
NASA
Ames R
ch Center
as ov/ames

1
00:00:14,950 --> 00:00:13,350
[Music]

2
00:00:16,470 --> 00:00:14,960
well good afternoon my name is duane

3
00:00:19,029 --> 00:00:16,480
brown with nasa headquarters office of

4
00:00:22,710 --> 00:00:19,039
communications we're coming to you from

5
00:00:25,349 --> 00:00:22,720
the museum here in the nation's capital

6
00:00:27,349 --> 00:00:25,359
our first briefing featured

7
00:00:30,310 --> 00:00:27,359
assets and being prepared the second and

8
00:00:32,069 --> 00:00:30,320
last briefing is about the science you

9
00:00:35,110 --> 00:00:32,079
really don't want to miss this we've got

10
00:00:36,790 --> 00:00:35,120
some very very excited and some pretty

11
00:00:38,709 --> 00:00:36,800
interesting things happening in the

12
00:00:40,470 --> 00:00:38,719
science community

13
00:00:41,910 --> 00:00:40,480

we'll have brief presentations then

14
00:00:44,150 --> 00:00:41,920
we'll open up for questions starting

15
00:00:46,630 --> 00:00:44,160
here at the museum and on our phone

16
00:00:50,069 --> 00:00:46,640
lines and of course social media

17
00:00:52,389 --> 00:00:50,079
social media hashtag eclipse2017

18
00:00:55,270 --> 00:00:52,399
but also everything that you hear and

19
00:00:58,389 --> 00:00:55,280
much much more on the websites at nasa

20
00:01:03,510 --> 00:01:01,910
eclipse live and remember nasa.gov

21
00:01:06,149 --> 00:01:03,520
eclipse live

22
00:01:11,109 --> 00:01:06,159
the live nasa television for the august

23
00:01:13,190 --> 00:01:11,119
21 19 1999 99. sorry 99 years in the

24
00:01:14,630 --> 00:01:13,200
making i've got a lot on my mind here

25
00:01:17,670 --> 00:01:14,640
i'm waiting for the scientists that got

26
00:01:19,429 --> 00:01:17,680
me excited 99 years in the making a

27
00:01:21,190 --> 00:01:19,439
total solar eclipse across america we're

28
00:01:22,710 --> 00:01:21,200
going to talk about the science

29
00:01:24,710 --> 00:01:22,720
i'm going to introduce our panelists and

30
00:01:26,950 --> 00:01:24,720
then i'm going to turn it over to thomas

31
00:01:27,830 --> 00:01:26,960
who has joined us again and he's got his

32
00:01:29,030 --> 00:01:27,840
uh

33
00:01:31,910 --> 00:01:29,040
interesting

34
00:01:33,670 --> 00:01:31,920
attire on he's changed on me today um

35
00:01:36,069 --> 00:01:33,680
and of course social media send those

36
00:01:37,990 --> 00:01:36,079
questions in

37
00:01:40,789 --> 00:01:38,000
eclipse 2017 and we're going to get to

38
00:01:42,069 --> 00:01:40,799

those so i'm excited about the science

39
00:01:45,109 --> 00:01:42,079
so let me introduce you to these

40
00:01:47,910 --> 00:01:45,119
incredible scientists um thomas zubukin

41
00:01:50,950 --> 00:01:47,920
uh back again uh nice red i think that

42
00:01:52,149 --> 00:01:50,960
means something there uh the associate

43
00:01:55,749 --> 00:01:52,159
administrator for science mission

44
00:01:57,670 --> 00:01:55,759
directorate at nasa headquarters

45
00:01:59,270 --> 00:01:57,680
angela desjardins

46
00:02:01,270 --> 00:01:59,280
principal investigator of the eclipse

47
00:02:04,950 --> 00:02:01,280
ballooning project at montana state

48
00:02:08,710 --> 00:02:07,109
going out to the west coast

49
00:02:10,790 --> 00:02:08,720
linda shaw

50
00:02:16,550 --> 00:02:10,800
executive director of the astronomical

51
00:02:21,030 --> 00:02:18,790
dave boboltz

52
00:02:23,270 --> 00:02:21,040
program director of solar physics

53
00:02:25,270 --> 00:02:23,280
in the division of astronomical sciences

54
00:02:29,670 --> 00:02:25,280
at the national science foundation in

55
00:02:33,509 --> 00:02:31,589
angela speck

56
00:02:35,110 --> 00:02:33,519
she has many titles

57
00:02:36,470 --> 00:02:35,120
professor of astrophysics and director

58
00:02:40,470 --> 00:02:36,480
of astronomy at the university of

59
00:02:43,430 --> 00:02:42,070
matt penn

60
00:02:46,070 --> 00:02:43,440
astronomer

61
00:02:48,550 --> 00:02:46,080
national soil observatory in tucson

62
00:02:50,309 --> 00:02:48,560
arizona and with that to facilitate the

63
00:02:51,589 --> 00:02:50,319

discussion i'll turn it back over to you

64
00:02:53,110 --> 00:02:51,599
thomas

65
00:02:54,949 --> 00:02:53,120
well i'm really excited to be part of

66
00:02:56,949 --> 00:02:54,959
this panel just because science is such

67
00:02:58,229 --> 00:02:56,959
an important part of being an eclipse

68
00:03:00,710 --> 00:02:58,239
and i'm going to kick off some

69
00:03:02,710 --> 00:03:00,720
presentations here about specific topics

70
00:03:05,190 --> 00:03:02,720
and angela i'd like to start with you

71
00:03:07,350 --> 00:03:05,200
really talking about observing the

72
00:03:09,750 --> 00:03:07,360
eclipse from the edge of space go for it

73
00:03:11,830 --> 00:03:09,760
angela absolutely

74
00:03:12,949 --> 00:03:11,840
the goal of the eclipse ballooning

75
00:03:16,070 --> 00:03:12,959
project

76
00:03:18,390 --> 00:03:16,080
is to connect to a basic human sense of

77
00:03:21,350 --> 00:03:18,400
wonder by providing

78
00:03:23,910 --> 00:03:21,360
live footage from the edge of space

79
00:03:26,710 --> 00:03:23,920
so how did this edge of space footage

80
00:03:29,270 --> 00:03:26,720
come about how did the idea come about

81
00:03:31,509 --> 00:03:29,280
about four years ago i was doing my

82
00:03:32,470 --> 00:03:31,519
daily approval of the news and i saw a

83
00:03:33,990 --> 00:03:32,480
story

84
00:03:36,070 --> 00:03:34,000
about a pilot

85
00:03:38,789 --> 00:03:36,080
who accomplished the really difficult

86
00:03:39,910 --> 00:03:38,799
task of getting his plane in just the

87
00:03:43,030 --> 00:03:39,920
right place

88
00:03:45,110 --> 00:03:43,040

at just the right time over an ocean

89
00:03:48,229 --> 00:03:45,120
so that his passengers could see the

90
00:03:50,390 --> 00:03:48,239
total solar eclipse from the air

91
00:03:51,670 --> 00:03:50,400
my first reaction was

92
00:03:53,670 --> 00:03:51,680
huh

93
00:03:55,910 --> 00:03:53,680
why would they do that why would they

94
00:03:58,390 --> 00:03:55,920
not just sit in a boat in the ocean and

95
00:04:00,710 --> 00:03:58,400
wait for the eclipse to come across

96
00:04:03,670 --> 00:04:00,720
there must be something special about

97
00:04:04,710 --> 00:04:03,680
seeing the eclipse from the air

98
00:04:05,509 --> 00:04:04,720
so

99
00:04:08,070 --> 00:04:05,519
i

100
00:04:08,949 --> 00:04:08,080
thought

101
00:04:11,270 --> 00:04:08,959
hmm

102
00:04:14,070 --> 00:04:11,280
if the eclipse is more interesting from

103
00:04:17,349 --> 00:04:14,080
the air than from the ground what would

104
00:04:19,270 --> 00:04:17,359
it be like from a high altitude balloon

105
00:04:22,710 --> 00:04:19,280
where you can see the curvature of the

106
00:04:25,270 --> 00:04:22,720
earth and the blackness of space

107
00:04:27,430 --> 00:04:25,280
i did some research and i found out that

108
00:04:29,430 --> 00:04:27,440
one group had taken

109
00:04:31,590 --> 00:04:29,440
footage from a high-altitude balloon of

110
00:04:34,950 --> 00:04:31,600
a total solar eclipse before with the

111
00:04:37,270 --> 00:04:34,960
gopro from australia in 2012.

