



1
00:00:08,470 --> 00:00:06,869
nasa's jet propulsion laboratory

2
00:00:11,110 --> 00:00:08,480
presents

3
00:00:13,110 --> 00:00:11,120
the von carmen lecture a series of talks

4
00:00:13,830 --> 00:00:13,120
by scientists and engineers who are

5
00:00:17,189 --> 00:00:13,840
exploring

6
00:00:18,090 --> 00:00:17,199
our planet our solar system and all that

7
00:00:25,750 --> 00:00:18,100
lies beyond

8
00:00:27,509 --> 00:00:25,760
[Music]

9
00:00:28,870 --> 00:00:27,519
hello and a very pleasant good evening

10
00:00:31,589 --> 00:00:28,880
to you wherever you may be

11
00:00:33,350 --> 00:00:31,599
i am brian white from jpl's office of

12
00:00:35,990 --> 00:00:33,360
communications and education

13
00:00:38,229 --> 00:00:36,000

and welcome to the von carmen talks

14

00:00:40,709 --> 00:00:38,239

tonight will be a steam-powered talk

15

00:00:43,670 --> 00:00:40,719

discussing how science influences art

16

00:00:45,110 --> 00:00:43,680

and art influences science do that we'll

17

00:00:47,830 --> 00:00:45,120

get perspectives from both

18

00:00:49,110 --> 00:00:47,840

ocean world astro chemists and visual

19

00:00:50,310 --> 00:00:49,120

art strategists

20

00:00:51,910 --> 00:00:50,320

we'll also be doing something a little

21

00:00:53,270 --> 00:00:51,920

different later so please make sure you

22

00:00:55,189 --> 00:00:53,280

stick around for that

23

00:00:56,630 --> 00:00:55,199

now joining us as our co-host fielding

24

00:00:59,430 --> 00:00:56,640

your questions this evening

25

00:01:02,069 --> 00:00:59,440

is public outreach specialist talia khan

26

00:01:05,030 --> 00:01:02,079

hi atalia

27

00:01:06,789 --> 00:01:05,040

thank you brian hello as always we would

28

00:01:08,070 --> 00:01:06,799

like to remind our viewers that this is

29

00:01:09,350 --> 00:01:08,080

your space program

30

00:01:11,750 --> 00:01:09,360

and we want you to be involved in the

31

00:01:12,870 --> 00:01:11,760

conversation this evening so please ask

32

00:01:14,710 --> 00:01:12,880

questions in the chat

33

00:01:16,789 --> 00:01:14,720

and our amazing social media team will

34

00:01:18,469 --> 00:01:16,799

be able to pass them along to us

35

00:01:20,950 --> 00:01:18,479

we will be taking questions through

36

00:01:22,469 --> 00:01:20,960

youtube chat facebook twitter linkedin

37

00:01:24,469 --> 00:01:22,479

and we'll try to get to as many of your

38

00:01:25,990 --> 00:01:24,479

questions as possible this evening

39

00:01:30,710 --> 00:01:26,000

if you do not see the chat please

40

00:01:35,270 --> 00:01:33,350

thank you very much dalia if we run into

41

00:01:37,190 --> 00:01:35,280

any technical difficulties folks we ask

42

00:01:38,069 --> 00:01:37,200

that you stick with us get those sorted

43

00:01:39,990 --> 00:01:38,079

out

44

00:01:41,670 --> 00:01:40,000

now our first speaker is a research

45

00:01:43,830 --> 00:01:41,680

scientist and group supervisor in the

46

00:01:45,270 --> 00:01:43,840

astrobiology and oceans world group at

47

00:01:46,469 --> 00:01:45,280

nasa jet propulsion laboratory in

48

00:01:48,870 --> 00:01:46,479

pasadena

49

00:01:50,789 --> 00:01:48,880

please welcome dr morgan cable i am

50

00:01:53,270 --> 00:01:50,799

morgan

51
00:01:54,310 --> 00:01:53,280
brian how are you i'm so excited to be

52
00:01:58,870 --> 00:01:54,320
here

53
00:02:01,190 --> 00:01:58,880
i want to just start off with everybody

54
00:02:01,670 --> 00:02:01,200
at jpl everybody at nasa has kind of

55
00:02:04,630 --> 00:02:01,680
their own

56
00:02:06,469 --> 00:02:04,640
superhero origin story um what's yours

57
00:02:08,710 --> 00:02:06,479
how did you get here

58
00:02:09,510 --> 00:02:08,720
gosh i don't know if i'm a superhero but

59
00:02:12,229 --> 00:02:09,520
i would say

60
00:02:12,630 --> 00:02:12,239
i definitely grew up inspired so i grew

61
00:02:15,190 --> 00:02:12,640
up

62
00:02:15,830 --> 00:02:15,200
in florida right next to kennedy space

63
00:02:17,990 --> 00:02:15,840

center

64

00:02:19,190 --> 00:02:18,000

and so for me rockets going off in my

65

00:02:21,270 --> 00:02:19,200

backyard was just

66

00:02:22,630 --> 00:02:21,280

kind of normal i didn't realize how

67

00:02:24,869 --> 00:02:22,640

unusual that was

68

00:02:26,550 --> 00:02:24,879

until i i moved away but it certainly

69

00:02:29,589 --> 00:02:26,560

had an impact on me

70

00:02:31,350 --> 00:02:29,599

and i was always interested in science

71

00:02:33,190 --> 00:02:31,360

or at least asking questions and then

72

00:02:34,150 --> 00:02:33,200

trying to figure out how to answer those

73

00:02:36,390 --> 00:02:34,160

questions

74

00:02:37,430 --> 00:02:36,400

and my parents encouraged me from a very

75

00:02:39,589 --> 00:02:37,440

young age to

76
00:02:40,790 --> 00:02:39,599
to do science projects and kind of get

77
00:02:43,910 --> 00:02:40,800
involved in

78
00:02:46,550 --> 00:02:43,920
my own education so i did that and

79
00:02:47,350 --> 00:02:46,560
realized that my passion lied in

80
00:02:51,750 --> 00:02:47,360
chemistry

81
00:02:52,550 --> 00:02:51,760
can understand the language of the

82
00:02:53,670 --> 00:02:52,560
universe

83
00:02:55,589 --> 00:02:53,680
you know by the time you get into

84
00:02:57,270 --> 00:02:55,599
physics and black holes and all sorts of

85
00:02:58,070 --> 00:02:57,280
subatomic particles things get a little

86
00:03:00,470 --> 00:02:58,080
weird

87
00:03:01,750 --> 00:03:00,480
but for chemistry you know the way that

88
00:03:03,990 --> 00:03:01,760

molecules are born

89

00:03:06,149 --> 00:03:04,000

when bonds are made and broken like i

90

00:03:07,509 --> 00:03:06,159

understand that i can visualize that

91

00:03:09,670 --> 00:03:07,519

and i can go in the lab and do

92

00:03:11,190 --> 00:03:09,680

experiments to study that

93

00:03:13,190 --> 00:03:11,200

and so i followed in my father's

94

00:03:15,910 --> 00:03:13,200

footsteps he was a chemist as well

95

00:03:16,550 --> 00:03:15,920

and studied that in school and then i

96

00:03:19,430 --> 00:03:16,560

stumbled

97

00:03:21,670 --> 00:03:19,440

across an internship for nasa when i was

98

00:03:24,149 --> 00:03:21,680

an undergraduate student in college

99

00:03:24,789 --> 00:03:24,159

and came over to the nasa jet propulsion

100

00:03:26,229 --> 00:03:24,799

lab

101

00:03:28,630 --> 00:03:26,239

where i basically have never left

102

00:03:30,390 --> 00:03:28,640

because it's such an amazing place

103

00:03:31,910 --> 00:03:30,400

so i'd encourage anyone out there who's

104

00:03:32,789 --> 00:03:31,920

interested in studying science or

105

00:03:34,789 --> 00:03:32,799

engineering

106

00:03:36,789 --> 00:03:34,799

do an internship it's a great way for

107

00:03:39,589 --> 00:03:36,799

you to get a feel for what a career

108

00:03:40,550 --> 00:03:39,599

a doing that kind of job would be like

109

00:03:42,070 --> 00:03:40,560

and so

110

00:03:43,750 --> 00:03:42,080

yeah i guess that's how i ended up

111

00:03:46,070 --> 00:03:43,760

studying astro chemistry

112

00:03:47,670 --> 00:03:46,080

astrobiology and searching for life and

113

00:03:50,390 --> 00:03:47,680

all these crazy places in our solar

114

00:03:52,710 --> 00:03:50,400

system and beyond

115

00:03:54,789 --> 00:03:52,720

very cool and and what specifically and

116

00:03:57,670 --> 00:03:54,799

i think you got some images here too

117

00:04:00,070 --> 00:03:57,680

uh what is an astro chemist i mean what

118

00:04:03,350 --> 00:04:00,080

what's the job do

119

00:04:05,350 --> 00:04:03,360

well it's a chemist who studies places

120

00:04:06,390 --> 00:04:05,360

on earth but beyond as well and i've

121

00:04:08,949 --> 00:04:06,400

been lucky enough

122

00:04:09,589 --> 00:04:08,959

if we pull up number two you can see

123

00:04:11,910 --> 00:04:09,599

that i've

124

00:04:12,789 --> 00:04:11,920

gotten the opportunity to do some field

125

00:04:14,789 --> 00:04:12,799

work too

126

00:04:15,990 --> 00:04:14,799

as part of my job turns out there are a

127

00:04:18,710 --> 00:04:16,000

lot of cool places

128

00:04:19,830 --> 00:04:18,720

on earth i hear some images of iceland

129

00:04:22,710 --> 00:04:19,840

and a few caves

130

00:04:23,110 --> 00:04:22,720

where we can study environments here on

131

00:04:25,909 --> 00:04:23,120

earth

132

00:04:27,189 --> 00:04:25,919

that are similar to other worlds and we

133

00:04:29,909 --> 00:04:27,199

pull up number three

134

00:04:30,469 --> 00:04:29,919

now you can see i was really lucky to be

135

00:04:32,150 --> 00:04:30,479

able to go

136

00:04:34,070 --> 00:04:32,160

not only to iceland which you can see in

137

00:04:35,189 --> 00:04:34,080

the background there but the top of

138

00:04:37,830 --> 00:04:35,199

kilimanjaro

139

00:04:38,390 --> 00:04:37,840

now just to my let's see my left in that

140

00:04:41,270 --> 00:04:38,400

picture

141

00:04:43,350 --> 00:04:41,280

is a giant ice field that actually makes

142

00:04:45,830 --> 00:04:43,360

a pretty good analog for places like

143

00:04:46,550 --> 00:04:45,840

jupiter's moon europa and other of these

144

00:04:49,350 --> 00:04:46,560

icy

145

00:04:50,870 --> 00:04:49,360

uh surfaces in our solar system and so i

146

00:04:53,670 --> 00:04:50,880

get to study things like that

147

00:04:54,790 --> 00:04:53,680

and i also get to go into the lab and do

148

00:04:56,950 --> 00:04:54,800

outreach so if we go

149

00:04:58,469 --> 00:04:56,960

over to the number one you can see a

150

00:05:01,270 --> 00:04:58,479

couple of photos here

151
00:05:03,029 --> 00:05:01,280
of me getting to be able to do outreach

152
00:05:04,310 --> 00:05:03,039
for a space camp that i run and there's

153
00:05:06,230 --> 00:05:04,320
a picture of me when i was

154
00:05:07,990 --> 00:05:06,240
pretty young and just starting to form

155
00:05:09,270 --> 00:05:08,000
these ideas of what it might be like to

156
00:05:11,909 --> 00:05:09,280
be a scientist

157
00:05:13,350 --> 00:05:11,919
i'm very lucky to be a triplet actually

158
00:05:13,670 --> 00:05:13,360
you could see my brother and sister

159
00:05:16,150 --> 00:05:13,680
there

160
00:05:17,590 --> 00:05:16,160
they're the the other kind of doctor the

161
00:05:19,990 --> 00:05:17,600
ones that save lives

162
00:05:20,710 --> 00:05:20,000
uh super proud of them but um we all

163
00:05:22,230 --> 00:05:20,720

ended up in

164

00:05:24,710 --> 00:05:22,240

some sort of science field which is

165

00:05:29,430 --> 00:05:24,720

pretty cool

166

00:05:30,310 --> 00:05:29,440

in our artist now let's talk a little

167

00:05:32,230 --> 00:05:30,320

bit about this

168

00:05:34,390 --> 00:05:32,240

uh so our other speaker tonight because

169

00:05:35,990 --> 00:05:34,400

this is science and art

170

00:05:37,590 --> 00:05:36,000

as a visual strategist with the office

171

00:05:38,550 --> 00:05:37,600

of communications and education here at

172

00:05:40,390 --> 00:05:38,560

jpl

173

00:05:42,390 --> 00:05:40,400

working with the design studio simply

174

00:05:45,670 --> 00:05:42,400

called the studio

175

00:05:48,950 --> 00:05:45,680

please welcome joby harris hi joe hello

176

00:05:51,990 --> 00:05:51,270

we're happy to have you here um your

177

00:05:55,510 --> 00:05:52,000

story's a little different

178

00:05:57,350 --> 00:05:55,520

than morgan's isn't it just a little bit

179

00:05:59,270 --> 00:05:57,360

i actually grew up next to mars if you

180

00:06:02,790 --> 00:05:59,280

want to go to slide five

181

00:06:03,590 --> 00:06:02,800

um actually about a mile outside of mars

182

00:06:06,950 --> 00:06:03,600

pennsylvania

183

00:06:08,950 --> 00:06:06,960

blink you miss it

184

00:06:10,710 --> 00:06:08,960

but it does have a mars national bank

185

00:06:11,189 --> 00:06:10,720

i've told our mars team here that there

186

00:06:13,830 --> 00:06:11,199

is a

187

00:06:14,629 --> 00:06:13,840

24-hour atm there if they need any more

188

00:06:16,070 --> 00:06:14,639

money

189

00:06:19,110 --> 00:06:16,080

but yeah i grew up near mars that would

190

00:06:21,430 --> 00:06:19,120

be probably the closest i would get

191

00:06:22,309 --> 00:06:21,440

to anything involving space if you go to

192

00:06:25,430 --> 00:06:22,319

slide six

193

00:06:27,110 --> 00:06:25,440

as my grades were not exemplary at all

194

00:06:28,550 --> 00:06:27,120

like morgan's i think morgan told me she

195

00:06:31,510 --> 00:06:28,560

got a b once

196

00:06:32,550 --> 00:06:31,520

um and my family would throw parties if

197

00:06:35,909 --> 00:06:32,560

i got bees

198

00:06:39,110 --> 00:06:35,919

so i struggled in math obviously that f

199

00:06:40,550 --> 00:06:39,120

is not for fantastic i loved drawing i

200

00:06:42,469 --> 00:06:40,560

was an artist

201
00:06:43,749 --> 00:06:42,479
clearly liked playing twister with

202
00:06:46,230 --> 00:06:43,759
twister in the background there

203
00:06:47,830 --> 00:06:46,240
but uh i was set to be an artist my

204
00:06:49,589 --> 00:06:47,840
whole life

205
00:06:51,670 --> 00:06:49,599
and if you go to the next slide slide

206
00:06:54,070 --> 00:06:51,680
seven i actually ended up moving to los

207
00:06:55,189 --> 00:06:54,080
angeles and became a full-time artist

208
00:06:58,870 --> 00:06:55,199
doing

209
00:07:01,670 --> 00:06:58,880
storyboards for tv and film

210
00:07:03,110 --> 00:07:01,680
i was doing graphic design i worked as a

211
00:07:04,710 --> 00:07:03,120
production designer and art director

212
00:07:07,670 --> 00:07:04,720
making props and

213
00:07:09,510 --> 00:07:07,680

and uh sets building sets i even started

214

00:07:10,550 --> 00:07:09,520

directing commercials started directing

215

00:07:12,710 --> 00:07:10,560

music videos

216

00:07:13,670 --> 00:07:12,720

so i kind of ran the whole gamut of a as

217

00:07:15,270 --> 00:07:13,680

an artist even

218

00:07:17,029 --> 00:07:15,280

getting involved in music playing noisy

219

00:07:19,749 --> 00:07:17,039

rock bands and yelling

220

00:07:21,510 --> 00:07:19,759

yelling and weird stuff like that so i i

