



ABSciCON 2017

MESA, ARIZONA

1
00:00:00,220 --> 00:00:12,820

[Music]

2
00:00:20,090 --> 00:00:16,100

good morning everyone thank you Oh a few

3
00:00:22,850 --> 00:00:20,100

but faithful welcome astrobiologists to

4
00:00:25,100 --> 00:00:22,860

8:30 in the morning on Friday what are

5
00:00:27,710 --> 00:00:25,110

we doing to ourselves no I'm just

6
00:00:28,730 --> 00:00:27,720

kidding thank you so much for coming my

7
00:00:31,159 --> 00:00:28,740

name is Brittany Schmidt I'm an

8
00:00:34,040 --> 00:00:31,169

assistant professor at Georgia Tech and

9
00:00:36,560 --> 00:00:34,050

I come to this community with a

10
00:00:37,970 --> 00:00:36,570

background in planetary science and one

11
00:00:41,240 --> 00:00:37,980

of the things that I've kind of heard a

12
00:00:42,380 --> 00:00:41,250

lot at least what early on was um we

13
00:00:43,940 --> 00:00:42,390

start talking about the missions that

14

00:00:46,160 --> 00:00:43,950

were going and at the time it was the

15

00:00:48,439 --> 00:00:46,170

arropa mission the previous one the one

16

00:00:50,750 --> 00:00:48,449

that never never happened

17

00:00:53,360 --> 00:00:50,760

it was called jeo at Jupiter Europa

18

00:00:56,389 --> 00:00:53,370

orbiter missions change a lot is what

19

00:01:00,200 --> 00:00:56,399

I've learned but so before clipper and

20

00:01:02,720 --> 00:01:00,210

what became clipper and the experience

21

00:01:04,970 --> 00:01:02,730

that I had at least talking to a strobe

22

00:01:07,760 --> 00:01:04,980

I ologists and in particular younger

23

00:01:09,860 --> 00:01:07,770

astrobiologists was oh there's no

24

00:01:11,810 --> 00:01:09,870

astrobiology instruments on this they

25

00:01:14,450 --> 00:01:11,820

don't really like it okay well maybe

26

00:01:16,700 --> 00:01:14,460

next time it was like no no no you have

27

00:01:18,080 --> 00:01:16,710

to come to all of the the places where

28

00:01:19,969 --> 00:01:18,090

the decisions are being made and we have

29

00:01:21,230 --> 00:01:19,979

to figure out how to get the instruments

30

00:01:23,690 --> 00:01:21,240

and the science that we're really

31

00:01:26,300 --> 00:01:23,700

interested in on the missions right so

32

00:01:28,460 --> 00:01:26,310

we've been talking we've now spent five

33

00:01:30,440 --> 00:01:28,470

or six or seven days depending on when

34

00:01:32,719 --> 00:01:30,450

you actually arrived in Mesa talking

35

00:01:35,600 --> 00:01:32,729

about astrobiology and the significance

36

00:01:38,539 --> 00:01:35,610

and how to discover life in the universe

37

00:01:40,160 --> 00:01:38,549

but we still have N equals one right we

38

00:01:42,050 --> 00:01:40,170

have one example of that and in order to

39

00:01:44,179 --> 00:01:42,060

do that we're going to probably need

40

00:01:46,130 --> 00:01:44,189

spacecraft missions and so the purpose

41

00:01:48,530 --> 00:01:46,140

of today's panel is actually to just

42

00:01:50,450 --> 00:01:48,540

kind of talk about the process of

43

00:01:54,590 --> 00:01:50,460

getting instruments and getting missions

44

00:01:56,660 --> 00:01:54,600

going and how to try to influence or try

45

00:01:58,459 --> 00:01:56,670

to improve the amount of direct

46

00:02:00,319 --> 00:01:58,469

astrobiology instruments and very

47

00:02:02,569 --> 00:02:00,329

importantly how to have this

48

00:02:05,090 --> 00:02:02,579

conversation and how to improve the

49

00:02:07,190 --> 00:02:05,100