112
00:04:38,150 --> 00:04:37,280
and indeed the footage from that vantage

113
00:04:41,590 --> 00:04:38,160

point

114
00:04:43,110 --> 00:04:41,600
seeing the shadow of the moon crossing

115
00:04:45,270 --> 00:04:43,120
across the earth

116
00:04:47,430 --> 00:04:45,280
was spectacular

117
00:04:49,430 --> 00:04:47,440
if you can show the first video please

118
00:04:52,310 --> 00:04:49,440
this is some footage of some students

119
00:04:54,310 --> 00:04:52,320
launching heil 2 balloons

120
00:04:56,870 --> 00:04:54,320
so with my work with nasa education i

121
00:04:58,629 --> 00:04:56,880
also knew that there were over 100

122
00:05:00,710 --> 00:04:58,639
student-led high-altitude looning

123
00:05:02,469 --> 00:05:00,720
programs across the country

124
00:05:04,790 --> 00:05:02,479
so the idea occurred to me that we could

125
00:05:07,270 --> 00:05:04,800
bring these student teams together and

126
00:05:10,230 --> 00:05:07,280
provide awe-inspiring edge of space

127
00:05:12,469 --> 00:05:10,240
footage to the public for the 2017 total

128
00:05:15,350 --> 00:05:12,479
solar eclipse

129
00:05:17,590 --> 00:05:15,360
but i knew that for the footage to

130
00:05:20,390 --> 00:05:17,600
really have an impact

131
00:05:23,430 --> 00:05:20,400
it would have to be live

132
00:05:25,590 --> 00:05:23,440
therefore we took the nasa science

133
00:05:27,749 --> 00:05:25,600
mission directorate and nasa space grant

134
00:05:30,230 --> 00:05:27,759
and teamed them together to create the

135
00:05:33,430 --> 00:05:30,240
eclipsable learning project

136
00:05:35,510 --> 00:05:33,440
a project that at the time we had no

137
00:05:38,469 --> 00:05:35,520
idea how to do

138
00:05:40,070 --> 00:05:38,479

nobody had ever live stream video from

139
00:05:43,110 --> 00:05:40,080
one high altitude balloon of a total

140
00:05:45,510 --> 00:05:43,120
solar eclipse before let alone dozens

141
00:05:47,830 --> 00:05:45,520
across a continent

142
00:05:50,390 --> 00:05:47,840
luckily an affinity for solving tricky

143
00:05:53,189 --> 00:05:50,400
problems is exactly what draws students

144
00:05:56,710 --> 00:05:53,199
into science and engineering fields

145
00:05:58,950 --> 00:05:56,720
if you can play the next video please

146
00:06:01,270 --> 00:05:58,960
so after a lot of hard work

147
00:06:02,629 --> 00:06:01,280
we have over 50 student teams from

148
00:06:05,189 --> 00:06:02,639
across the country

149
00:06:07,270 --> 00:06:05,199
ready to stream high altitude video from

150
00:06:09,189 --> 00:06:07,280
dozens of locations across the path of

151
00:06:10,150 --> 00:06:09,199
totality

152
00:06:11,909 --> 00:06:10,160
sharing

153
00:06:14,150 --> 00:06:11,919
inspiring

154
00:06:15,430 --> 00:06:14,160
imagination sparking footage

155
00:06:16,550 --> 00:06:15,440
with the public

156
00:06:17,830 --> 00:06:16,560
live

157
00:06:20,870 --> 00:06:17,840
we hope you check out our footage on

158
00:06:23,189 --> 00:06:20,880
eclipse day thanks

159
00:06:25,510 --> 00:06:23,199
thanks so much uh angela and what i'm

160
00:06:28,710 --> 00:06:25,520
going to do now is i kick it over to

161
00:06:30,629 --> 00:06:28,720
linda who is talking about taking this

162
00:06:32,390 --> 00:06:30,639
eclipse as an opportunity to learn and

163
00:06:35,990 --> 00:06:32,400

also to inspire the next generation of

164
00:06:38,390 --> 00:06:36,000
scientists linda take it away

165
00:06:40,550 --> 00:06:38,400
hi thanks it's great to be here

166
00:06:41,590 --> 00:06:40,560
so i wanted to talk just a little bit

167
00:06:43,430 --> 00:06:41,600
about

168
00:06:45,189 --> 00:06:43,440
not the current eclipse coming up but

169
00:06:47,749 --> 00:06:45,199
one from the past that was really

170
00:06:51,110 --> 00:06:47,759
interesting to forming my society the

171
00:06:52,710 --> 00:06:51,120
astronomical society of the pacific and

172
00:06:55,189 --> 00:06:52,720
i think it's an interesting one to look

173
00:06:57,029 --> 00:06:55,199
at in terms of the science

174
00:06:59,589 --> 00:06:57,039
every eclipse

175
00:07:02,469 --> 00:06:59,599
tells scientists something new about the

176
00:07:04,150 --> 00:07:02,479
sun and allows scientists to use new

177
00:07:05,510 --> 00:07:04,160
techniques and this eclipse is no

178
00:07:07,510 --> 00:07:05,520
different and the scientists on the

179
00:07:11,270 --> 00:07:07,520
panel are going to talk about that

180
00:07:12,710 --> 00:07:11,280
but think about eclipses prior to having

181
00:07:14,790 --> 00:07:12,720
photography

182
00:07:17,430 --> 00:07:14,800
eclipses were studied the beautiful

183
00:07:19,589 --> 00:07:17,440
corona was observed

184
00:07:21,589 --> 00:07:19,599
but you couldn't photograph what what

185
00:07:23,749 --> 00:07:21,599
they did was they sketched

186
00:07:25,990 --> 00:07:23,759
scientists would sketch and i thought

187
00:07:28,230 --> 00:07:26,000
about that and i realized well that's

188
00:07:30,309 --> 00:07:28,240

kind of difficult it's pitch dark during

189
00:07:31,830 --> 00:07:30,319
an eclipse your heart's racing because

190
00:07:33,909 --> 00:07:31,840
you're excited and here you are with a

191
00:07:35,990 --> 00:07:33,919
pen trying to sketch the corona

192
00:07:39,270 --> 00:07:36,000
or you'd have to do it from memory

193
00:07:42,550 --> 00:07:39,280
but there was an eclipse in 1889 the new

194
00:07:44,629 --> 00:07:42,560
year's day eclipse which passed through

195
00:07:46,950 --> 00:07:44,639
california it didn't go coast to coast

196
00:07:49,270 --> 00:07:46,960
the way this one is going to but it

197
00:07:51,510 --> 00:07:49,280
passed north of san francisco and then

198
00:07:54,869 --> 00:07:51,520
took a curve and went through montana

199
00:07:57,110 --> 00:07:54,879
the dakotas and then on into canada

200
00:07:59,589 --> 00:07:57,120
on that eclipse there was a group of

201
00:08:02,790 --> 00:07:59,599
intrepid amateur astronomers with their

202
00:08:05,189 --> 00:08:02,800
telescopes who joined forces with a

203
00:08:06,790 --> 00:08:05,199
photography society in san francisco

204
00:08:08,629 --> 00:08:06,800
brand new these were

205
00:08:10,950 --> 00:08:08,639
folks who got their cameras and were

206
00:08:13,029 --> 00:08:10,960
super excited about this new technology

207
00:08:14,629 --> 00:08:13,039
they joined forces and went north into

208
00:08:17,270 --> 00:08:14,639
the wine country

209
00:08:20,550 --> 00:08:17,280
and the next slide or this slide

210
00:08:23,270 --> 00:08:20,560
shows one of the first photographs ever

211
00:08:25,670 --> 00:08:23,280
taken of an eclipse this particular one

212
00:08:27,990 --> 00:08:25,680
is a time exposure

213
00:08:30,230 --> 00:08:28,000

showing the different

214
00:08:33,589 --> 00:08:30,240
phases the partial phases approaching

215
00:08:36,149 --> 00:08:33,599
totality and imagine how excited this

216
00:08:38,790 --> 00:08:36,159
photographer was to develop this plate

217
00:08:41,350 --> 00:08:38,800
and for the first time capture the

218
00:08:43,909 --> 00:08:41,360
partial phases of an eclipse this was

219
00:08:45,190 --> 00:08:43,919
really remarkable and what happened

220
00:08:48,310 --> 00:08:45,200
after this

221
00:08:50,310 --> 00:08:48,320
is what is the group of amateurs and

222
00:08:51,509 --> 00:08:50,320
professionals went back to san francisco

223
00:08:53,350 --> 00:08:51,519
a month later

224
00:08:54,389 --> 00:08:53,360
shared their photographs shared what

225
00:08:57,269 --> 00:08:54,399
they'd learned

226
00:08:59,190 --> 00:08:57,279
and they had such a great time

227
00:09:01,430 --> 00:08:59,200
forming this community that they decided

228
00:09:03,829 --> 00:09:01,440
that very evening to form a society the

229
00:09:05,430 --> 00:09:03,839
astronomical society of the pacific

230
00:09:08,790 --> 00:09:05,440
and

231
00:09:11,110 --> 00:09:08,800
while we were once a small provincial

232
00:09:14,070 --> 00:09:11,120
society located in san francisco this is

233
00:09:16,310 --> 00:09:14,080
our 128th year now we're a national

234
00:09:18,949 --> 00:09:16,320
society and we're actually dedicated to

235
00:09:20,790 --> 00:09:18,959
education and outreach and helping

236
00:09:23,269 --> 00:09:20,800
people of every kind whether they be

237
00:09:24,470 --> 00:09:23,279
children students teachers

238
00:09:26,150 --> 00:09:24,480

professors

239
00:09:29,030 --> 00:09:26,160
college teachers

240
00:09:31,430 --> 00:09:29,040
rangers girl scout leaders everybody

241
00:09:33,430 --> 00:09:31,440
learn astronomy and be able to share

242
00:09:34,829 --> 00:09:33,440
that knowledge with other people and

243
00:09:36,870 --> 00:09:34,839
that's what we're

244
00:09:38,550 --> 00:09:36,880
about so

245
00:09:40,389 --> 00:09:38,560
this particular eclipse and you're going

246
00:09:41,509 --> 00:09:40,399
to hear this later from the scientists

247
00:09:43,910 --> 00:09:41,519
as well

248
00:09:46,389 --> 00:09:43,920
is going to excite a lot of people and

249
00:09:50,310 --> 00:09:46,399
many of them watching this eclipse may

250
00:09:53,030 --> 00:09:50,320
choose astronomy as a career i did in

251
00:09:54,630 --> 00:09:53,040
1979 a partial eclipse of the sun was

252
00:09:57,030 --> 00:09:54,640
visible in san francisco i was a

253
00:09:59,190 --> 00:09:57,040
broadcasting major i happened to be

254
00:10:02,389 --> 00:09:59,200
interested in science and i took a bunch

255
00:10:05,190 --> 00:10:02,399
of tools to the student union and showed

256
00:10:06,710 --> 00:10:05,200
people how to watch a partial eclipse

257
00:10:07,829 --> 00:10:06,720
safely most people didn't even know it

258
00:10:09,110 --> 00:10:07,839
was happening

259
00:10:10,550 --> 00:10:09,120
so with me

260
00:10:12,389 --> 00:10:10,560
i had

261
00:10:14,550 --> 00:10:12,399
eclipse glasses which were very

262
00:10:16,069 --> 00:10:14,560
important for viewing the partial phases

263
00:10:18,389 --> 00:10:16,079

and people were amazed that they could

264
00:10:20,470 --> 00:10:18,399
look at the sun and see it

265
00:10:23,910 --> 00:10:20,480
i had ways to project

266
00:10:27,030 --> 00:10:23,920
the image onto cardboard using

267
00:10:30,069 --> 00:10:27,040
pinholes using tiny holes and allowing a

268
00:10:32,630 --> 00:10:30,079
single image of the sun to appear on a

269
00:10:34,069 --> 00:10:32,640
piece of white cardboard and then you

270
00:10:36,949 --> 00:10:34,079
can have a lot of fun and if you have a

271
00:10:39,030 --> 00:10:36,959
lot of holes like a colander you can

272
00:10:41,110 --> 00:10:39,040
project many many many images of the

273
00:10:43,190 --> 00:10:41,120
partial phases

274
00:10:45,269 --> 00:10:43,200
so that got me hooked that day i decided

275
00:10:47,590 --> 00:10:45,279
not only to become an astronomer but to

276
00:10:49,110 --> 00:10:47,600
become an astronomy educator because it

277
00:10:51,430 --> 00:10:49,120
was really

278
00:10:53,190 --> 00:10:51,440
revelatory for me to change the lives of

279
00:10:54,710 --> 00:10:53,200
these people that were watching the

280
00:10:56,870 --> 00:10:54,720
eclipse with me

281
00:10:58,389 --> 00:10:56,880
so let me show you a little bit about

282
00:10:59,990 --> 00:10:58,399
what's going to happen

283
00:11:00,949 --> 00:11:00,000
for this eclipse so if i can have the

284
00:11:02,710 --> 00:11:00,959
slide

285
00:11:03,990 --> 00:11:02,720
see a lot of you have already seen this

286
00:11:06,389 --> 00:11:04,000
this shows

287
00:11:08,230 --> 00:11:06,399
the path of totality across the u.s

288
00:11:10,470 --> 00:11:08,240

starting in oregon

289
00:11:13,030 --> 00:11:10,480
in an hour and a half little

290
00:11:15,509 --> 00:11:13,040
the shadow will traverse the u.s and

291
00:11:17,269 --> 00:11:15,519
exit in the carolinas but what i'd like

292
00:11:19,670 --> 00:11:17,279
you to pay attention to

293
00:11:22,389 --> 00:11:19,680
are the partial phases there are many

294
00:11:24,550 --> 00:11:22,399
many many millions of people who are not

295
00:11:27,590 --> 00:11:24,560
going to get to the path of totality

296
00:11:30,069 --> 00:11:27,600
because of time because of money lack of

297
00:11:32,389 --> 00:11:30,079
resources transportation there's lots of

298
00:11:34,150 --> 00:11:32,399
reasons people can't travel

299
00:11:37,430 --> 00:11:34,160
the eclipse is going to be just as

300
00:11:39,430 --> 00:11:37,440
magical for them if we can provide them

301
00:11:40,870 --> 00:11:39,440
with the materials they need to see the

302
00:11:42,630 --> 00:11:40,880
eclipse safely

303
00:11:44,710 --> 00:11:42,640
and we can use this as a teaching moment

304
00:11:46,870 --> 00:11:44,720
this is an opportunity to reach out to

305
00:11:49,110 --> 00:11:46,880
youth across the country and teach them

306
00:11:50,870 --> 00:11:49,120
a little astronomy because as this

307
00:11:53,990 --> 00:11:50,880
partial is unfolding so take a look at

308
00:11:56,790 --> 00:11:54,000
the map you'll see most of the in fact

309
00:12:00,870 --> 00:11:56,800
all of the continental u.s sees at least

310
00:12:03,590 --> 00:12:00,880
a 70 percent partial eclipse 70 of the

311
00:12:04,790 --> 00:12:03,600
sun will be obscured by the moon

312
00:12:06,870 --> 00:12:04,800
now find

313
00:12:09,829 --> 00:12:06,880

the place where you live on the map

314
00:12:12,230 --> 00:12:09,839
maybe you live in detroit

315
00:12:13,670 --> 00:12:12,240
new orleans the rural parts of new

316
00:12:15,350 --> 00:12:13,680
mexico

317
00:12:17,670 --> 00:12:15,360
all of you are going to be able to

318
00:12:19,430 --> 00:12:17,680
experience this partial

319
00:12:21,990 --> 00:12:19,440
at the astronomical society of the

320
00:12:26,230 --> 00:12:22,000
pacific we particularly are interested

321
00:12:28,550 --> 00:12:26,240
in reaching underserved communities and

322
00:12:30,550 --> 00:12:28,560
children who

323
00:12:32,710 --> 00:12:30,560
represent communities underrepresented

324
00:12:34,870 --> 00:12:32,720
in science we want to make sure that

325
00:12:37,269 --> 00:12:34,880
those kids are engaged fully in the

326
00:12:39,269 --> 00:12:37,279
eclipse even if it's a partial so that

327
00:12:41,430 --> 00:12:39,279
they might be decide to become an

328
00:12:42,230 --> 00:12:41,440
astronomer like i did

329
00:12:43,509 --> 00:12:42,240
so

330
00:12:44,389 --> 00:12:43,519
what i have

331
00:12:47,110 --> 00:12:44,399
is

332
00:12:49,030 --> 00:12:47,120
some examples of

333
00:12:50,949 --> 00:12:49,040
activities that the astronomical society

334
00:12:53,110 --> 00:12:50,959
of the pacific has developed and

335
00:12:55,030 --> 00:12:53,120
disseminated across the country to make

336
00:12:56,629 --> 00:12:55,040
sure that kids are engaged

337
00:12:58,470 --> 00:12:56,639
let me give you an example of one in the

338
00:12:59,509 --> 00:12:58,480

interest of time

339