221

00:07:24,950 --> 00:07:21,520

absolutely embodied an artist

222

00:07:28,629 --> 00:07:27,510

i uh you know artists aren't very good

223

00:07:30,550 --> 00:07:28,639

at um

224

00:07:32,070 --> 00:07:30,560

managing their time or their finances

225

00:07:32,950 --> 00:07:32,080

because we're so passionate about what

226

00:07:35,189 --> 00:07:32,960

we do

227

00:07:36,230 --> 00:07:35,199

um that's why we'll jump on helping a

228

00:07:37,909 --> 00:07:36,240

friend with a wedding

229

00:07:39,350 --> 00:07:37,919

you know invitation all the way to a

230

00:07:41,029 --> 00:07:39,360

larger job

231

00:07:42,950 --> 00:07:41,039

so i knew i wanted something a little

232

00:07:43,990 --> 00:07:42,960

bit more consistent and to be honest i

233

00:07:45,990 --> 00:07:44,000

wanted something a little bit more

234

00:07:47,909 --> 00:07:46,000

meaningful and so i got a call from this

235

00:07:48,869 --> 00:07:47,919

guy dan goods dan goods is my current

236

00:07:51,029 --> 00:07:48,879

supervisor

237

00:07:53,029 --> 00:07:51,039

at the studio but he ended up calling me

238

00:07:54,469 --> 00:07:53,039

one day and said yobe i i need someone

239

00:07:55,589 --> 00:07:54,479

who can wear a bunch of different hats

240

00:07:58,230 --> 00:07:55,599

artistically

241

00:07:59,510 --> 00:07:58,240

uh to help support these scientists and

242

00:08:01,350 --> 00:07:59,520

engineers who are coming in here with

243

00:08:03,270 --> 00:08:01,360

these really really unique needs

244

00:08:04,790 --> 00:08:03,280

and we really want to assist them so i

245

00:08:06,309 --> 00:08:04,800

started working at jpl

246

00:08:08,469 --> 00:08:06,319

i had no idea what i was going to be

247

00:08:11,510 --> 00:08:08,479

doing or if i could even contribute

248

00:08:13,029 --> 00:08:11,520

of if you go to slide nine within the

249

00:08:14,629 --> 00:08:13,039

first couple of years i found myself

250

00:08:17,110 --> 00:08:14,639

doing graphic design

251

00:08:19,589 --> 00:08:17,120

and doing illustration uh in early

252

00:08:20,150 --> 00:08:19,599

mission formulation uh helping proposals

253

00:08:23,589 --> 00:08:20,160

like

254

00:08:24,790 --> 00:08:23,599

for planet finding telescopes and um and

255

00:08:27,110 --> 00:08:24,800

even as you can see there there's

256

00:08:28,629 --> 00:08:27,120

there's a image of ingenuity there

257

00:08:30,309 --> 00:08:28,639

so i think it's coming up on its tenth

258

00:08:31,029 --> 00:08:30,319

flight this coming weekend i think it's

259

00:08:33,670 --> 00:08:31,039

gonna

260

00:08:34,469 --> 00:08:33,680

you know go up higher and do greater

261

00:08:36,630 --> 00:08:34,479

things but

262

00:08:37,509 --> 00:08:36,640

a long time ago it was just an idea in

263

00:08:40,230 --> 00:08:37,519

mimiong's

264

00:08:42,230 --> 00:08:40,240

you know mind and her team and so i got

265

00:08:44,389 --> 00:08:42,240

to support them doing some art

266

00:08:45,509 --> 00:08:44,399

early on and then for brilliant people

267

00:08:48,070 --> 00:08:45,519

like morgan

268

00:08:48,630 --> 00:08:48,080

you know doing doing data vis and

269

00:08:50,870 --> 00:08:48,640

science

270

00:08:52,630 --> 00:08:50,880

uh visualizations of what could possibly

271

00:08:54,070 --> 00:08:52,640

be going on underneath europa

272

00:08:56,470 --> 00:08:54,080

so within the first couple of years this

273

00:08:58,310 --> 00:08:56,480

is what i was able to apply my skills to

274

00:09:00,389 --> 00:08:58,320

it was more meaningful it was factual

275

00:09:03,430 --> 00:09:00,399

and quite frankly a lot more fun

276

00:09:04,870 --> 00:09:03,440

um but it didn't stop there so

277

00:09:06,470 --> 00:09:04,880

then suddenly if you go to the next

278

00:09:07,590 --> 00:09:06,480

slide it's like 10 then they were like

279

00:09:09,110 --> 00:09:07,600

hey

280

00:09:11,110 --> 00:09:09,120

do you know anyone that can sculpt a

281

00:09:11,590 --> 00:09:11,120

giant moon of enceladus and i was like

282

00:09:14,150 --> 00:09:11,600

me

283

00:09:15,110 --> 00:09:14,160

i can i used to do that for tv

284

00:09:17,910 --> 00:09:15,120

commercials and

285

00:09:20,630 --> 00:09:17,920

everything else so i sculpted this giant

286

00:09:23,190 --> 00:09:20,640

moon of enceladus down to the detail of

287

00:09:24,790 --> 00:09:23,200

the actual typography um and it was

288

00:09:26,870 --> 00:09:24,800

shooting out geysers

289

00:09:28,710 --> 00:09:26,880

and uh the teams took it took it around

290

00:09:30,389 --> 00:09:28,720

to talk to it that's linda spelker talk

291

00:09:31,829 --> 00:09:30,399

talking about enceladus there and this

292

00:09:33,110 --> 00:09:31,839

thing went to comic-con and south by

293

00:09:35,430 --> 00:09:33,120

southwest

294

00:09:36,710 --> 00:09:35,440

different museums kids are climbing all

295

00:09:39,269 --> 00:09:36,720

over it you know we

296

00:09:41,030 --> 00:09:39,279

had to clean it all the time and repaint

297

00:09:42,389 --> 00:09:41,040

it because kids were just wanting to get

298

00:09:43,509 --> 00:09:42,399

in there and really understand this

299

00:09:45,269 --> 00:09:43,519

thing and learn it

300

00:09:47,590 --> 00:09:45,279

so again i was shocked so that was more

301
00:09:49,030 --> 00:09:47,600
of an out word facing way that i was

302
00:09:51,030 --> 00:09:49,040
able to help as well

303
00:09:53,110 --> 00:09:51,040
but then also internally so if you go to

304
00:09:56,389 --> 00:09:53,120
the next slide

305
00:09:58,150 --> 00:09:56,399
uh slide 11 you i actually got to help

306
00:10:00,870 --> 00:09:58,160
our ops lab team

307
00:10:02,630 --> 00:10:00,880
created a life-size replica space hatch

308
00:10:04,630 --> 00:10:02,640
for the space station

309
00:10:06,710 --> 00:10:04,640
because at that time astronauts were

310
00:10:07,030 --> 00:10:06,720
using these giant binders instructions

311
00:10:10,230 --> 00:10:07,040
to

312
00:10:12,470 --> 00:10:10,240
station so

313
00:10:14,630 --> 00:10:12,480

our opslab team just figured out how to

314

00:10:16,470 --> 00:10:14,640

put the instructions in oculus for our

315

00:10:18,230 --> 00:10:16,480

for our astronauts so that they can see

316

00:10:19,509 --> 00:10:18,240

the instructions floating over whatever

317

00:10:21,269 --> 00:10:19,519

they needed to work on

318

00:10:22,870 --> 00:10:21,279

so in order to do that they needed a

319

00:10:25,190 --> 00:10:22,880

life-size space hatch

320

00:10:27,110 --> 00:10:25,200

so i say all of this because i had no

321

00:10:27,750 --> 00:10:27,120

idea how i could contribute when i first

322

00:10:30,069 --> 00:10:27,760

started

323

00:10:31,910 --> 00:10:30,079

and now it's been about 10 years being

324

00:10:33,430 --> 00:10:31,920

able to assist people like morgan and so

325

00:10:34,630 --> 00:10:33,440

many engineers and scientists with what

326

00:10:35,430 --> 00:10:34,640

it is that they need to do and

327

00:10:37,590 --> 00:10:35,440

accomplish

328

00:10:39,350 --> 00:10:37,600

and communicate that to the public so if

329

00:10:41,670 --> 00:10:39,360

you go to slide 12

330

00:10:43,350 --> 00:10:41,680

this is now the studio so it's been over

331

00:10:45,190 --> 00:10:43,360

10 or over 10 years

332

00:10:47,509 --> 00:10:45,200

the studio has formed we sit within

333

00:10:51,110 --> 00:10:47,519

something called the design lab

334

00:10:53,350 --> 00:10:51,120

at jpl and that's all we do we help

335

00:10:55,030 --> 00:10:53,360

uh engineers and scientists think

336

00:10:57,750 --> 00:10:55,040

through their thinking we help them

337

00:11:00,389 --> 00:10:57,760

brainstorm and really

338

00:11:02,630 --> 00:11:00,399

really flex out their ideas and ask

339

00:11:04,710 --> 00:11:02,640

great questions but then we also assist

340

00:11:05,750 --> 00:11:04,720

uh the missions whenever they're going

341

00:11:07,590 --> 00:11:05,760

and and

342

00:11:09,670 --> 00:11:07,600

how how to communicate these things to

343

00:11:13,509 --> 00:11:09,680

the public in in amazing ways

344

00:11:17,030 --> 00:11:13,519

um so yeah so i if i could replace

345

00:11:17,350 --> 00:11:17,040

artist uh brian i would replace artists

346

00:11:19,670 --> 00:11:17,360

with

347

00:11:21,430 --> 00:11:19,680

communicator and if i could replace art

348

00:11:22,790 --> 00:11:21,440

i would replace it with communication

349

00:11:26,829 --> 00:11:22,800

because that that's essentially what we

350

00:11:29,350 --> 00:11:26,839

do artists at jpl and nasa we help

351
00:11:31,350 --> 00:11:29,360
communication i think that's a wonderful

352
00:11:32,310 --> 00:11:31,360
way to put it um and in the lead up to

353
00:11:35,350 --> 00:11:32,320
this talk

354
00:11:36,389 --> 00:11:35,360
we saw a few folks surprised that nasa

355
00:11:38,069 --> 00:11:36,399
and jpl had

356
00:11:39,910 --> 00:11:38,079
artists now some people think this is a

357
00:11:41,509 --> 00:11:39,920
relatively new thing but that's not the

358
00:11:43,509 --> 00:11:41,519
case is it

359
00:11:45,590 --> 00:11:43,519
no that's not the it's not a new

360
00:11:46,870 --> 00:11:45,600
conversation it may seem like it

361
00:11:48,069 --> 00:11:46,880
uh because i think a lot of people have

362
00:11:50,069 --> 00:11:48,079
the misunderstanding that when you

363
00:11:51,190 --> 00:11:50,079

attach art to science or especially art

364

00:11:53,110 --> 00:11:51,200

to nasa

365

00:11:54,389 --> 00:11:53,120

that it's it's some random person in a

366

00:11:56,069 --> 00:11:54,399

smock in a corner

367

00:11:58,629 --> 00:11:56,079

talking to themselves throwing paint

368

00:12:00,470 --> 00:11:58,639

everywhere charging the taxpayer and and

369

00:12:02,310 --> 00:12:00,480

that's that's what art and science is

370

00:12:03,670 --> 00:12:02,320

right but it's not i mean i do

371

00:12:05,110 --> 00:12:03,680

i do stand in the corner and talk to

372

00:12:05,750 --> 00:12:05,120

myself sometimes but that's beside the

373

00:12:08,069 --> 00:12:05,760

point

374

00:12:10,150 --> 00:12:08,079

so going back into history if you want

375

00:12:12,550 --> 00:12:10,160

to go to slide 13

376

00:12:13,990 --> 00:12:12,560

you know art has been fully inscribed

377

00:12:16,949 --> 00:12:14,000

with science since the beginning i mean

378

00:12:18,389 --> 00:12:16,959

let's look at aristotle in 300 bc

379

00:12:20,150 --> 00:12:18,399

what that guy was talking about the

380

00:12:20,710 --> 00:12:20,160

whole gamut of what he was talking about

381

00:12:23,910 --> 00:12:20,720

i mean

382

00:12:25,509 --> 00:12:23,920

back when science was being explored uh

383

00:12:27,110 --> 00:12:25,519

you know there was really no way of

384

00:12:28,310 --> 00:12:27,120

understanding what these guys were

385

00:12:30,389 --> 00:12:28,320

talking about until

386

00:12:31,990 --> 00:12:30,399

say an artist like peter apien in the

387

00:12:34,790 --> 00:12:32,000

1500s

388

00:12:36,470 --> 00:12:34,800

excuse me started breaking down what

389

00:12:37,990 --> 00:12:36,480

these people were talking about into

390

00:12:39,509 --> 00:12:38,000

image form that was the only way that we

391

00:12:41,110 --> 00:12:39,519

could understand the stars

392

00:12:42,949 --> 00:12:41,120

and the heavens was through story and

393

00:12:45,269 --> 00:12:42,959

through imagery you know getting into

394

00:12:46,790 --> 00:12:45,279

kepler kepler doing his own

395

00:12:48,470 --> 00:12:46,800

um you know his own drawings and

396

00:12:49,110 --> 00:12:48,480

sketches of his discoveries what he was

397

00:12:51,269 --> 00:12:49,120

thinking

398

00:12:53,190 --> 00:12:51,279

of course leonardo da vinci and you know

399

00:12:55,110 --> 00:12:53,200

as you get into the 1600s there were

400

00:12:57,190 --> 00:12:55,120

actual engravers that started

401
00:12:58,550 --> 00:12:57,200
breaking down the science that was being

402
00:13:00,949 --> 00:12:58,560
talked about at that time

403
00:13:02,230 --> 00:13:00,959
into almost comic book form so as you

404
00:13:03,670 --> 00:13:02,240
can see there's there's a whole image

405
00:13:05,590 --> 00:13:03,680
there about metaphysics

406
00:13:06,949 --> 00:13:05,600
right so this is the only way that these

407
00:13:08,629 --> 00:13:06,959
complex things that were being

408
00:13:09,590 --> 00:13:08,639
discovered could be communicated to the

409
00:13:11,750 --> 00:13:09,600
general public

410
00:13:13,590 --> 00:13:11,760
so as we go to the next slide now we're

411
00:13:15,430 --> 00:13:13,600
heading into the 1700s and watch out

412
00:13:18,629 --> 00:13:15,440
these are the marias showing up

413
00:13:19,590 --> 00:13:18,639

both of these maria's actually women

414

00:13:22,310 --> 00:13:19,600

were

415

00:13:22,629 --> 00:13:22,320

pioneers in the field of art and science

416

00:13:26,710 --> 00:13:22,639

so

417

00:13:30,069 --> 00:13:26,720

maria marion was from germany she was

418

00:13:32,389 --> 00:13:30,079

drawing beetles and bugs and plants

419

00:13:33,910 --> 00:13:32,399

in for the purpose of studying so that

420

00:13:35,030 --> 00:13:33,920

other people could study these things

421

00:13:38,069 --> 00:13:35,040

and then maria

422

00:13:40,629 --> 00:13:38,079

imart was astronomer and also

423

00:13:41,189 --> 00:13:40,639

doing some amazing artwork to to show

424

00:13:43,269 --> 00:13:41,199

what it is

425

00:13:44,389 --> 00:13:43,279

she was seeing there's also another

426

00:13:46,870 --> 00:13:44,399

woman

427

00:13:48,310 --> 00:13:46,880

that was particularly one of known as

428

00:13:50,150 --> 00:13:48,320

one of the first photographers

429

00:13:51,750 --> 00:13:50,160

and she was a botanist around that time

430

00:13:53,189 --> 00:13:51,760

as well so that's you know we're in the

431

00:13:54,790 --> 00:13:53,199

1700s now so

432

00:13:57,590 --> 00:13:54,800

i do want to point out another artist if

433

00:13:59,269 --> 00:13:57,600

we go to the next slide slide 15.