number of instruments that are doing

50

00:02:08,570 --> 00:02:07,200

specifically our science and I think one

51
00:02:10,880 --> 00:02:08,580
of the really important things we have

52
00:02:13,100 --> 00:02:10,890
to think about is that we can't be

53
00:02:14,660 --> 00:02:13,110
frustrated with the missions of today if

54
00:02:16,520 --> 00:02:14,670
we didn't do the technology beforehand

55
00:02:19,370 --> 00:02:16,530
and that's a very long path to

56
00:02:22,220 --> 00:02:19,380
development and so these are just kind

57
00:02:24,800 --> 00:02:22,230
of supposed to be informative for people

58
00:02:25,770 --> 00:02:24,810
who haven't been on missions before the

59
00:02:28,140 --> 00:02:25,780
perhaps

60
00:02:30,180 --> 00:02:28,150
a way to solve some problems for those

61
00:02:32,490 --> 00:02:30,190
who are currently trying to get missions

62
00:02:34,800 --> 00:02:32,500
through the TRL process technology

63
00:02:36,930 --> 00:02:34,810

readiness level process things like that

64

00:02:38,820 --> 00:02:36,940

so what we're going to do is we're going

65

00:02:41,580 --> 00:02:38,830

to have a quick introduction of the

66

00:02:44,340 --> 00:02:41,590

panel mary wojtek's prepared a couple of

67

00:02:46,620 --> 00:02:44,350

slides about the interest behind it and

68

00:02:49,020 --> 00:02:46,630

the motivation behind astrobiology on

69

00:02:51,390 --> 00:02:49,030

missions and then each of the panelists

70

00:02:53,550 --> 00:02:51,400

up here has some kind of experience

71

00:02:55,800 --> 00:02:53,560

getting instruments and science on

72

00:02:57,360 --> 00:02:55,810

missions and they'll talk a little bit

73

00:02:59,400 --> 00:02:57,370

about their experiences and then we'll

74

00:03:01,710 --> 00:02:59,410

kind of open it up to a discussion about

75

00:03:04,530 --> 00:03:01,720

how we might change that or or how we

76

00:03:06,570 --> 00:03:04,540

might be better informed about how this

77

00:03:08,550 --> 00:03:06,580

process works and how we might improve

78

00:03:10,740 --> 00:03:08,560

it for the astrobiology community in the

79

00:03:12,479 --> 00:03:10,750

future the first thing that I really

80

00:03:16,110 --> 00:03:12,489

wanted to mention those whilst I have

81

00:03:19,710 --> 00:03:16,120

the podium is that one of the things

82

00:03:22,560 --> 00:03:19,720

that's very very important though in the

83

00:03:24,780 --> 00:03:22,570

current organization of NASA's

84

00:03:26,729 --> 00:03:24,790

scientific community is assessment

85

00:03:28,740 --> 00:03:26,739

groups how many people here have been to

86

00:03:31,289 --> 00:03:28,750

an assessment group meeting or know what

87

00:03:35,400 --> 00:03:31,299

I'm talking about that's what I thought

88

00:03:38,070 --> 00:03:35,410

so assessment groups Mars exploration

89

00:03:40,680 --> 00:03:38,080

so the meatbag Oh peg the outer planets

90

00:03:42,060 --> 00:03:40,690

assessment group s bag unfortunately

91

00:03:44,759 --> 00:03:42,070

what a terrible terrible name that one

92

00:03:46,740 --> 00:03:44,769

is but the small bodies assessment group

93

00:03:49,110 --> 00:03:46,750

these are actually how the community

94

00:03:51,330 --> 00:03:49,120

gets together and does some of the I

95

00:03:53,220 --> 00:03:51,340

wouldn't say politics but does some of

96

00:03:55,530 --> 00:03:53,230

the organization that's not exactly

97

00:03:56,910 --> 00:03:55,540