00:13:01,350 --> 00:12:59,519
so

340
00:13:04,230 --> 00:13:01,360
what i'm holding up

341
00:13:08,870 --> 00:13:04,240
is a scale model of the earth and moon

342
00:13:10,470 --> 00:13:08,880
on a series of rulers so let me explain

343
00:13:12,870 --> 00:13:10,480
this is the moon

344
00:13:16,150 --> 00:13:12,880
this is the earth over on that side

345
00:13:18,710 --> 00:13:16,160
and you'll notice that the earth is a

346
00:13:22,629 --> 00:13:18,720
one-inch diameter marble

347
00:13:25,190 --> 00:13:22,639
and 30 inches away 30 earths laid end to

348
00:13:27,269 --> 00:13:25,200
end is where we place the moon and the

349
00:13:28,949 --> 00:13:27,279
moon is a quarter of the diameter so

350
00:13:30,389 --> 00:13:28,959
this is a quarter of an inch quarter of

351
00:13:33,110 --> 00:13:30,399
a diameter

352
00:13:35,110 --> 00:13:33,120
of the earth so this is an actual scale

353
00:13:37,910 --> 00:13:35,120
model first of all you might be

354
00:13:40,230 --> 00:13:37,920
surprised because a lot lots of the

355
00:13:42,550 --> 00:13:40,240
pictures and images you normally see the

356
00:13:44,870 --> 00:13:42,560
earth is and moon are much closer

357
00:13:45,990 --> 00:13:44,880
together than this but this is the

358
00:13:49,110 --> 00:13:46,000
actual

359
00:13:51,030 --> 00:13:49,120
distance in size so that's a learning

360
00:13:53,829 --> 00:13:51,040
experience in and of itself and now we

361
00:13:55,269 --> 00:13:53,839
can use this to actually model what's

362
00:13:59,509 --> 00:13:55,279
going to happen

363
00:14:00,949 --> 00:13:59,519

in terms of the shadow of the moon

364
00:14:02,069 --> 00:14:00,959
hitting the earth and what that's going

365
00:14:04,790 --> 00:14:02,079
to look like because you've got

366
00:14:06,629 --> 00:14:04,800
everything to scale so the sun and the

367
00:14:08,150 --> 00:14:06,639
shadows are going to work to scale too

368
00:14:09,350 --> 00:14:08,160
so what you can do is you take this

369
00:14:11,030 --> 00:14:09,360
outside

370
00:14:11,910 --> 00:14:11,040
and the tricky part

371
00:14:14,470 --> 00:14:11,920
is

372
00:14:15,590 --> 00:14:14,480
you use the actual sun in the sky

373
00:14:18,389 --> 00:14:15,600
and you

374
00:14:20,550 --> 00:14:18,399
manipulate this stick so that the shadow

375
00:14:22,069 --> 00:14:20,560
of the moon is cast

376
00:14:24,150 --> 00:14:22,079
on the earth

377
00:14:26,310 --> 00:14:24,160
and i can't do that in studio because i

378
00:14:27,670 --> 00:14:26,320
don't have the sun right here but i have

379
00:14:33,269 --> 00:14:27,680
a photograph

380
00:14:34,949 --> 00:14:33,279
the earth ball is going to look like if

381
00:14:37,110 --> 00:14:34,959
you line things up properly which is

382
00:14:39,189 --> 00:14:37,120
actually pretty easy to do and if you

383
00:14:42,150 --> 00:14:39,199
look carefully what i love about this

384
00:14:44,470 --> 00:14:42,160
model is the very very dark shadow

385
00:14:45,430 --> 00:14:44,480
you're seeing in the in the middle of

386
00:14:48,389 --> 00:14:45,440
this

387
00:14:50,150 --> 00:14:48,399
marble representing the earth is

388
00:14:53,110 --> 00:14:50,160

the total eclipse

389
00:14:55,509 --> 00:14:53,120
location if you live on the earth in

390
00:14:58,470 --> 00:14:55,519
that super super dark shadow you get to

391
00:15:00,230 --> 00:14:58,480
see the total eclipse of the sun but you

392
00:15:01,509 --> 00:15:00,240
may notice on the outside of the very

393
00:15:04,470 --> 00:15:01,519
dark circle

394
00:15:05,990 --> 00:15:04,480
is another shadow not as dark

395
00:15:07,670 --> 00:15:06,000
that's where you're going to see the

396
00:15:08,949 --> 00:15:07,680
partial eclipse

397
00:15:10,550 --> 00:15:08,959
and so

398
00:15:13,269 --> 00:15:10,560
using this activity

399
00:15:14,949 --> 00:15:13,279
you're learning about shadows about the

400
00:15:16,629 --> 00:15:14,959
umbra shadow the penumbra shadow the

401
00:15:18,310 --> 00:15:16,639
dark the light shadow you're learning

402
00:15:20,069 --> 00:15:18,320
about the geometry

403
00:15:21,509 --> 00:15:20,079
of the eclipse

404
00:15:24,310 --> 00:15:21,519
you can do a lot of things with this

405
00:15:26,230 --> 00:15:24,320
model and this is just one of many

406
00:15:27,829 --> 00:15:26,240
activities that the astronomical society

407
00:15:29,990 --> 00:15:27,839
of the pacific has developed and

408
00:15:30,870 --> 00:15:30,000
disseminated

409
00:15:33,430 --> 00:15:30,880
to

410
00:15:35,350 --> 00:15:33,440
rangers in parks libraries across the

411
00:15:37,590 --> 00:15:35,360
country museums

412
00:15:39,189 --> 00:15:37,600
schools

413
00:15:41,670 --> 00:15:39,199

lots of different places with with

414
00:15:43,749 --> 00:15:41,680
support from nasa and also the national

415
00:15:46,870 --> 00:15:43,759
science foundation so that's just gives

416
00:15:48,629 --> 00:15:46,880
you an uh some idea of how you can reach

417
00:15:50,870 --> 00:15:48,639
kids across

418
00:15:52,310 --> 00:15:50,880
the u.s to make sure everybody is

419
00:15:54,230 --> 00:15:52,320
engaged

420
00:15:56,389 --> 00:15:54,240
so that astronomy can be diverse and

421
00:15:59,829 --> 00:15:56,399
inclusive um

422
00:16:01,990 --> 00:15:59,839
and a wonderful experience for all

423
00:16:04,069 --> 00:16:02,000
thanks so much linda

424
00:16:05,910 --> 00:16:04,079
nom you're going to talk about some of

425
00:16:07,269 --> 00:16:05,920
the most amazing telescopes looking at

426
00:16:09,030 --> 00:16:07,279
the sun and

427
00:16:11,670 --> 00:16:09,040
about space sweater take it away david

428
00:16:13,910 --> 00:16:11,680
yeah sure so um one of the things that

429
00:16:15,829 --> 00:16:13,920
uh most people probably don't know is

430
00:16:17,910 --> 00:16:15,839
that the national science foundation is

431
00:16:19,910 --> 00:16:17,920
the steward for all ground-based

432
00:16:21,990 --> 00:16:19,920
astronomy in the united states so nasa

433
00:16:24,069 --> 00:16:22,000
does a lot of the space-based stuff or

434
00:16:26,310 --> 00:16:24,079
most of the space stuff we do

435
00:16:28,150 --> 00:16:26,320
most of the ground-based stuff and we do

436
00:16:29,590 --> 00:16:28,160
this through our national laboratory so

437
00:16:31,749 --> 00:16:29,600
one of those national laboratories is

438
00:16:34,150 --> 00:16:31,759

the national solar observatory that matt

439
00:16:35,590 --> 00:16:34,160
penn works at and then another of our

440
00:16:37,749 --> 00:16:35,600
national laboratories is the national

441
00:16:39,990 --> 00:16:37,759
center for atmospheric research and so

442
00:16:42,230 --> 00:16:40,000
they do things like what's shown in our

443
00:16:44,629 --> 00:16:42,240
in my first slide uh this is a beautiful

444
00:16:49,030 --> 00:16:44,639
image of the sun and so what one might

445
00:16:50,870 --> 00:16:49,040
not might ask is why does nsf or nasa or

446
00:16:52,870 --> 00:16:50,880
the federal government for that matter

447
00:16:54,629 --> 00:16:52,880
even care about solar science what are

448
00:16:56,870 --> 00:16:54,639
the sort of things that i mean don't we

449
00:16:58,389 --> 00:16:56,880
know all the questions uh haven't we

450
00:17:00,069 --> 00:16:58,399
answered all the questions about the sun

451
00:17:02,790 --> 00:17:00,079
that we that we would want to ask and

452
00:17:05,270 --> 00:17:02,800
the answer to that is is no and so

453
00:17:07,189 --> 00:17:05,280
basically from nss perspective we look

454
00:17:09,110 --> 00:17:07,199
at the sun from both an astronomy

455
00:17:11,669 --> 00:17:09,120
perspective uh from the astronomy

456
00:17:14,309 --> 00:17:11,679
division that i work in and also from a

457
00:17:16,470 --> 00:17:14,319
sun earth connection heliospheric

458
00:17:19,189 --> 00:17:16,480
uh connection um

459
00:17:21,990 --> 00:17:19,199
within our geospace sciences section and

460
00:17:24,230 --> 00:17:22,000
so um from the uh astronomy's

461
00:17:26,949 --> 00:17:24,240
perspective perspective uh we look at

462
00:17:30,070 --> 00:17:26,959
the sun as a star and it's our nearby

463
00:17:33,350 --> 00:17:30,080

laboratory that we can use to study uh

464
00:17:35,830 --> 00:17:33,360
stars like our sun and then try to

465
00:17:38,310 --> 00:17:35,840
expand that to stars that are further

466
00:17:40,070 --> 00:17:38,320
away much further away and we also look

467
00:17:42,710 --> 00:17:40,080
at the sun and its interaction with the

468
00:17:45,669 --> 00:17:42,720
planets in our solar system there's

469
00:17:47,190 --> 00:17:45,679
a number of exoplanet systems uh planets

470
00:17:49,350 --> 00:17:47,200
outside our own solar system that have

471
00:17:50,950 --> 00:17:49,360
been discovered uh over i think the

472
00:17:53,430 --> 00:17:50,960
account is over two thousand now

473
00:17:55,669 --> 00:17:53,440
confirmed and over four thousand our

474
00:17:58,230 --> 00:17:55,679
candidates and so

475
00:18:00,310 --> 00:17:58,240
we wanna apply the theories that we get

476
00:18:02,390 --> 00:18:00,320
from uh studying the sun to those

477
00:18:03,830 --> 00:18:02,400
exoplanet systems the other thing is we

478
00:18:06,630 --> 00:18:03,840
want to also

479
00:18:09,190 --> 00:18:06,640
figure out and and and talk about the uh

480
00:18:11,350 --> 00:18:09,200
the heliosphere and the interactions uh

481
00:18:13,669 --> 00:18:11,360
between the sun and the earth especially

482
00:18:16,549 --> 00:18:13,679
with regards to space weather so the sun

483
00:18:19,430 --> 00:18:16,559
has all these interesting phenomena like

484
00:18:21,430 --> 00:18:19,440
solar flares coronal mass ejections the

485
00:18:23,430 --> 00:18:21,440
solar wind and all of those things are

486
00:18:26,830 --> 00:18:23,440
collectively known as as what we

487
00:18:29,590 --> 00:18:26,840
consider space weather and so next slide

488
00:18:30,549 --> 00:18:29,600

please and so a lot of that space

489
00:18:32,470 --> 00:18:30,559
weather

490
00:18:35,110 --> 00:18:32,480
occurs in this in this region of the

491
00:18:36,950 --> 00:18:35,120
corona and so the corona is the thing

492
00:18:38,789 --> 00:18:36,960
that we'll see during the total solar

493
00:18:40,870 --> 00:18:38,799
eclipse and so you can see here is an

494
00:18:43,190 --> 00:18:40,880
image of it and so that's where a lot of

495
00:18:44,470 --> 00:18:43,200
the action is and so matt's going to

496
00:18:46,070 --> 00:18:44,480
talk about

497
00:18:47,510 --> 00:18:46,080
his coronal science that he's going to

498
00:18:49,830 --> 00:18:47,520
do from the ground

499
00:18:51,110 --> 00:18:49,840
with his citizen kate project but the

500
00:18:53,830 --> 00:18:51,120
interesting thing is there's there's a

501
00:18:56,470 --> 00:18:53,840
bit of a gap now in in what in the

502
00:18:58,470 --> 00:18:56,480
coverage of the corona this especially

503
00:19:01,430 --> 00:18:58,480
this nearby corona that we don't see and

504
00:19:03,750 --> 00:19:01,440
that's where we want to uh use uh and do

505
00:19:05,590 --> 00:19:03,760
science uh for the eclipse and use the

506
00:19:07,750 --> 00:19:05,600
eclipse for that type of science another

507
00:19:09,110 --> 00:19:07,760
thing we're doing um at the uh at the

508
00:19:10,870 --> 00:19:09,120
nsf is

509
00:19:11,990 --> 00:19:10,880
we have um

510
00:19:13,510 --> 00:19:12,000
through our national center for

511
00:19:15,990 --> 00:19:13,520
atmospheric research we're going to fly

512
00:19:17,669 --> 00:19:16,000
one of our gulf stream jets

513
00:19:19,270 --> 00:19:17,679

and we're going to fly it through as the

514
00:19:22,549 --> 00:19:19,280
eclipse is happening fly it along the

515
00:19:24,390 --> 00:19:22,559
path of the eclipse and use a

516
00:19:27,270 --> 00:19:24,400
instrument called an airborne infrared

517
00:19:30,230 --> 00:19:27,280
spectrometer and uh basically take uh

518
00:19:31,430 --> 00:19:30,240
spectral um images of the corona during

519
00:19:34,070 --> 00:19:31,440
the eclipse

520
00:19:35,029 --> 00:19:34,080
and then the final last slide

521
00:19:35,909 --> 00:19:35,039
and so

522
00:19:37,430 --> 00:19:35,919
um

523
00:19:39,990 --> 00:19:37,440
we as i mentioned before we're the

524
00:19:41,750 --> 00:19:40,000
steward of ground-based astronomy and so

525
00:19:45,110 --> 00:19:41,760
right now we have uh two different

526
00:19:47,110 --> 00:19:45,120
construction projects uh within nsf uh

527
00:19:49,430 --> 00:19:47,120
one is called the large synoptic survey

528
00:19:51,510 --> 00:19:49,440
telescope and that's in south america

529
00:19:53,909 --> 00:19:51,520
and chile and that's designed is going

530
00:19:55,909 --> 00:19:53,919
to observe over 37 billion stars and

531
00:19:58,549 --> 00:19:55,919
galaxies

532
00:20:00,630 --> 00:19:58,559
over a course of several days and then

533
00:20:02,549 --> 00:20:00,640
repeat that over and over again and

534
00:20:04,070 --> 00:20:02,559
it'll basically survey the universe

535
00:20:05,750 --> 00:20:04,080
another one that the one that i'm

536
00:20:08,390 --> 00:20:05,760
involved in and and the one that's

537
00:20:09,669 --> 00:20:08,400
important for solar science is this uh

538
00:20:11,830 --> 00:20:09,679

this telescope right here it's called

539
00:20:13,590 --> 00:20:11,840
the daniel k in a way solar telescope

540
00:20:16,630 --> 00:20:13,600
where we as we affectionately call it

541
00:20:18,950 --> 00:20:16,640
decast and so dkis is going to be the

542
00:20:20,390 --> 00:20:18,960
world's largest and most powerful solar

543
00:20:22,390 --> 00:20:20,400
telescope ever

544
00:20:25,190 --> 00:20:22,400
built and so it's going to have a 4

545
00:20:27,430 --> 00:20:25,200
meter aperture 4 meter diameter mirror

546
00:20:28,710 --> 00:20:27,440
which is 13 feet across and so if you

547
00:20:30,390 --> 00:20:28,720
can imagine

548
00:20:32,630 --> 00:20:30,400
the amount of solar light that we can

549
00:20:34,149 --> 00:20:32,640
collect with that type of mirror and so

550
00:20:36,470 --> 00:20:34,159
it's going to be an incredible

551
00:20:38,390 --> 00:20:36,480
high-resolution machine that's going to

552
00:20:42,149 --> 00:20:38,400
it's going to be able to observe uh the

553
00:20:44,470 --> 00:20:42,159
sun at 20 to 30 or pixels on the sun at

554
00:20:46,710 --> 00:20:44,480
20 to 30 kilometers across and that's

555
00:20:48,149 --> 00:20:46,720
really where the interesting science

556
00:20:49,830 --> 00:20:48,159
we're really getting down to the

557
00:20:51,029 --> 00:20:49,840
interesting science

558
00:20:53,190 --> 00:20:51,039
and so

559
00:20:54,789 --> 00:20:53,200
with that i'll hand it back to thomas

560
00:20:56,630 --> 00:20:54,799
well thanks so much that's truly

561
00:20:58,789 --> 00:20:56,640
exciting uh what's happening in that

562
00:21:00,710 --> 00:20:58,799
telescope and the other things

563
00:21:02,870 --> 00:21:00,720