434

00:14:01,509 --> 00:13:59,279

this this may not be somebody you've

435

00:14:02,550 --> 00:14:01,519

heard of but this gentleman was a

436

00:14:05,350 --> 00:14:02,560

pioneer

437

00:14:06,389 --> 00:14:05,360

in the field of of data visual

438

00:14:09,509 --> 00:14:06,399

visualization

439

00:14:12,389 --> 00:14:09,519

so this is w-e-b uh du bois or dubois

440

00:14:13,269 --> 00:14:12,399

but uh he was a sociologist and he was a

441

00:14:16,389 --> 00:14:13,279

professor

442

00:14:19,030 --> 00:14:16,399

back in 1899 he

443

00:14:19,670 --> 00:14:19,040

he and a team were coming up with uh

444

00:14:24,470 --> 00:14:19,680

data

445

00:14:24,870 --> 00:14:24,480

happening to slaves when they were freed

446

00:14:28,949 --> 00:14:24,880

and

447

00:14:31,189 --> 00:14:28,959

seen this stuff before

448

00:14:32,990 --> 00:14:31,199

but this this group was creating these

449

00:14:35,509 --> 00:14:33,000

these early early early on data

450

00:14:36,310 --> 00:14:35,519

visualization visualizations to help

451

00:14:37,829 --> 00:14:36,320

communicate

452

00:14:39,590 --> 00:14:37,839

and educate people and help them

453

00:14:41,590 --> 00:14:39,600

understand what was happening so

454

00:14:43,670 --> 00:14:41,600

again we're going into the you know 1600

455

00:14:45,590 --> 00:14:43,680

1700 1800s

456

00:14:46,790 --> 00:14:45,600

where art is being used to help people

457

00:14:48,389 --> 00:14:46,800

communicate and understand

458

00:14:50,470 --> 00:14:48,399

we haven't even gotten to the space race

459

00:14:53,189 --> 00:14:50,480

yet if you wanna go to slide 16.

460

00:14:54,870 --> 00:14:53,199

so of course with space you now have

461

00:14:55,670 --> 00:14:54,880

physics and engineering going to next

462

00:14:58,790 --> 00:14:55,680

levels

463

00:14:59,750 --> 00:14:58,800

so why wouldn't art go with them to help

464

00:15:01,910 --> 00:14:59,760

communicate these

465

00:15:04,710 --> 00:15:01,920

incredibly complex things so i started

466

00:15:06,310 --> 00:15:04,720

digging around our archives at jpl

467

00:15:08,230 --> 00:15:06,320

because that's what i do during my lunch

468

00:15:09,350 --> 00:15:08,240

most people interact i sit in a corner

469

00:15:10,230 --> 00:15:09,360

and talk to myself and look at the

470

00:15:12,949 --> 00:15:10,240

archives

471

00:15:14,069 --> 00:15:12,959

so i found this amazing photo this is a

472

00:15:15,670 --> 00:15:14,079

super computer

473

00:15:17,990 --> 00:15:15,680

right you've got two people there

474

00:15:20,230 --> 00:15:18,000

crunching data pressing buttons it's

475

00:15:22,069 --> 00:15:20,240

making noises that spits out a card and

476

00:15:23,750 --> 00:15:22,079

and that's that's like something

477

00:15:25,110 --> 00:15:23,760

massively ingenious but i noticed what

478

00:15:27,350 --> 00:15:25,120

was on the right there

479

00:15:28,150 --> 00:15:27,360

that little board in the back there um

480

00:15:32,310 --> 00:15:28,160

that is

481

00:15:34,069 --> 00:15:32,320

plan to the moon

482

00:15:35,670 --> 00:15:34,079

so someone did that i was immediately

483

00:15:36,870 --> 00:15:35,680

like wait somebody did that and that

484

00:15:39,350 --> 00:15:36,880

would have been my job

485

00:15:40,310 --> 00:15:39,360

had i been back then so where does where

486

00:15:42,470 --> 00:15:40,320

does art exist

487

00:15:44,069 --> 00:15:42,480

internally at jpl and nasa i wanted to

488

00:15:46,790 --> 00:15:44,079

really look for that

489

00:15:47,350 --> 00:15:46,800

so uh digging a little bit deeper brian

490

00:15:49,189 --> 00:15:47,360

um

491

00:15:51,430 --> 00:15:49,199

in terms of the history of artists

492

00:15:52,470 --> 00:15:51,440

supporting nasa in the space industry

493

00:15:54,150 --> 00:15:52,480

since the beginning

494

00:15:56,949 --> 00:15:54,160

you know if you want to go to slide 17 i

495

00:15:57,670 --> 00:15:56,959

found out that jpl actually had an art

496

00:16:00,790 --> 00:15:57,680

director

497

00:16:02,550 --> 00:16:00,800

back in 1952 his name was artbeam and of

498

00:16:05,590 --> 00:16:02,560

course his name's art

499

00:16:06,069 --> 00:16:05,600

but he led a team of 14 women and seven

500

00:16:08,389 --> 00:16:06,079

men

501
00:16:10,230 --> 00:16:08,399
known as the graphics group now this is

502
00:16:12,550 --> 00:16:10,240
this is before the moon like this is

503
00:16:14,389 --> 00:16:12,560
this is at the start of the space race

504
00:16:16,069 --> 00:16:14,399
artists were a key part at the very

505
00:16:16,949 --> 00:16:16,079
beginning supporting these scientists

506
00:16:19,110 --> 00:16:16,959
and engineers

507
00:16:20,069 --> 00:16:19,120
with brainstorming figuring out what it

508
00:16:22,230 --> 00:16:20,079
is they were going to do

509
00:16:23,110 --> 00:16:22,240
and communicating to the public what was

510
00:16:24,790 --> 00:16:23,120
going to happen

511
00:16:27,670 --> 00:16:24,800
so then we get in so that was the the

512
00:16:29,829 --> 00:16:27,680
50s and and now we get into the 60s

513
00:16:31,110 --> 00:16:29,839

nasa has been formed um if you want to

514

00:16:33,590 --> 00:16:31,120

go to slide 18.

