astronomy from the

269
00:10:39,569 --> 00:10:35,860
South Pole and I think that we will have

270
00:10:41,430 --> 00:10:39,579
lunar bases and then Mars bases that

271
00:10:43,230 --> 00:10:41,440
have similar scope to what the National

272
00:10:46,380 --> 00:10:43,240
Science Foundation does down at South

273
00:10:49,130 --> 00:10:46,390
Pole within the lifetimes of people who

274
00:10:51,480 --> 00:10:49,140
are in their careers now it's gonna be

275
00:10:55,230 --> 00:10:51,490
incredibly exciting and it really is

276
00:10:57,060 --> 00:10:55,240
where Star Trek begins so when you get

277
00:10:58,430 --> 00:10:57,070
asked the question like why bother like

278
00:11:00,660 --> 00:10:58,440
because there are people right now

279
00:11:02,970 --> 00:11:00,670
high-profile people that are saying Mars

280
00:11:05,190 --> 00:11:02,980
isn't worth the hassle like how do you

281
00:11:06,120 --> 00:11:05,200
as a planetary scientist obviously

282
00:11:09,180 --> 00:11:06,130
there's a lot to discover and explore

283
00:11:11,220 --> 00:11:09,190
there but like is it worth going like

284
00:11:13,710 --> 00:11:11,230
sending people there on this nine-month

285
00:11:15,210 --> 00:11:13,720
journey on this planet that's ultimately

286
00:11:17,639 --> 00:11:15,220
like currently a hostile environment for

287
00:11:20,340 --> 00:11:17,649
humans and trying to set up these

288
00:11:21,930 --> 00:11:20,350

habitats there well you know a long time

289
00:11:23,490 --> 00:11:21,940
ago Arizona was a pretty hostile

290
00:11:25,170 --> 00:11:23,500
environment for humans and it was even

291
00:11:27,600 --> 00:11:25,180
worse because other humans were chasing

292
00:11:30,030 --> 00:11:27,610
you you know with lethal weapons you

293
00:11:31,890 --> 00:11:30,040
won't find that on Mars we hope not

294
00:11:33,810 --> 00:11:31,900
right but think about

295
00:11:35,760 --> 00:11:33,820
the value of what we're doing and I'm

296
00:11:38,730 --> 00:11:35,770
not I don't want to discount it but I'm

297
00:11:40,290 --> 00:11:38,740
not talking about the value of rewriting

298
00:11:43,800 --> 00:11:40,300
textbooks and expanding our knowledge

299
00:11:45,780 --> 00:11:43,810
and doing epical science like finding

300
00:11:49,110 --> 00:11:45,790
out how prevalent life is in the solar

301
00:11:51,210 --> 00:11:49,120
system right if you think about the

302
00:11:53,490 --> 00:11:51,220
United States as a world leader and

303
00:11:56,040 --> 00:11:53,500
setting the pace for the whole planet

304
00:11:57,990 --> 00:11:56,050
space exploration is one important way

305
00:12:00,930 --> 00:11:58,000
we do that it's also soft power

306
00:12:03,360 --> 00:12:00,940
projection because every kid in every

307
00:12:04,890 --> 00:12:03,370
nation on the earth reads in their

308
00:12:07,380 --> 00:12:04,900
science textbooks and they have these

309
00:12:09,540 --> 00:12:07,390
brands that they read about NASA's a

310
00:12:12,120 --> 00:12:09,550
brand but even when NASA isn't mentioned

311
00:12:15,720 --> 00:12:12,130
just the Hubble Space Telescope the ISS

312
00:12:16,860 --> 00:12:15,730
a mission like New Horizons that's soft

313
00:12:18,769 --> 00:12:16,870

power projection they're learning about

314
00:12:20,850 --> 00:12:18,779
what great things the United States does

315
00:12:22,530 --> 00:12:20,860
even in countries don't like us very

316
00:12:25,620 --> 00:12:22,540
much just because the kids are taught

317
00:12:30,829 --> 00:12:25,630
about space science but way beyond that

318
00:12:34,740 --> 00:12:30,839
the breakout moment for the economy for

319
00:12:37,620 --> 00:12:34,750
space becoming a very important part of

320
00:12:39,720 --> 00:12:37,630
the economy from colonization of other

321
00:12:43,800 --> 00:12:39,730
worlds to applications like remote

322
00:12:45,750 --> 00:12:43,810
sensing security handheld communications

323
00:12:48,780 --> 00:12:45,760
on the internet from any spot on the

324
00:12:50,730 --> 00:12:48,790
earth fire and disaster recovery and

325
00:12:52,260 --> 00:12:50,740
then all the applications we haven't

326
00:12:54,900 --> 00:12:52,270
thought of including space tourism

327
00:12:56,699 --> 00:12:54,910
everybody wants to go to space everybody

328
00:12:59,100 --> 00:12:56,709
wants to see the Earth from space yeah

329
00:13:00,449 --> 00:12:59,110
right people want to actually walk on

330
00:13:02,880 --> 00:13:00,459
the moon and go to Mars and it's not

331
00:13:05,730 --> 00:13:02,890
possible yet but later in this century

332
00:13:09,030 --> 00:13:05,740
it will be and to ask what is the value

333
00:13:12,570 --> 00:13:09,040
of that is a little bit like you know

334
00:13:15,680 --> 00:13:12,580
the naivete of asking the tinkers with

335
00:13:18,090 --> 00:13:15,690
electronics a century and a half ago

336
00:13:19,199 --> 00:13:18,100
what's all that research about what's

337
00:13:24,240 --> 00:13:19,209
there ever gonna come with those things

338
00:13:27,449 --> 00:13:24,250

with the wires it's just a fad yeah like

339
00:13:29,699 --> 00:13:27,459
that so when you talk about the moon

340
00:13:30,960 --> 00:13:29,709
playing a part in our economy can you

341
00:13:32,730 --> 00:13:30,970
flesh that out for me some more because

342
00:13:34,829 --> 00:13:32,740
I hear people say that and again I don't

343
00:13:36,810 --> 00:13:34,839
know that can disagree but like how does

344
00:13:38,310 --> 00:13:36,820
that happen on a practical level yeah

345
00:13:42,370 --> 00:13:38,320
well I think at first it'll be a walk

346
00:13:45,010 --> 00:13:42,380
before we run thing or we will have

347
00:13:47,350 --> 00:13:45,020
a NASA slash international presence on

348
00:13:49,270 --> 00:13:47,360
the moon at the South Pole that will be

349
00:13:51,330 --> 00:13:49,280
a research establishment and private

350
00:13:54,030 --> 00:13:51,340
companies will be there selling services

351
00:13:56,740 --> 00:13:54,040
right up through space tourism I think

352
00:13:59,650 --> 00:13:56,750
but then people will start to settle

353
00:14:02,190 --> 00:13:59,660
there and very much like you know the

354
00:14:04,480 --> 00:14:02,200
push across the Americas centuries ago

355
00:14:06,130 --> 00:14:04,490
little dots of light will start to

356
00:14:10,090 --> 00:14:06,140
appear across the surface of the Moon as

357
00:14:13,120 --> 00:14:10,100
humans establish multiple locations and

358
00:14:14,920 --> 00:14:13,130
we'll we'll have everything we have here

359
00:14:17,410 --> 00:14:14,930
on earth eventually there'll be schools

360
00:14:20,560 --> 00:14:17,420
and hospitals and businesses and

361