many of the stories about eclipses you

564
00:21:05,029 --> 00:21:02,880
know don't actually just have to do with

565
00:21:07,430 --> 00:21:05,039
astronomy but they have to do with birds

566
00:21:09,990 --> 00:21:07,440
with nature kind of the atmospheric kind

567
00:21:11,590 --> 00:21:10,000
of effects and and angela uh spec you're

568
00:21:15,350 --> 00:21:11,600
going to talk about that why don't you

569
00:21:16,390 --> 00:21:15,360
uh tell us about your work

570
00:21:17,110 --> 00:21:16,400
thanks thomas

571
00:21:19,909 --> 00:21:17,120
so

572
00:21:22,149 --> 00:21:19,919
we've already heard a lot about how the

573
00:21:25,270 --> 00:21:22,159
space and looking at the corona and

574
00:21:27,270 --> 00:21:25,280
doing research on the sun itself and

575
00:21:29,750 --> 00:21:27,280
we've heard about engaging with the

576
00:21:31,750 --> 00:21:29,760
public and what i'm going to talk about

577
00:21:34,710 --> 00:21:31,760
is kind of somewhere in between all of

578
00:21:36,950 --> 00:21:34,720
that so we want to do research on the

579
00:21:38,870 --> 00:21:36,960
impact of the eclipse on the ground that

580
00:21:41,110 --> 00:21:38,880
is the atmosphere the animals and the

581
00:21:43,350 --> 00:21:41,120
plants and also how we can use that to

582
00:21:45,669 --> 00:21:43,360
engage the public

583
00:21:47,430 --> 00:21:45,679
in some cases to encourage people to

584
00:21:49,990 --> 00:21:47,440
become scientists and then others to

585
00:21:51,669 --> 00:21:50,000
turn them into fans of science so let's

586
00:21:53,990 --> 00:21:51,679
start with the atmosphere and if i can

587
00:21:56,149 --> 00:21:54,000
have that first video um you know we

588
00:21:58,789 --> 00:21:56,159

know that over the course of a day the

589
00:22:00,149 --> 00:21:58,799
sun comes up and it gets up to its

590
00:22:01,830 --> 00:22:00,159
highest point and then goes back down

591
00:22:05,029 --> 00:22:01,840
and over that time we get different

592
00:22:07,029 --> 00:22:05,039
levels of uh illumination from the sun

593
00:22:09,510 --> 00:22:07,039
but during the eclipse we have an added

594
00:22:10,870 --> 00:22:09,520
thing that's changing our elimination so

595
00:22:13,029 --> 00:22:10,880
the video's showing you what the

596
00:22:15,510 --> 00:22:13,039
illumination looks like as the sun is

597
00:22:17,110 --> 00:22:15,520
moving across the sky and now it is

598
00:22:18,950 --> 00:22:17,120
being eclipsed and so we're getting a

599
00:22:20,470 --> 00:22:18,960
decrease in the amount of sunlight and

600
00:22:22,230 --> 00:22:20,480
that's going to have all these multiple

601
00:22:25,190 --> 00:22:22,240
effects so if we start with the

602
00:22:27,350 --> 00:22:25,200
atmosphere you can imagine that as you

603
00:22:29,430 --> 00:22:27,360
block out the sun with this big rock the

604
00:22:30,950 --> 00:22:29,440
moon um you're going to decrease the

605
00:22:32,870 --> 00:22:30,960
temperature we know it gets colder when

606
00:22:34,789 --> 00:22:32,880
a cloud comes in front of the sun so now

607
00:22:37,270 --> 00:22:34,799
it's a big rock and the temperature is

608
00:22:39,350 --> 00:22:37,280
going to drop and there's still science

609
00:22:41,510 --> 00:22:39,360
to be done in terms of understanding the

610
00:22:43,590 --> 00:22:41,520
magnitude of that drop how it changes

611
00:22:44,870 --> 00:22:43,600
across the course of the

612
00:22:47,110 --> 00:22:44,880
eclipse

613
00:22:49,029 --> 00:22:47,120

but also that drop generates air

614
00:22:51,510 --> 00:22:49,039
pressure changes which gives

615
00:22:53,990 --> 00:22:51,520
rise to air currents so there'll be

616
00:22:56,230 --> 00:22:54,000
experiments being done that will involve

617
00:22:58,630 --> 00:22:56,240
measuring temperatures and air currents

618
00:23:00,630 --> 00:22:58,640
as the eclipse passes over the us and

619
00:23:03,909 --> 00:23:00,640
that will involve citizen science where

620
00:23:05,750 --> 00:23:03,919
we involve the public in collecting data

621
00:23:07,510 --> 00:23:05,760
if we can move on to

622
00:23:08,549 --> 00:23:07,520
the second

623
00:23:09,430 --> 00:23:08,559
photograph

624
00:23:11,350 --> 00:23:09,440
uh

625
00:23:12,549 --> 00:23:11,360
this is showing you a bird in the sky

626
00:23:15,350 --> 00:23:12,559
during an eclipse it's actually an

627
00:23:16,789 --> 00:23:15,360
annular eclipse but we know that animals

628
00:23:18,950 --> 00:23:16,799
react differently at different times of

629
00:23:21,909 --> 00:23:18,960
day and we know from anecdotal evidence

630
00:23:23,909 --> 00:23:21,919
from previous eclipses that you get uh

631
00:23:25,029 --> 00:23:23,919
animals interacting with that change in

632
00:23:27,750 --> 00:23:25,039
light and maybe the change in

633
00:23:29,350 --> 00:23:27,760
temperature too so birds for instance we

634
00:23:30,789 --> 00:23:29,360
know that you know towards twilight

635
00:23:33,990 --> 00:23:30,799
birds we'll start doing the swarming

636
00:23:35,909 --> 00:23:34,000
around thing and they're going to uh be

637
00:23:36,950 --> 00:23:35,919
showing you making lots of noise and

638
00:23:39,669 --> 00:23:36,960

showing you that they're getting ready

639
00:23:41,590 --> 00:23:39,679
to go to bed and then it goes dark and

640
00:23:43,430 --> 00:23:41,600
they settle down well that's going to

641
00:23:45,029 --> 00:23:43,440
happen probably during the eclipse but

642
00:23:47,190 --> 00:23:45,039
different types of birds are going to

643
00:23:48,950 --> 00:23:47,200
interact differently other animals we

644
00:23:50,230 --> 00:23:48,960
know that farm animals cattle will tend

645
00:23:51,590 --> 00:23:50,240
to go back to the barn because it's

646
00:23:53,350 --> 00:23:51,600
bedtime

647
00:23:55,190 --> 00:23:53,360
insects that chirp at night or frogs

648
00:23:57,110 --> 00:23:55,200
that chip at night may start chirping

649
00:23:59,590 --> 00:23:57,120
once it gets dark and so one of the

650
00:24:02,630 --> 00:23:59,600
things that we want to do is to be able

651
00:24:05,029 --> 00:24:02,640
to really collect data and not only is

652
00:24:07,430 --> 00:24:05,039
this going to be done on uh the basis of

653
00:24:09,430 --> 00:24:07,440
universities uh like you know schools

654
00:24:12,149 --> 00:24:09,440
that have animal and plant science

655
00:24:14,390 --> 00:24:12,159
programs but also with the public

656
00:24:15,750 --> 00:24:14,400
through the inaturalist app and life

657
00:24:18,470 --> 00:24:15,760
response which is a program of the

658
00:24:20,950 --> 00:24:18,480
california academy of sciences where we

659
00:24:23,909 --> 00:24:20,960
want to collect exactly what all these

660
00:24:26,070 --> 00:24:23,919
animals are doing um as it gets dark and

661
00:24:28,149 --> 00:24:26,080
so even before it gets completely dark

662
00:24:30,390 --> 00:24:28,159
with the change in brightness of the sun

663
00:24:33,029 --> 00:24:30,400

what do the animals do what do we see

664
00:24:34,630 --> 00:24:33,039
what do we hear we can move on to the

665
00:24:37,029 --> 00:24:34,640
last slide

666
00:24:39,190 --> 00:24:37,039
now what this is showing you is how the

667
00:24:41,110 --> 00:24:39,200
eclipse interacts with a plant

668
00:24:43,029 --> 00:24:41,120
this is a tree and as you've got the

669
00:24:44,470 --> 00:24:43,039
leaves overlapping

670
00:24:46,789 --> 00:24:44,480
on the tree you're making little

671
00:24:49,269 --> 00:24:46,799
pinholes and each of those little holes

672
00:24:51,110 --> 00:24:49,279
acts as a pinhole camera and so what

673
00:24:54,149 --> 00:24:51,120
you're seeing is lots and lots of images

674
00:24:55,750 --> 00:24:54,159
of that partially eclipsed sun and so

675
00:24:57,110 --> 00:24:55,760
that's one way in which a planet is

676
00:24:59,430 --> 00:24:57,120
interacting with the sun but that's just

677
00:25:00,710 --> 00:24:59,440
visual and it's pretty cool to see but

678
00:25:03,110 --> 00:25:00,720
some plants

679
00:25:04,630 --> 00:25:03,120
will do things at night like you have

680
00:25:06,390 --> 00:25:04,640
some plants like lotuses that will close

681
00:25:07,990 --> 00:25:06,400
up you have some plants for instance

682
00:25:11,830 --> 00:25:08,000
some varieties of corn will actually

683
00:25:14,789 --> 00:25:11,840
unfurl during darkness and so as well as

684
00:25:16,950 --> 00:25:14,799
looking at the animals what they do as

685
00:25:19,029 --> 00:25:16,960
we get eclipsed we also want to study

686
00:25:21,430 --> 00:25:19,039
the plants and so there are all these

687
00:25:22,230 --> 00:25:21,440
different ways in which we are seeing

688
00:25:23,590 --> 00:25:22,240

how

689
00:25:25,750 --> 00:25:23,600
our um

690
00:25:27,430 --> 00:25:25,760
our own natural world is interacting

691
00:25:30,230 --> 00:25:27,440
with that change in light and it helps

692
00:25:32,710 --> 00:25:30,240
us to understand not only how science is

693
00:25:34,710 --> 00:25:32,720
all interconnected but how much we rely

694
00:25:36,390 --> 00:25:34,720
on the sun and it helps us test some

695
00:25:38,390 --> 00:25:36,400
ideas about just things that we do with

696
00:25:40,710 --> 00:25:38,400
plants and animals on the ground every

697
00:25:44,470 --> 00:25:40,720
day and with that i'll hand it back to

698
00:25:46,470 --> 00:25:44,480
thomas thank you thanks so much

699
00:25:48,230 --> 00:25:46,480
so matt you know some of the signs we do

700
00:25:50,310 --> 00:25:48,240
are with professional astronomers but

701
00:25:52,230 --> 00:25:50,320
some of them are with amateurs you know

702
00:25:54,310 --> 00:25:52,240
citizen science and you have a really

703
00:25:55,590 --> 00:25:54,320
exciting project tell us about it yes

704
00:25:57,909 --> 00:25:55,600
thomas the thing that excites me the

705
00:25:59,510 --> 00:25:57,919
most about this eclipse is that millions

706
00:26:01,830 --> 00:25:59,520
of people across the country in the path

707
00:26:03,669 --> 00:26:01,840
of totality can walk out on their porch

708
00:26:05,830 --> 00:26:03,679
you know in their slippers and collect

709
00:26:07,750 --> 00:26:05,840
world-class data we don't have to travel

710
00:26:09,990 --> 00:26:07,760
to a telescope a large telescope on top

711
00:26:11,510 --> 00:26:10,000
of a mountain and go in your backyard

712
00:26:13,110 --> 00:26:11,520
and using fairly modest sized

713
00:26:15,029 --> 00:26:13,120

instruments collect really important

714
00:26:17,909 --> 00:26:15,039
research data so if we go to the first

715
00:26:20,390 --> 00:26:17,919
slide the citizen continental america

716
00:26:21,830 --> 00:26:20,400
telescopic eclipse experiment or citizen

717
00:26:24,470 --> 00:26:21,840
kate experiment

718
00:26:26,789 --> 00:26:24,480
involves over 200 volunteers stationed

719
00:26:28,470 --> 00:26:26,799
at 68 points across the country they

720
00:26:30,789 --> 00:26:28,480
have identical equipment and they'll

721
00:26:32,549 --> 00:26:30,799
take data during the eclipse now the key

722
00:26:34,230 --> 00:26:32,559
is at any given site you'll see the

723
00:26:36,789 --> 00:26:34,240
corona for about two minutes at one

724
00:26:39,029 --> 00:26:36,799
location and the cone is big

725
00:26:40,390 --> 00:26:39,039
it changes but slowly and in two minutes

726
00:26:42,230 --> 00:26:40,400
you really can't see changes that we

727
00:26:44,070 --> 00:26:42,240
want to study in the solar wind

728
00:26:45,909 --> 00:26:44,080
but if we take data as a shadow of the

729
00:26:47,510 --> 00:26:45,919
moon crosses the country and then

730
00:26:49,669 --> 00:26:47,520
combine that data into a continuous

731
00:26:51,350 --> 00:26:49,679
movie we can observe the corona for 93

732
00:26:54,070 --> 00:26:51,360
minutes and therefore see changes that

733
00:26:56,230 --> 00:26:54,080
we wouldn't normally otherwise uh detect

734
00:26:58,070 --> 00:26:56,240
um so it's really exciting to be

735
00:26:59,590 --> 00:26:58,080
involved in this project um after the

736
00:27:01,510 --> 00:26:59,600
eclipse

737
00:27:03,269 --> 00:27:01,520
the volunteers will keep their equipment

738
00:27:04,830 --> 00:27:03,279

due to the generous donations from the

739
00:27:07,029 --> 00:27:04,840
federal and our private and corporate

740
00:27:09,350 --> 00:27:07,039
sponsors but right now at this current

741
00:27:11,669 --> 00:27:09,360
stage we had some students go to

742
00:27:13,830 --> 00:27:11,679
indonesia last year and get on-the-job

743
00:27:16,070 --> 00:27:13,840
training at a solar eclipse they came

744
00:27:17,990 --> 00:27:16,080
back to the u.s and now they've trained

745
00:27:20,230 --> 00:27:18,000
all the volunteers for the august event

746
00:27:21,909 --> 00:27:20,240
in a series of 11 workshops so our

747
00:27:23,750 --> 00:27:21,919
volunteers have their equipment they're

748
00:27:25,909 --> 00:27:23,760
practicing on the sun on the moon uh

749
00:27:26,710 --> 00:27:25,919
even as we speak and getting ready for

750
00:27:28,710 --> 00:27:26,720
the

751
00:27:30,310 --> 00:27:28,720
day on august 21st

752
00:27:32,549 --> 00:27:30,320
so how does this data fit into the big

753
00:27:34,149 --> 00:27:32,559
picture when we study the sun

754
00:27:36,070 --> 00:27:34,159
we've heard that nasa has a fleet of

755
00:27:37,830 --> 00:27:36,080
spacecraft studying various parts of the

756
00:27:39,510 --> 00:27:37,840
corona how does the eclipse data fit in

757
00:27:41,909 --> 00:27:39,520
well if we go to the next slide we'll

758
00:27:43,990 --> 00:27:41,919
see that some of the nasa emissions have

759
00:27:45,430 --> 00:27:44,000
a data gap and that's in the lower part

760
00:27:47,590 --> 00:27:45,440
of the corona where we really want to

761
00:27:50,549 --> 00:27:47,600
study the solar wind where space weather

762
00:27:52,149 --> 00:27:50,559
can have a big effect and so here we're

763
00:27:55,990 --> 00:27:52,159

superimposing our data from the

764
00:27:58,470 --> 00:27:56,000
indonesian eclipse onto a set of nasa

765
00:28:00,950 --> 00:27:58,480
observations that shows exactly where

766
00:28:02,470 --> 00:28:00,960
our eclipse data will fit in

767
00:28:04,070 --> 00:28:02,480
there's a lot of interesting physics and

768
00:28:05,990 --> 00:28:04,080
exciting things that go on the sun is

769
00:28:07,669 --> 00:28:06,000
really hiding some science in that data

770
00:28:08,710 --> 00:28:07,679
gap that we want to get at and that's

771
00:28:10,149 --> 00:28:08,720
what we're going to try to do with the

772
00:28:10,950 --> 00:28:10,159
eclipse data

773
00:28:12,470 --> 00:28:10,960
um

774
00:28:14,389 --> 00:28:12,480
you know we talked a little bit about

775
00:28:16,870 --> 00:28:14,399
the space weather impact and how it

776
00:28:17,830 --> 00:28:16,880
affects us here on the earth

777
00:28:19,590 --> 00:28:17,840
when we're

778
00:28:21,269 --> 00:28:19,600