515

00:16:35,350 --> 00:16:33,600

nasa's been formed in the in the 60s uh

516

00:16:36,069 --> 00:16:35,360

the nasa administrator james webb

517

00:16:37,990 --> 00:16:36,079

decided

518

00:16:40,150 --> 00:16:38,000

we need to create an art program because

519

00:16:42,310 --> 00:16:40,160

data is not

520

00:16:44,470 --> 00:16:42,320

communicating to everyone we want

521

00:16:45,910 --> 00:16:44,480

everyone from phd level people down to

522

00:16:46,470 --> 00:16:45,920

students to understand and be excited

523

00:16:48,150 --> 00:16:46,480

about

524

00:16:50,550 --> 00:16:48,160

this exploration and innovation that's

525

00:16:52,629 --> 00:16:50,560

happening so an art program was created

526
00:16:53,749 --> 00:16:52,639
where artists like norman rockwell and

527
00:16:56,069 --> 00:16:53,759
andy warhol

528
00:16:57,910 --> 00:16:56,079
and even anna leibowitz were simply

529
00:16:59,910 --> 00:16:57,920
given access that's it

530
00:17:01,749 --> 00:16:59,920
you have access as an artist to what

531
00:17:03,670 --> 00:17:01,759
nasa is doing full access

532
00:17:05,590 --> 00:17:03,680
and we want you to then go back and do

533
00:17:07,590 --> 00:17:05,600
your interpretation of what you saw

534
00:17:09,510 --> 00:17:07,600
what you smelled what you heard and

535
00:17:12,309 --> 00:17:09,520
there was an amazing amount of art

536
00:17:14,390 --> 00:17:12,319
uh created and so that program existed

537
00:17:15,029 --> 00:17:14,400
in the 60s 70s it ended up ending in the

538
00:17:17,829 --> 00:17:15,039

90s

539

00:17:19,189 --> 00:17:17,839

it was run by um by bert ulrich who's

540

00:17:21,510 --> 00:17:19,199

currently at headquarters one of our

541

00:17:23,189 --> 00:17:21,520

liaisons for media and special projects

542

00:17:24,549 --> 00:17:23,199

but uh what an exciting program that was

543

00:17:27,029 --> 00:17:24,559

and it was in the 60s

544

00:17:29,430 --> 00:17:27,039

but quickly as we get into the 70s um

545

00:17:31,830 --> 00:17:29,440

aims nasa and started inviting in if you

546

00:17:33,669 --> 00:17:31,840

want to go to the next slide in

547

00:17:35,190 --> 00:17:33,679

nasa ames started inviting in amazing

548

00:17:36,310 --> 00:17:35,200

artists to get involved in what would

549

00:17:38,390 --> 00:17:36,320

the future look like

550

00:17:39,990 --> 00:17:38,400

artists started to be included in early

551
00:17:41,510 --> 00:17:40,000
formulation of projects

552
00:17:44,230 --> 00:17:41,520
and what could things look like in the

553
00:17:46,470 --> 00:17:44,240
future also in the 70s speaking of

554
00:17:50,630 --> 00:17:46,480
future if you want to go to slide 19

555
00:17:54,150 --> 00:17:50,640
at jpl was a computer lab

556
00:17:55,190 --> 00:17:54,160
um started by a gentleman named bob

557
00:17:57,590 --> 00:17:55,200
holtzman

558
00:17:58,470 --> 00:17:57,600
who had some money bought a bunch of

559
00:18:00,070 --> 00:17:58,480
equipment

560
00:18:02,230 --> 00:18:00,080
pulled some talented people together and

561
00:18:04,549 --> 00:18:02,240
said figure out what this stuff does

562
00:18:06,630 --> 00:18:04,559
so so in the early 70s you had an

563
00:18:09,350 --> 00:18:06,640

individual named dr jim blind

564

00:18:10,070 --> 00:18:09,360

who was one of the pioneers of early 3d

565

00:18:12,390 --> 00:18:10,080

graphics

566

00:18:13,350 --> 00:18:12,400

animation contributing to space flight

567

00:18:15,350 --> 00:18:13,360

operations

568

00:18:16,950 --> 00:18:15,360

figuring out spacecraft uh planetary

569

00:18:18,630 --> 00:18:16,960

encounters

570

00:18:20,310 --> 00:18:18,640

doing animations that were being sent to

571

00:18:21,909 --> 00:18:20,320

the news and media

572

00:18:23,750 --> 00:18:21,919

so this was way ahead of a time and i

573

00:18:25,990 --> 00:18:23,760

had the privilege of talking with

574

00:18:28,070 --> 00:18:26,000

dr blinn and he was telling me yes

575

00:18:29,510 --> 00:18:28,080

people from early early pixar

576

00:18:31,270 --> 00:18:29,520

people are starting lucasfilm were

577

00:18:31,909 --> 00:18:31,280

coming to them to find out what is going

578

00:18:34,789 --> 00:18:31,919

on here

579

00:18:35,750 --> 00:18:34,799

so computer 3d graphics were pioneered

580

00:18:36,870 --> 00:18:35,760

by nasa

581

00:18:38,950 --> 00:18:36,880

i'm just going to say that i'm throwing

582

00:18:41,510 --> 00:18:38,960

that out there so quickly as we get into

583

00:18:43,830 --> 00:18:41,520

slide 21 then the 80s hit and i honestly

584

00:18:45,430 --> 00:18:43,840

i'm maybe a little biased i'm an 80s kid

585

00:18:47,909 --> 00:18:45,440

but i really think that's when nasa

586

00:18:49,430 --> 00:18:47,919

solidified itself in culture with art

587

00:18:51,669 --> 00:18:49,440

um i don't think there was a bedroom

588

00:18:53,750 --> 00:18:51,679

that didn't have a nasa poster on it

589

00:18:54,870 --> 00:18:53,760

the nasa worm logo which has had a a

590

00:18:57,830 --> 00:18:54,880

resurgence

591

00:18:58,630 --> 00:18:57,840

it just a lot of people love the 80s

592

00:19:00,950 --> 00:18:58,640

nasa

593

00:19:01,669 --> 00:19:00,960

because they were cranking out a lot of

594

00:19:03,750 --> 00:19:01,679

great art

595

00:19:05,590 --> 00:19:03,760

from from artists then as we got into

596

00:19:07,350 --> 00:19:05,600

the 90s and 2000s i think

597

00:19:09,270 --> 00:19:07,360

once the shuttle program ended people

598

00:19:11,190 --> 00:19:09,280

thought maybe nasa went away

599

00:19:12,870 --> 00:19:11,200

which is unfortunate but nasa was just

600

00:19:14,470 --> 00:19:12,880

as busy doing amazing things

601
00:19:16,789 --> 00:19:14,480
but i think artistically in terms of the

602
00:19:18,549 --> 00:19:16,799
artisan stride with uh engineers and

603
00:19:20,150 --> 00:19:18,559
scientists it went more internal

604
00:19:21,830 --> 00:19:20,160
to help figure out what is our vision

605
00:19:24,870 --> 00:19:21,840
now what should we be doing

606
00:19:28,390 --> 00:19:24,880
and then lastly as we get to slide 23 or

607
00:19:30,870 --> 00:19:28,400
sorry 22

608
00:19:32,630 --> 00:19:30,880
um you know that leads us to today so i

609
00:19:34,710 --> 00:19:32,640
believe in 2012

610
00:19:36,070 --> 00:19:34,720
curiosity landed on mars with a lot of

611
00:19:37,669 --> 00:19:36,080
drama and excitement

612
00:19:40,230 --> 00:19:37,679
and i really think that that

613
00:19:42,070 --> 00:19:40,240

resuscitated uh a lot of excitement

614

00:19:44,549 --> 00:19:42,080

around space and exploration

615

00:19:46,070 --> 00:19:44,559

and then along with 2015 there were some

616

00:19:46,310 --> 00:19:46,080

exoplanet posters which we're going to

617

00:19:47,590 --> 00:19:46,320

be

618

00:19:49,350 --> 00:19:47,600

kind of talking about today there were

619

00:19:51,830 --> 00:19:49,360

some posters to to to

620

00:19:53,350 --> 00:19:51,840

real worlds out there that went viral

621

00:19:55,270 --> 00:19:53,360

online and i remember one of the

622

00:19:56,470 --> 00:19:55,280

comments said finally nasa's creating

623

00:19:59,110 --> 00:19:56,480

art for people again

624

00:20:00,150 --> 00:19:59,120

and so over these past probably 10 years

625

00:20:03,430 --> 00:20:00,160

um

626

00:20:05,669 --> 00:20:03,440

we have seen a resurgence of the arts in

627

00:20:06,789 --> 00:20:05,679

a lot in stride with nasa not only

628

00:20:09,510 --> 00:20:06,799

externally

629

00:20:10,950 --> 00:20:09,520

but also internally um with with artists

630

00:20:13,190 --> 00:20:10,960

and designers accompanying

631

00:20:14,630 --> 00:20:13,200

uh scientists and engineers in early

632

00:20:17,590 --> 00:20:14,640

early development of

633

00:20:18,950 --> 00:20:17,600

of missions so i i'm going to summarize

634

00:20:20,390 --> 00:20:18,960

by this because i really want to get

635

00:20:22,149 --> 00:20:20,400

back to morgan

636

00:20:23,110 --> 00:20:22,159

and and kind of what the program is but

637

00:20:23,830 --> 00:20:23,120

i really felt like i had to kind of

638

00:20:26,310 --> 00:20:23,840

state the case

639

00:20:27,909 --> 00:20:26,320

that this has always been around uh it's

640

00:20:30,630 --> 00:20:27,919

always been a key part of

641

00:20:31,029 --> 00:20:30,640

exploration and uh it shouldn't go away

642

00:20:34,390 --> 00:20:31,039

because

643

00:20:36,870 --> 00:20:34,400

here's the thing if we go to slide 23

644

00:20:38,870 --> 00:20:36,880

these are all the people involved uh i

645

00:20:40,630 --> 00:20:38,880

would say with nasa or just space in

646

00:20:41,909 --> 00:20:40,640

general or innovation exploration you

647

00:20:43,430 --> 00:20:41,919

know you've got nasa headquarters you've

648

00:20:45,669 --> 00:20:43,440

got the different centers and facilities

649

00:20:47,350 --> 00:20:45,679

there's like 15 or 20 of them

650

00:20:49,029 --> 00:20:47,360

you have all your engineers you have all

651
00:20:50,230 --> 00:20:49,039
your scientists you have your public

652
00:20:52,230 --> 00:20:50,240
engagement people

653
00:20:53,669 --> 00:20:52,240
your other nasa specialists your web

654
00:20:55,190 --> 00:20:53,679
developers software you have

655
00:20:56,789 --> 00:20:55,200
all of those people then you have news

656
00:20:58,549 --> 00:20:56,799
and media right

657
00:21:00,630 --> 00:20:58,559
now you have those people both

658
00:21:01,350 --> 00:21:00,640
internally and news and media out in the

659
00:21:03,029 --> 00:21:01,360
world

660
00:21:04,470 --> 00:21:03,039
now you have schools and universities

661
00:21:07,110 --> 00:21:04,480
you have the general public

662
00:21:08,310 --> 00:21:07,120
so this is nasa it's not one person

663
00:21:09,510 --> 00:21:08,320

sitting in a room coming up with

664

00:21:10,470 --> 00:21:09,520

something and then they release it in

665

00:21:12,230 --> 00:21:10,480

the news

666

00:21:14,070 --> 00:21:12,240

nasa is very transparent they're working

667

00:21:16,630 --> 00:21:14,080

with tons of specialists on

668

00:21:18,390 --> 00:21:16,640

everything that's a lot of communication

669

00:21:19,750 --> 00:21:18,400

a lot of different people from students

670

00:21:21,510 --> 00:21:19,760

to phd level people

671

00:21:23,350 --> 00:21:21,520

this is where this is where artists live

672

00:21:25,270 --> 00:21:23,360

this is where art lives if you go to the

673

00:21:27,590 --> 00:21:25,280

next slide

674

00:21:28,950 --> 00:21:27,600

this is where art lives lives in between

675

00:21:30,390 --> 00:21:28,960

all of these people

676
00:21:32,070 --> 00:21:30,400
they are the bridge builders of

677
00:21:32,950 --> 00:21:32,080
communication between all of these

678
00:21:36,710 --> 00:21:32,960
people

679
00:21:39,669 --> 00:21:36,720
um if you go to the next slide

680
00:21:41,430 --> 00:21:39,679
the reason being is uh you know you have

681
00:21:42,789 --> 00:21:41,440
your data you have your research you

682
00:21:44,070 --> 00:21:42,799
have your facts you have your science

683
00:21:45,110 --> 00:21:44,080
you have your brilliant things that

684
00:21:47,190 --> 00:21:45,120
morgan

685
00:21:48,549 --> 00:21:47,200
is spending her daily life discovering

686
00:21:51,669 --> 00:21:48,559
and figuring out

687
00:21:53,750 --> 00:21:51,679
she has to now communicate that

688
00:21:55,430 --> 00:21:53,760

to the widest audience possible

689

00:21:56,549 --> 00:21:55,440

otherwise you're just a musician making

690

00:21:58,310 --> 00:21:56,559

music for yourself

691

00:21:59,430 --> 00:21:58,320

right there's no point in it there's no

692

00:22:00,310 --> 00:21:59,440

point in doing the research if you're

693

00:22:02,310 --> 00:22:00,320

not gonna

694

00:22:04,230 --> 00:22:02,320

communicate it to people all the way

695

00:22:05,909 --> 00:22:04,240

from phd level professionals

696

00:22:07,669 --> 00:22:05,919

down to children and that's where art

697

00:22:08,390 --> 00:22:07,679

comes in because art is a universal

698

00:22:11,029 --> 00:22:08,400

language

699

00:22:12,470 --> 00:22:11,039

it's visual so no matter who you are

700

00:22:13,990 --> 00:22:12,480

where you are what age you are what

701

00:22:14,710 --> 00:22:14,000

level of education you are it is

702

00:22:16,470 --> 00:22:14,720

possible

703

00:22:19,029 --> 00:22:16,480

to look at something and get a general

704

00:22:21,350 --> 00:22:19,039

understanding of what things like morgan

705

00:22:22,549 --> 00:22:21,360

are talking about so again if i can

706

00:22:24,549 --> 00:22:22,559

replace art

707

00:22:26,149 --> 00:22:24,559

with communication that is the role of

708

00:22:28,310 --> 00:22:26,159

an artist at

709

00:22:30,070 --> 00:22:28,320

jpl nasa but not you know we're not just

710

00:22:34,230 --> 00:22:30,080

painters if you can go um

711

00:22:36,549 --> 00:22:34,240

go to the slide to the next slide

712

00:22:37,669 --> 00:22:36,559

at jpl in nasa we have so many

713

00:22:39,590 --> 00:22:37,679

incredible people

714

00:22:41,190 --> 00:22:39,600

outside of engineering and science that

715

00:22:42,710 --> 00:22:41,200

work as communicators

716

00:22:44,789 --> 00:22:42,720

the visual strategist that's what my

717

00:22:46,149 --> 00:22:44,799

title is we have news teams we have

718

00:22:48,230 --> 00:22:46,159

social media people

719

00:22:49,430 --> 00:22:48,240

incredible writers photographers film

720

00:22:52,950 --> 00:22:49,440

and video people

721

00:22:55,110 --> 00:22:52,960

education specialists outreach public

722

00:22:57,669 --> 00:22:55,120

engagement uh web developers ar

723

00:22:59,430 --> 00:22:57,679

vr asmr whatever all the ours printing

724

00:23:00,950 --> 00:22:59,440

specialists archives historians

725

00:23:02,710 --> 00:23:00,960

we have all of these incredible people

726

00:23:05,190 --> 00:23:02,720

that fill in those spaces

727

00:23:07,270 --> 00:23:05,200

to do one thing and that is to help take

728

00:23:09,430 --> 00:23:07,280

these incredibly complex things

729

00:23:10,870 --> 00:23:09,440

and communicate it to as many people as

730

00:23:11,830 --> 00:23:10,880

possible and i just kind of want to end

731

00:23:15,110 --> 00:23:11,840

with this quote

732

00:23:15,909 --> 00:23:15,120

this is going back to the nasa art

733

00:23:17,669 --> 00:23:15,919

program

734

00:23:19,510 --> 00:23:17,679

uh where lester cook said i hope the

735

00:23:20,789 --> 00:23:19,520

future generations will realize that we

736

00:23:22,470 --> 00:23:20,799

have not only the scientists and

737

00:23:23,430 --> 00:23:22,480

engineers capable of shaping the destiny

738

00:23:25,750 --> 00:23:23,440

of our age

739

00:23:26,630 --> 00:23:25,760

but artists worthy to keep them company

740

00:23:30,230 --> 00:23:26,640

so

741

00:23:34,390 --> 00:23:30,240

nasa is humanity's r d division

742

00:23:37,310 --> 00:23:34,400

space is is the place of the greatest

743

00:23:38,870 --> 00:23:37,320

complexities and mysteries in in

744

00:23:41,990 --> 00:23:38,880

impossibilities

745

00:23:44,310 --> 00:23:42,000

that humans need to innovate

746

00:23:45,990 --> 00:23:44,320

it stretches us to innovate and as

747

00:23:48,230 --> 00:23:46,000

scientists and engineers innovate

748

00:23:49,510 --> 00:23:48,240

in that space there need to be artists

749

00:23:51,750 --> 00:23:49,520

going alongside them

750

00:23:53,350 --> 00:23:51,760

to help communicate those things to the

751

00:23:55,669 --> 00:23:53,360

public so that we can all be excited

752

00:23:57,269 --> 00:23:55,679

right so thanks for letting me share all

753

00:24:00,230 --> 00:23:57,279

that i felt like it was important

754

00:24:02,070 --> 00:24:00,240

i would love to get back to morgan and

755

00:24:04,549 --> 00:24:02,080

really start diving in deep

756

00:24:05,990 --> 00:24:04,559

into some of these really complex things

757

00:24:09,510 --> 00:24:06,000

that none of us study

758

00:24:11,029 --> 00:24:09,520

except for her thank you joby we're

759

00:24:12,470 --> 00:24:11,039

going to get to that in just a second

760

00:24:14,549 --> 00:24:12,480

um earlier this week our wonderful

761

00:24:17,830 --> 00:24:14,559

social media team created a poll

762

00:24:19,190 --> 00:24:17,840