00:14:23,470 --> 00:14:20,570
everything else because it is the solar

362
00:14:25,810 --> 00:14:23,480
system is this unlimited frontier with

363
00:14:28,180 --> 00:14:25,820

these tremendous resources and

364
00:14:30,040 --> 00:14:28,190
opportunities for our economy coming

365
00:14:34,530 --> 00:14:30,050
across how many centuries into the

366
00:14:38,140 --> 00:14:34,540
future I don't know but it's humankind's

367
00:14:40,360 --> 00:14:38,150
back playground if you will it's it's

368
00:14:42,400 --> 00:14:40,370
our backyard before we launch to the

369
00:14:45,220 --> 00:14:42,410
stars when we have the technology to do

370
00:14:48,130 --> 00:14:45,230
that so you talk about kind of the

371
00:14:50,680 --> 00:14:48,140
expansion across the moon do you

372
00:14:51,970 --> 00:14:50,690
envision a time when you walk out your

373
00:14:53,740 --> 00:14:51,980
door here on earth and you look up at

374
00:14:54,790 --> 00:14:53,750
the moon and it's not just reflecting

375
00:14:56,650 --> 00:14:54,800
the sun's light anymore but now you

376
00:14:58,540 --> 00:14:56,660
actually see lights being generated that

377
00:14:59,860 --> 00:14:58,550
are visible from Earth I think about

378
00:15:01,720 --> 00:14:59,870
that a lot and I think one of the most

379
00:15:05,080 --> 00:15:01,730
powerful things we can do as soon as we

380
00:15:06,360 --> 00:15:05,090
set up the first outpost on the moon to

381
00:15:08,500 --> 00:15:06,370
prove we did it and send a light back

382
00:15:11,170 --> 00:15:08,510
not to prove that it did it but to be

383
00:15:13,810 --> 00:15:11,180
inspirational if if you can see that

384
00:15:15,520 --> 00:15:13,820
base through binoculars or even naked

385
00:15:17,260 --> 00:15:15,530
eye because there's a searchlight there

386
00:15:19,690 --> 00:15:17,270
or some equivalent thereof yeah when

387
00:15:21,400 --> 00:15:19,700
moms and dads can take their kids out in

388
00:15:24,130 --> 00:15:21,410

the yard and point up at the moon and

389
00:15:27,520 --> 00:15:24,140
say you see that light there on the moon

390
00:15:29,590 --> 00:15:27,530
people live there I think that's going

391
00:15:32,200 --> 00:15:29,600
to be so powerful no and not just for

392
00:15:35,590 --> 00:15:32,210
STEM education just for feeling the

393
00:15:38,950 --> 00:15:35,600
power of of what humans can do that we

394
00:15:41,110 --> 00:15:38,960
can live off our cradle of the earth

395
00:15:44,320 --> 00:15:41,120
that we can move out into the universe

396
00:15:47,590 --> 00:15:44,330
in a real way not in the way that Apollo

397
00:15:49,930 --> 00:15:47,600
did it to be there for a few moments for

398
00:15:51,910 --> 00:15:49,940
a weekend and come back but that people

399
00:15:54,850 --> 00:15:51,920
really live and work there on another

400
00:15:55,929 --> 00:15:54,860
world and you know Mars and the

401
00:15:57,609 --> 00:15:55,939
asteroids of

402
00:16:00,129 --> 00:15:57,619
initially humans will go further those

403
00:16:04,629 --> 00:16:00,139
places are so much further away yeah

404
00:16:06,969 --> 00:16:04,639
that although they'll be very important

405
00:16:09,519 --> 00:16:06,979
the moon is the only world close enough

406
00:16:11,739 --> 00:16:09,529
where you can look up naked eye and you

407
00:16:14,349 --> 00:16:11,749
will be able to see the outposts and

408
00:16:16,089 --> 00:16:14,359
eventually the cities that are there do

409
00:16:18,789 --> 00:16:16,099
you do you see anything stopping

410
00:16:21,549 --> 00:16:18,799
humanity like are there are there

411
00:16:23,049 --> 00:16:21,559
dangers that we have to encounter or we

412
00:16:26,859 --> 00:16:23,059
don't even kind of foresee coming that

413
00:16:30,159 --> 00:16:26,869

will just like thwart this effort there

414
00:16:32,319 --> 00:16:30,169
might be but I think that the very great

415
00:16:34,059 --> 00:16:32,329
odds are that this is what we're going

416
00:16:36,549 --> 00:16:34,069
to be doing more and more of in every

417
00:16:38,710 --> 00:16:36,559
decade of this century and because it's

418
00:16:40,989 --> 00:16:38,720
now flowering into the commercial the

419
00:16:45,249 --> 00:16:40,999
private sector so that it doesn't just

420
00:16:47,409 --> 00:16:45,259
depend upon votes and legislators and

421
00:16:50,019 --> 00:16:47,419
government budgets but that it's the

422
00:16:52,359 --> 00:16:50,029
civil plus the commercial partner

423
00:16:54,069 --> 00:16:52,369
together in public private enterprises

424
00:16:56,619 --> 00:16:54,079
and to some extent just private things

425
00:16:59,799 --> 00:16:56,629
and just civil things also that it's a

426
00:17:02,259 --> 00:16:59,809
much more robust and nuanced space

427
00:17:05,710 --> 00:17:02,269
economy that we're looking at then the

428
00:17:07,809 --> 00:17:05,720
old school 1960s centrally planned let's

429
00:17:12,149 --> 00:17:07,819
compete with the Soviets model that

430
00:17:14,919 --> 00:17:12,159
entirely depended upon the women will of

431
00:17:17,429 --> 00:17:14,929
administration's and congresses so

432
00:17:19,689 --> 00:17:17,439
thinking about obviously your work

433
00:17:21,610 --> 00:17:19,699
people know your name they probably know

434
00:17:23,889 --> 00:17:21,620
it as associated with New Horizons and

435
00:17:25,689 --> 00:17:23,899
the Pluto flyby I think 2015 was the

436
00:17:27,279 --> 00:17:25,699
year we saw the flyby happen

437
00:17:29,289 --> 00:17:27,289
so certainly like I feel like

438
00:17:30,460 --> 00:17:29,299

congratulations are always in order for

439
00:17:32,049 --> 00:17:30,470
that I'm sure it feels good to have it

440
00:17:33,940 --> 00:17:32,059
out there exploring but so can you kind

441
00:17:36,419 --> 00:17:33,950
of recap for our listeners who maybe

442
00:17:39,490 --> 00:17:36,429
aren't familiar take us through like a

443
00:17:41,289 --> 00:17:39,500
flyby of the the development the launch

444
00:17:42,700 --> 00:17:41,299
and then that flyby that happened and

445
00:17:44,619 --> 00:17:42,710
kind of now what's what's coming up in

446
00:17:47,139 --> 00:17:44,629
the future right sure happy to do that

447
00:17:49,450 --> 00:17:47,149
and let me say you know New Horizons has

448
00:17:53,590 --> 00:17:49,460
been the mission of a lifetime to be

449
00:17:55,480 --> 00:17:53,600
involved in and 2,500 American men and

450
00:17:57,490 --> 00:17:55,490
women were involved in designing

451
00:17:58,899 --> 00:17:57,500
building and flying that spacecraft out

452
00:18:01,810 --> 00:17:58,909
to the edge of our solar system

453
00:18:04,930 --> 00:18:01,820
New Horizons made the first exploration

454
00:18:07,450 --> 00:18:04,940