trying to understand space weather and

779
00:28:23,110 --> 00:28:21,279
solar storms

780
00:28:24,630 --> 00:28:23,120
it's similar to understanding whether on

781
00:28:25,990 --> 00:28:24,640
the earth if you want to know if a storm

782
00:28:27,669 --> 00:28:26,000
is going to hit a particular city and

783
00:28:29,830 --> 00:28:27,679
when it's going to hit a city you need

784
00:28:31,029 --> 00:28:29,840
to understand the wind on the earth and

785
00:28:33,190 --> 00:28:31,039
so in a similar way we're studying the

786
00:28:35,190 --> 00:28:33,200
solar wind to try to better predict what

787
00:28:37,750 --> 00:28:35,200
happens in space with space storms or

788
00:28:39,909 --> 00:28:37,760

solar storms in space weather

789
00:28:41,909 --> 00:28:39,919
we know from our nasa measurements that

790
00:28:44,230 --> 00:28:41,919
the solar wind does accelerate a lot in

791
00:28:45,909 --> 00:28:44,240
this region in this data gap but we

792
00:28:48,470 --> 00:28:45,919
don't know exactly how that happens yet

793
00:28:50,389 --> 00:28:48,480
so if we go to the last slide

794
00:28:52,710 --> 00:28:50,399
everybody in this room accelerated today

795
00:28:54,710 --> 00:28:52,720
when you got onto a freeway so at the

796
00:28:56,710 --> 00:28:54,720
bottom of the freeway on-ramp you're

797
00:28:58,630 --> 00:28:56,720
going at a slow speed and you hit the

798
00:29:00,389 --> 00:28:58,640
gas pedal in your car and you sped up

799
00:29:01,669 --> 00:29:00,399
and then merged with traffic going at 60

800
00:29:03,029 --> 00:29:01,679
miles an hour

801
00:29:05,190 --> 00:29:03,039
we know that solar wind is doing the

802
00:29:06,549 --> 00:29:05,200
same thing in this region of the solar

803
00:29:08,149 --> 00:29:06,559
corona but we don't have the

804
00:29:09,590 --> 00:29:08,159
measurements to show exactly how that

805
00:29:10,870 --> 00:29:09,600
velocity is changing what is the

806
00:29:13,110 --> 00:29:10,880
acceleration

807
00:29:15,350 --> 00:29:13,120
and so hopefully after we collect all of

808
00:29:17,269 --> 00:29:15,360
our data with no clouds uh we'll come

809
00:29:19,190 --> 00:29:17,279
back after the eclipse and tell you

810
00:29:20,630 --> 00:29:19,200
exactly what is pushing on the gas pedal

811
00:29:23,190 --> 00:29:20,640
for the solar wind in this part of the

812
00:29:25,269 --> 00:29:23,200
corona yeah it's really exciting

813
00:29:28,630 --> 00:29:25,279

uh research you're going to do with so

814
00:29:31,190 --> 00:29:28,640
many excited students we hope right and

815
00:29:32,630 --> 00:29:31,200
hopefully our future colleagues too

816
00:29:35,110 --> 00:29:32,640
exactly so what i'm going to do is

817
00:29:37,110 --> 00:29:35,120
before i turn it over to dwayne just ask

818
00:29:38,870 --> 00:29:37,120
one question from each of you and i'll

819
00:29:41,269 --> 00:29:38,880
just go in the same order as we just did

820
00:29:43,029 --> 00:29:41,279
and that is what you expect is the most

821
00:29:45,190 --> 00:29:43,039
important impact from this eclipse i'll

822
00:29:47,350 --> 00:29:45,200
start with you okay

823
00:29:49,909 --> 00:29:47,360
for me the most important impact of the

824
00:29:51,510 --> 00:29:49,919
eclipse is really an opportunity

825
00:29:53,430 --> 00:29:51,520
for us together

826
00:29:55,350 --> 00:29:53,440
to come together as a country you know

827
00:29:57,110 --> 00:29:55,360
everything that's going on in the

828
00:29:58,149 --> 00:29:57,120
country in the earlier panel mentioned

829
00:30:00,230 --> 00:29:58,159
kind of the

830
00:30:01,909 --> 00:30:00,240
separation between science and the

831
00:30:03,350 --> 00:30:01,919
public and i think this is a really

832
00:30:05,350 --> 00:30:03,360
amazing chance

833
00:30:08,230 --> 00:30:05,360
to just open

834
00:30:10,549 --> 00:30:08,240
the public's eyes to wonder and to get

835
00:30:13,350 --> 00:30:10,559
people thinking about really the most

836
00:30:14,950 --> 00:30:13,360
amazing natural phenomenon that happens

837
00:30:17,110 --> 00:30:14,960
on the surface of the earth a total

838
00:30:20,470 --> 00:30:17,120

solar eclipse and to get people to

839
00:30:23,029 --> 00:30:20,480
wonder and just incorporate that into

840
00:30:25,990 --> 00:30:23,039
thinking about what's going on in our

841
00:30:27,750 --> 00:30:26,000
cosmos um and and to come together in

842
00:30:29,909 --> 00:30:27,760
that very human way

843
00:30:32,950 --> 00:30:29,919
great sense of wonder linda how would

844
00:31:01,590 --> 00:30:33,669
i

845
00:31:04,310 --> 00:31:01,600
everybody whether whether you

846
00:31:06,070 --> 00:31:04,320
live in cities or in the countryside or

847
00:31:07,669 --> 00:31:06,080
no matter you know what part of the

848
00:31:10,549 --> 00:31:07,679
world you're in and this is an

849
00:31:13,190 --> 00:31:10,559
opportunity to engage the citizenry

850
00:31:15,909 --> 00:31:13,200
in an incredible event that has shaped

851
00:31:18,549 --> 00:31:15,919
humanity for thousands of years and if

852
00:31:19,990 --> 00:31:18,559
we can encourage more people to get into

853
00:31:22,950 --> 00:31:20,000
astronomy and space science that's

854
00:31:24,549 --> 00:31:22,960
fabulous but if what we do is excite

855
00:31:25,909 --> 00:31:24,559
people about science in general so that

856
00:31:27,509 --> 00:31:25,919
they're curious and they want to know

857
00:31:29,430 --> 00:31:27,519
more about astronomy

858
00:31:31,110 --> 00:31:29,440
that's fabulous too

859
00:31:33,029 --> 00:31:31,120
well thanks so much david how would you

860
00:31:35,269 --> 00:31:33,039
answer it i completely agree with lin

861
00:31:36,389 --> 00:31:35,279
what linda said about where nsf is very

862
00:31:38,870 --> 00:31:36,399
concerned with

863
00:31:41,350 --> 00:31:38,880

building a new stem workforce for the

864
00:31:44,230 --> 00:31:41,360
nation and so and we're also looking for

865
00:31:46,230 --> 00:31:44,240
new users for our telescopes and so

866
00:31:48,070 --> 00:31:46,240
astronomy is sort of a gateway to you

867
00:31:50,070 --> 00:31:48,080
know all kind all different kinds of

868
00:31:51,750 --> 00:31:50,080
science and so i we think that this

869
00:31:54,310 --> 00:31:51,760
eclipse will be a a wonderful

870
00:31:56,230 --> 00:31:54,320
opportunity to get uh people engaged in

871
00:31:58,549 --> 00:31:56,240
stem education and stem

872
00:32:02,950 --> 00:31:58,559
and so and you know will be better for

873
00:32:04,549 --> 00:32:02,960
the nation how about you angela respect

874
00:32:06,470 --> 00:32:04,559
well so i i love the stuff that's

875
00:32:08,230 --> 00:32:06,480
already been said and obviously you know

876
00:32:09,909 --> 00:32:08,240
encouraging people to

877
00:32:12,149 --> 00:32:09,919
be interested in pursuing science is

878
00:32:15,029 --> 00:32:12,159
great i'd like to go a step further i

879
00:32:17,909 --> 00:32:15,039
think that uh one of the things that has

880
00:32:20,389 --> 00:32:17,919
happened in recent years is that

881
00:32:22,389 --> 00:32:20,399
scientists are seen as this you know

882
00:32:25,590 --> 00:32:22,399
kind of weirdos and that we're not

883
00:32:27,750 --> 00:32:25,600
normal um and that the public in general

884
00:32:30,470 --> 00:32:27,760
is not necessarily a fan of science and

885
00:32:31,990 --> 00:32:30,480
so i would like to generate science fans

886
00:32:34,149 --> 00:32:32,000
and i just want to kind of qualify that

887
00:32:35,590 --> 00:32:34,159
a little bit so i like football and i

888
00:32:37,590 --> 00:32:35,600

mean american football because you know

889
00:32:38,549 --> 00:32:37,600
with my accent that might not be clear

890
00:32:41,110 --> 00:32:38,559
um

891
00:32:43,430 --> 00:32:41,120
i like american football and

892
00:32:45,669 --> 00:32:43,440
i'm five foot three i'm pretty petite

893
00:32:47,750 --> 00:32:45,679
i'm never gonna play american football i

894
00:32:50,070 --> 00:32:47,760
know the rules i watch the games i can

895
00:32:51,990 --> 00:32:50,080
be you know a sunday my monday morning

896
00:32:53,430 --> 00:32:52,000
quarterback all of that

897
00:32:54,870 --> 00:32:53,440
but

898
00:32:57,029 --> 00:32:54,880
that doesn't mean that i'm ever going to

899
00:32:59,830 --> 00:32:57,039
be professional or even amateur but i

900
00:33:01,750 --> 00:32:59,840
appreciate the game and i'm a fan and so

901
00:33:05,509 --> 00:33:01,760
what i would like to see is that this is

902
00:33:08,230 --> 00:33:05,519
an opportunity to be able to draw people

903
00:33:11,190 --> 00:33:08,240
from across the country into

904
00:33:13,350 --> 00:33:11,200
being fans of science and really loving

905
00:33:15,269 --> 00:33:13,360
science even if it's not something that

906
00:33:17,909 --> 00:33:15,279
they themselves practice

907
00:33:20,149 --> 00:33:17,919
all right finally matt well i agree with

908
00:33:22,230 --> 00:33:20,159
angela and and uh you know maybe even go

909
00:33:23,590 --> 00:33:22,240
a step further is to get the equipment

910
00:33:25,750 --> 00:33:23,600
and the training in the hands of people

911
00:33:28,149 --> 00:33:25,760
across the country and to enable them to

912
00:33:29,830 --> 00:33:28,159
continue with citizen science after the

913
00:33:31,110 --> 00:33:29,840

eclipse we'd like to use the eclipse to

914
00:33:33,029 --> 00:33:31,120
capture their attention there's no way

915
00:33:35,110 --> 00:33:33,039
you can avoid noticing a solar eclipse

916
00:33:36,470 --> 00:33:35,120
it's a spectacular event but then after

917
00:33:39,029 --> 00:33:36,480
the eclipse we'd like to extend their

918
00:33:41,269 --> 00:33:39,039
interest further and keep them observing

919
00:33:43,110 --> 00:33:41,279
and engaging in astronomy thanks so much

920
00:33:44,870 --> 00:33:43,120
all of you duane

921
00:33:46,789 --> 00:33:44,880
okay i'm going to do a couple of things

922
00:33:48,549 --> 00:33:46,799
before we open the questions first i

923
00:33:50,230 --> 00:33:48,559
want to make a slight correction and

924
00:33:51,669 --> 00:33:50,240
then i see that angela here has some

925
00:33:55,990 --> 00:33:51,679
interesting items on the desk that she's

926
00:33:58,070 --> 00:33:56,000
going to share so uh dave at nsf we've

927
00:34:00,070 --> 00:33:58,080
had an interesting conversation uh a

928
00:34:03,110 --> 00:34:00,080
couple of days and he has an incredible

929
00:34:04,950 --> 00:34:03,120
uh portfolio and he does a lot more as

930
00:34:07,430 --> 00:34:04,960
program director not just solar physics

931
00:34:08,710 --> 00:34:07,440
so i want to just say his portfolio is

932
00:34:12,310 --> 00:34:08,720
larger as the program director and

933
00:34:16,149 --> 00:34:12,320
division of astronomical sciences so

934
00:34:19,030 --> 00:34:16,159
um and angela you have some interesting

935
00:34:20,790 --> 00:34:19,040
toys there yeah so i wanted to

936
00:34:21,750 --> 00:34:20,800
show a great way

937
00:34:23,909 --> 00:34:21,760
of

938
00:34:26,310 --> 00:34:23,919

being able to observe the total solar

939
00:34:27,430 --> 00:34:26,320
eclipse on the nasa website there are

940
00:34:30,389 --> 00:34:27,440
actually

941
00:34:33,669 --> 00:34:30,399
3d printed files so that you can

942
00:34:36,869 --> 00:34:33,679
download the file and find your nearest

943
00:34:39,030 --> 00:34:36,879
3d printer and there's one for every

944
00:34:42,470 --> 00:34:39,040
state so this is my home state of

945
00:34:45,109 --> 00:34:42,480
montana and there's a hole in the center

946
00:34:48,310 --> 00:34:45,119
of each particular state and what you

947
00:34:51,190 --> 00:34:48,320
can do on eclipse day for the partial

948
00:34:53,750 --> 00:34:51,200
eclipse is just hold your

949
00:34:55,829 --> 00:34:53,760
favorite state or your home state in the

950
00:34:57,910 --> 00:34:55,839
path of the sun and it'll shine that

951
00:35:00,230 --> 00:34:57,920
hole on the ground oftentimes we call

952
00:35:02,390 --> 00:35:00,240
these pinhole projectors and that way

953
00:35:03,670 --> 00:35:02,400
you can see what the

954
00:35:05,510 --> 00:35:03,680
path of

955
00:35:07,670 --> 00:35:05,520
the sun is

956
00:35:10,390 --> 00:35:07,680
you know being blocked by the moon so

957
00:35:12,310 --> 00:35:10,400
that's just another way if you don't

958
00:35:13,990 --> 00:35:12,320
have a chance to get your hands on a

959
00:35:16,390 --> 00:35:14,000
pair of glasses

960
00:35:18,870 --> 00:35:16,400
to interact to see what's happening with

961
00:35:20,470 --> 00:35:18,880
the the partial eclipse so there's all

962
00:35:23,589 --> 00:35:20,480
the different states and there's also

963
00:35:25,829 --> 00:35:23,599

one of the united states that's a a fun

964
00:35:27,109 --> 00:35:25,839
way to get your hands

965
00:35:29,030 --> 00:35:27,119
on the eclipse

966
00:35:30,870 --> 00:35:29,040
excellent okay if you're just joining us

967
00:35:32,790 --> 00:35:30,880
we're here at the museum in the nation's

968
00:35:36,069 --> 00:35:32,800
capital talking about the upcoming

969
00:35:38,470 --> 00:35:36,079
august 21 total solar eclipse across

970
00:35:40,870 --> 00:35:38,480
america we have a scientist here we're

971
00:35:42,150 --> 00:35:40,880
going to open up for questions social

972
00:35:43,069 --> 00:35:42,160
media

973
00:35:44,790 --> 00:35:43,079
eclipse

974
00:35:46,630 --> 00:35:44,800
2017

975
00:35:48,870 --> 00:35:46,640
and we're gonna start here if you wait

976
00:35:50,230 --> 00:35:48,880
for the mic uh we have a number of

977
00:35:52,550 --> 00:35:50,240
questions on the phone and of course

978
00:35:54,950 --> 00:35:52,560
we'll go to social media so

979
00:35:56,870 --> 00:35:54,960
let's see sef uh you got your hand up so

980
00:35:58,470 --> 00:35:56,880
here we go again yes thank you seth

981
00:36:01,510 --> 00:35:58,480
bornstein the associated press for

982
00:36:04,470 --> 00:36:01,520
thomas to start with um can you give us

983
00:36:06,550 --> 00:36:04,480
a sense at least in magnitude or figures

984
00:36:07,430 --> 00:36:06,560
of how much more obs

985
00:36:09,349 --> 00:36:07,440
this

986
00:36:10,630 --> 00:36:09,359
eclipse will be observed scientifically

987
00:36:13,270 --> 00:36:10,640
not by people

988
00:36:15,589 --> 00:36:13,280

regular people but by astronomers

989
00:36:18,630 --> 00:36:15,599
compared to previous ones is this going

990
00:36:21,109 --> 00:36:18,640
to be the most observed scientific

991
00:36:25,349 --> 00:36:21,119
scientifically observed eclipse

992
00:36:27,190 --> 00:36:25,359
um ever and also for angela you talked

993
00:36:29,030 --> 00:36:27,200
about the wonder and the beauty of the

994
00:36:30,790 --> 00:36:29,040
high altitude balloons

995
00:36:32,630 --> 00:36:30,800
um this briefing is sort of about the

996
00:36:34,950 --> 00:36:32,640
science i thought

997
00:36:36,950 --> 00:36:34,960
what do you hope to learn besides just