for you our audience asking which

763

00:24:20,310 --> 00:24:19,200

exoplanet we should use for our

764

00:24:22,310 --> 00:24:20,320

discussion tonight

765

00:24:23,430 --> 00:24:22,320

as we say this is your space program we

766

00:24:25,029 --> 00:24:23,440

want you to be involved in the

767

00:24:27,110 --> 00:24:25,039

conversation you kind of guided it

768

00:24:28,630 --> 00:24:27,120

this evening for us now if we pull those

769

00:24:31,990 --> 00:24:28,640

results up

770

00:24:32,789 --> 00:24:32,000

that's 28 b you'll see the voters

771

00:24:35,990 --> 00:24:32,799

decided on

772

00:24:38,710 --> 00:24:36,000

super earth super ocean the planet you

773

00:24:40,310 --> 00:24:38,720

chose is called kepler 22b

774

00:24:42,070 --> 00:24:40,320

uh we asked you to choose this to give

775

00:24:43,590 --> 00:24:42,080

our speakers a target now they didn't

776

00:24:46,149 --> 00:24:43,600

know what exoplanet y'all were going to

777

00:24:49,830 --> 00:24:46,159

choose until earlier today uh

778

00:24:51,029 --> 00:24:49,840

essentially we everybody not morgan and

779

00:24:53,750 --> 00:24:51,039

joby are going to sit in

780

00:24:54,870 --> 00:24:53,760

on a meeting with them uh this isn't a

781

00:24:56,789 --> 00:24:54,880

real mission

782

00:24:58,710 --> 00:24:56,799

we're not actually sending a mission to

783

00:25:01,750 --> 00:24:58,720

this exoplanet but we will be using

784

00:25:03,990 --> 00:25:01,760

real science for this discussion now if

785

00:25:05,750 --> 00:25:04,000

you're an artist watching at home

786

00:25:07,350 --> 00:25:05,760

and want to follow along and create

787

00:25:09,750 --> 00:25:07,360

something of your own please do

788

00:25:10,870 --> 00:25:09,760

and post it on social media and tag us

789

00:25:13,190 --> 00:25:10,880

at

790

00:25:16,470 --> 00:25:13,200

nasa exoplanets now i'm going to throw

791

00:25:19,909 --> 00:25:16,480

it over to morgan it's your meeting

792

00:25:21,990 --> 00:25:19,919

awesome well brian thanks so much and

793

00:25:23,750 --> 00:25:22,000

toby i'm so excited to work with you on

794

00:25:25,990 --> 00:25:23,760

this just as excited as i am

795

00:25:27,590 --> 00:25:26,000

anytime we get to sit down and come up

796

00:25:28,149 --> 00:25:27,600

with something new together i couldn't

797

00:25:31,350 --> 00:25:28,159

imagine

798

00:25:33,909 --> 00:25:31,360

better company as well so yeah

799

00:25:34,950 --> 00:25:33,919

super excited let's start thinking about

800

00:25:38,710 --> 00:25:34,960

what we can do

801
00:25:40,710 --> 00:25:38,720
for kepler 22b this is the exoplanet

802
00:25:42,070 --> 00:25:40,720
that you all chose i should note the

803
00:25:43,510 --> 00:25:42,080
other two options were really

804
00:25:45,750 --> 00:25:43,520
exciting as well but this one was

805
00:25:46,549 --> 00:25:45,760
honestly my favorite uh the other two

806
00:25:48,950 --> 00:25:46,559
one was

807
00:25:50,549 --> 00:25:48,960
more of a huff-like world very cold

808
00:25:52,310 --> 00:25:50,559
frigid on the outside might have some

809
00:25:53,269 --> 00:25:52,320
interesting things maybe an ocean going

810
00:25:55,029 --> 00:25:53,279
on underneath

811
00:25:57,190 --> 00:25:55,039
uh the other one that star hugging

812
00:26:00,070 --> 00:25:57,200
subnet tune think of that more like

813
00:26:01,510 --> 00:26:00,080

cloud city it's a place that may not

814

00:26:03,269 --> 00:26:01,520

have any ground at all that we might

815

00:26:03,750 --> 00:26:03,279

send a balloon to one day that would be

816

00:26:06,710 --> 00:26:03,760

cool

817

00:26:08,789 --> 00:26:06,720

but we're going to focus on earth's twin

818

00:26:10,310 --> 00:26:08,799

kepler 22b

819

00:26:12,549 --> 00:26:10,320

so joby i think what we're going to do

820

00:26:15,430 --> 00:26:12,559

now is we're going to come up with

821

00:26:16,870 --> 00:26:15,440

essentially a a poster we usually use

822

00:26:19,909 --> 00:26:16,880

these when we

823

00:26:21,830 --> 00:26:19,919

advertise proposals or when we

824

00:26:23,669 --> 00:26:21,840

start to work on mission concepts that

825

00:26:26,470 --> 00:26:23,679

we want to send to world one day

826

00:26:27,430 --> 00:26:26,480

and this helps us visualize and also

827

00:26:29,909 --> 00:26:27,440

communicate

828

00:26:31,510 --> 00:26:29,919

this idea of what our mission concept is

829

00:26:34,789 --> 00:26:31,520

like and what it's going to do

830

00:26:37,029 --> 00:26:34,799

at this alien world and so kepler-22b

831

00:26:37,990 --> 00:26:37,039

is a really fascinating place it's about

832

00:26:41,269 --> 00:26:38,000

twice as big as

833

00:26:42,230 --> 00:26:41,279

earth but it's also orbiting a very

834

00:26:44,630 --> 00:26:42,240

similar star

835

00:26:46,310 --> 00:26:44,640

in the habitable zone and that's really

836

00:26:47,430 --> 00:26:46,320

exciting for those of us who study

837

00:26:50,789 --> 00:26:47,440

astrobiology

838

00:26:53,190 --> 00:26:50,799

and astrochemistry because this may hold

839

00:26:54,630 --> 00:26:53,200

liquid water and some similar building

840

00:26:56,789 --> 00:26:54,640

blocks to

841

00:26:57,750 --> 00:26:56,799

earth and could potentially be a place

842

00:26:59,830 --> 00:26:57,760

where

843

00:27:00,870 --> 00:26:59,840

life might have already formed or or

844

00:27:03,350 --> 00:27:00,880

could still form

845

00:27:05,110 --> 00:27:03,360

and definitely a worthy place to study

846

00:27:08,070 --> 00:27:05,120

yeah that's amazing so usually

847

00:27:09,190 --> 00:27:08,080

what happens is um you know morgan will

848

00:27:12,390 --> 00:27:09,200

set up a meeting

849

00:27:14,950 --> 00:27:12,400

i'll go down to her office and um

850

00:27:16,230 --> 00:27:14,960

kind of set up shop or um of course

851
00:27:17,750 --> 00:27:16,240
there's the formalities because i know

852
00:27:19,510 --> 00:27:17,760
morgan and i'll be like hey did you go

853
00:27:20,070 --> 00:27:19,520
unicycle mountain biking this weekend or

854
00:27:22,710 --> 00:27:20,080
something

855
00:27:24,230 --> 00:27:22,720
which she does which is insane so uh you

856
00:27:26,789 --> 00:27:24,240
know we'll talk a little bit but

857
00:27:28,230 --> 00:27:26,799
there really isn't anything beyond me

858
00:27:29,909 --> 00:27:28,240
just going morgan

859
00:27:32,070 --> 00:27:29,919
you want to do a mission to this pla

860
00:27:33,590 --> 00:27:32,080
planet you know tell me about why

861
00:27:35,510 --> 00:27:33,600
tell me what's so special about this

862
00:27:37,110 --> 00:27:35,520
planet and then i'll start to piece

863
00:27:39,909 --> 00:27:37,120

together some visuals

864

00:27:41,510 --> 00:27:39,919

for this proposal cover so i know that

865

00:27:42,630 --> 00:27:41,520

there are some formalities with proposal

866

00:27:43,269 --> 00:27:42,640

covers they're eight and a half by

867

00:27:45,110 --> 00:27:43,279

eleven

868

00:27:46,549 --> 00:27:45,120

and they usually um i'm just hoping you

869

00:27:49,029 --> 00:27:46,559

can see my screen here

870

00:27:50,070 --> 00:27:49,039

uh so so usually uh you know it's eight

871

00:27:51,269 --> 00:27:50,080

and a half by eleven and then you have

872

00:27:53,590 --> 00:27:51,279

some formalities

873

00:27:55,269 --> 00:27:53,600

you usually have signatures of somebody

874

00:27:56,870 --> 00:27:55,279

down here which would be morgan

875

00:27:58,789 --> 00:27:56,880

you'd have some some technicalities

876

00:28:00,149 --> 00:27:58,799

because it is a proposal cover this is

877

00:28:01,350 --> 00:28:00,159

legit they're gonna be talking about

878

00:28:01,990 --> 00:28:01,360

science they're gonna be talking about

879

00:28:03,990 --> 00:28:02,000

the spacecraft

880

00:28:06,470 --> 00:28:04,000

and talking about everything in it so i

881

00:28:07,669 --> 00:28:06,480

know i can't do anything down here

882

00:28:09,750 --> 00:28:07,679

i'm going to be used i'm going to be

883

00:28:12,230 --> 00:28:09,760

doing everything up in here so i'm

884

00:28:13,590 --> 00:28:12,240

essentially doing a movie poster almost

885

00:28:16,549 --> 00:28:13,600

i'm going to get people excited

886

00:28:17,510 --> 00:28:16,559

can i communicate what's going on in one

887

00:28:20,549 --> 00:28:17,520

image so

888

00:28:22,630 --> 00:28:20,559

morgan tell me about kepler 22b i'm

889

00:28:27,190 --> 00:28:22,640

actually going to type it in here

890

00:28:29,590 --> 00:28:27,200

and um first of all is that correct

891

00:28:30,549 --> 00:28:29,600

you are so close actually do you mind

892

00:28:32,389 --> 00:28:30,559

making that b

893

00:28:33,990 --> 00:28:32,399

lower case that's actually really

894

00:28:35,110 --> 00:28:34,000

important so when it comes to naming

895

00:28:38,149 --> 00:28:35,120

exoplanets

896

00:28:41,590 --> 00:28:38,159

we tend to use those capital letters for

897

00:28:43,269 --> 00:28:41,600

the stars that's where we identify and

898

00:28:44,389 --> 00:28:43,279

so if you kept it as a capital b

899

00:28:46,870 --> 00:28:44,399

people might think we were going to

900

00:28:49,909 --> 00:28:46,880

visit the the sun essentially

901
00:28:52,230 --> 00:28:49,919
of this solar system oh wow

902
00:28:54,230 --> 00:28:52,240
okay yeah so i'm going to change this to

903
00:28:57,190 --> 00:28:54,240
our lower case b

904
00:28:57,990 --> 00:28:57,200
how is that okay that looks awesome yeah

905
00:28:59,830 --> 00:28:58,000
so kepler

906
00:29:01,430 --> 00:28:59,840
is the mission that discovered this

907
00:29:05,510 --> 00:29:01,440
world 22

908
00:29:07,029 --> 00:29:05,520
in this case is because this is the 22nd

909
00:29:08,389 --> 00:29:07,039
star that looks like it might have

910
00:29:10,149 --> 00:29:08,399
planets around it there's some

911
00:29:11,669 --> 00:29:10,159
probabilities associated with that but

912
00:29:12,230 --> 00:29:11,679
we're pretty confident that these worlds

913
00:29:13,669 --> 00:29:12,240

exist

914

00:29:15,269 --> 00:29:13,679

and then once we've identified them

915

00:29:15,669 --> 00:29:15,279

through all sorts of different ways you

916

00:29:17,830 --> 00:29:15,679

can

917

00:29:19,909 --> 00:29:17,840

hunt these exoplanets then we start to

918

00:29:21,669 --> 00:29:19,919

give them letters and they're identified

919

00:29:24,389 --> 00:29:21,679

in order starting with the letter b

920

00:29:26,470 --> 00:29:24,399

a is reserved for the most massive thing

921

00:29:28,710 --> 00:29:26,480

in the solar system which is usually

922

00:29:30,149 --> 00:29:28,720

the host star and so this was the first

923

00:29:33,830 --> 00:29:30,159

one discovered which is why

924

00:29:35,430 --> 00:29:33,840

it's got that lowercase b all right so

925

00:29:36,549 --> 00:29:35,440

okay so here notice what are you what

926
00:29:37,350 --> 00:29:36,559
are you doing down to the bottom there

927
00:29:39,190 --> 00:29:37,360
domi

928
00:29:41,110 --> 00:29:39,200
what am i doing on the bottom i'm going

929
00:29:43,110 --> 00:29:41,120
to start working on your planet so i

930
00:29:45,110 --> 00:29:43,120
i don't you know if as you're sort of

931
00:29:47,590 --> 00:29:45,120
describing the planet

932
00:29:49,510 --> 00:29:47,600
i um i wanted to kind of piece something

933
00:29:51,110 --> 00:29:49,520
together there i figure

934
00:29:52,549 --> 00:29:51,120
you know let's at least get this on

935
00:29:55,110 --> 00:29:52,559
there um

936
00:29:56,149 --> 00:29:55,120
now there are people who who when they

937
00:29:57,990 --> 00:29:56,159
have more time

938
00:29:59,909 --> 00:29:58,000

are going to be you know they they dive

939

00:30:02,950 --> 00:29:59,919

into 3d you know

940

00:30:05,029 --> 00:30:02,960

3d stuff to really get this stuff um

941

00:30:07,269 --> 00:30:05,039

sitting right but uh for the sake of

942

00:30:09,350 --> 00:30:07,279

time i'm literally just going to be

943

00:30:10,950 --> 00:30:09,360

kind of bending this stuff on there but

944

00:30:11,830 --> 00:30:10,960

morgan i want to get this as close as

945

00:30:13,350 --> 00:30:11,840

possible to

946

00:30:15,269 --> 00:30:13,360

what it is that you're thinking is going

947

00:30:18,230 --> 00:30:15,279

on on this planet down there so

948

00:30:18,710 --> 00:30:18,240

you mentioned clouds um what what kind

949

00:30:20,630 --> 00:30:18,720

of

950

00:30:22,070 --> 00:30:20,640

does it have an atmosphere what's going

951
00:30:23,510 --> 00:30:22,080
on on there um

952
00:30:25,110 --> 00:30:23,520
as i just sort of piece this thing

953
00:30:27,269 --> 00:30:25,120
together yeah

954
00:30:29,350 --> 00:30:27,279
no that's great question joby we do

955
00:30:31,830 --> 00:30:29,360
think that this world has an atmosphere

956
00:30:33,590 --> 00:30:31,840
based on its size and where it's

957
00:30:35,430 --> 00:30:33,600
orbiting in the habitable zone so that

958
00:30:37,750 --> 00:30:35,440
means it's in that goldilocks spot

959
00:30:38,710 --> 00:30:37,760
where it's not too hot not too cold but

960
00:30:40,389 --> 00:30:38,720
just right

961
00:30:41,750 --> 00:30:40,399
so we think this one may be a bit more

962
00:30:43,990 --> 00:30:41,760
earth-like i think

963
00:30:46,230 --> 00:30:44,000

it's going to have water vapor and water

964

00:30:47,830 --> 00:30:46,240

clouds so white colored clouds just like

965

00:30:49,350 --> 00:30:47,840

we have here on earth

966

00:30:51,909 --> 00:30:49,360

and i'm noticing that you've got a lot

967

00:30:53,029 --> 00:30:51,919

of sort of reds and oranges in there but

968

00:30:55,510 --> 00:30:53,039

i'm hoping

969

00:30:57,269 --> 00:30:55,520

since this world is in that habitable

970

00:30:57,830 --> 00:30:57,279

zone that it may have some blues and

971

00:31:00,230 --> 00:30:57,840

greens

972

00:31:01,350 --> 00:31:00,240

it may have liquid water potentially

973

00:31:02,870 --> 00:31:01,360

some oceans

974

00:31:04,389 --> 00:31:02,880

so i don't know if you can tweak the

975

00:31:05,430 --> 00:31:04,399

colors a bit but that would be really

976

00:31:08,549 --> 00:31:05,440

nice

977

00:31:11,590 --> 00:31:08,559

absolutely let's do that now

978

00:31:13,830 --> 00:31:11,600

sweet so yeah this one's actually

979

00:31:15,029 --> 00:31:13,840

in orbit around oh that's starting to

980

00:31:16,950 --> 00:31:15,039

look pretty good

981

00:31:18,070 --> 00:31:16,960

this is an orbit around a very similar

982

00:31:21,430 --> 00:31:18,080

star to our

983

00:31:23,590 --> 00:31:21,440

sun it's a g-class or a yellow dwarf

984

00:31:24,950 --> 00:31:23,600

and so i think we would be within

985

00:31:27,990 --> 00:31:24,960

creative license

986

00:31:29,029 --> 00:31:28,000

to include some green in there for green

987

00:31:30,710 --> 00:31:29,039

plants

988

00:31:33,110 --> 00:31:30,720

right and the reason i say that is

989

00:31:35,029 --> 00:31:33,120

because while there could be

990

00:31:36,389 --> 00:31:35,039

other types of plants that are different

991

00:31:38,149 --> 00:31:36,399

colors

992

00:31:40,230 --> 00:31:38,159

life on earth has adopted that green

993

00:31:41,269 --> 00:31:40,240

color because of the wavelengths coming

994

00:31:42,710 --> 00:31:41,279

from our sun

995

00:31:44,549 --> 00:31:42,720

from our star and since this one's

996

00:31:46,389 --> 00:31:44,559

orbiting a similar star

997

00:31:48,789 --> 00:31:46,399

it's not unreasonable to think that

998

00:31:51,509 --> 00:31:48,799

maybe it might adopt similar pigments

999

00:31:52,870 --> 00:31:51,519

to absorb that that light and to do

1000

00:31:54,549 --> 00:31:52,880

photosynthesis

1001
00:31:56,149 --> 00:31:54,559
so now that's starting to look a lot

1002
00:31:58,950 --> 00:31:56,159
better okay

1003
00:32:00,470 --> 00:31:58,960
this is looking really great so what is

1004
00:32:00,710 --> 00:32:00,480
so you mentioned the starlight what kind

1005
00:32:04,870 --> 00:32:00,720
of

1006
00:32:06,630 --> 00:32:04,880
it what side would it be on what's going

1007
00:32:11,029 --> 00:32:06,640
on

1008
00:32:14,070 --> 00:32:11,039
when it comes to exoplanets

1009
00:32:17,269 --> 00:32:14,080
sometimes they can be tidally locked

1010
00:32:17,990 --> 00:32:17,279
around their host star which means that

1011