of the Pluto system and then went on out

455
00:18:09,039 --> 00:18:07,460
into the Kuiper belt and has explored

456
00:18:12,070 --> 00:18:09,049
the farthest world's ever

457
00:18:14,169 --> 00:18:12,080
explored that farthest places in human

458
00:18:16,090 --> 00:18:14,179
history it's a single little spacecraft

459
00:18:19,299 --> 00:18:16,100
that was built up in Maryland by the

460
00:18:21,850 --> 00:18:19,309
Johns Hopkins Applied Physics lab in a

461
00:18:24,340 --> 00:18:21,860
mission that I am to this day pinching

462
00:18:26,799 --> 00:18:24,350
myself I've been the principal

463
00:18:30,039 --> 00:18:26,809

investigator for have a tremendous team

464
00:18:33,820 --> 00:18:30,049
of people the flight team is about 50

465
00:18:35,440 --> 00:18:33,830
men and women around the flybys it bulks

466
00:18:37,029 --> 00:18:35,450
up to a couple hundred with very

467
00:18:39,039 --> 00:18:37,039
intensive activity for just a few weeks

468
00:18:40,090 --> 00:18:39,049
sure back when we were building as I

469
00:18:41,859 --> 00:18:40,100
said there were thousands of people

470
00:18:43,659 --> 00:18:41,869
involved including in the launch vehicle

471
00:18:47,019 --> 00:18:43,669
and here at the Cape where we launched

472
00:18:50,619 --> 00:18:47,029
it from but it's just a single small

473
00:18:53,229 --> 00:18:50,629
robotic spacecraft very high-tech built

474
00:18:56,379 --> 00:18:53,239
in the early 2000s launched in 2006

475
00:18:58,869 --> 00:18:56,389
that's now further than four billion

476
00:19:01,869 --> 00:18:58,879
miles billion with a B as Carl Sagan

477
00:19:03,849 --> 00:19:01,879
would say billion miles away right then

478
00:19:07,810 --> 00:19:03,859
traveling a million miles a day for

479
00:19:09,849 --> 00:19:07,820
almost 14 years now and it's not going

480
00:19:12,970 --> 00:19:09,859
slowly it's the fastest spacecraft ever

481
00:19:16,149 --> 00:19:12,980
launched it got to the moon not in three

482
00:19:18,489 --> 00:19:16,159
days like Apollo but in nine hours and

483
00:19:21,310 --> 00:19:18,499
it's been traveling at that clip ever

484
00:19:22,960 --> 00:19:21,320
since for 14 years it's not as far away

485
00:19:25,930 --> 00:19:22,970
as the voyagers because they launched in

486
00:19:28,299 --> 00:19:25,940
the 70s surance explored worlds farther

487
00:19:30,129 --> 00:19:28,309
away than the voyagers ever went to and

488
00:19:32,560 --> 00:19:30,139

has revolutionized our knowledge about

489
00:19:34,840 --> 00:19:32,570
small planets and about the origin of

490
00:19:38,049 --> 00:19:34,850
planets through the studies of the

491
00:19:41,200 --> 00:19:38,059
Kuiper belt which has the power and fuel

492
00:19:42,789 --> 00:19:41,210
and frankly the the health onboard the

493
00:19:45,519 --> 00:19:42,799
spacecraft to keep doing this for

494
00:19:47,590 --> 00:19:45,529
another 20 years there's been years of

495
00:19:49,629 --> 00:19:47,600
development there was nine years of

496
00:19:51,039 --> 00:19:49,639
flight so Pluto is so far away that

497
00:19:53,519 --> 00:19:51,049
we're traveling a million miles a day

498
00:19:55,299 --> 00:19:53,529
and it took us nine years to get there

499
00:19:56,950 --> 00:19:55,309
expedited by I think a gravity assist

500
00:19:58,570 --> 00:19:56,960
around Jupiter that's right that we

501
00:19:59,859 --> 00:19:58,580
almost missed out on what it cost us

502
00:20:01,210 --> 00:19:59,869
like four more years if we had been a

503
00:20:03,249 --> 00:20:01,220
little bit later we got it well we got

504
00:20:04,539 --> 00:20:03,259
it we launched on time from the Cape and

505
00:20:07,269 --> 00:20:04,549
we made it to Jupiter so you've waited

506
00:20:08,229 --> 00:20:07,279
decades for this moment and flybys

507
00:20:09,190 --> 00:20:08,239
happening there's still a little bit

508
00:20:10,869 --> 00:20:09,200
concerned that you're gonna fly right

509
00:20:13,539 --> 00:20:10,879
through some debris and mess up

510
00:20:15,489 --> 00:20:13,549
instruments or destroy shred the space

511
00:20:17,470 --> 00:20:15,499
or just shred the spacecraft and so so

512
00:20:19,269 --> 00:20:17,480
tell me about this day with your team

513
00:20:20,980 --> 00:20:19,279

and and what are the emotions what's

514
00:20:22,460 --> 00:20:20,990
kind of like the process of watching

515
00:20:25,220 --> 00:20:22,470
this data come back you know

516
00:20:27,770 --> 00:20:25,230
Oh Joshua it's so hard to describe when

517
00:20:30,230 --> 00:20:27,780
you work with people so long in our case

518
00:20:33,110 --> 00:20:30,240
from 2001 to 2015 from the time we

519
00:20:35,090 --> 00:20:33,120
competed with other teams so who's gonna

520
00:20:39,110 --> 00:20:35,100
get selected by NASA - it'd be the team

521
00:20:40,820 --> 00:20:39,120
to build and fly this and we had many

522
00:20:43,039 --> 00:20:40,830
problems in development because all

523
00:20:46,010 --> 00:20:43,049
space missions do their share Lex

524
00:20:49,700 --> 00:20:46,020
we had many challenges we overcame them

525
00:20:52,279 --> 00:20:49,710
we had a textbook launch and a very long

526
00:20:54,950 --> 00:20:52,289
flight across the solar system we plan

527
00:20:56,480 --> 00:20:54,960
for everything we could think of and we

528
00:20:58,130 --> 00:20:56,490
brought in experts helping us think of

529
00:21:01,130 --> 00:20:58,140
things we couldn't even think of just to

530
00:21:04,039 --> 00:21:01,140
be prepared for contingencies sure and

531
00:21:08,180 --> 00:21:04,049
then when it worked and when the first

532
00:21:12,470 --> 00:21:08,190
high-resolution images came back on the

533
00:21:15,110 --> 00:21:12,480
14th of July 2015 which by the way was

534
00:21:17,240 --> 00:21:15,120
to the very day the 50th anniversary of

535
00:21:19,430 --> 00:21:17,250
the first images from Mars that's

536
00:21:20,630 --> 00:21:19,440
amazing that's when that happened you

537
00:21:22,730 --> 00:21:20,640
time that you planned that out didn't

538
00:21:24,799 --> 00:21:22,740

you I wish I could say that we we timed

539
00:21:29,570 --> 00:21:24,809
it that way just worked out but you know

540
00:21:32,810 --> 00:21:29,580
when we saw those images it's not an

541
00:21:35,000 --> 00:21:32,820
exaggeration to say that the adults

542
00:21:36,620 --> 00:21:35,010
cried you know people who'd worked on it

543
00:21:37,940 --> 00:21:36,630
that long and there was no backup there

544
00:21:40,640 --> 00:21:37,950
was no second chance it's not like

545
00:21:42,950 --> 00:21:40,650
Voyager there isn't a New Horizons - we

546
00:21:46,600 --> 00:21:42,960
got it wrong you know it was all

547
00:21:50,750 --> 00:21:46,610