998
00:36:39,750 --> 00:36:36,960
give us beautiful pictures is there

999
00:36:41,270 --> 00:36:39,760
something like what matt has told us

1000
00:36:43,430 --> 00:36:41,280
what can we learn from high altitude

1001
00:36:45,270 --> 00:36:43,440
balloons

1002
00:36:46,950 --> 00:36:45,280
so what i'm going to do is uh try to

1003
00:36:48,790 --> 00:36:46,960
answer your question first so first of

1004
00:36:49,750 --> 00:36:48,800
all what we did for this particular

1005
00:36:51,750 --> 00:36:49,760
eclipse

1006
00:36:52,870 --> 00:36:51,760
at nasa and you may have done similar

1007
00:36:54,310 --> 00:36:52,880
things at the national science

1008
00:36:55,829 --> 00:36:54,320
foundation we actually had an

1009
00:36:59,030 --> 00:36:55,839
announcement for opportunity that

1010
00:37:01,829 --> 00:36:59,040
basically actually funded researchers uh

1011
00:37:03,670 --> 00:37:01,839
to develop um research programs

1012
00:37:06,150 --> 00:37:03,680
associated with that eclipse that's out

1013
00:37:08,870 --> 00:37:06,160

of the heliophysics division that but

1014
00:37:10,390 --> 00:37:08,880
also other research was supported

1015
00:37:12,230 --> 00:37:10,400
through that and so through that

1016
00:37:14,870 --> 00:37:12,240
research not only will some of the

1017
00:37:17,349 --> 00:37:14,880
research focused on the corona uh be

1018
00:37:19,190 --> 00:37:17,359
performed but also new technologies i

1019
00:37:20,710 --> 00:37:19,200
will be tested that have the potential

1020
00:37:24,310 --> 00:37:20,720
of perhaps flying

1021
00:37:27,349 --> 00:37:24,320
on a balloon or in space later so for us

1022
00:37:29,829 --> 00:37:27,359
uh this is the uh eclipse we're most

1023
00:37:32,310 --> 00:37:29,839
focused on and uh undoubtedly the one

1024
00:37:34,390 --> 00:37:32,320
that will lead to the most researchers

1025
00:37:35,829 --> 00:37:34,400
involved

1026
00:37:37,430 --> 00:37:35,839
so to answer the question about the

1027
00:37:39,589 --> 00:37:37,440
science the balloons are going to do

1028
00:37:41,109 --> 00:37:39,599
there's actually three pieces of science

1029
00:37:43,430 --> 00:37:41,119
that we're focused on

1030
00:37:46,069 --> 00:37:43,440
we're really two different projects one

1031
00:37:49,190 --> 00:37:46,079
providing the live feeds and one looking

1032
00:37:51,349 --> 00:37:49,200
at changes in the atmosphere so normally

1033
00:37:52,950 --> 00:37:51,359
the atmospheric experience has changed

1034
00:37:55,510 --> 00:37:52,960
with night and day but the eclipse

1035
00:37:57,829 --> 00:37:55,520
coming across the country in a dark

1036
00:38:01,190 --> 00:37:57,839
shadow at an average about 1500 miles

1037
00:38:02,870 --> 00:38:01,200
per hour is going to set up waves in the

1038
00:38:05,349 --> 00:38:02,880

atmosphere and that the temperature

1039
00:38:07,030 --> 00:38:05,359
changes will also affect that so we're

1040
00:38:09,190 --> 00:38:07,040
going to have a series of weather

1041
00:38:11,190 --> 00:38:09,200
balloons in many locations across the

1042
00:38:13,190 --> 00:38:11,200
country that will launch every 15

1043
00:38:15,510 --> 00:38:13,200
minutes or so and be collecting

1044
00:38:17,109 --> 00:38:15,520
information about how the atmosphere is

1045
00:38:19,030 --> 00:38:17,119
responding

1046
00:38:21,109 --> 00:38:19,040
in addition all the footage that we'll

1047
00:38:23,589 --> 00:38:21,119
get from the balloons that are doing the

1048
00:38:25,510 --> 00:38:23,599
video and the still images

1049
00:38:27,510 --> 00:38:25,520
will be able to capture images of the

1050
00:38:29,510 --> 00:38:27,520
clouds which can also tell us

1051
00:38:31,510 --> 00:38:29,520
information about how our atmosphere is

1052
00:38:33,430 --> 00:38:31,520
responding to the eclipse

1053
00:38:35,670 --> 00:38:33,440
the second piece of science that's being

1054
00:38:37,829 --> 00:38:35,680
done is all of our footage will go into

1055
00:38:41,030 --> 00:38:37,839
a project called the eclipse mega movie

1056
00:38:42,710 --> 00:38:41,040
project and the idea here is that we

1057
00:38:44,950 --> 00:38:42,720
know the exact

1058
00:38:46,470 --> 00:38:44,960
surface of the moon from previous

1059
00:38:47,430 --> 00:38:46,480
satellite studies

1060
00:38:49,270 --> 00:38:47,440
and

1061
00:38:51,670 --> 00:38:49,280
looking at the bailey's beads which are

1062
00:38:54,069 --> 00:38:51,680
just the last little bits of light

1063
00:38:56,069 --> 00:38:54,079

before the total solar eclipse we can

1064
00:38:58,550 --> 00:38:56,079
actually use that data and collecting

1065
00:39:01,030 --> 00:38:58,560
lots of different images to learn about

1066
00:39:03,829 --> 00:39:01,040
the exact surface of the sun

1067
00:39:06,150 --> 00:39:03,839
actually so using the moon surface

1068
00:39:08,470 --> 00:39:06,160
to learn about the surface of the sun so

1069
00:39:11,190 --> 00:39:08,480
that's the second piece the third piece

1070
00:39:13,109 --> 00:39:11,200
is that it turns out at high altitude

1071
00:39:15,270 --> 00:39:13,119
where the balloons are going to be

1072
00:39:17,510 --> 00:39:15,280
is an analogy in temperature and

1073
00:39:19,349 --> 00:39:17,520
pressure to the surface of mars

1074
00:39:23,430 --> 00:39:19,359
so we're partnering with nasa ames

1075
00:39:24,630 --> 00:39:23,440
researchers to fly resilient bacteria on

1076
00:39:26,069 --> 00:39:24,640
the balloons

1077
00:39:28,390 --> 00:39:26,079
to get a feel

1078
00:39:30,390 --> 00:39:28,400
in many different balloons across the

1079
00:39:31,430 --> 00:39:30,400
country but all happening at the same

1080
00:39:34,150 --> 00:39:31,440
time

1081
00:39:36,790 --> 00:39:34,160
what these bacteria go through so that

1082
00:39:39,349 --> 00:39:36,800
we can learn that analogy

1083
00:39:41,190 --> 00:39:39,359
for the surface of mars so nasa has done

1084
00:39:43,750 --> 00:39:41,200
this kind of study on a nasa balloon

1085
00:39:45,270 --> 00:39:43,760
before but not on multiple balloons at

1086
00:39:47,109 --> 00:39:45,280
the same time

1087
00:39:48,310 --> 00:39:47,119
so those are the three key pieces of

1088
00:39:50,230 --> 00:39:48,320

science

1089
00:39:53,270 --> 00:39:50,240
and just seth that's an interesting

1090
00:39:55,109 --> 00:39:53,280
storyline by itself those experiments so

1091
00:39:56,630 --> 00:39:55,119
for the media here

1092
00:39:59,430 --> 00:39:56,640
you may want to get it take a deeper

1093
00:40:01,910 --> 00:39:59,440
dive in that astrobiology's experiments

1094
00:40:03,670 --> 00:40:01,920
um i'm going to stay here for one more

1095
00:40:04,950 --> 00:40:03,680
question and we have social media folks

1096
00:40:06,150 --> 00:40:04,960
if you want to do but we have a question

1097
00:40:07,990 --> 00:40:06,160
here then we're going to go to the phone

1098
00:40:09,750 --> 00:40:08,000
lines uh name and affiliation please hi

1099
00:40:11,109 --> 00:40:09,760
hanukkah whitering with space.com

1100
00:40:13,030 --> 00:40:11,119
another quick balloon question and then

1101
00:40:15,270 --> 00:40:13,040
i'll have a follow-up are the gopro

1102
00:40:17,270 --> 00:40:15,280
cameras on the balloons also going to be

1103
00:40:19,670 --> 00:40:17,280
pointed down towards the earth and like

1104
00:40:21,829 --> 00:40:19,680
watching the the shadow of the moon

1105
00:40:23,829 --> 00:40:21,839
that's a great question and just a minor

1106
00:40:25,990 --> 00:40:23,839
correction to the question so the

1107
00:40:28,630 --> 00:40:26,000
technology that we use actually is

1108
00:40:30,150 --> 00:40:28,640
raspberry pi so we have little raspberry

1109
00:40:32,950 --> 00:40:30,160
pi computers so the cameras are actually

1110
00:40:34,950 --> 00:40:32,960
raspberry pi um cameras

1111
00:40:37,030 --> 00:40:34,960
and actually the teams will be looking

1112
00:40:38,390 --> 00:40:37,040
at different things so the cameras are

1113
00:40:39,829 --> 00:40:38,400

actually controllable from the ground

1114
00:40:41,990 --> 00:40:39,839
there's really great you know speaking

1115
00:40:44,150 --> 00:40:42,000
of technology that's really interesting

1116
00:40:45,990 --> 00:40:44,160
thing we're cutting edge technology with

1117
00:40:47,670 --> 00:40:46,000
so much that we're doing so the teams

1118
00:40:49,750 --> 00:40:47,680
can actually control from the ground

1119
00:40:51,670 --> 00:40:49,760
through a satellite link

1120
00:40:54,550 --> 00:40:51,680
and and other radio links what the

1121
00:40:56,470 --> 00:40:54,560
camera is looking at um and on most of

1122
00:40:57,750 --> 00:40:56,480
the balloons they'll have also

1123
00:40:59,349 --> 00:40:57,760
cameras pointing in lots of different

1124
00:41:00,790 --> 00:40:59,359
directions so they can choose the camera

1125
00:41:03,030 --> 00:41:00,800
as the balloon is spinning to look at

1126
00:41:05,030 --> 00:41:03,040
what they want to so we have some teams

1127
00:41:06,870 --> 00:41:05,040
that will be wanting to look at the sun

1128
00:41:08,630 --> 00:41:06,880
to see what's happening in totality we

1129
00:41:09,829 --> 00:41:08,640
have some that will be looking at the

1130
00:41:12,710 --> 00:41:09,839
ground

1131
00:41:15,750 --> 00:41:12,720
for me personally it's the shadow like

1132
00:41:17,750 --> 00:41:15,760
looking down on the earth and seeing the

1133
00:41:18,950 --> 00:41:17,760
shadow coming across

1134
00:41:20,630 --> 00:41:18,960
that is really the most spectac

1135
00:41:22,150 --> 00:41:20,640
spectacular

1136
00:41:25,990 --> 00:41:22,160
but the teams will kind of choose what

1137
00:41:29,670 --> 00:41:27,990
with looking at the shadow is there

1138
00:41:31,190 --> 00:41:29,680

anything scientific that we can really

1139
00:41:32,390 --> 00:41:31,200
learn other than i guess

1140
00:41:33,990 --> 00:41:32,400
if you're looking at the atmosphere is

1141
00:41:35,670 --> 00:41:34,000
there anything about the shadow itself

1142
00:41:40,390 --> 00:41:35,680
that will teach us something about the

1143
00:41:44,309 --> 00:41:41,589
you know i

1144
00:41:45,990 --> 00:41:44,319
i think that there is um i i can't

1145
00:41:48,470 --> 00:41:46,000
answer that question in detail i'd have

1146
00:41:50,710 --> 00:41:48,480
to to follow up with you or the person

1147
00:41:52,230 --> 00:41:50,720
from noah on the earlier panel could

1148
00:41:54,870 --> 00:41:52,240
probably answer that question in more

1149
00:41:57,190 --> 00:41:54,880
detail perhaps uh one

1150
00:41:59,270 --> 00:41:57,200
possibility angela are you there angela

1151
00:42:00,470 --> 00:41:59,280
speck

1152
00:42:02,230 --> 00:42:00,480
i'm here

1153
00:42:03,589 --> 00:42:02,240
do you have an answer to that because

1154
00:42:07,510 --> 00:42:03,599
you're thinking about these shadows and

1155
00:42:11,190 --> 00:42:08,950
right so so there's a couple of

1156
00:42:13,349 --> 00:42:11,200
different things um one of the things is

1157
00:42:15,670 --> 00:42:13,359
that you know we're now at the point

1158
00:42:17,670 --> 00:42:15,680
where as we're looking at the shadow and

1159
00:42:19,589 --> 00:42:17,680
understanding exactly where it's going

1160
00:42:21,750 --> 00:42:19,599
being able to see it from the outside

1161
00:42:23,670 --> 00:42:21,760
and the inside at the same time that is

1162
00:42:26,390 --> 00:42:23,680
going to have an impact on how we're

1163
00:42:27,910 --> 00:42:26,400

looking at atmospheric effects um but

1164
00:42:30,950 --> 00:42:27,920
i'm not sure that i think your question

1165
00:42:33,349 --> 00:42:30,960
was the shadow itself um and i think

1166
00:42:35,349 --> 00:42:33,359
what it's going to do is test an idea

1167
00:42:37,349 --> 00:42:35,359
that was put forward for how we

1168
00:42:38,630 --> 00:42:37,359
determine the shape of the shadow so

1169
00:42:41,430 --> 00:42:38,640
there's some interesting effects that

1170
00:42:43,750 --> 00:42:41,440
happen to do with the fact that um as

1171
00:42:46,150 --> 00:42:43,760
the other angela said you've got these

1172
00:42:48,069 --> 00:42:46,160
uh craters and mountains on the moon

1173
00:42:49,750 --> 00:42:48,079
that give rise to bailey's beads but

1174
00:42:51,589 --> 00:42:49,760
they also mean that you get this really

1175
00:42:54,710 --> 00:42:51,599
interesting visual effect that the

1176
00:42:56,710 --> 00:42:54,720
shadow of the moon is not um actually a

1177
00:42:58,790 --> 00:42:56,720
circle and in fact it's not even just a

1178
00:43:00,710 --> 00:42:58,800
stretched out circle it's kind of a an

1179
00:43:03,670 --> 00:43:00,720
irregular polygon

1180
00:43:05,670 --> 00:43:03,680
and so having data that's letting us see

1181
00:43:08,309 --> 00:43:05,680
the shadow in all directions is going to

1182
00:43:09,589 --> 00:43:08,319
help us see how well did we do in in

1183
00:43:12,790 --> 00:43:09,599
working out what that shadow was going

1184
00:43:16,790 --> 00:43:14,630
we're gonna go to the phone lines uh

1185
00:43:17,750 --> 00:43:16,800
first and then we'll head over to uh

1186
00:43:22,550 --> 00:43:17,760
jason

1187
00:43:24,630 --> 00:43:22,560
media and all of the traffic uh all over

1188
00:43:27,430 --> 00:43:24,640

the world actually uh

1189
00:43:29,510 --> 00:43:27,440
preparing for the august 21 total solar

1190
00:43:31,270 --> 00:43:29,520
eclipse across america on the phone

1191
00:43:37,589 --> 00:43:31,280
lines um

1192
00:43:44,630 --> 00:43:39,829
rebecca

1193
00:43:46,390 --> 00:43:44,640
hi can you hear me loud and clear

1194
00:43:48,150 --> 00:43:46,400
okay they i guess i went away while you

1195
00:43:49,030 --> 00:43:48,160
were calling on me so i didn't know my

1196
00:43:49,910 --> 00:43:49,040
name

1197
00:43:51,829 --> 00:43:49,920
sorry

1198
00:43:53,430 --> 00:43:51,839
um i guess i have a couple questions i'm

1199
00:43:56,069 --> 00:43:53,440
wondering first of all

1200
00:43:57,910 --> 00:43:56,079
why you all think this will be an event

1201
00:44:00,870 --> 00:43:57,920
that excites people and gets them

1202
00:44:02,470 --> 00:44:00,880
interested in science if you can explain

1203
00:44:04,309 --> 00:44:02,480
i guess what your thoughts are about

1204
00:44:06,069 --> 00:44:04,319
that anyone who's experienced one of

1205
00:44:08,309 --> 00:44:06,079
these or has not but is looking forward

1206
00:44:11,190 --> 00:44:08,319
to experiencing one of these what about

1207
00:44:13,430 --> 00:44:11,200
this event will create that kind of

1208
00:44:15,270 --> 00:44:13,440
inspiration for people

1209
00:44:18,309 --> 00:44:15,280
i want to do a start with you matt

1210
00:44:21,589 --> 00:44:18,319
perhaps before i go to uh angela on the

1211
00:44:24,470 --> 00:44:21,599
phone um yes so um i've only seen two

1212
00:44:26,069 --> 00:44:24,480
total eclipses um and i've seen it by

1213
00:44:28,069 --> 00:44:26,079

trying to do science at both of them too