science and that's where are these

98

00:03:59,130 --> 00:03:56,920

decisions are made so meatbag for

99

00:04:01,259 --> 00:03:59,140

example is where most of the landing

100

00:04:03,569 --> 00:04:01,269

site discussions are held for mars 2020

101

00:04:05,370 --> 00:04:03,579

so if you haven't been there or you

102

00:04:07,350 --> 00:04:05,380

haven't participated in that you haven't

103

00:04:09,060 --> 00:04:07,360

given them ideas on where they should

104

00:04:11,190 --> 00:04:09,070

land and look for things that we care

105

00:04:13,470 --> 00:04:11,200

about so getting to me pag and getting

106

00:04:15,930 --> 00:04:13,480

to opec i'm in the outer planets

107

00:04:17,580 --> 00:04:15,940

community getting to those places is

108

00:04:19,590 --> 00:04:17,590

really really important

109

00:04:22,620 --> 00:04:19,600

we had a roadmap for ocean worlds

110

00:04:24,960 --> 00:04:22,630

meeting on Monday and my experience so

111

00:04:27,270 --> 00:04:24,970

far has been that mostly those were

112

00:04:29,190 --> 00:04:27,280

planetary scientists because we email

113

00:04:30,810 --> 00:04:29,200

out to the planetary science community

114

00:04:31,860 --> 00:04:30,820

and it doesn't always the information

115

00:04:34,020 --> 00:04:31,870

doesn't always make it out to

116

00:04:35,640 --> 00:04:34,030

astrobiologists so if I could give you

117

00:04:37,920 --> 00:04:35,650

one piece of advice it is that the

118

00:04:38,560 --> 00:04:37,930

assessment groups matter they don't have

119

00:04:41,050 --> 00:04:38,570

science

120

00:04:42,460 --> 00:04:41,060

necessarily at those meetings but you

121

00:04:44,020 --> 00:04:42,470

should really think about it because

122

00:04:45,910 --> 00:04:44,030

that's where you actually impact the

123

00:04:48,160 --> 00:04:45,920

direction of future at least direct

124

00:04:49,750 --> 00:04:48,170

admissions and it's a great place to go

125

00:04:51,910 --> 00:04:49,760

for information and just figure out how

126

00:04:54,460 --> 00:04:51,920

it works so anyway so now I will get

127

00:04:57,100 --> 00:04:54,470

down off of my high horse and introduce

128

00:04:59,260 --> 00:04:57,110

our panel Mary we'll get on it soon soon

129

00:05:02,860 --> 00:04:59,270

thereafter so let me quickly introduce

130

00:05:04,810 --> 00:05:02,870

everyone this is dr. Mary Wojtek of NASA

131

00:05:06,850 --> 00:05:04,820

headquarters if you don't know her you

132

00:05:08,410 --> 00:05:06,860

should probably come up hug her she does

133

00:05:11,770 --> 00:05:08,420

a fantastic job

134

00:05:14,110 --> 00:05:11,780

she's probably why myself and many other

135

00:05:17,020 --> 00:05:14,120

people in the room have Dollars and also

136

00:05:25,360 --> 00:05:17,030

have a career and thank you very much

137

00:05:30,400 --> 00:05:25,370

for everything you do next to her is is

138

00:05:33,940 --> 00:05:30,410

Stephanie Getty next to her is Erin Noel

139

00:05:36,160 --> 00:05:33,950

next to him is Amanda Stockton and next

140

00:05:37,680 --> 00:05:36,170

to her is dr. Jim Bell so actually

141

00:05:40,360 --> 00:05:37,690

doctors all I apologize

142

00:05:44,620 --> 00:05:40,370

so everyone everyone is a doctor as it

143

00:05:47,080 --> 00:05:44,630

turns out all right very good let's go

144

00:05:50,470 --> 00:05:47,090

ahead and Mary would you inspire us with

145

00:05:51,850 --> 00:05:50,480

healthcare information all of us are