00:32:20,389 --> 00:32:18,000
the same

1012
00:32:22,149 --> 00:32:20,399
face like maybe i can do a little demo

1013
00:32:24,389 --> 00:32:22,159

here so i've got let's pretend like

1014

00:32:25,830 --> 00:32:24,399

like this rubik's cube is the sun and

1015

00:32:26,870 --> 00:32:25,840

this rubik's cube is a plant although

1016

00:32:28,870 --> 00:32:26,880

wait let's switch that because this

1017

00:32:31,990 --> 00:32:28,880

one's bigger okay so this is the planet

1018

00:32:33,590 --> 00:32:32,000

and so so in instead of it orbiting like

1019

00:32:35,029 --> 00:32:33,600

we do where we have night and day and

1020

00:32:37,509 --> 00:32:35,039

this guy spins around

1021

00:32:38,070 --> 00:32:37,519

um instead it would be tidally locked

1022

00:32:41,669 --> 00:32:38,080

the same

1023

00:32:44,710 --> 00:32:41,679

face would face the star the entire time

1024

00:32:47,269 --> 00:32:44,720

and that means that one side let's see

1025

00:32:48,950 --> 00:32:47,279

the white side will be really cold and

1026

00:32:50,149 --> 00:32:48,960

and the blue side well it's not totally

1027

00:32:50,630 --> 00:32:50,159

blue because i haven't solved this one

1028

00:32:53,509 --> 00:32:50,640

yet

1029

00:32:54,789 --> 00:32:53,519

would be really hot and yeah so joey

1030

00:32:55,750 --> 00:32:54,799

that's perfect we would need a

1031

00:32:57,830 --> 00:32:55,760

terminator

1032

00:32:59,269 --> 00:32:57,840

something like that so we have a side

1033

00:32:59,669 --> 00:32:59,279

that's in darkness a side that's in

1034

00:33:01,990 --> 00:32:59,679

light

1035

00:33:02,710 --> 00:33:02,000

now for kepler 22b we're actually not

1036

00:33:04,630 --> 00:33:02,720

sure

1037

00:33:06,950 --> 00:33:04,640

if it's tidally locked or not but we're

1038

00:33:08,549 --> 00:33:06,960

we're going to just assume that it is

1039

00:33:10,789 --> 00:33:08,559

because if we send a mission there one

1040

00:33:13,190 --> 00:33:10,799

day we don't want to be surprised

1041

00:33:15,110 --> 00:33:13,200

and have designed for a particular case

1042

00:33:16,549 --> 00:33:15,120

that ends up not being correct

1043

00:33:18,070 --> 00:33:16,559

uh so let's just assume that it's

1044

00:33:20,230 --> 00:33:18,080

tidally locked for right now but we'll

1045

00:33:22,470 --> 00:33:20,240

keep our mission concept open

1046

00:33:24,149 --> 00:33:22,480

so that we can be adaptive if indeed

1047

00:33:26,149 --> 00:33:24,159

it's more earth-like

1048

00:33:27,909 --> 00:33:26,159

okay let's do that so we've got our

1049

00:33:30,470 --> 00:33:27,919

title locked we're

1050

00:33:31,909 --> 00:33:30,480

we're gonna you know light on one side

1051

00:33:34,950 --> 00:33:31,919

darken the other side

1052

00:33:35,430 --> 00:33:34,960

so what what exactly is uh going on

1053

00:33:37,909 --> 00:33:35,440

above

1054

00:33:39,190 --> 00:33:37,919

there is there is there you know what

1055

00:33:41,269 --> 00:33:39,200

are you sending there

1056

00:33:42,230 --> 00:33:41,279

is there is it like an orbiter like this

1057

00:33:45,990 --> 00:33:42,240

or is it

1058

00:33:48,789 --> 00:33:46,000

is it you know a giant

1059

00:33:49,750 --> 00:33:48,799

restaurant spaceship i don't know so

1060

00:33:53,590 --> 00:33:49,760

well it

1061

00:33:55,430 --> 00:33:53,600

also just to let you guys know

1062

00:33:57,269 --> 00:33:55,440

i i am given permission to ask the

1063

00:33:59,750 --> 00:33:57,279

dumbest questions in the room

1064

00:34:01,350 --> 00:33:59,760

so and i often do so a lot of times that

1065

00:34:02,950 --> 00:34:01,360

gets morgan thinking differently

1066

00:34:05,350 --> 00:34:02,960

of course they're not sending a giant

1067

00:34:07,190 --> 00:34:05,360

restaurant out to kepler 22b

1068

00:34:08,389 --> 00:34:07,200

but as i do inquire about what the

1069

00:34:10,310 --> 00:34:08,399

spacecraft is

1070

00:34:11,829 --> 00:34:10,320

um that gets her really thinking about

1071

00:34:13,750 --> 00:34:11,839

you know her mission

1072

00:34:15,510 --> 00:34:13,760

um and how to communicate that best to

1073

00:34:15,990 --> 00:34:15,520

to people so i in a way i represent the

1074

00:34:19,030 --> 00:34:16,000

public

1075

00:34:20,790 --> 00:34:19,040

as well you totally do and you always

1076

00:34:22,710 --> 00:34:20,800

ask good questions joby there are no

1077

00:34:24,310 --> 00:34:22,720

stupid questions

1078

00:34:26,310 --> 00:34:24,320

okay this is great i like the idea of

1079

00:34:26,869 --> 00:34:26,320

putting in our spacecraft and i'm

1080

00:34:29,829 --> 00:34:26,879

thinking

1081

00:34:30,389 --> 00:34:29,839

it's gonna have three pieces it's going

1082

00:34:32,790 --> 00:34:30,399

to have

1083

00:34:34,869 --> 00:34:32,800

an orbiter something that stays in space

1084

00:34:36,790 --> 00:34:34,879

that will orbit around this planet

1085

00:34:38,710 --> 00:34:36,800

and i think solar panels is the way to

1086

00:34:40,069 --> 00:34:38,720

go here for power

1087

00:34:41,990 --> 00:34:40,079

because it may take us a while to get

1088

00:34:43,669 --> 00:34:42,000

there so that looks really nice but i'm

1089

00:34:46,950 --> 00:34:43,679

thinking we're also going to want

1090

00:34:49,829 --> 00:34:46,960

two landers and the reason that i say

1091

00:34:50,310 --> 00:34:49,839

that we need two is because well first

1092

00:34:53,669 --> 00:34:50,320

of all

1093

00:34:54,869 --> 00:34:53,679

if indeed this moon sorry this world is

1094

00:34:56,470 --> 00:34:54,879

tidally locked

1095

00:34:58,069 --> 00:34:56,480

it would be really fascinating to send

1096

00:35:00,710 --> 00:34:58,079

one to the sunlit side

1097

00:35:01,430 --> 00:35:00,720

and one to the side that's forever in

1098

00:35:03,829 --> 00:35:01,440

darkness

1099

00:35:04,790 --> 00:35:03,839

to compare and contrast and study

1100

00:35:06,950 --> 00:35:04,800

between them

1101

00:35:08,870 --> 00:35:06,960

and also if we send two landers then we

1102

00:35:09,990 --> 00:35:08,880

have redundancy if something happens or

1103

00:35:11,589 --> 00:35:10,000

goes wrong with one

1104

00:35:13,349 --> 00:35:11,599

we can still get plenty of data from

1105

00:35:15,190 --> 00:35:13,359

another and so which

1106

00:35:17,030 --> 00:35:15,200

what prototype are you pulling up there

1107

00:35:19,589 --> 00:35:17,040

that looks really neat

1108

00:35:20,790 --> 00:35:19,599

i think it's the hoyden's probe nice the

1109

00:35:22,230 --> 00:35:20,800

huygens probe that's

1110

00:35:23,750 --> 00:35:22,240

that is near and dear to my heart

1111

00:35:24,630 --> 00:35:23,760

because that was part of the cassini

1112

00:35:27,190 --> 00:35:24,640

mission

1113

00:35:27,910 --> 00:35:27,200

cassini went to to saturn and it

1114

00:35:30,470 --> 00:35:27,920

explored

1115

00:35:31,430 --> 00:35:30,480

saturn and its rings and moons and

1116

00:35:33,670 --> 00:35:31,440

brought along with it

1117

00:35:36,069 --> 00:35:33,680

a collaboration from the european space

1118

00:35:38,710 --> 00:35:36,079

agency which is a probe that landed

1119

00:35:40,310 --> 00:35:38,720

on saturn's moon titan and it's actually

1120

00:35:41,270 --> 00:35:40,320

perfect that you picked that jovi

1121

00:35:44,230 --> 00:35:41,280

because

1122

00:35:45,190 --> 00:35:44,240

when huygens was designed we didn't know

1123

00:35:47,670 --> 00:35:45,200

if titan had

1124

00:35:48,310 --> 00:35:47,680

solid land or if it was covered in

1125

00:35:50,870 --> 00:35:48,320

oceans

1126
00:35:52,790 --> 00:35:50,880
of liquid methane and ethane and so they

1127
00:35:55,030 --> 00:35:52,800
designed that probe so it could float

1128
00:35:56,390 --> 00:35:55,040
even if there was just liquid around it

1129
00:35:57,589 --> 00:35:56,400
would still work just fine

1130
00:36:00,069 --> 00:35:57,599
and i think that's what we would want to

1131
00:36:01,750 --> 00:36:00,079
design for this exoplanet as well in

1132
00:36:02,870 --> 00:36:01,760
this mission concept

1133
00:36:04,390 --> 00:36:02,880
because we don't know if there's

1134
00:36:05,430 --> 00:36:04,400
actually going to be solid rocky ground

1135
00:36:07,030 --> 00:36:05,440
until we get there

1136
00:36:08,550 --> 00:36:07,040
and by then it's too late to you know

1137
00:36:09,750 --> 00:36:08,560
oops let's go back to earth let's pick

1138
00:36:10,710 --> 00:36:09,760

up a different kind of probe and come

1139

00:36:12,230 --> 00:36:10,720

back that would

1140

00:36:13,990 --> 00:36:12,240

that would take too long i don't want to

1141

00:36:16,710 --> 00:36:14,000

wait that long

1142

00:36:18,710 --> 00:36:16,720

yeah nice so we'll send two so we'll

1143

00:36:19,990 --> 00:36:18,720

send one to the sunlit side one to the

1144

00:36:21,750 --> 00:36:20,000

dark side

1145

00:36:23,670 --> 00:36:21,760

i really like what you're doing here

1146

00:36:26,230 --> 00:36:23,680

maybe we could also include

1147

00:36:27,030 --> 00:36:26,240

something to show oh those colors are

1148

00:36:28,870 --> 00:36:27,040

cool

1149

00:36:31,510 --> 00:36:28,880

oh that looks really awesome you're so

1150

00:36:35,990 --> 00:36:34,150

i'm flying here i'm trying to uh i'm

1151

00:36:38,630 --> 00:36:36,000

trying more again i'm trying

1152

00:36:39,190 --> 00:36:38,640

um so so what we're gonna add so i know

1153

00:36:42,710 --> 00:36:39,200

that these

1154

00:36:49,510 --> 00:36:42,720

one's gonna go

1155

00:36:53,109 --> 00:36:49,520

light correct yes so

1156

00:36:54,390 --> 00:36:53,119

so probably should show some some

1157

00:36:57,430 --> 00:36:54,400

way of doing that i'm gonna i'm gonna

1158

00:37:01,510 --> 00:36:57,440

continue messing with these but you know

1159

00:37:04,630 --> 00:37:01,520

for now perhaps we don't do the color

1160

00:37:08,790 --> 00:37:04,640

but uh i i do want to show

1161

00:37:11,109 --> 00:37:08,800

you know some way of of

1162

00:37:12,069 --> 00:37:11,119

that that you know yeah like the

1163

00:37:15,109 --> 00:37:12,079

trajectory

1164

00:37:18,150 --> 00:37:15,119

something yeah correct

1165

00:37:19,829 --> 00:37:18,160

so yeah something like that is pretty

1166

00:37:22,150 --> 00:37:19,839

good i really like how you sort of

1167

00:37:23,510 --> 00:37:22,160

got this nice kind of left and right

1168

00:37:25,910 --> 00:37:23,520

dark and light

1169

00:37:27,109 --> 00:37:25,920

it's it's really got some some cool feel

1170

00:37:28,950 --> 00:37:27,119

to it

1171

00:37:30,950 --> 00:37:28,960

and yeah we would want to show the

1172

00:37:33,589 --> 00:37:30,960

trajectories and i don't know if there's

1173

00:37:34,230 --> 00:37:33,599

space or a way that we could show we'll

1174

00:37:36,069 --> 00:37:34,240

probably

1175

00:37:37,910 --> 00:37:36,079

have to use parachutes or something for

1176

00:37:39,829 --> 00:37:37,920

these guys to land

1177

00:37:41,270 --> 00:37:39,839

because this has an atmosphere so

1178

00:37:43,109 --> 00:37:41,280

chances are you

1179

00:37:44,310 --> 00:37:43,119

will probably employ something similar

1180

00:37:47,750 --> 00:37:44,320

to how we land

1181

00:37:49,829 --> 00:37:47,760

our rovers on mars where we use

1182

00:37:51,670 --> 00:37:49,839

supersonic or hypersonic parachutes and

1183

00:37:52,550 --> 00:37:51,680

then some combination of retro rockets

1184

00:37:54,470 --> 00:37:52,560

at the end

1185

00:37:56,790 --> 00:37:54,480

and the nice thing about that is if we

1186

00:37:59,109 --> 00:37:56,800

come to this alien exoplanet

1187

00:38:01,190 --> 00:37:59,119

and we find the atmosphere surprisingly

1188

00:38:03,510 --> 00:38:01,200

thick or surprisingly thin we may still

1189

00:38:06,069 --> 00:38:03,520

be able to use some combination of those

1190

00:38:07,670 --> 00:38:06,079

to land i don't know if that's going to

1191

00:38:09,349 --> 00:38:07,680

mess up the flow of the image but it

1192

00:38:11,349 --> 00:38:09,359

might be neat to include

1193

00:38:12,630 --> 00:38:11,359

uh maybe like a parachute or something

1194

00:38:13,829 --> 00:38:12,640

like that in there although

1195

00:38:16,710 --> 00:38:13,839

where they are right now they're pretty

1196

00:38:19,750 --> 00:38:16,720

high up that would get deployed later

1197

00:38:20,069 --> 00:38:19,760

but we can show that kind of a um you

1198

00:38:23,109 --> 00:38:20,079

know

1199

00:38:23,510 --> 00:38:23,119

do you want to show stages of of things

1200

00:38:27,589 --> 00:38:23,520

or

1201
00:38:30,870 --> 00:38:27,599
um you know that's a really good idea

1202
00:38:33,990 --> 00:38:30,880
do that then

1203
00:38:34,630 --> 00:38:34,000
try and fix this a little bit what would

1204
00:38:37,109 --> 00:38:34,640
the final

1205
00:38:38,710 --> 00:38:37,119
step be kind of just to make sure we get

1206
00:38:40,310 --> 00:38:38,720
enough time for audience questions and i

1207
00:38:41,750 --> 00:38:40,320
could watch you do this all day

1208
00:38:43,750 --> 00:38:41,760
what would kind of be the last step that

1209
00:38:46,230 --> 00:38:43,760
you both have in this meeting

1210
00:38:48,150 --> 00:38:46,240
yeah well i think we would want to show

1211
00:38:49,829 --> 00:38:48,160
maybe something about the science that

1212
00:38:52,790 --> 00:38:49,839
we might discover

1213
00:38:54,470 --> 00:38:52,800

and to me one of the most exciting

1214

00:38:55,990 --> 00:38:54,480

aspects of visiting a world like this

1215

00:38:59,190 --> 00:38:56,000

would be to search for

1216

00:39:00,550 --> 00:38:59,200

biosignatures evidence of life and that

1217

00:39:03,270 --> 00:39:00,560

could take the form of

1218

00:39:05,109 --> 00:39:03,280

molecules like amino acids it could take

1219

00:39:07,510 --> 00:39:05,119

the form of looking for cells

1220

00:39:08,950 --> 00:39:07,520

or you know even techno signatures if

1221

00:39:10,950 --> 00:39:08,960

there's actually a civilization

1222

00:39:13,670 --> 00:39:10,960

here but joby i wonder if there's a way

1223

00:39:15,190 --> 00:39:13,680

that we could include something

1224

00:39:16,710 --> 00:39:15,200

maybe up in one of the corners or i

1225

00:39:18,069 --> 00:39:16,720

don't know you're the expert on where it

1226
00:39:20,310 --> 00:39:18,079
should go but maybe

1227
00:39:22,550 --> 00:39:20,320
do you have like any example molecules

1228
00:39:26,550 --> 00:39:22,560
that we could drop in there

1229
00:39:31,750 --> 00:39:26,560
i do let me let me pull that down

1230
00:39:36,630 --> 00:39:34,790
maybe like boom that

1231
00:39:38,630 --> 00:39:36,640
oh yeah that's perfect what is that that

1232
00:39:42,870 --> 00:39:38,640
looks like is that history

1233
00:39:44,950 --> 00:39:42,880
i think i'm not sure you would know that

1234
00:39:46,870 --> 00:39:44,960
yeah that's an amino acid which is great

1235
00:39:49,190 --> 00:39:46,880
these make great bio signatures

1236
00:39:50,870 --> 00:39:49,200
uh so this is actually perfect uh these

1237
00:39:53,109 --> 00:39:50,880
types of molecules

1238
00:39:54,550 --> 00:39:53,119

all earth life uses them we find them

1239

00:39:56,870 --> 00:39:54,560

all over the solar system

1240

00:39:57,990 --> 00:39:56,880

so they're made some of them are made

1241

00:40:00,950 --> 00:39:58,000

abiotically too

1242

00:40:02,150 --> 00:40:00,960

not by life but life uses them and when

1243

00:40:05,109 --> 00:40:02,160

life uses them

1244

00:40:06,069 --> 00:40:05,119

it will make more of some and less of

1245

00:40:07,910 --> 00:40:06,079

another and

1246

00:40:09,990 --> 00:40:07,920

create these funky patterns that we can

1247

00:40:11,349 --> 00:40:10,000

then detect and so i really like using

1248

00:40:12,710 --> 00:40:11,359

that as a good example because that

1249

00:40:13,910 --> 00:40:12,720

might actually be one of the ones that

1250

00:40:16,150 --> 00:40:13,920

we include in our

1251
00:40:18,150 --> 00:40:16,160
our science traceability where we target

1252
00:40:21,190 --> 00:40:18,160
those molecules specifically

1253
00:40:24,230 --> 00:40:21,200
so that's looking really really nice

1254
00:40:25,990 --> 00:40:24,240
would um is it okay that they're sort of

1255
00:40:28,390 --> 00:40:26,000
you know spinning around a little bit

1256
00:40:28,710 --> 00:40:28,400