1214
00:44:30,309 --> 00:44:28,079
so my perspective may be a little skewed

1215
00:44:31,510 --> 00:44:30,319
um but first of all the the corona i

1216
00:44:32,870 --> 00:44:31,520
think is the most beautiful thing you

1217
00:44:34,870 --> 00:44:32,880
can see in the sky it's much more

1218
00:44:36,710 --> 00:44:34,880
beautiful than planetary alignments or

1219
00:44:38,790 --> 00:44:36,720
even comets that i've seen the corona is

1220
00:44:41,270 --> 00:44:38,800
just fantastic and filamentary and

1221
00:44:43,190 --> 00:44:41,280
delicate and awesome

1222
00:44:44,390 --> 00:44:43,200
the second thing is that uh in the

1223
00:44:46,870 --> 00:44:44,400
middle of the day the sun is not

1224
00:44:48,630 --> 00:44:46,880
supposed to go away so you get this sort

1225
00:44:50,470 --> 00:44:48,640
of primal feeling that something is

1226
00:44:51,510 --> 00:44:50,480
wrong this is just not supposed to

1227
00:44:54,069 --> 00:44:51,520
happen

1228
00:44:55,829 --> 00:44:54,079
it's a wonderful way to understand where

1229
00:44:57,990 --> 00:44:55,839
we fit in in this cosmic perspective

1230
00:44:59,829 --> 00:44:58,000
that thomas mentioned before

1231
00:45:01,829 --> 00:44:59,839
you can actually get a three-dimensional

1232
00:45:03,430 --> 00:45:01,839
sense of where you're at

1233
00:45:05,829 --> 00:45:03,440
and so i suppose you know if you're

1234
00:45:07,270 --> 00:45:05,839
really um you know adamant about not

1235
00:45:08,550 --> 00:45:07,280
being affected by the solar eclipse you

1236
00:45:10,710 --> 00:45:08,560
might be driving down the road and try

1237
00:45:12,470 --> 00:45:10,720
to ignore it and turn on your headlights

1238
00:45:13,750 --> 00:45:12,480

but i have a feeling that about 90 of

1239
00:45:16,790 --> 00:45:13,760
the people in the path are going to be

1240
00:45:19,910 --> 00:45:16,800
just awestruck with this event

1241
00:45:24,950 --> 00:45:22,309
yeah and i think that what matt said is

1242
00:45:27,030 --> 00:45:24,960
is great we have um

1243
00:45:28,150 --> 00:45:27,040
you know we know that people

1244
00:45:30,550 --> 00:45:28,160
are

1245
00:45:33,030 --> 00:45:30,560
affected viscerally by this it's such an

1246
00:45:34,550 --> 00:45:33,040
um you know the change in light is so

1247
00:45:37,190 --> 00:45:34,560
fast and what you get to see is so

1248
00:45:40,069 --> 00:45:37,200
amazing that even people who chase

1249
00:45:41,349 --> 00:45:40,079
eclipses and have seen dozens of them

1250
00:45:45,109 --> 00:45:41,359
will still

1251
00:45:47,270 --> 00:45:45,119
be wowed by this they'll still have this

1252
00:45:48,950 --> 00:45:47,280
intake of breath as it happens and

1253
00:45:50,870 --> 00:45:48,960
people are

1254
00:45:52,790 --> 00:45:50,880
excited about the idea you know i think

1255
00:45:54,710 --> 00:45:52,800
this is one of those things where

1256
00:45:56,790 --> 00:45:54,720
even if you haven't seen one you're

1257
00:45:59,510 --> 00:45:56,800
aware of the concept and once you start

1258
00:46:01,430 --> 00:45:59,520
to hear more about it

1259
00:46:03,190 --> 00:46:01,440
people get excited i've been going all

1260
00:46:05,589 --> 00:46:03,200
over the country doing talks trying to

1261
00:46:07,349 --> 00:46:05,599
help people get excited but also get

1262
00:46:08,550 --> 00:46:07,359
ready because it's going to be such a

1263
00:46:11,270 --> 00:46:08,560

huge event

1264
00:46:12,870 --> 00:46:11,280
and there'll be people like you know i

1265
00:46:14,150 --> 00:46:12,880
wasn't sure but then i heard you talk

1266
00:46:15,829 --> 00:46:14,160
about what's going to happen and now i'm

1267
00:46:18,309 --> 00:46:15,839
really excited and that's people who

1268
00:46:20,150 --> 00:46:18,319
haven't even seen one yet so you know i

1269
00:46:22,390 --> 00:46:20,160
think that what we're going to see is

1270
00:46:24,309 --> 00:46:22,400
there'll be people who it's like this it

1271
00:46:26,710 --> 00:46:24,319
really is for a lot of people a once in

1272
00:46:28,790 --> 00:46:26,720
a lifetime opportunity it's expensive to

1273
00:46:30,550 --> 00:46:28,800
travel the world following these things

1274
00:46:32,309 --> 00:46:30,560
um and so they will make the effort to

1275
00:46:34,550 --> 00:46:32,319
come and see it and then they're going

1276
00:46:37,750 --> 00:46:34,560
to be so blown away by just how amazing

1277
00:46:39,589 --> 00:46:37,760
it is and just the overall feeling of

1278
00:46:41,670 --> 00:46:39,599
it's not just visual it's it's an

1279
00:46:45,109 --> 00:46:41,680
all-over experience that they will be

1280
00:46:45,119 --> 00:46:50,630
next question on the phone

1281
00:46:53,910 --> 00:46:52,150
taylor

1282
00:46:55,589 --> 00:46:53,920
hi can you guys hear me

1283
00:46:58,390 --> 00:46:55,599
loud and clear

1284
00:47:01,750 --> 00:46:58,400
all right i'm from wkms we're an npr

1285
00:47:04,069 --> 00:47:01,760
affiliate station in west kentucky um

1286
00:47:06,150 --> 00:47:04,079
what we wanted to know is uh where is

1287
00:47:08,710 --> 00:47:06,160
nasa going to be posted during the

1288
00:47:11,190 --> 00:47:08,720

eclipse um we've heard rumors about you

1289
00:47:13,430 --> 00:47:11,200
guys coming to west kentucky where the

1290
00:47:15,430 --> 00:47:13,440
greatest duration of totality is going

1291
00:47:18,550 --> 00:47:15,440
to be we just wanted to know where you

1292
00:47:22,230 --> 00:47:19,990
thomas what i'm going to do is kick it

1293
00:47:23,910 --> 00:47:22,240
over to alex he's our expert who has

1294
00:47:24,950 --> 00:47:23,920
been thinking about the eclipse for how

1295
00:47:27,829 --> 00:47:24,960
many years

1296
00:47:30,150 --> 00:47:27,839
uh a lot of years a lot of years um so

1297
00:47:33,030 --> 00:47:30,160
nasa's got a lot of places across the

1298
00:47:34,870 --> 00:47:33,040
country starting in salem oregon moving

1299
00:47:38,069 --> 00:47:34,880
all the way down to charleston but we

1300
00:47:41,750 --> 00:47:38,079
have places in wyoming and idaho in

1301
00:47:43,670 --> 00:47:41,760
nebraska and illinois in missouri

1302
00:47:46,630 --> 00:47:43,680
in tennessee

1303
00:47:50,230 --> 00:47:46,640
so in kentucky so what you need to do

1304
00:47:53,349 --> 00:47:50,240
is go to eclipse2017.nasa.gov

1305
00:47:55,990 --> 00:47:53,359
under events and there you will find

1306
00:47:58,870 --> 00:47:56,000
a google map with all of the television

1307
00:48:02,069 --> 00:47:58,880
broadcast locations the education

1308
00:48:03,589 --> 00:48:02,079
outreach locations as well as all of the

1309
00:48:04,870 --> 00:48:03,599
different people who have registered

1310
00:48:06,710 --> 00:48:04,880
their events

1311
00:48:08,710 --> 00:48:06,720
to share with nasa and share with

1312
00:48:11,030 --> 00:48:08,720
everyone in the country about what's

1313
00:48:13,349 --> 00:48:11,040

going on so there's a lot of official

1314
00:48:16,069 --> 00:48:13,359
nasa sites as well as lots of other ones

1315
00:48:17,109 --> 00:48:16,079
that that nasa is helping to support and

1316
00:48:19,030 --> 00:48:17,119
promote

1317
00:48:20,790 --> 00:48:19,040
and let me just add that

1318
00:48:22,870 --> 00:48:20,800
we've got a total of i believe eight

1319
00:48:25,190 --> 00:48:22,880
types of things happening in that area

1320
00:48:27,190 --> 00:48:25,200
phenomenal things happening wanna

1321
00:48:30,309 --> 00:48:27,200
ensure that you go to the website to get

1322
00:48:31,510 --> 00:48:30,319
the specific details and charleston uh

1323
00:48:33,430 --> 00:48:31,520
that will be

1324
00:48:34,870 --> 00:48:33,440
eclipse central right now that's what

1325
00:48:37,349 --> 00:48:34,880
we're calling it that name could change

1326
00:48:38,710 --> 00:48:37,359
but charleston will be our home base as

1327
00:48:40,670 --> 00:48:38,720
i've been talking about as you heard in

1328
00:48:43,270 --> 00:48:40,680
the first show

1329
00:48:45,670 --> 00:48:43,280
nasa.gov slash eclipse live for the

1330
00:48:47,430 --> 00:48:45,680
three-hour unprecedented nasa tv show

1331
00:48:49,430 --> 00:48:47,440
through the eyes of nasa charleston will

1332
00:48:50,950 --> 00:48:49,440
be at home base western kentucky a lot

1333
00:48:52,630 --> 00:48:50,960
of things happening and if you want to

1334
00:48:55,190 --> 00:48:52,640
follow up with us at nasa we can give

1335
00:48:56,630 --> 00:48:55,200
you specifics but as alex said lots of

1336
00:48:58,790 --> 00:48:56,640
things across the country but

1337
00:49:01,349 --> 00:48:58,800
particularly in western kentucky

1338
00:49:05,589 --> 00:49:01,359

any other phone questions before i go to

1339
00:49:05,599 --> 00:49:11,190
chelsea on the phone

1340
00:49:16,390 --> 00:49:14,150
hi chelsea vallarte from geekwire

1341
00:49:19,030 --> 00:49:16,400
we hear you

1342
00:49:21,270 --> 00:49:19,040
i will have a question for angela

1343
00:49:23,109 --> 00:49:21,280
so you had talked a lot about student

1344
00:49:25,349 --> 00:49:23,119
research and the involvement with nasa

1345
00:49:27,270 --> 00:49:25,359
space grant will the removal of the

1346
00:49:30,230 --> 00:49:27,280
office of education reduce student

1347
00:49:32,390 --> 00:49:30,240
involvement in the future for research

1348
00:49:34,630 --> 00:49:32,400
you know that's a very interesting point

1349
00:49:37,270 --> 00:49:34,640
that you bring up and i'm obviously

1350
00:49:40,069 --> 00:49:37,280
working very hard with folks at nasa and

1351
00:49:42,309 --> 00:49:40,079
also with our legislatures to make sure

1352
00:49:44,470 --> 00:49:42,319
that our really valuable education

1353
00:49:45,750 --> 00:49:44,480
programs do continue

1354
00:49:47,589 --> 00:49:45,760
to exist

1355
00:49:50,309 --> 00:49:47,599
so obviously if that elimination

1356
00:49:51,670 --> 00:49:50,319
happened that would have a huge negative

1357
00:49:53,829 --> 00:49:51,680
impact

1358
00:49:56,150 --> 00:49:53,839
as i said this is a collaboration

1359
00:49:58,309 --> 00:49:56,160
amongst many different nasa entities the

1360
00:50:00,630 --> 00:49:58,319
nasa science mission directorate nasa

1361
00:50:03,349 --> 00:50:00,640
space grant and you know there's lots of

1362
00:50:04,950 --> 00:50:03,359
different centers involved in as well

1363
00:50:07,510 --> 00:50:04,960

so that's something that we're really

1364
00:50:10,549 --> 00:50:07,520
working on i mean as we speak literally

1365
00:50:12,470 --> 00:50:10,559
our community to save the important

1366
00:50:14,710 --> 00:50:12,480
parts of nasa education if things need

1367
00:50:16,790 --> 00:50:14,720
to to change a little bit we understand

1368
00:50:19,030 --> 00:50:16,800
that but we're working very hard to

1369
00:50:20,710 --> 00:50:19,040
maintain those really impactful

1370
00:50:22,390 --> 00:50:20,720
programs

1371
00:50:23,589 --> 00:50:22,400
okay we're gonna take one more question

1372
00:50:25,349 --> 00:50:23,599
on the phone and then we're gonna go to

1373
00:50:28,950 --> 00:50:25,359
social media and we'll wrap up and i

1374
00:50:30,710 --> 00:50:28,960
believe we have uh cbs news bill

1375
00:50:32,230 --> 00:50:30,720
yeah hi uh thanks uh and i might have

1376
00:50:33,670 --> 00:50:32,240
missed this earlier but uh we talked

1377
00:50:35,990 --> 00:50:33,680
about satellites that will be observing

1378
00:50:37,750 --> 00:50:36,000
it uh the balloon campaign do any of you

1379
00:50:39,990 --> 00:50:37,760
have a sense of how many

1380
00:50:41,589 --> 00:50:40,000
observatories uh you know professional

1381
00:50:43,190 --> 00:50:41,599
telescopes that'll be

1382
00:50:45,270 --> 00:50:43,200
uh studying this thing while it's

1383
00:50:48,470 --> 00:50:45,280
happening even ballpark just curiosity

1384
00:50:52,870 --> 00:50:50,870
um go ahead so at the way i would answer

1385
00:50:55,589 --> 00:50:52,880
that i'm going to start with the nasa

1386
00:50:57,030 --> 00:50:55,599
number first we have 11 spacecraft that

1387
00:50:58,230 --> 00:50:57,040
are going to observe two of which of

1388
00:51:00,309 --> 00:50:58,240

course we're doing together with our

1389
00:51:03,190 --> 00:51:00,319
sister agency at noaa

1390
00:51:04,790 --> 00:51:03,200
we have in addition to that you know uh

1391
00:51:07,190 --> 00:51:04,800
well over 50

1392
00:51:10,150 --> 00:51:07,200
uh you know balloon platforms we have

1393
00:51:12,230 --> 00:51:10,160
three uh aircraft and and uh i'm really

1394
00:51:14,710 --> 00:51:12,240
interested in your answer uh david later

1395
00:51:16,950 --> 00:51:14,720
but but i think there are

1396
00:51:19,190 --> 00:51:16,960
really thousands of ground-based uh

1397
00:51:21,349 --> 00:51:19,200
observatories a variety of professional

1398
00:51:23,270 --> 00:51:21,359
grade that will uh look at this just of

1399
00:51:25,589 --> 00:51:23,280
the type that you talked about matt you

1400
00:51:27,510 --> 00:51:25,599
know of uh you know telescopes that are

1401
00:51:29,109 --> 00:51:27,520
out there that you helped disseminate

1402
00:51:31,109 --> 00:51:29,119
but also others but uh david how would

1403
00:51:33,109 --> 00:51:31,119
you answer it yeah well unfortunately

1404
00:51:34,710 --> 00:51:33,119
our our major national facilities are

1405
00:51:36,630 --> 00:51:34,720
located in um

1406
00:51:40,150 --> 00:51:36,640
in arizona new mexico

1407
00:51:41,990 --> 00:51:40,160
and uh and and soon to be in hawaii and

1408
00:51:43,510 --> 00:51:42,000
so our major national facilities uh

1409
00:51:45,670 --> 00:51:43,520
ground-based facilities won't be able to

1410
00:51:47,349 --> 00:51:45,680
observe it but um you know there's

1411
00:51:49,670 --> 00:51:47,359
there's matt's project we're also

1412
00:51:52,069 --> 00:51:49,680
funding another project uh where they're

1413
00:51:54,549 --> 00:51:52,079

going to observe it from five different

1414
00:51:56,150 --> 00:51:54,559
sites in in the past and then i also

1415
00:51:59,349 --> 00:51:56,160
describe

1416
00:52:00,790 --> 00:51:59,359
the uh the end car air flight that we're

1417
00:52:02,069 --> 00:52:00,800
sponsoring through

1418
00:52:04,150 --> 00:52:02,079
the national center for atmospheric

1419
00:52:06,790 --> 00:52:04,160
research

1420
00:52:08,950 --> 00:52:06,800
so bill um we'll see if we can get you a

1421
00:52:11,910 --> 00:52:08,960
number uh if we say a whole lot i

1422
00:52:13,829 --> 00:52:11,920
probably won't cut it for you um

1423
00:52:16,470 --> 00:52:13,839
so uh this is why it's good that we

1424
00:52:17,910 --> 00:52:16,480
we're doing this two months out we can

1425
00:52:19,190 --> 00:52:17,920
get these questions and again the

1426
00:52:21,190 --> 00:52:19,200
questions we can't answer a lot of

1427
00:52:24,870 --> 00:52:21,200
things we're still confirming up uh but

1428
00:52:26,710 --> 00:52:24,880
we'll get those on as i said eclipse 27

1429
00:52:29,109 --> 00:52:26,720
2017.