146

00:05:56,290 --> 00:05:51,860

doctors but no one will help you if

147

00:05:58,720 --> 00:05:56,300

you're sick so okay so so I'm going to

148

00:06:02,020 --> 00:05:58,730

start out with what leads us to this

149

00:06:04,840 --> 00:06:02,030

incredibly important time in in

150

00:06:06,570 --> 00:06:04,850

astrobiology and at NASA and start with

151
00:06:08,830 --> 00:06:06,580
this great picture we took the other day

152
00:06:10,360 --> 00:06:08,840
astrobiologists 800 strong and growing

153
00:06:12,400 --> 00:06:10,370
this is the largest meeting we've had

154
00:06:15,520 --> 00:06:12,410
the last one there about 750 people

155
00:06:17,140 --> 00:06:15,530
registered yay and what's incredible of

156
00:06:19,270 --> 00:06:17,150
course and one of the reasons we decided

157
00:06:22,800 --> 00:06:19,280
to take the picture is if you look at

158
00:06:25,000 --> 00:06:22,810
the demographics of this of this shot

159
00:06:26,590 --> 00:06:25,010
basically we worry about the future

160
00:06:30,130 --> 00:06:26,600
workforce I think the future workforce

161
00:06:31,510 --> 00:06:30,140
in astrobiology is incredibly safe we

162
00:06:35,610 --> 00:06:31,520
need to keep making sure that it's

163
00:06:40,540 --> 00:06:38,590

I'm going to start out by giving a sort

164

00:06:42,490 --> 00:06:40,550

of two perspective to assure you that

165

00:06:44,860 --> 00:06:42,500

the public is extremely interested in

166

00:06:47,650 --> 00:06:44,870

what it is that we do so the top figure

167

00:06:49,930 --> 00:06:47,660

is a graph since January 1st of 2015 of

168

00:06:51,990 --> 00:06:49,940

announcements that were made at NASA and

169

00:06:53,340 --> 00:06:52,000

the page views for each of them

170

00:06:56,540 --> 00:06:53,350

of course people continue to be

171

00:06:59,220 --> 00:06:56,550

fascinated by Mars they continue to be

172

00:07:01,080 --> 00:06:59,230

fascinated or not continue but they're

173

00:07:02,820 --> 00:07:01,090

getting more and more fascinated but you

174

00:07:06,180 --> 00:07:02,830

can see down there I want to move

175

00:07:07,560 --> 00:07:06,190

forward lean forward so you can see that

176

00:07:10,170 --> 00:07:07,570

that's one of the highest ones there's

177

00:07:13,470 --> 00:07:10,180

also interested in exoplanets turns out

178

00:07:15,300 --> 00:07:13,480

that Trappist won the announcement there

179

00:07:17,640 --> 00:07:15,310

in many regards surpassed almost any

180

00:07:20,370 --> 00:07:17,650

other announcement that we had but below

181

00:07:22,680 --> 00:07:20,380

that is another image just showing their

182

00:07:26,220 --> 00:07:22,690

own social post in the reach of those

183

00:07:29,060 --> 00:07:26,230

and so again we see Mars water being

184

00:07:33,980 --> 00:07:29,070

important we see

185

00:07:41,070 --> 00:07:39,060

exoplanets in the and Trappist I just

186

00:07:43,590 --> 00:07:41,080

want to share with you I was part of the

187

00:07:45,150 --> 00:07:43,600

lipsticks let me go back a second it's

188

00:07:46,770 --> 00:07:45,160

not plotted on here but I've been told

189

00:07:48,750 --> 00:07:46,780

that the recent announcements of

190

00:07:51,780 --> 00:07:48,760

hydrogen coming found in the plume of

191

00:07:55,440 --> 00:07:51,790

Enceladus and a confirmation or second

192

00:07:57,210 --> 00:07:55,450

observation of plumes from your ropa was

193

00:08:00,409 --> 00:07:57,220