make-or-break and when it all worked out

548
00:21:53,480 --> 00:21:50,760
to see not just to see your your work

549
00:21:55,610 --> 00:21:53,490
succeed but to see how excited people

550
00:21:59,210 --> 00:21:55,620
all around the world were and to see how

551
00:22:02,360 --> 00:21:59,220
how provocative how game-changing the

552
00:22:04,730 --> 00:22:02,370
science was all of that at once was

553
00:22:06,440 --> 00:22:04,740
almost overwhelming for some people it

554
00:22:07,820 --> 00:22:06,450
was overwhelming and it was super

555
00:22:13,029 --> 00:22:07,830
emotional which i think is great

556
00:22:18,830 --> 00:22:16,159
there's lots of emotions no that's so

557
00:22:21,980 --> 00:22:18,840
good because and I enjoy getting to work

558
00:22:24,409 --> 00:22:21,990
with students and kind of talk about new

559
00:22:27,529 --> 00:22:24,419
horizons over the past decade of my

560
00:22:30,620 --> 00:22:27,539
career if I'm correct I think that

561
00:22:32,600 --> 00:22:30,630
before 2015 the best shot we had a Pluto

562
00:22:34,159 --> 00:22:32,610
was basically for fuzzy pixels that's

563
00:22:36,230 --> 00:22:34,169

right and that's with the Hubble that

564
00:22:38,330 --> 00:22:36,240
you get better telescope

565
00:22:39,560 --> 00:22:38,340
right it's just so far away it's so far

566
00:22:44,630 --> 00:22:39,570
away the other interesting thing about

567
00:22:46,790 --> 00:22:44,640
it is that in 2015 we had not been to a

568
00:22:50,620 --> 00:22:46,800
new planet we had not sent a spacecraft

569
00:22:55,430 --> 00:22:50,630
to a wholly new you know large place

570
00:22:58,790 --> 00:22:55,440
since 1989 I was in graduate school I

571
00:23:00,350 --> 00:22:58,800
finished my PhD that year in December of

572
00:23:03,110 --> 00:23:00,360
that year and that was the same year

573
00:23:06,140 --> 00:23:03,120
that Voyager made its last hurrah

574
00:23:07,880 --> 00:23:06,150
of planetary exploration by going

575
00:23:10,130 --> 00:23:07,890
through the Neptune system called say

576
00:23:12,890 --> 00:23:10,140
for anybody that was born from the early

577
00:23:14,510 --> 00:23:12,900
80s on they were either not alive then

578
00:23:17,660 --> 00:23:14,520
or they were too young to remember it

579
00:23:19,310 --> 00:23:17,670
and by the time we got to 2015 according

580
00:23:21,560 --> 00:23:19,320
to Census Bureau records

581
00:23:24,020 --> 00:23:21,570
40% of the people in the United States

582
00:23:25,700 --> 00:23:24,030
almost half had never seen anything like

583
00:23:28,790 --> 00:23:25,710
this before while they'd never been a

584
00:23:30,680 --> 00:23:28,800
part of this kind of raw first time to

585
00:23:32,900 --> 00:23:30,690
unwrap the present and see what's inside

586
00:23:34,700 --> 00:23:32,910
see what a whole new planets all about

587
00:23:36,890 --> 00:23:34,710
see a point of light become a planet

588
00:23:39,440 --> 00:23:36,900

almost overnight and I think that was

589
00:23:42,440 --> 00:23:39,450
part of the tidal wave of excitement was

590
00:23:45,200 --> 00:23:42,450
for a new generation to actually get to

591
00:23:47,510 --> 00:23:45,210
take part in that and and to see how

592
00:23:50,990 --> 00:23:47,520
cool it was and to this day you know

593
00:23:53,300 --> 00:23:51,000
were four plus years later not only i

594
00:23:57,280 --> 00:23:53,310
but others on my team we give public

595
00:24:02,630 --> 00:23:57,290
talks we go to schools universities

596
00:24:05,480 --> 00:24:02,640
corporations planetarium shows we go to

597
00:24:08,300 --> 00:24:05,490
conventions and everywhere we go people

598
00:24:09,860 --> 00:24:08,310
come up to us and say this somebody will

599
00:24:11,840 --> 00:24:09,870
tell you at almost any talk this was

600
00:24:13,760 --> 00:24:11,850
life-changing for me it made me want to

601
00:24:15,830 --> 00:24:13,770
be an engineer it maybe want to be a

602
00:24:19,850 --> 00:24:15,840
scientist it turned my son or daughter

603
00:24:21,890 --> 00:24:19,860
around to be a good student it I've

604
00:24:24,620 --> 00:24:21,900
heard so many stories like this and it

605
00:24:26,420 --> 00:24:24,630
for me as a scientist it's something

606
00:24:28,490 --> 00:24:26,430
that was really unanticipated I knew

607
00:24:30,080 --> 00:24:28,500
people would groove on it but I didn't

608
00:24:32,060 --> 00:24:30,090
think it would be a life changing it's

609
00:24:36,020 --> 00:24:32,070
something we would do yeah it was really

610
00:24:38,390 --> 00:24:36,030
dorky and geeky and and you know done

611
00:24:41,330 --> 00:24:38,400
for knowledge would be so inspiring to

612
00:24:43,580 --> 00:24:41,340
other people yeah yeah one of the things

613
00:24:45,710 --> 00:24:43,590

that I I tried to convey when I when I

614
00:24:46,910 --> 00:24:45,720
speak about New Horizons is pulling up

615
00:24:49,470 --> 00:24:46,920
just these magnificent and beautiful

616
00:24:51,900 --> 00:24:49,480
images that were captured of Pluto

617
00:24:54,180 --> 00:24:51,910
and then reminding everybody that the

618
00:24:56,460 --> 00:24:54,190
camera that took that left earth nine

619
00:24:58,740 --> 00:24:56,470
years earlier and it was built years

620
00:25:01,080 --> 00:24:58,750
before that and the picture looked like

621
00:25:03,480 --> 00:25:01,090
it was a modern high-definition image

622
00:25:05,730 --> 00:25:03,490
and so it's remarkable to think about

623
00:25:07,919 --> 00:25:05,740
like the amount of Technology and like

624
00:25:10,830 --> 00:25:07,929
that that brilliant work that stood the

625
00:25:12,240 --> 00:25:10,840
test of I mean more or less like 1314

626
00:25:14,430 --> 00:25:12,250
years you know from the time it was

627
00:25:16,320 --> 00:25:14,440
created until it got to flyby and in a

628
00:25:18,750 --> 00:25:16,330
4-hour chunk you got this data that I

629
00:25:20,010 --> 00:25:18,760
think you were still receiving a year

630
00:25:22,470 --> 00:25:20,020
and a half later it took about a year

631
00:25:25,440 --> 00:25:22,480
and a half yeah it did which is unreal

632
00:25:29,240 --> 00:25:25,450
and I would be remiss if I didn't ask

633
00:25:31,740 --> 00:25:29,250
the question because I I would contend

634
00:25:33,930 --> 00:25:31,750
certainly I think this mission got the

635
00:25:35,220 --> 00:25:33,940
respect that it was due but I think that

636
00:25:37,590 --> 00:25:35,230
a lot of attention was drawn to it

637
00:25:40,350 --> 00:25:37,600
especially because of the controversy

638
00:25:42,270 --> 00:25:40,360

over Pluto being a planet or not and so

639
00:25:45,060 --> 00:25:42,280
I I'll pose the question to you dr.