and i mean maybe i'll that's it's a

1257
00:40:31,430 --> 00:40:28,720
little

1258
00:40:33,109 --> 00:40:31,440
kind of on the nose i might i might kind

1259
00:40:36,470 --> 00:40:33,119
of play those back a little bit but

1260
00:40:40,309 --> 00:40:36,480
um but in fact let's let's try this

1261
00:40:43,670 --> 00:40:40,319
i'm gonna uh get a little rd on you

1262
00:40:45,030 --> 00:40:43,680
and you know see let's let's see what

1263
00:40:47,190 --> 00:40:45,040

happens

1264

00:40:48,470 --> 00:40:47,200

you know something something along these

1265

00:40:52,150 --> 00:40:48,480

lines

1266

00:40:53,430 --> 00:40:52,160

um that can help pop some of these

1267

00:40:55,829 --> 00:40:53,440

things

1268

00:40:56,790 --> 00:40:55,839

oh wow it's kind of dreamy um oh that's

1269

00:41:00,150 --> 00:40:56,800

super cool

1270

00:41:01,349 --> 00:41:00,160

wait go back what was that oh that looks

1271

00:41:04,710 --> 00:41:01,359

amazing

1272

00:41:06,150 --> 00:41:04,720

uh one more wait no okay that

1273

00:41:08,710 --> 00:41:06,160

is that too much that might be too much

1274

00:41:10,950 --> 00:41:08,720

you're i trust your judgment too

1275

00:41:12,870 --> 00:41:10,960

i can i can i can scale it back just a

1276

00:41:15,670 --> 00:41:12,880

hair

1277

00:41:17,589 --> 00:41:15,680

oh that looks amazing it might be a

1278

00:41:22,790 --> 00:41:17,599

little blown out

1279

00:41:25,030 --> 00:41:22,800

because who are you who are you who's

1280

00:41:29,030 --> 00:41:25,040

going to be looking at this morgan

1281

00:41:32,230 --> 00:41:29,040

so this is going to go to a review board

1282

00:41:33,349 --> 00:41:32,240

of very you know top-notch best in their

1283

00:41:35,510 --> 00:41:33,359

game in their field

1284

00:41:36,710 --> 00:41:35,520

scientists and engineers will look at

1285

00:41:38,950 --> 00:41:36,720

this proposal

1286

00:41:40,710 --> 00:41:38,960

and they'll check our science they'll

1287

00:41:41,670 --> 00:41:40,720

check our spacecraft and our engineering

1288

00:41:43,589 --> 00:41:41,680

to make sure

1289

00:41:44,870 --> 00:41:43,599

that what we're proposing to build is

1290

00:41:46,390 --> 00:41:44,880

going to work the way that we think it's

1291

00:41:47,430 --> 00:41:46,400

going to work and that will answer the

1292

00:41:50,230 --> 00:41:47,440

science questions

1293

00:41:51,430 --> 00:41:50,240

that we're trying to ask and so it's

1294

00:41:53,430 --> 00:41:51,440

going to go to a lot of people

1295

00:41:55,510 --> 00:41:53,440

at nasa headquarters and all sorts of

1296

00:41:57,190 --> 00:41:55,520

places and if this gets picked

1297

00:41:58,790 --> 00:41:57,200

this is the kind of poster that we will

1298

00:42:01,030 --> 00:41:58,800

use to tell the public

1299

00:42:02,470 --> 00:42:01,040

about this amazing new mission it's not

1300

00:42:04,470 --> 00:42:02,480

a real mission this is just

1301
00:42:06,309 --> 00:42:04,480
an example concept but this is the type

1302
00:42:10,069 --> 00:42:06,319
of thing that we would then use to

1303
00:42:16,390 --> 00:42:13,270
very cool yeah we um

1304
00:42:19,910 --> 00:42:16,400
beautiful i love it i'm

1305
00:42:23,190 --> 00:42:19,920
i'm just gonna and then

1306
00:42:27,190 --> 00:42:23,200
make something fine i'll get some

1307
00:42:28,710 --> 00:42:27,200
yeah i'm just gonna kind of um you know

1308
00:42:30,390 --> 00:42:28,720
do some final touches on it this is

1309
00:42:33,430 --> 00:42:30,400
where i tinker

1310
00:42:36,710 --> 00:42:33,440
and we'll often go back and

1311
00:42:37,589 --> 00:42:36,720
and give morgan like you know five or

1312
00:42:40,790 --> 00:42:37,599
six

1313
00:42:42,950 --> 00:42:40,800

options almost um of

1314

00:42:44,230 --> 00:42:42,960

you know what about this what about that

1315

00:42:48,630 --> 00:42:44,240

um is

1316

00:42:50,390 --> 00:42:48,640

this okay is that okay you know

1317

00:42:51,750 --> 00:42:50,400

messing around with literal messing

1318

00:42:56,069 --> 00:42:51,760

around with

1319

00:42:58,950 --> 00:42:56,079

you know what's not literal um

1320

00:43:01,910 --> 00:42:58,960

getting super rd not getting already so

1321

00:43:05,109 --> 00:43:01,920

just whatever communicates the best

1322

00:43:07,270 --> 00:43:05,119

the best thing is uh um

1323

00:43:08,150 --> 00:43:07,280

usually what i'll kind of dive into off

1324

00:43:11,510 --> 00:43:08,160

offline because

1325

00:43:12,069 --> 00:43:11,520

morgan's very busy we're all busy but i

1326

00:43:15,190 --> 00:43:12,079

think that's

1327

00:43:17,670 --> 00:43:15,200

perfect i call it done let's let's take

1328

00:43:20,470 --> 00:43:17,680

that to the printers and run with it

1329

00:43:20,950 --> 00:43:20,480

okay so and then i i always do one more

1330

00:43:23,349 --> 00:43:20,960

layer

1331

00:43:24,150 --> 00:43:23,359

of just playing around just for oohs and

1332

00:43:27,030 --> 00:43:24,160

oz

1333

00:43:27,510 --> 00:43:27,040

um just to see so while joey does that

1334

00:43:29,430 --> 00:43:27,520

final

1335

00:43:31,349 --> 00:43:29,440

error of of playing around and for the

1336

00:43:33,510 --> 00:43:31,359

oohs and oz i actually want to ask

1337

00:43:35,270 --> 00:43:33,520

morgan since joey talked a little bit

1338

00:43:37,109 --> 00:43:35,280

about the history of this place

1339

00:43:39,190 --> 00:43:37,119

well he keeps continuing to fiddle with

1340

00:43:41,510 --> 00:43:39,200

that um

1341

00:43:43,670 --> 00:43:41,520

what's essentially the future of this

1342

00:43:46,790 --> 00:43:43,680

relationship

1343

00:43:47,190 --> 00:43:46,800

well i think maybe we've demonstrated

1344

00:43:49,829 --> 00:43:47,200

here

1345

00:43:51,030 --> 00:43:49,839

just giving you a taste of how crucial

1346

00:43:54,150 --> 00:43:51,040

art is

1347

00:43:55,829 --> 00:43:54,160

to science the science process to

1348

00:43:57,349 --> 00:43:55,839

answering the questions figuring out

1349

00:43:58,630 --> 00:43:57,359

those answers

1350

00:44:00,230 --> 00:43:58,640

you know asking the questions figuring

1351
00:44:00,630 --> 00:44:00,240
out those answers and then communicating

1352
00:44:03,510 --> 00:44:00,640
it

1353
00:44:04,390 --> 00:44:03,520
to the public to the rest of the world

1354
00:44:07,990 --> 00:44:04,400
so

1355
00:44:09,910 --> 00:44:08,000
joby i end up

1356
00:44:11,109 --> 00:44:09,920
thinking about things in a different way

1357
00:44:12,150 --> 00:44:11,119
i end up

1358
00:44:14,470 --> 00:44:12,160
looking at things from a different

1359
00:44:15,190 --> 00:44:14,480
perspective because that's what toby

1360
00:44:17,510 --> 00:44:15,200
brings

1361
00:44:18,230 --> 00:44:17,520
he and other artists at jpl and other

1362
00:44:20,309 --> 00:44:18,240
places

1363
00:44:21,270 --> 00:44:20,319

they have a very diverse set of

1364

00:44:23,430 --> 00:44:21,280

experiences

1365

00:44:24,870 --> 00:44:23,440

and any time you can bring that into a

1366

00:44:26,950 --> 00:44:24,880

team and interleave

1367

00:44:28,069 --> 00:44:26,960

all of your different backgrounds your

1368

00:44:30,230 --> 00:44:28,079

ideas

1369

00:44:32,390 --> 00:44:30,240

you end up with something much stronger

1370

00:44:35,109 --> 00:44:32,400

and so being able to integrate

1371

00:44:36,230 --> 00:44:35,119

art in an early stage like this into a

1372

00:44:39,109 --> 00:44:36,240

concept

1373

00:44:40,950 --> 00:44:39,119

makes it much stronger and it makes us

1374

00:44:41,589 --> 00:44:40,960

better as scientists in terms of how we

1375

00:44:43,430 --> 00:44:41,599

frame

1376

00:44:45,910 --> 00:44:43,440

even the basic things like our questions

1377

00:44:48,950 --> 00:44:45,920

in our science

1378

00:44:50,630 --> 00:44:48,960

very cool um i see joby is still working

1379

00:44:51,750 --> 00:44:50,640

on it so we're gonna get to your

1380

00:44:54,230 --> 00:44:51,760

questions here

1381

00:44:55,430 --> 00:44:54,240

while he's still messing around never

1382

00:44:57,430 --> 00:44:55,440

stops never stops

1383

00:44:58,710 --> 00:44:57,440

can't stop won't stop um but i want to

1384

00:45:00,309 --> 00:44:58,720

thank them both because i'm not gonna

1385

00:45:01,829 --> 00:45:00,319

throw it over to talia

1386

00:45:03,430 --> 00:45:01,839

for some audience questions but before

1387

00:45:05,030 --> 00:45:03,440

we do she does have something she wants

1388

00:45:08,870 --> 00:45:05,040

to share with all of us particularly you

1389

00:45:12,950 --> 00:45:12,150

i do thank you brian so if we can pull

1390

00:45:16,150 --> 00:45:12,960

up slide

1391

00:45:19,270 --> 00:45:16,160

38 speaking of art and science

1392

00:45:21,270 --> 00:45:19,280

an amazing exoplanets and the technology

1393

00:45:23,510 --> 00:45:21,280

that we use to discover them

1394

00:45:25,030 --> 00:45:23,520

we have a brand new poster that has been

1395

00:45:28,230 --> 00:45:25,040

released today

1396

00:45:31,190 --> 00:45:28,240

it is featuring the spitzer telescope

1397

00:45:32,150 --> 00:45:31,200

which is a telescope that has been used

1398

00:45:34,230 --> 00:45:32,160

to characterize

1399

00:45:36,309 --> 00:45:34,240

and discover many exoplanets along with

1400

00:45:36,870 --> 00:45:36,319

a lot of other amazing science that is

1401

00:45:41,990 --> 00:45:36,880

that

1402

00:45:46,069 --> 00:45:42,000

you would like to download the poster

1403

00:45:48,069 --> 00:45:46,079

i'm sorry uh visit exoplanets.nasa.gov

1404

00:45:50,390 --> 00:45:48,079

we will be releasing a new one each week

1405

00:45:52,309 --> 00:45:50,400

so stay tuned to see all of the amazing

1406

00:45:54,309 --> 00:45:52,319

exoplanet telescopes

1407

00:45:57,430 --> 00:45:54,319

that we use to find and characterize

1408

00:46:01,270 --> 00:45:59,430

wonderful what questions do we have out

1409

00:46:04,870 --> 00:46:01,280

there i imagine there were a lot because

1410

00:46:06,710 --> 00:46:04,880

i'm full of questions right now too

1411

00:46:08,150 --> 00:46:06,720

yes so we have a lot of amazing

1412

00:46:10,550 --> 00:46:08,160

questions right now

1413

00:46:11,430 --> 00:46:10,560

um but why don't we start off with um

1414

00:46:14,470 --> 00:46:11,440

one from

1415

00:46:16,069 --> 00:46:14,480

linkedin so phyllis on linkedin asks do

1416

00:46:18,230 --> 00:46:16,079

you find that the process

1417

00:46:20,150 --> 00:46:18,240

of creating art contributes to

1418

00:46:21,910 --> 00:46:20,160

innovation by helping the scientists see

1419

00:46:23,910 --> 00:46:21,920

their concept in a new way i know you

1420

00:46:26,309 --> 00:46:23,920

talked a little bit about this morgan

1421

00:46:27,430 --> 00:46:26,319

but have you yourself experienced a

1422

00:46:29,349 --> 00:46:27,440

moment where you've

1423

00:46:31,109 --> 00:46:29,359

um you know seen signs in a different

1424

00:46:32,790 --> 00:46:31,119

way after having a meeting with someone

1425

00:46:36,390 --> 00:46:32,800

like joey

1426

00:46:38,790 --> 00:46:36,400

oh totally i mean sometimes

1427

00:46:40,950 --> 00:46:38,800

we'll we'll engage with joby very early

1428

00:46:43,589 --> 00:46:40,960

in the process or artists like him

1429

00:46:44,950 --> 00:46:43,599

and uh they'll point out something that

1430

00:46:47,750 --> 00:46:44,960

we were so

1431

00:46:49,510 --> 00:46:47,760

you know deeply entrained in the the

1432

00:46:51,349 --> 00:46:49,520

idea of the concepts

1433

00:46:53,109 --> 00:46:51,359

that we didn't stop to take a look a

1434

00:46:53,670 --> 00:46:53,119

step back and take a look and be like oh

1435

00:46:56,470 --> 00:46:53,680

man

1436

00:46:57,750 --> 00:46:56,480

yeah that's right this this um maybe

1437

00:46:58,950 --> 00:46:57,760

this instrument

1438

00:47:00,870 --> 00:46:58,960

isn't going to fit the way that we

1439

00:47:02,390 --> 00:47:00,880

expected or boy that whole spacecraft

1440

00:47:04,630 --> 00:47:02,400

looks really boxy

1441

00:47:06,069 --> 00:47:04,640

and we're going to be landing someplace

1442

00:47:07,430 --> 00:47:06,079

like titan we need to make this more

1443

00:47:08,309 --> 00:47:07,440

aerodynamic because it's got an

1444

00:47:10,390 --> 00:47:08,319

atmosphere

1445

00:47:12,069 --> 00:47:10,400

there are a lot of different things that

1446

00:47:12,870 --> 00:47:12,079

artists can bring to us early in a

1447

00:47:15,349 --> 00:47:12,880

concept

1448

00:47:15,990 --> 00:47:15,359

or even later on as we're starting to do

1449

00:47:18,150 --> 00:47:16,000

tweaks

1450

00:47:19,270 --> 00:47:18,160

to think about things like foot pad

1451
00:47:21,670 --> 00:47:19,280
designs

1452
00:47:22,950 --> 00:47:21,680
how they might interact with the surface

1453
00:47:25,030 --> 00:47:22,960
artists can also weigh in

1454
00:47:27,670 --> 00:47:25,040
on things like that as well so it's

1455
00:47:29,030 --> 00:47:27,680
really amazing to be able to have that

1456
00:47:30,790 --> 00:47:29,040
perspective

1457
00:47:32,549 --> 00:47:30,800
at every stage of mission development

1458
00:47:33,829 --> 00:47:32,559
not just in the early stages not just in

1459
00:47:34,790 --> 00:47:33,839
the end when we're working on the

1460
00:47:39,829 --> 00:47:34,800
proposal but

1461
00:47:42,549 --> 00:47:39,839
throughout the entire process

1462
00:47:43,270 --> 00:47:42,559
excellent so we have a lot a lot more

1463
00:47:45,430 --> 00:47:43,280

questions

1464

00:47:47,910 --> 00:47:45,440

um and let's see if either you or joey

1465

00:47:50,630 --> 00:47:47,920

can answer this one so lisa on facebook

1466

00:47:52,870 --> 00:47:50,640

asks for meetings such as these what is

1467

00:47:54,470 --> 00:47:52,880

your deadline to create a poster now i

1468

00:47:56,390 --> 00:47:54,480

have been heavily involved in the

1469

00:47:59,190 --> 00:47:56,400

creation of posters before

1470

00:48:00,630 --> 00:47:59,200

especially with joby um but i would like

1471

00:48:02,870 --> 00:48:00,640

to hear what you guys

1472

00:48:04,470 --> 00:48:02,880

would have to say in terms of trying to

1473

00:48:05,670 --> 00:48:04,480

meet deadlines

1474

00:48:07,430 --> 00:48:05,680

especially when you're trying to put

1475

00:48:09,990 --> 00:48:07,440

together a proposal what might that

1476

00:48:12,710 --> 00:48:10,000

deadline look like

1477

00:48:13,589 --> 00:48:12,720

well whenever we work on mission

1478

00:48:15,589 --> 00:48:13,599

proposals

1479

00:48:18,069 --> 00:48:15,599

this is something that we usually start

1480

00:48:19,510 --> 00:48:18,079

sometimes many years in advance of when

1481

00:48:19,990 --> 00:48:19,520

we plan on delivering what is

1482

00:48:22,470 --> 00:48:20,000

essentially

1483

00:48:23,589 --> 00:48:22,480

a book with this beautiful cover on it

1484

00:48:25,990 --> 00:48:23,599

to nasa

1485

00:48:28,069 --> 00:48:26,000

and so some things will start very early

1486

00:48:28,950 --> 00:48:28,079

and we like to impose our own internal

1487

00:48:30,950 --> 00:48:28,960

deadlines

1488

00:48:32,790 --> 00:48:30,960

to keep us from getting you know right

1489

00:48:33,670 --> 00:48:32,800

up to the wire such that we have plenty

1490

00:48:36,470 --> 00:48:33,680

of time

1491

00:48:38,549 --> 00:48:36,480

to iterate on one of these drafts send

1492

00:48:40,069 --> 00:48:38,559

it around for internal review have a few

1493

00:48:41,510 --> 00:48:40,079

other people look at it as well who've

1494

00:48:43,829 --> 00:48:41,520

never seen it before

1495

00:48:45,349 --> 00:48:43,839

and see if they can get that concept

1496

00:48:46,710 --> 00:48:45,359

that we're trying to convey so we might

1497

00:48:49,910 --> 00:48:46,720

take this poster

1498

00:48:52,069 --> 00:48:49,920

that joby is tweaking and without

1499

00:48:53,589 --> 00:48:52,079

us saying a word hand it to someone else

1500

00:48:55,589 --> 00:48:53,599

and be be like what does this

1501
00:48:56,790 --> 00:48:55,599
tell you and they may look at those

1502
00:48:58,630 --> 00:48:56,800
those two

1503
00:49:00,470 --> 00:48:58,640
landers that we're designing and they

1504
00:49:02,710 --> 00:49:00,480
may say oh well are those

1505
00:49:04,069 --> 00:49:02,720
are those separate orbiters is it are