about a quarter the size of the Trappist

194

00:08:03,600 --> 00:08:00,419

and what they considered in NASA

195

00:08:06,750 --> 00:08:03,610

promotion or PA Oh speak you know a top

196

00:08:09,719 --> 00:08:06,760

a top story of a year of a year maybe

197

00:08:11,460 --> 00:08:09,729

not of all times but of a year so again

198

00:08:13,620 --> 00:08:11,470

we continue the interest with the public

199

00:08:16,890 --> 00:08:13,630

I want to share some of the things that

200

00:08:19,530 --> 00:08:16,900

came out of that press conference which

201
00:08:21,140 --> 00:08:19,540
I was part of some of the reactions one

202
00:08:23,219 --> 00:08:21,150
of my favorite so they had a bingo on

203
00:08:26,550 --> 00:08:23,229
social media and one of my favorite was

204
00:08:28,200 --> 00:08:26,560
someone designing their own graphic of

205
00:08:30,980 --> 00:08:28,210
what was going on in Europa one of the

206
00:08:32,670 --> 00:08:30,990
quotes that was that came out of

207
00:08:35,310 --> 00:08:32,680
microbiologist that was actually working

208
00:08:39,719 --> 00:08:35,320
on it was that Europa was producing

209
00:08:41,250 --> 00:08:39,729
about 35 pizzas a day for as food for

210
00:08:42,810 --> 00:08:41,260
microbes and again they kind of got the

211
00:08:45,900 --> 00:08:42,820
chemistry wrong here they decide to make

212
00:08:48,510 --> 00:08:45,910
pizza they equated cheese and sauce and

213
00:08:50,280 --> 00:08:48,520

toppings with carbon and hydrogen

214

00:08:52,440 --> 00:08:50,290

because they thought they were making a

215

00:08:53,760 --> 00:08:52,450

methane but but you see the point

216

00:08:56,400 --> 00:08:53,770

they're actually getting it and

217

00:08:57,570 --> 00:08:56,410

responding quite positively to us the

218

00:08:59,579 --> 00:08:57,580

other thing of course is another

219

00:09:00,750 --> 00:08:59,589

favorite is on the left people are a

220

00:09:02,850 --> 00:09:00,760

little disappointed that there aren't

221

00:09:05,110 --> 00:09:02,860

whales or porpoises leaping out of the

222

00:09:07,030 --> 00:09:05,120

plumes of of Enceladus

223

00:09:08,650 --> 00:09:07,040

and someone is already to go and give a

224

00:09:12,220 --> 00:09:08,660

perspective of what maybe it might be

225

00:09:14,050 --> 00:09:12,230

like to be within one of those moons and

226

00:09:16,120 --> 00:09:14,060

here are some of the you know the

227

00:09:18,880 --> 00:09:16,130

comments that that were I thought were

228

00:09:21,760 --> 00:09:18,890

quite fun who wants to come icing on on

229

00:09:24,370 --> 00:09:21,770

Enceladus and again NASA has delivered

230

00:09:27,150 --> 00:09:24,380

amazing new news one of Saturn's moon

231

00:09:31,000 --> 00:09:27,160

and Seles could Harbor life in its ocean

232

00:09:32,500 --> 00:09:31,010

and then I just want to note that one of

233

00:09:33,910 --> 00:09:32,510

the reasons that we predicted that

234

00:09:36,660 --> 00:09:33,920

perhaps we didn't get as much coverage

235

00:09:39,220 --> 00:09:36,670

as we thought we might is the fact that

236

00:09:41,110 --> 00:09:39,230

at the same time this was going on we

237

00:09:44,200 --> 00:09:41,120

had dropped the mother of all bombs and

238

00:09:46,600 --> 00:09:44,210

so there was some some competition and

239

00:09:48,579 --> 00:09:46,610

coverage and interest in the public but

240

00:09:50,769 --> 00:09:48,589

I really like the the observation on the

241