640
00:25:47,190 --> 00:25:45,070
Stern is Pluto a planet of course it's a

641
00:25:50,340 --> 00:25:47,200
planet take a look at it if it came on

642
00:25:52,169 --> 00:25:50,350
the view finder of a starship on Star

643
00:25:53,310 --> 00:25:52,179
Trek you would say they're orbiting a

644
00:25:54,659 --> 00:25:53,320
planet you wouldn't know what else to

645
00:25:56,520 --> 00:25:54,669
call it and need to do planetary

646
00:25:59,250 --> 00:25:56,530
scientists the people who actually

647
00:26:01,169 --> 00:25:59,260
practice the field consider all these

648
00:26:03,840 --> 00:26:01,179
small planets planets and use that in

649
00:26:05,400 --> 00:26:03,850
the scientific literature now I realize

650
00:26:08,669 --> 00:26:05,410
the astronomers the people that work on

651
00:26:11,640 --> 00:26:08,679
black holes and galaxies you know they

652
00:26:16,080 --> 00:26:11,650
had their say back in 2006 but other

653
00:26:18,480 --> 00:26:16,090
than the press I really don't know who

654
00:26:20,100 --> 00:26:18,490
ever bought that and certainly from from

655
00:26:22,320 --> 00:26:20,110
a professional planetary scientist

656
00:26:24,150 --> 00:26:22,330
standpoint you know I would claim that

657
00:26:26,430 --> 00:26:24,160
the New Horizons team is more expert in

658
00:26:28,289 --> 00:26:26,440
this than almost anybody but you can go

659
00:26:30,060 --> 00:26:28,299
way beyond us the general planetary

660
00:26:32,669 --> 00:26:30,070
science community calls these worlds

661
00:26:34,409 --> 00:26:32,679
planets in technical publications

662
00:26:36,900 --> 00:26:34,419
because we don't know what else to call

663
00:26:38,580 --> 00:26:36,910

them that's what they are and it doesn't

664
00:26:41,430 --> 00:26:38,590
matter what they orbit with or what they

665
00:26:43,980 --> 00:26:41,440
orbit around or where they are you know

666
00:26:46,409 --> 00:26:43,990
just from a purely physics and

667
00:26:50,789 --> 00:26:46,419
geophysics standpoint these worlds are

668
00:26:53,510 --> 00:26:50,799
planets and Pluto is kind of the poster

669
00:26:55,650 --> 00:26:53,520
child for what we call dwarf planets

670
00:26:57,539 --> 00:26:55,660
what a lot of people don't know and

671
00:27:00,870 --> 00:26:57,549
maybe a lot of listeners don't know is

672
00:27:03,420 --> 00:27:00,880
that the Sun is called it the worst star

673
00:27:05,580 --> 00:27:03,430
by astronomers and just as

674
00:27:07,650 --> 00:27:05,590
stars or stars and dwarf galaxies or

675
00:27:08,880 --> 00:27:07,660
galaxies dwarf planets or planets

676
00:27:12,540 --> 00:27:08,890
they're just smaller ones they're the

677
00:27:14,850 --> 00:27:12,550
size of continents the surface area of

678
00:27:17,610 --> 00:27:14,860
Pluto is not very different from the

679
00:27:18,420 --> 00:27:17,620
surface area of the United States it's a

680
00:27:19,560 --> 00:27:18,430
big place

681
00:27:24,990 --> 00:27:19,570
interest you wouldn't want to walk

682
00:27:27,540 --> 00:27:25,000
across it so and then again thinking

683
00:27:29,250 --> 00:27:27,550
about new horizons the flyby was

684
00:27:30,900 --> 00:27:29,260
obviously a Pluto that's the primary

685
00:27:32,760 --> 00:27:30,910
mission that's what it was built for

686
00:27:35,580 --> 00:27:32,770
right but certainly built with some

687
00:27:37,050 --> 00:27:35,590
excess capacity there so I know there

688
00:27:38,610 --> 00:27:37,060

was there's a process to kind of get

689
00:27:40,560 --> 00:27:38,620
extensions but you guys were approved

690
00:27:42,960 --> 00:27:40,570
for extension so what's happened since

691
00:27:44,520 --> 00:27:42,970
2015 because New Horizons is still going

692
00:27:45,330 --> 00:27:44,530
and still sending data as far as I know

693
00:27:48,980 --> 00:27:45,340
we are

694
00:27:52,410 --> 00:27:48,990
we had a most recent flyby took place on

695
00:27:57,560 --> 00:27:52,420
January 1st just 37 minutes East Coast

696
00:28:00,360 --> 00:27:57,570
time into the new year cool and beyond

697
00:28:02,550 --> 00:28:00,370
where we encountered Pluto a billion

698
00:28:03,780 --> 00:28:02,560
miles beyond just a billion mile just a

699
00:28:05,730 --> 00:28:03,790
billion miles no big data yeah just

700
00:28:08,190 --> 00:28:05,740
between us on new horizons another

701
00:28:13,170 --> 00:28:08,200
billion miles out we did a close flyby

702
00:28:16,290 --> 00:28:13,180
of this this geeky object called 2014 mu

703
00:28:18,660 --> 00:28:16,300
69 is this hourglass looking one yeah

704
00:28:19,470 --> 00:28:18,670
okay it kind of looks like that or a

705
00:28:22,830 --> 00:28:19,480
snowman

706
00:28:25,410 --> 00:28:22,840
maybe you're sure yeah but but it's

707
00:28:27,420 --> 00:28:25,420
really one of the building blocks of of

708
00:28:28,740 --> 00:28:27,430
the planets out there and it's been

709
00:28:30,690 --> 00:28:28,750
untouched for four and a half billion

710
00:28:33,990 --> 00:28:30,700
years it's kind of an archaeological dig

711
00:28:35,340 --> 00:28:34,000
in history of the solar system nobody

712
00:28:39,390 --> 00:28:35,350
had ever been to something this ancient

713
00:28:40,980 --> 00:28:39,400

none touched before it was very tough

714
00:28:44,220 --> 00:28:40,990
technical challenge we had to hunt it

715
00:28:47,160 --> 00:28:44,230
down in the darkness out there and and

716
00:28:49,320 --> 00:28:47,170
fly by it at 32,000 miles an hour with

717
00:28:51,060 --> 00:28:49,330
you know literally only about an hour

718
00:28:53,640 --> 00:28:51,070
and a half to get all the data and again

719
00:28:55,500 --> 00:28:53,650
no second chance yeah and we made all

720
00:28:56,880 --> 00:28:55,510
that work and then we've been spooling

721
00:28:59,310 --> 00:28:56,890
the data back because the data

722
00:29:00,690 --> 00:28:59,320
transmission rates are low it's still

723
00:29:02,610 --> 00:29:00,700
coming back and it will still be coming

724
00:29:05,250 --> 00:29:02,620
back through most of next year to finish

725
00:29:06,660 --> 00:29:05,260
the job on that flyby and then we're

726
00:29:08,940 --> 00:29:06,670
gonna look for other targets whether

727
00:29:10,590 --> 00:29:08,950