1430
00:52:30,950 --> 00:52:29,119
okay we're gonna go to social and jason

1431
00:52:33,670 --> 00:52:30,960
uh let's take a few questions before we

1432
00:52:35,750 --> 00:52:33,680
wrap up indeed thanks dwayne uh just a

1433
00:52:37,030 --> 00:52:35,760
couple of things here coming in uh

1434
00:52:40,230 --> 00:52:37,040
there's a lot of folks who are concerned

1435
00:52:41,510 --> 00:52:40,240
about pets and animals here um so there

1436
00:52:43,910 --> 00:52:41,520
is a friendly reminder from one of our

1437
00:52:45,829 --> 00:52:43,920
social media participants out there who

1438
00:52:48,230 --> 00:52:45,839

says don't forget to leave your pets in

1439
00:52:50,710 --> 00:52:48,240
your hot cars during this take them out

1440
00:52:53,750 --> 00:52:50,720
and so on so that way there's no safety

1441
00:52:54,710 --> 00:52:53,760
issues there but the other person here

1442
00:52:56,630 --> 00:52:54,720
um

1443
00:52:58,710 --> 00:52:56,640
is asking us

1444
00:53:00,630 --> 00:52:58,720
terry on twitter is asking how will this

1445
00:53:05,030 --> 00:53:00,640
affect the big critters out there things

1446
00:53:09,430 --> 00:53:07,270
i could take that one

1447
00:53:11,430 --> 00:53:09,440
angela spec do you have a do you have an

1448
00:53:13,349 --> 00:53:11,440
answer there or

1449
00:53:15,990 --> 00:53:13,359
i i've never met one of those and not

1450
00:53:18,309 --> 00:53:16,000
during an eclipse

1451
00:53:19,990 --> 00:53:18,319
so actually i'm up in wyoming in bear

1452
00:53:22,390 --> 00:53:20,000
country right now

1453
00:53:24,390 --> 00:53:22,400
so um i can i can definitely certainly

1454
00:53:25,670 --> 00:53:24,400
talk to this a little bit so i think

1455
00:53:27,109 --> 00:53:25,680
that you know

1456
00:53:29,030 --> 00:53:27,119
first of all i want to address one of

1457
00:53:31,030 --> 00:53:29,040
those earlier comments which is that you

1458
00:53:33,670 --> 00:53:31,040
know what it's no different than any

1459
00:53:35,030 --> 00:53:33,680
other day on a normal day your pets

1460
00:53:36,950 --> 00:53:35,040
don't try to look at the sun and

1461
00:53:38,549 --> 00:53:36,960
therefore don't damage their eyes so on

1462
00:53:41,510 --> 00:53:38,559
this day they're not going to do it

1463
00:53:43,190 --> 00:53:41,520

either it's not a concern

1464
00:53:45,030 --> 00:53:43,200
letting them outside it is all that's

1465
00:53:47,589 --> 00:53:45,040
happened as we've blocked out the sun

1466
00:53:49,430 --> 00:53:47,599
it's not more dangerous so i think that

1467
00:53:52,230 --> 00:53:49,440
people who have pets want to think about

1468
00:53:54,630 --> 00:53:52,240
that i'm not going to worry about my cat

1469
00:53:56,790 --> 00:53:54,640
um but for the for the big beasties you

1470
00:53:58,790 --> 00:53:56,800
know we've got i'm up here and we've got

1471
00:54:01,349 --> 00:53:58,800
things like mountain lions and bears and

1472
00:54:03,990 --> 00:54:01,359
wolves and coyotes and a lot of them

1473
00:54:06,390 --> 00:54:04,000
have nocturnal activities but the night

1474
00:54:08,230 --> 00:54:06,400
time comes so fast and i don't think we

1475
00:54:10,710 --> 00:54:08,240
have good data on this so it's actually

1476
00:54:12,710 --> 00:54:10,720
going to be really interesting to

1477
00:54:15,349 --> 00:54:12,720
actually see what happens because

1478
00:54:16,870 --> 00:54:15,359
remember we go through a period of maybe

1479
00:54:18,790 --> 00:54:16,880
half an hour where it's kind of early

1480
00:54:22,150 --> 00:54:18,800
twilight colors and then it goes to

1481
00:54:24,710 --> 00:54:22,160
quite dark very fast so depending on how

1482
00:54:27,589 --> 00:54:24,720
fast an animal reacts to it becoming

1483
00:54:29,829 --> 00:54:27,599
dark it may not be an issue at all

1484
00:54:32,390 --> 00:54:29,839
but one of the fun things is going to be

1485
00:54:34,630 --> 00:54:32,400
that this eclipse goes right over the

1486
00:54:37,750 --> 00:54:34,640
tetons national park and across a swath

1487
00:54:38,870 --> 00:54:37,760
of wyoming and there are a lot of bison

1488
00:54:41,030 --> 00:54:38,880

bears

1489
00:54:42,950 --> 00:54:41,040
other beasties rattlesnakes all that

1490
00:54:47,030 --> 00:54:42,960
sort of thing where

1491
00:54:50,150 --> 00:54:47,829
all right

1492
00:54:52,710 --> 00:54:50,160
speaking of it getting dark out there um

1493
00:54:55,109 --> 00:54:52,720
on facebook user jessica is asking here

1494
00:54:58,789 --> 00:54:55,119
uh is it gonna get dark like night out

1495
00:55:03,750 --> 00:55:01,190
um it gets to be about as dark as it is

1496
00:55:05,750 --> 00:55:03,760
about a half an hour after sunset um so

1497
00:55:07,349 --> 00:55:05,760
a deep twilight is is what you'll

1498
00:55:10,390 --> 00:55:07,359
experience

1499
00:55:11,990 --> 00:55:10,400
in the path of totality sorry yes

1500
00:55:14,390 --> 00:55:12,000
all right wonderful and then twitter

1501
00:55:16,069 --> 00:55:14,400
user brandon here is asking um what are

1502
00:55:18,710 --> 00:55:16,079
the differences and similarities between

1503
00:55:21,270 --> 00:55:18,720
the solar eclipse uh coming up in 2017

1504
00:55:25,030 --> 00:55:21,280
and the solar eclipse of 1979 for those

1505
00:55:31,510 --> 00:55:27,109
angela on the phone do you have uh do

1506
00:55:34,630 --> 00:55:32,390
okay

1507
00:55:36,309 --> 00:55:34,640
so in terms of

1508
00:55:38,870 --> 00:55:36,319
the the way that this is going to affect

1509
00:55:40,549 --> 00:55:38,880
the country it's huge um i

1510
00:55:42,789 --> 00:55:40,559
would have been in like second grade in

1511
00:55:44,309 --> 00:55:42,799
1979 and i certainly wasn't under the

1512
00:55:45,910 --> 00:55:44,319
path of totality

1513
00:55:47,910 --> 00:55:45,920

but if we just look at where the path

1514
00:55:50,470 --> 00:55:47,920
went now only hit a small corner of the

1515
00:55:52,390 --> 00:55:50,480
u.s this one goes all the way from coast

1516
00:55:54,549 --> 00:55:52,400
to coast it's very accessible from

1517
00:55:56,950 --> 00:55:54,559
people all over the country

1518
00:55:58,230 --> 00:55:56,960
so we have lots of opportunities all

1519
00:56:01,670 --> 00:55:58,240
right linda

1520
00:56:03,670 --> 00:56:01,680
sorry flynn on the phone i'll get to you

1521
00:56:06,230 --> 00:56:03,680
no actually i think angela answered that

1522
00:56:08,549 --> 00:56:06,240
one pretty well i think um it's the

1523
00:56:10,309 --> 00:56:08,559
coast to coast nature of it that's

1524
00:56:11,910 --> 00:56:10,319
really spectacular and i think people

1525
00:56:14,950 --> 00:56:11,920
have mentioned all of these

1526
00:56:17,990 --> 00:56:14,960
opportunities to stitch together

1527
00:56:19,910 --> 00:56:18,000
all the photographs and all the images

1528
00:56:23,589 --> 00:56:19,920
of the eclipse from coast to coast is a

1529
00:56:27,270 --> 00:56:25,270
one more all right last question here

1530
00:56:29,510 --> 00:56:27,280
comes from twitter user emily who asks

1531
00:56:31,030 --> 00:56:29,520
uh when will another phenomenon like

1532
00:56:32,150 --> 00:56:31,040
this occur

1533
00:56:35,430 --> 00:56:32,160
so

1534
00:56:38,150 --> 00:56:35,440
it'll be in april of 2024

1535
00:56:40,150 --> 00:56:38,160
the path will go north to south but

1536
00:56:43,109 --> 00:56:40,160
it'll cross mexico the united states and

1537
00:56:47,750 --> 00:56:46,069
okay so what i'm going to do here is um

1538
00:56:48,789 --> 00:56:47,760

you know you you're hearing all of these

1539
00:56:50,710 --> 00:56:48,799
incredible

1540
00:56:53,109 --> 00:56:50,720
stories and it really reaches down on

1541
00:56:55,510 --> 00:56:53,119
the soul and and and the personality and

1542
00:56:57,670 --> 00:56:55,520
the human seeing nature but there's also

1543
00:57:01,109 --> 00:56:57,680
some really personal uh story lines here

1544
00:57:03,910 --> 00:57:01,119
and i'm gonna uh go over to you uh matt

1545
00:57:04,950 --> 00:57:03,920
about how your name of your organization

1546
00:57:07,109 --> 00:57:04,960
came about

1547
00:57:09,510 --> 00:57:07,119
oh yeah i have happen to have a 14 year

1548
00:57:11,190 --> 00:57:09,520
old daughter who has the same name as as

1549
00:57:13,190 --> 00:57:11,200
the project and i'd like her to grow up

1550
00:57:14,950 --> 00:57:13,200
to be a nice citizen so

1551
00:57:16,390 --> 00:57:14,960
that's how he came came about with the

1552
00:57:18,950 --> 00:57:16,400
name

1553
00:57:21,430 --> 00:57:18,960
fantastic so um

1554
00:57:23,430 --> 00:57:21,440
we're two months to the day everyone and

1555
00:57:25,270 --> 00:57:23,440
all viewing here

1556
00:57:26,710 --> 00:57:25,280
the total solar eclipse across america

1557
00:57:28,390 --> 00:57:26,720
august 21.

1558
00:57:31,270 --> 00:57:28,400
early in our briefing we gave a shout

1559
00:57:33,030 --> 00:57:31,280
out to the u.s postal service if you

1560
00:57:34,710 --> 00:57:33,040
didn't know they came out with a first

1561
00:57:36,870 --> 00:57:34,720
of a kind stamp

1562
00:57:38,390 --> 00:57:36,880
and go out get those they're great

1563
00:57:40,470 --> 00:57:38,400

collectibles they've been selling them

1564
00:57:44,309 --> 00:57:40,480
here at the museum you can get them at

1565
00:57:46,470 --> 00:57:44,319
your local post offices and online

1566
00:57:49,109 --> 00:57:46,480
all of this information again you heard

1567
00:57:50,549 --> 00:57:49,119
a lot of websites at the nasa website so

1568
00:57:53,589 --> 00:57:50,559
we can put those up again we want to

1569
00:57:56,390 --> 00:57:53,599
commit those to memory very important

1570
00:57:58,069 --> 00:57:56,400
eclipse 2017 everything on eclipse a

1571
00:58:00,069 --> 00:57:58,079
through z if it's not on there it will

1572
00:58:01,670 --> 00:58:00,079
be on there we got two months to put it

1573
00:58:04,150 --> 00:58:01,680
up you call us

1574
00:58:06,069 --> 00:58:04,160
and for the live broadcast

1575
00:58:07,750 --> 00:58:06,079
with the space station with the

1576
00:58:10,230 --> 00:58:07,760
unprecedented

1577
00:58:11,589 --> 00:58:10,240
unique advantages in space on the ground

1578
00:58:13,670 --> 00:58:11,599
in the balloons and everything in

1579
00:58:17,990 --> 00:58:13,680
between eclipse

1580
00:58:19,990 --> 00:58:18,000
live nasa.gov slash eclipse live i want

1581
00:58:21,750 --> 00:58:20,000
to thank the museum again i want to

1582
00:58:30,710 --> 00:58:21,760
thank our can we have a round of

1583
00:58:33,670 --> 00:58:32,150
for the social media keep those

1584
00:58:35,270 --> 00:58:33,680
questions coming in we have a team of

1585
00:58:37,349 --> 00:58:35,280
scientists that we will be answering

1586
00:58:39,030 --> 00:58:37,359
questions almost on a daily basis and i

1587
00:58:40,710 --> 00:58:39,040
know the pace will pick up there are

1588
00:58:42,309 --> 00:58:40,720

some plans to do an additional briefing

1589
00:58:44,549 --> 00:58:42,319
to give you even more details on the

1590
00:58:45,670 --> 00:58:44,559
assets in the space station and others

1591
00:58:48,069 --> 00:58:45,680
and we'll probably have some other

1592
00:58:49,510 --> 00:58:48,079
agencies join us so before we go we're

1593
00:58:51,910 --> 00:58:49,520
going to do what we did last time for

1594
00:58:54,390 --> 00:58:51,920
the folks out there safety

1595
00:58:56,870 --> 00:58:54,400
get your glasses you heard some other

1596
00:58:58,950 --> 00:58:56,880
options we want to be safe we want to be

1597
00:59:04,410 --> 00:58:58,960
prepared the eclipse is coming mark the