1506
00:49:05,750 --> 00:49:04,079
those land you know

1507
00:49:07,430 --> 00:49:05,760
if they can get that oh there's an

1508
00:49:08,870 --> 00:49:07,440
orbiter it's going to have two landers

1509
00:49:10,870 --> 00:49:08,880
that'll go down and i see the

1510
00:49:12,470 --> 00:49:10,880
the world has two different sides one's

1511
00:49:14,150 --> 00:49:12,480
in light and one's in darkness

1512
00:49:15,510 --> 00:49:14,160
oh okay i get it you guys are going to

1513
00:49:17,030 --> 00:49:15,520

send two different landers there to

1514

00:49:18,309 --> 00:49:17,040

study the two different sides of this

1515

00:49:19,750 --> 00:49:18,319

tidally locked world

1516

00:49:21,910 --> 00:49:19,760

that's what we would like because we're

1517

00:49:23,589 --> 00:49:21,920

not going to be there standing over this

1518

00:49:24,630 --> 00:49:23,599

reviewer's shoulders as they're reading

1519

00:49:27,109 --> 00:49:24,640

our proposal

1520

00:49:29,349 --> 00:49:27,119

our graphics our science everything in

1521

00:49:30,309 --> 00:49:29,359

there needs to stand by itself and speak

1522

00:49:32,309 --> 00:49:30,319

for itself

1523

00:49:34,470 --> 00:49:32,319

and so that's what joby does is he he

1524

00:49:37,030 --> 00:49:34,480

gives us this beautiful words

1525

00:49:38,710 --> 00:49:37,040

this music that we can use to convey

1526

00:49:41,190 --> 00:49:38,720

these concepts and hopefully

1527

00:49:42,630 --> 00:49:41,200

win those the hearts and minds of all of

1528

00:49:44,150 --> 00:49:42,640

those people so that they'll

1529

00:49:46,870 --> 00:49:44,160

fund this mission and we can do the

1530

00:49:51,510 --> 00:49:46,880

science we want to do

1531

00:49:52,870 --> 00:49:51,520

yes great yeah so oh go ahead

1532

00:49:55,670 --> 00:49:52,880

i was going to move on to the next

1533

00:49:56,950 --> 00:49:55,680

question and i think this one's probably

1534

00:49:59,589 --> 00:49:56,960

for you

1535

00:50:01,349 --> 00:49:59,599

so strawberry muffin on youtube asks

1536

00:50:03,990 --> 00:50:01,359

what would you have to major in

1537

00:50:07,349 --> 00:50:04,000

in order to have a job as an artist

1538

00:50:10,230 --> 00:50:07,359

working with scientists at nasa

1539

00:50:11,910 --> 00:50:10,240

well strawberry muffin you're already

1540

00:50:12,230 --> 00:50:11,920

off to a good start with that creative

1541

00:50:16,549 --> 00:50:12,240

name

1542

00:50:19,430 --> 00:50:16,559

so i i would say that the the number of

1543

00:50:20,950 --> 00:50:19,440

people that work in our studio and um

1544

00:50:22,390 --> 00:50:20,960

income so of course if you're

1545

00:50:24,710 --> 00:50:22,400

working in communications there are

1546

00:50:25,990 --> 00:50:24,720

communication majors but in terms of our

1547

00:50:28,549 --> 00:50:26,000

studio in terms of an artist

1548

00:50:29,430 --> 00:50:28,559

supporting scientists and engineers i've

1549

00:50:30,870 --> 00:50:29,440

found that

1550

00:50:33,349 --> 00:50:30,880

you know i have an industrial design

1551

00:50:34,549 --> 00:50:33,359

degree so that sort of taught me the

1552

00:50:37,109 --> 00:50:34,559

gamut of

1553

00:50:38,150 --> 00:50:37,119

illustration graphics learning a lot of

1554

00:50:40,630 --> 00:50:38,160

the digital art

1555

00:50:42,309 --> 00:50:40,640

tools i started with a foundation of

1556

00:50:42,950 --> 00:50:42,319

sketching if anyone wants to know where

1557

00:50:45,670 --> 00:50:42,960

to start

1558

00:50:47,030 --> 00:50:45,680

even scientists and engineers start to

1559

00:50:48,549 --> 00:50:47,040

learn how to draw and sketch

1560

00:50:50,470 --> 00:50:48,559

there are so many classes online you can

1561

00:50:52,470 --> 00:50:50,480

do it but learn how to draw learn how to

1562

00:50:54,549 --> 00:50:52,480

get your ideas down quickly

1563

00:50:55,670 --> 00:50:54,559

then i went into learning 2d programs

1564

00:50:57,589 --> 00:50:55,680

graphic design

1565

00:50:59,349 --> 00:50:57,599

then learning in 3d programs but the

1566

00:51:00,950 --> 00:50:59,359

reason why industrial design has helped

1567

00:51:02,710 --> 00:51:00,960

me is because i have to build things i

1568

00:51:04,390 --> 00:51:02,720

have to use my hands all the time

1569

00:51:06,150 --> 00:51:04,400

i'm constantly building things setting

1570

00:51:08,870 --> 00:51:06,160

things up um

1571

00:51:10,710 --> 00:51:08,880

so either an industrial design degree or

1572

00:51:12,790 --> 00:51:10,720

we have a lot of product designers

1573

00:51:13,990 --> 00:51:12,800

um just anything that can teach you the

1574

00:51:16,069 --> 00:51:14,000

2d elements

1575

00:51:17,670 --> 00:51:16,079

and getting into making things into 3d

1576

00:51:19,030 --> 00:51:17,680

printers things like that because

1577

00:51:19,910 --> 00:51:19,040

so you're going to be talking to a lot

1578

00:51:21,030 --> 00:51:19,920

of different people they're going to

1579

00:51:21,990 --> 00:51:21,040

want a lot of different things

1580

00:51:24,549 --> 00:51:22,000

everything from

1581

00:51:27,030 --> 00:51:24,559

from a graphic to can you build me this

1582

00:51:29,910 --> 00:51:27,040

that shows up here and does this so

1583

00:51:30,790 --> 00:51:29,920

um we have people who are animation

1584

00:51:32,950 --> 00:51:30,800

folks

1585

00:51:34,309 --> 00:51:32,960

we we have people with uh graphic design

1586

00:51:36,549 --> 00:51:34,319

degrees

1587

00:51:37,750 --> 00:51:36,559

we have people who are producers on

1588

00:51:40,950 --> 00:51:37,760

music videos

1589

00:51:41,910 --> 00:51:40,960

um helping orchestrate our our uh site

1590

00:51:44,309 --> 00:51:41,920

visits and

1591

00:51:45,030 --> 00:51:44,319

in proposal showings and things like

1592

00:51:47,670 --> 00:51:45,040

that so

1593

00:51:48,309 --> 00:51:47,680

it really is quite a good gamut of

1594

00:51:50,309 --> 00:51:48,319

people

1595

00:51:51,670 --> 00:51:50,319

uh but it starts with being creative

1596

00:51:53,109 --> 00:51:51,680

start to use your hands start to

1597

00:51:54,230 --> 00:51:53,119

understand some of the tools and i think

1598

00:51:55,510 --> 00:51:54,240

you should be good to go

1599

00:51:57,750 --> 00:51:55,520

if you're wondering where to start i

1600

00:52:00,069 --> 00:51:57,760

would start at a university

1601
00:52:01,030 --> 00:52:00,079
nasa jpl have great internships you can

1602
00:52:02,390 --> 00:52:01,040
get in for those

1603
00:52:04,069 --> 00:52:02,400
but i would say support your local

1604
00:52:06,470 --> 00:52:04,079
school support your local university

1605
00:52:07,910 --> 00:52:06,480
and their science departments and um and

1606
00:52:09,349 --> 00:52:07,920
figure out how to support them with your

1607
00:52:11,190 --> 00:52:09,359
art

1608
00:52:12,870 --> 00:52:11,200
morgan don't don't be don't be angry but

1609
00:52:13,670 --> 00:52:12,880
i took your science molecules off of

1610
00:52:15,990 --> 00:52:13,680
here

1611
00:52:16,870 --> 00:52:16,000
um just to keep it simple we can put we

1612
00:52:19,270 --> 00:52:16,880
can put those

1613
00:52:20,630 --> 00:52:19,280

inside or or if when i have more time

1614

00:52:22,950 --> 00:52:20,640

i'm going to figure out

1615

00:52:23,670 --> 00:52:22,960

other ways to kind of get them in there

1616

00:52:25,270 --> 00:52:23,680

that's okay

1617

00:52:27,109 --> 00:52:25,280

you know what i think i like it this

1618

00:52:30,309 --> 00:52:27,119

cleaner version without them

1619

00:52:32,790 --> 00:52:30,319

and i think this leaves us open for

1620

00:52:33,910 --> 00:52:32,800

more creativity when it comes to people

1621

00:52:35,589 --> 00:52:33,920

imagining

1622

00:52:37,670 --> 00:52:35,599

what we might search for on this world

1623

00:52:39,349 --> 00:52:37,680

instead of just upfront telling them

1624

00:52:41,030 --> 00:52:39,359

so i i really like what you've done with

1625

00:52:44,390 --> 00:52:41,040

this joby as always

1626
00:52:45,910 --> 00:52:44,400
brilliant work oh thank you morgan

1627
00:52:47,910 --> 00:52:45,920
starts with you everything starts with a

1628
00:52:49,670 --> 00:52:47,920
science question right

1629
00:52:52,150 --> 00:52:49,680
i'm happy to be a part of the start but

1630
00:52:54,309 --> 00:52:52,160
you definitely bring us to the finish

1631
00:52:56,150 --> 00:52:54,319
well very nice we've got time for one

1632
00:52:58,710 --> 00:52:56,160
last final question and then we're gonna

1633
00:53:02,069 --> 00:52:58,720
have to wrap it up

1634
00:53:05,030 --> 00:53:02,079
that's a lot of pressure all right so

1635
00:53:05,670 --> 00:53:05,040
a question for both of you uh niron on

1636
00:53:07,589 --> 00:53:05,680
youtube

1637
00:53:08,870 --> 00:53:07,599
asks what is the most memorable

1638
00:53:13,109 --> 00:53:08,880

memorable project

1639

00:53:20,309 --> 00:53:16,549

oh oh my gosh i don't know

1640

00:53:20,950 --> 00:53:20,319

yes i do i think well oh that is so hard

1641

00:53:22,710 --> 00:53:20,960

okay

1642

00:53:24,950 --> 00:53:22,720

i would say one of the most memorable

1643

00:53:27,829 --> 00:53:24,960

experiences so far

1644

00:53:29,190 --> 00:53:27,839

was when i was a part of the cassini

1645

00:53:32,950 --> 00:53:29,200

mission

1646

00:53:35,190 --> 00:53:32,960

right near uh the the end of cassini's

1647

00:53:37,109 --> 00:53:35,200

life it was running out of gas and we

1648

00:53:38,710 --> 00:53:37,119

didn't want to just drift around in the

1649

00:53:40,309 --> 00:53:38,720

saturn system

1650

00:53:42,549 --> 00:53:40,319

because it was a victim of its own

1651
00:53:45,030 --> 00:53:42,559
success we actually found

1652
00:53:47,190 --> 00:53:45,040
places with liquid water out as far as

1653
00:53:49,670 --> 00:53:47,200
saturn cassini discovered that

1654
00:53:52,390 --> 00:53:49,680
but then that meant that uh cassini

1655
00:53:54,549 --> 00:53:52,400
which we cleaned but we didn't sterilize

1656
00:53:56,230 --> 00:53:54,559
because we didn't think we needed to uh

1657
00:53:56,790 --> 00:53:56,240
it might have brought some microfield

1658
00:53:59,829 --> 00:53:56,800
hitchhike

1659
00:54:01,430 --> 00:53:59,839
hikers along with it so we had to put

1660
00:54:01,990 --> 00:54:01,440
cassini in a safe place where it

1661
00:54:03,990 --> 00:54:02,000
couldn't

1662
00:54:05,270 --> 00:54:04,000
contaminate these worlds potentially

1663
00:54:07,670 --> 00:54:05,280

with earth life

1664

00:54:09,670 --> 00:54:07,680

and so for cassini's grand finale we did

1665

00:54:11,910 --> 00:54:09,680

this beautiful swan dive

1666

00:54:13,030 --> 00:54:11,920

into saturn a place that does not have

1667

00:54:15,190 --> 00:54:13,040

liquid water

1668

00:54:17,270 --> 00:54:15,200

and we knew that we would be able to

1669

00:54:19,910 --> 00:54:17,280

preserve these future worlds like

1670

00:54:21,910 --> 00:54:19,920

enceladus and titan for

1671

00:54:24,069 --> 00:54:21,920

future robotic explorers and who knows

1672

00:54:25,030 --> 00:54:24,079

maybe even humans to step foot on them

1673

00:54:28,069 --> 00:54:25,040

one day

1674

00:54:29,829 --> 00:54:28,079

and i remember being with all the

1675

00:54:31,510 --> 00:54:29,839

scientists and all the engineers who'd

1676

00:54:32,630 --> 00:54:31,520

ever been involved with cassini we all

1677

00:54:34,390 --> 00:54:32,640

came back together

1678

00:54:35,670 --> 00:54:34,400

at like five in the morning of course

1679

00:54:37,030 --> 00:54:35,680

because you can't control where the

1680

00:54:39,190 --> 00:54:37,040

planets are

1681

00:54:41,510 --> 00:54:39,200

and when when it did that beautiful swan

1682

00:54:43,430 --> 00:54:41,520

dive and we said farewell to cassini and

1683

00:54:45,030 --> 00:54:43,440

that was such an amazing thing

1684

00:54:46,710 --> 00:54:45,040

because one of the things that that joby

1685

00:54:48,710 --> 00:54:46,720

helps us do that the artists help us do

1686

00:54:50,789 --> 00:54:48,720

is bring these spacecraft to life

1687

00:54:52,470 --> 00:54:50,799

you know it was part of our family it

1688

00:54:53,510 --> 00:54:52,480

was it was something that was so

1689

00:54:55,990 --> 00:54:53,520

familiar to us

1690

00:54:56,789 --> 00:54:56,000

that we grew to love that became a part

1691

00:54:58,950 --> 00:54:56,799

of us

1692

00:55:01,990 --> 00:54:58,960

and it was incredibly difficult to say

1693

00:55:03,270 --> 00:55:02,000

goodbye to that spacecraft but

1694

00:55:04,950 --> 00:55:03,280

the knowledge that we have from

1695

00:55:06,390 --> 00:55:04,960

spacecraft like that now we get to apply

1696

00:55:08,309 --> 00:55:06,400

to new missions like

1697

00:55:09,750 --> 00:55:08,319

concepts like the one that we were

1698

00:55:12,309 --> 00:55:09,760

messing around with today

1699

00:55:13,589 --> 00:55:12,319

and that i think is the most inspiring

1700

00:55:14,470 --> 00:55:13,599

thing that we're always learning

1701

00:55:16,230 --> 00:55:14,480

something new

1702

00:55:17,510 --> 00:55:16,240

and then we get to apply it to these new

1703

00:55:19,109 --> 00:55:17,520

worlds and i'll be falling

1704

00:55:22,710 --> 00:55:19,119

in love again with the next spacecraft

1705

00:55:26,789 --> 00:55:25,270

and i think for me uh well cassini was

1706

00:55:28,069 --> 00:55:26,799

incredibly beautiful i was in the room

1707

00:55:30,390 --> 00:55:28,079

for that as well

1708

00:55:33,109 --> 00:55:30,400

and um but i would have to say that you

1709

00:55:35,270 --> 00:55:33,119

know the surprise and explosion of these

1710

00:55:36,549 --> 00:55:35,280

he's traveling to other worlds uh

1711

00:55:39,670 --> 00:55:36,559

posters that came out in

1712

00:55:41,750 --> 00:55:39,680

2015 um we were shocked

1713

00:55:43,190 --> 00:55:41,760

at their popularity uh no one saw it

1714

00:55:45,030 --> 00:55:43,200

coming and

1715

00:55:46,390 --> 00:55:45,040

um and we were able to do more called

1716

00:55:48,870 --> 00:55:46,400

visions of the future

1717

00:55:49,750 --> 00:55:48,880

uh we've got a ton of schools writing to

1718

00:55:51,829 --> 00:55:49,760

us

1719

00:55:53,430 --> 00:55:51,839

of of kids making their own travel

1720

00:55:54,710 --> 00:55:53,440

posters to other planets it was a way to

1721

00:55:57,829 --> 00:55:54,720

learn about the planet so

1722

00:55:59,750 --> 00:55:57,839

i think that was probably my favorite um

1723

00:56:01,430 --> 00:55:59,760

project that i worked on and uh

1724

00:56:02,069 --> 00:56:01,440

something that my mother is tired of me

1725

00:56:05,190 --> 00:56:02,079

talking about

1726

00:56:08,549 --> 00:56:05,200

quite frankly i'm kidding um so

1727

00:56:10,870 --> 00:56:08,559

good times good times that

1728

00:56:13,030 --> 00:56:10,880

is all the time that we have tonight uh

1729

00:56:15,270 --> 00:56:13,040

please join us next month for our talk

1730

00:56:16,870 --> 00:56:15,280

psyche mission to a mental world with dr

1731

00:56:19,510 --> 00:56:16,880

glindy elk stanton

1732

00:56:21,270 --> 00:56:19,520

remember folks the posters are available

1733

00:56:23,829 --> 00:56:21,280

online and those links will be

1734

00:56:24,549 --> 00:56:23,839

in the chat i would like to thank our

1735

00:56:28,470 --> 00:56:24,559

terrific

1736

00:56:29,990 --> 00:56:28,480

speakers dr morgan cable and joby harris

1737

00:56:31,829 --> 00:56:30,000

as we're about to lead out if we could

1738

00:56:33,430 --> 00:56:31,839

bring up what the final parts of that

1739

00:56:35,030 --> 00:56:33,440

poster while i'm thinking everybody else

1740

00:56:35,829 --> 00:56:35,040

what we got to today just did that

1741

00:56:38,789 --> 00:56:35,839

tonight

1742

00:56:39,430 --> 00:56:38,799

um thank you to our co-host talia khan

1743

00:56:40,789 --> 00:56:39,440

um and

1744

00:56:42,710 --> 00:56:40,799

everyone behind the scenes who make

1745

00:56:46,230 --> 00:56:42,720

these talks possible and finally

1746

00:56:49,349 --> 00:56:46,240

a big big thank you to all of you

1747

00:56:52,950 --> 00:56:49,359

who join us every single month stay

1748

00:56:58,040 --> 00:56:52,960

safe stay kind stay curious

1749

00:57:08,309 --> 00:56:58,050

and we'll see you in august