we'll find one or not depends as much on

728
00:29:12,570 --> 00:29:10,600
Mother Nature's anything else we have

729
00:29:14,430 --> 00:29:12,580
always great giant ground-based

730
00:29:16,590 --> 00:29:14,440
telescopes we have telescopes on board

731
00:29:17,310 --> 00:29:16,600
New Horizons we have the Hubble Space

732
00:29:20,129 --> 00:29:17,320
Telescope

733
00:29:21,960 --> 00:29:20,139
and we're gonna use all of those

734
00:29:24,389 --> 00:29:21,970
techniques to look for another flyby

735
00:29:26,730 --> 00:29:24,399
target still further out billions of

736
00:29:29,850 --> 00:29:26,740
miles further out and we have the fuel

737
00:29:33,060 --> 00:29:29,860
in the power to fly new horizons into

738
00:29:34,799 --> 00:29:33,070

the late 2030s cool we'll probably be

739
00:29:37,350 --> 00:29:34,809
beyond the Kuiper belt by the late 2020s

740
00:29:39,029 --> 00:29:37,360
okay so eight nine years for now but

741
00:29:41,850 --> 00:29:39,039
that's a long time so we're gonna be

742
00:29:44,850 --> 00:29:41,860
looking and we're gonna propose a second

743
00:29:47,820 --> 00:29:44,860
extended mission to go on we made I

744
00:29:51,450 --> 00:29:47,830
think an A+ at Pluto I think we made an

745
00:29:54,240 --> 00:29:51,460
A plus and mu 69 the spacecraft's in

746
00:29:55,560 --> 00:29:54,250
great health and you know that's what we

747
00:29:57,600 --> 00:29:55,570
were sent out here to do is to go

748
00:29:59,580 --> 00:29:57,610
exploring and there's nothing else

749
00:30:01,019 --> 00:29:59,590
coming this way yeah there probably will

750
00:30:03,240 --> 00:30:01,029
be missions in the future but right now

751
00:30:04,710 --> 00:30:03,250
there's not even one that's been

752
00:30:07,560 --> 00:30:04,720
approved to get started

753
00:30:10,169 --> 00:30:07,570
so sure so for a long time this is it

754
00:30:12,779 --> 00:30:10,179
for corporate exploration and we're

755
00:30:15,509 --> 00:30:12,789
gonna milk New Horizons to get as much

756
00:30:18,029 --> 00:30:15,519
out of it as we possibly can because we

757
00:30:20,340 --> 00:30:18,039
put our our brains and our hearts into

758
00:30:24,810 --> 00:30:20,350
building it now it's there we want to

759
00:30:27,720 --> 00:30:24,820
use it sure sure so the past the Clipper

760
00:30:31,139 --> 00:30:27,730
belt is New Horizons set up to kind of

761
00:30:34,080 --> 00:30:31,149
analyze intergalactic space if we get

762
00:30:35,850 --> 00:30:34,090
that far yeah and you know the voyagers

763
00:30:37,669 --> 00:30:35,860

are out there in right interstellar

764
00:30:40,820 --> 00:30:37,679
medium now they're beyond the Suns

765
00:30:44,430 --> 00:30:40,830
kakouton called the heliosphere okay and

766
00:30:45,990 --> 00:30:44,440
there we have the possibility not we

767
00:30:47,519 --> 00:30:46,000
have much more sophisticated sensors on

768
00:30:51,539 --> 00:30:47,529
board than what they could build in the

769
00:30:53,999 --> 00:30:51,549
70s right right right I mean you think

770
00:30:55,560 --> 00:30:54,009
of what a computer was like then it

771
00:30:57,450 --> 00:30:55,570
filled the room and at blinking lights

772
00:31:00,320 --> 00:30:57,460
and it couldn't figure out anything

773
00:31:04,499 --> 00:31:00,330
compared to your you know your iPhone or

774
00:31:06,600 --> 00:31:04,509
droid right but but anyway New Horizons

775
00:31:09,570 --> 00:31:06,610
was built to do this exploration and to

776
00:31:11,129 --> 00:31:09,580
go on much further and not only for the

777
00:31:13,259 --> 00:31:11,139
interstellar exploration but to go

778
00:31:14,909 --> 00:31:13,269
beyond the Kuiper belt and studied the

779
00:31:18,360 --> 00:31:14,919
inner reaches of the so-called Oort

780
00:31:19,889 --> 00:31:18,370
cloud of our solar system are all things

781
00:31:21,590 --> 00:31:19,899
we're really only spaceship that's out

782
00:31:24,840 --> 00:31:21,600
there that can do anything about it

783
00:31:26,730 --> 00:31:24,850
and we want to get as much out of it

784
00:31:29,580 --> 00:31:26,740
we've already paid for it sure the

785
00:31:30,200 --> 00:31:29,590
ongoing cost of operating it every year

786
00:31:32,090 --> 00:31:30,210
you

787
00:31:33,740 --> 00:31:32,100
it's just tiny compared to what it cost

788
00:31:34,220 --> 00:31:33,750

to build it and charge it and fly it out

789
00:31:37,760 --> 00:31:34,230
there

790
00:31:40,610 --> 00:31:37,770
so now you know is just more presents to

791
00:31:42,230 --> 00:31:40,620
unwrap every year does it feel like it's

792
00:31:44,510 --> 00:31:42,240
Christmas every year it feels like it's

793
00:31:45,980 --> 00:31:44,520
Christmas every month on new horizons

794
00:31:47,510 --> 00:31:45,990
awesome because there's new data coming

795
00:31:50,690 --> 00:31:47,520
down all the time so I know you

796
00:31:53,720 --> 00:31:50,700
mentioned your suborbital science

797
00:31:54,980 --> 00:31:53,730
research work obviously new horizons

798
00:31:56,420 --> 00:31:54,990
want to give a tip of the hat again I

799
00:31:58,220 --> 00:31:56,430
think you mentioned I think was at Alice

800
00:32:00,520 --> 00:31:58,230
5 and launched on we did launch at

801
00:32:04,040 --> 00:32:00,530
Launch Alliance we launched an Atlas 5

802
00:32:06,470 --> 00:32:04,050
in 2006 just a few months before the

803
00:32:10,370 --> 00:32:06,480
United Launch Alliance was in business

804
00:32:11,990 --> 00:32:10,380
at that time it was a Lockheed rocket

805
00:32:14,390 --> 00:32:12,000
with a Boeing upper stage Oh interesting

806
00:32:18,140 --> 00:32:14,400
okay and those two companies formed ula

807
00:32:19,850 --> 00:32:18,150
together awesome 50-50 partnership so we

808
00:32:22,160 --> 00:32:19,860
were not under the ula banner when it

809
00:32:25,370 --> 00:32:22,170
launched but when GLA operates the Atlas

810
00:32:27,980 --> 00:32:25,380
line now and and we're very grateful to

811
00:32:29,540 --> 00:32:27,990
all those engineers and executives and

812
00:32:33,110 --> 00:32:29,550
everybody else that worked at Lockheed

813
00:32:35,690 --> 00:32:33,120

and at Boeing to create that launch

814
00:32:37,340 --> 00:32:35,700
vehicle that works so perfectly yeah so

815
00:32:39,950 --> 00:32:37,350
I mean the folks at the Cape that got it

816
00:32:41,570 --> 00:32:39,960
launched and want to also shout out to

817
00:32:43,250 --> 00:32:41,580
the the launch services program folks

818
00:32:46,520 --> 00:32:43,260
involved in that process you know the

819
00:32:49,400 --> 00:32:46,530
LSP was just tremendous for us and we

820
00:32:51,260 --> 00:32:49,410
even had technical challenges with

821
00:32:53,540 --> 00:32:51,270
regard to the rocket because of some

822
00:32:56,840 --> 00:32:53,550
testing taking place on other models and

823
00:32:59,210 --> 00:32:56,850
the LSP team the engineering team at LSP

824
00:33:02,180 --> 00:32:59,220
got us cleared to launch and did it

825
00:33:05,240 --> 00:33:02,190
really under the gun on schedule because

826
00:33:07,670 --> 00:33:05,250
we had to launch in January of 2006 to

827
00:33:10,520 --> 00:33:07,680
get the Jupiter flyby that we talked

828
00:33:12,470 --> 00:33:10,530
about earlier yeah and they didn't skip

829
00:33:14,030 --> 00:33:12,480
any steps but they worked they really

830
00:33:16,310 --> 00:33:14,040
burned the midnight oil to make sure

831
00:33:18,500 --> 00:33:16,320
that that they got their work done in

832
00:33:20,060 --> 00:33:18,510
order to get us cleared to launch so

833
00:33:22,070 --> 00:33:20,070
that we would make that critical launch

834
00:33:23,720 --> 00:33:22,080
window cool amazing job I will never

835
00:33:25,070 --> 00:33:23,730
forget it cool and you're working on

836
00:33:28,670 --> 00:33:25,080
another one of the missions that they're

837
00:33:29,840 --> 00:33:28,680
helping to manage Lucy are a couple Lucy

838
00:33:32,570 --> 00:33:29,850

is one of them on note I think Lucy's

839
00:33:34,340 --> 00:33:32,580
targeted for like a late 2021 launch

840
00:33:37,910 --> 00:33:34,350
date we're gonna launch two years from

841
00:33:40,280 --> 00:33:37,920
this past October ok so just under two

842
00:33:42,590 --> 00:33:40,290
years from now cool on a mission to

843
00:33:43,260 --> 00:33:42,600
explore a class of asteroids called the

844
00:33:45,990 --> 00:33:43,270
Jovian

845
00:33:49,320 --> 00:33:46,000
genes that are actually left over relics

846
00:33:51,960 --> 00:33:49,330
from the formation days of the giant

847
00:33:55,590 --> 00:33:51,970
planets really excited about that and

848
00:33:56,940 --> 00:33:55,600
then involved in Europa clipper we don't

849
00:33:58,920 --> 00:33:56,950
know what it's gonna launch on just yet

850
00:34:01,140 --> 00:33:58,930
it's that that's somebody else's to

851
00:34:02,790 --> 00:34:01,150
decide sure but the spacecraft is coming

852
00:34:05,220 --> 00:34:02,800
along very nicely and it'll be ready to

853
00:34:07,230 --> 00:34:05,230
launch in their early 20s also all right

854
00:34:08,520 --> 00:34:07,240
so I'm gonna hopefully I won't come

855
00:34:10,409 --> 00:34:08,530
across this too ignorant here but all

856
00:34:12,990 --> 00:34:10,419
those things you just mentioned I have

857
00:34:14,520 --> 00:34:13,000
never heard of them before the space are

858
00:34:15,990 --> 00:34:14,530
going to investigate and these giant

859
00:34:18,300 --> 00:34:16,000
planets you speak of can you give me a

860
00:34:19,440 --> 00:34:18,310
little bit more on those well sure sure

861
00:34:21,149 --> 00:34:19,450
so you're going to learn more about them

862
00:34:23,790 --> 00:34:21,159
so you don't know as much as you will in

863
00:34:26,010 --> 00:34:23,800

a couple years from to hell right right

864
00:34:28,260 --> 00:34:26,020
and you know it they are they are

865
00:34:29,760 --> 00:34:28,270
they're gonna be a lot better known once

866
00:34:33,120 --> 00:34:29,770
we go there and they are gonna be more

867
00:34:34,710 --> 00:34:33,130
in the public consciousness certain just

868
00:34:37,290 --> 00:34:34,720
as other worlds that are closer to home

869
00:34:42,300 --> 00:34:37,300
got explored now you know we know about

870
00:34:44,850 --> 00:34:42,310
them the Jovian Trojans are a vast field

871
00:34:47,130 --> 00:34:44,860
of asteroids that orbit in Jupiter's

872
00:34:49,590 --> 00:34:47,140
orbit they were trapped by Jupiter's

873
00:34:52,230 --> 00:34:49,600
gravity in these stable pockets that

874
00:34:55,050 --> 00:34:52,240
lead and trail the giant planet Jupiter

875
00:34:56,850 --> 00:34:55,060
and but but what's important is not

876
00:35:00,630 --> 00:34:56,860
where they orbit and how they got

877
00:35:03,000 --> 00:35:00,640
trapped it's that they were they are

878
00:35:05,100 --> 00:35:03,010
samples leftover from the formation days

879
00:35:09,420 --> 00:35:05,110
of the giant planets and they have been

880
00:35:16,830 --> 00:35:09,430
kept in this deep freeze of space like a

881
00:35:20,160 --> 00:35:16,840
perfect preservation of the chemistry

882
00:35:22,140 --> 00:35:20,170
and the formation conditions of these

883
00:35:23,430 --> 00:35:22,150
bodies that will teach us about not only

884
00:35:25,110 --> 00:35:23,440
how the giant planets formed bit about

885
00:35:27,000 --> 00:35:25,120
the bombardment of the earth how

886
00:35:29,070 --> 00:35:27,010
volatiles and organics were originally

887
00:35:31,650 --> 00:35:29,080
transported to the terrestrial planets

888
00:35:35,730 --> 00:35:31,660

including the earth and you know just

889
00:35:37,860 --> 00:35:35,740
from a scientific standpoint it come to

890
00:35:40,260 --> 00:35:37,870
be how did it come to be arranged this

891
00:35:43,050 --> 00:35:40,270
way so this is a very important mission

892
00:35:47,490 --> 00:35:43,060
and it's a relatively low cost planetary

893
00:35:50,460 --> 00:35:47,500
mission New Horizons was only about a

894
00:35:52,350 --> 00:35:50,470
quarter as expensive as Voyager Lucie is

895
00:35:54,480 --> 00:35:52,360
half as expensive his new horizon Wow

896
00:35:57,630 --> 00:35:54,490
and then Europa clipper is a bigger

897
00:35:59,430 --> 00:35:57,640
mission with much more bristling

898
00:36:01,950 --> 00:35:59,440
scientific payload than either new

899
00:36:04,200 --> 00:36:01,960
Verizon's or Lucy but it's going to do

900
00:36:07,320 --> 00:36:04,210
one of the most important things in the

901
00:36:09,960 --> 00:36:07,330
entirety of space science which is look

902
00:36:12,300 --> 00:36:09,970
for habitable environments these oceans

903
00:36:16,440 --> 00:36:12,310
that are so prevalent in the outer solar

904
00:36:18,270 --> 00:36:16,450
system beneath the ice of satellites of

905
00:36:19,859 --> 00:36:18,280
the giant planets that matter Pluto we

906
00:36:22,109 --> 00:36:19,869
think almost certainly has an ocean on

907
00:36:24,330 --> 00:36:22,119
the inside - these could be abodes for

908
00:36:28,109 --> 00:36:24,340
life and much more hospitable in many

909
00:36:29,850 --> 00:36:28,119
ways than the surface of Mars so even

910
00:36:32,370 --> 00:36:29,860
though they're farther away they have a

911
00:36:35,280 --> 00:36:32,380
higher astrobiological potential and

912
00:36:38,100 --> 00:36:35,290
we're just beginning their real

913
00:36:40,230 --> 00:36:38,110

exploration Europa clipper pardon the

914
00:36:44,310 --> 00:36:40,240
pun but it's it's the icebreaker mission

915
00:36:46,020 --> 00:36:44,320
for this whole field awesome we're just

916
00:36:48,810 --> 00:36:46,030
about out of time but I want to ask you

917
00:36:51,690 --> 00:36:48,820
dr. stern without your crystal ball for

918
00:36:53,820 --> 00:36:51,700
a second and tell me if you look forward

919
00:36:55,770 --> 00:36:53,830
kind of as you see exploration in space

920
00:36:57,450 --> 00:36:55,780
the next 10 years what's the most

921
00:37:03,000 --> 00:36:57,460
exciting thing we see happen in the next

922
00:37:05,640 --> 00:37:03,010
decade wow you made that so hard by MIT

923
00:37:06,870 --> 00:37:05,650
I I don't know how to pick one thing I I

924
00:37:08,880 --> 00:37:06,880
mean we'll get a couple then you may

925
00:37:11,250 --> 00:37:08,890
come home I just think that the advent

926
00:37:12,780 --> 00:37:11,260
of space tourism in which so many people

927
00:37:14,790 --> 00:37:12,790
from different walks of life are gonna

928
00:37:16,170 --> 00:37:14,800
get to do it only test pilots and

929
00:37:18,359 --> 00:37:16,180
scientists could do which is see the

930
00:37:21,330 --> 00:37:18,369
Earth from space and and maybe even in

931
00:37:24,540 --> 00:37:21,340
ten years even have have tourists that

932
00:37:27,570 --> 00:37:24,550
have been in the moon is going to be

933
00:37:29,580 --> 00:37:27,580
game-changing I think the development of

934
00:37:31,859 --> 00:37:29,590
a lunar outpost over the next 10 years

935
00:37:34,230 --> 00:37:31,869
even the very earliest stages of it like

936
00:37:36,270 --> 00:37:34,240
when the ISS was you know this tiny

937
00:37:38,849 --> 00:37:36,280
little thing in Earth orbit is gonna be

938
00:37:41,580 --> 00:37:38,859

very powerful the advent of worldwide

939
00:37:43,410 --> 00:37:41,590
internet we're not just the first world

940
00:37:45,720 --> 00:37:43,420
and second world nations but everybody

941
00:37:48,720 --> 00:37:45,730
on the earth is connected is gonna be

942
00:37:51,780 --> 00:37:48,730
very powerful yeah the search for life

943
00:37:54,170 --> 00:37:51,790
and habitability around other worlds in

944
00:37:56,910 --> 00:37:54,180
our solar system and across the galaxy

945
00:37:58,620 --> 00:37:56,920
that's another game-changer and that's

946
00:38:00,540 --> 00:37:58,630
before the things we haven't thought of

947
00:38:02,970 --> 00:38:00,550
you know what comes out of nowhere the

948
00:38:04,470 --> 00:38:02,980
way that people didn't really predict

949
00:38:07,109 --> 00:38:04,480
the internet but then it happened and it

950
00:38:09,150 --> 00:38:07,119
changed the world I think all of this is

951
00:38:11,130 --> 00:38:09,160
gonna be happening in the 20s it is it

952
00:38:14,309 --> 00:38:11,140
is just the most exciting time for space

953
00:38:16,200 --> 00:38:14,319
there's ever been alright dr. stern if

954
00:38:17,370 --> 00:38:16,210
people want to learn more about what

955
00:38:18,210 --> 00:38:17,380
you're doing and kind of keep track of

956
00:38:20,190 --> 00:38:18,220
what you're up to

957
00:38:21,870 --> 00:38:20,200
how can they follow you well I guess

958
00:38:24,359 --> 00:38:21,880
it's like anybody else you can go to my

959
00:38:29,009 --> 00:38:24,369
website Allen Stern space that's alien

960
00:38:31,680 --> 00:38:29,019
st ER n dot SP AC e and I have a Twitter

961
00:38:34,519 --> 00:38:31,690
feed and that's just at Allen Stern

962
00:38:36,599 --> 00:38:34,529
ailing and ste RN thanks for asking

963
00:38:38,400 --> 00:38:36,609

awesome well as you head out I don't

964
00:38:40,019 --> 00:38:38,410
think you're going for necessarily just

965
00:38:41,999 --> 00:38:40,029
touristy purposes but enjoy your time

966
00:38:43,620 --> 00:38:42,009
and space suborbital flight here sooner

967
00:38:45,029 --> 00:38:43,630
than later good luck with Lucien the

968
00:38:46,289 --> 00:38:45,039
other missions you've got coming up dr.

969
00:38:49,079 --> 00:38:46,299
Stearn thanks for joining me thank you

970
00:38:50,789 --> 00:38:49,089
so much Joshua I'm Joshua Santora and

971
00:38:52,620 --> 00:38:50,799
that's our show thanks for stopping by

972
00:38:55,170 --> 00:38:52,630
the rocket ranch and special thanks to

973
00:38:57,420 --> 00:38:55,180
my guest dr. Alan Stern to learn more

974
00:38:59,640 --> 00:38:57,430
about new horizons visit nasa.gov slash

975
00:39:00,960 --> 00:38:59,650
new horizons and to learn more about

976
00:39:03,410 --> 00:39:00,970
everything going on for Kennedy Space

977
00:39:05,759 --> 00:39:03,420
Center go to nasa.gov slash Kennedy

978
00:39:06,809 --> 00:39:05,769
check out NASA's other podcasts to learn

979
00:39:09,890 --> 00:39:06,819
more about what's happening in all of

980
00:39:11,970 --> 00:39:09,900
our centers at nasa.gov slash podcasts a

981
00:39:13,739 --> 00:39:11,980
special shout out to our producer John

982
00:39:16,499 --> 00:39:13,749
Sackman our sound man Lorne a tree

983
00:39:19,140 --> 00:39:16,509
editor Michelle stone and special thanks

984
00:39:21,269 --> 00:39:19,150
to Mary McLaughlin and remember on the

985
00:39:22,190 --> 00:39:21,279
rocket ranch even the sky isn't the