00:09:53,440 --> 00:09:50,779

right which is so we dropped the biggest

242

00:09:55,180 --> 00:09:53,450

non nuclear bomb ever NASA's is already

243

00:10:01,090 --> 00:09:55,190

looking for ways to get off the planet

244

00:10:03,010 --> 00:10:01,100

take me with you so so in addition to

245

00:10:04,930 --> 00:10:03,020

the public their representatives and

246

00:10:07,510 --> 00:10:04,940

Congress are extraordinarily supportive

247

00:10:09,310 --> 00:10:07,520

of astrobiology and the search for life

248

00:10:12,370 --> 00:10:09,320

that while we were attending this

249

00:10:14,500 --> 00:10:12,380

meeting there was a hearing on Congress

250

00:10:16,930 --> 00:10:14,510

and the in the committee for Science

251
00:10:18,610 --> 00:10:16,940
Space and Technology and this is a part

252
00:10:21,220 --> 00:10:18,620
from the statement that the Chairman

253
00:10:24,070 --> 00:10:21,230
Lamar Smith made about the hearing on

254
00:10:25,930 --> 00:10:24,080
advances in the search for life you know

255
00:10:27,820 --> 00:10:25,940
he acknowledges that we have pioneered

256
00:10:29,829 --> 00:10:27,830
and it's not the United States it's us

257
00:10:32,050 --> 00:10:29,839
in this room and you know everyone who's

258
00:10:33,790 --> 00:10:32,060
attended this conference and Beyond have

259
00:10:35,920 --> 00:10:33,800
had pioneered the field of astrobiology

260
00:10:38,829 --> 00:10:35,930
and continues to lead the world in this

261
00:10:40,420 --> 00:10:38,839
type of research since its beginning

262
00:10:42,790 --> 00:10:40,430
nASA has searched for life beyond Earth

263
00:10:43,900 --> 00:10:42,800

and then he actually has a call-out or

264

00:10:45,910 --> 00:10:43,910

shoutout for us

265

00:10:48,280 --> 00:10:45,920

he actually acknowledged that part of

266

00:10:50,710 --> 00:10:48,290

the reason well that while he was

267

00:10:52,510 --> 00:10:50,720

discussing advances and considering or

268

00:10:54,880 --> 00:10:52,520

educating the rest of Congress about

269

00:10:57,730 --> 00:10:54,890

after biology we were here doing our

270

00:11:00,250 --> 00:10:57,740

jobs sharing with each other the the new

271

00:11:02,110 --> 00:11:00,260

research findings and and working

272

00:11:04,420 --> 00:11:02,120

together to plan for future

273

00:11:05,500 --> 00:11:04,430

opportunities and then I want to hit on

274

00:11:07,420 --> 00:11:05,510

a little bit with something which is

275

00:11:09,790 --> 00:11:07,430

extraordinarily exciting to me and

276
00:11:15,270 --> 00:11:09,800
that's the NASA transition Authorization

277
00:11:17,710 --> 00:11:15,280
Act of 2017 it most ill in coming to

278
00:11:18,740 --> 00:11:17,720
NASA headquarters I got to relearn

279
00:11:20,360 --> 00:11:18,750
civics

280
00:11:22,429 --> 00:11:20,370
really understand how bills were made

281
00:11:25,040 --> 00:11:22,439
and budges gets lines and all that stuff

282
00:11:26,900 --> 00:11:25,050
so the authorization is actually setting

283
00:11:29,389 --> 00:11:26,910
priorities for agencies and it's on

284
00:11:31,639 --> 00:11:29,399
opportunity to give direction that

285
00:11:33,350 --> 00:11:31,649
signifies interest by Congress it also

286
00:11:37,069 --> 00:11:33,360
is an opportunity to change the existing

287
00:11:38,629 --> 00:11:37,079
enactment laws that govern agencies and

288
00:11:41,769 --> 00:11:38,639

other activities within the federal

289

00:11:44,600 --> 00:11:41,779

government we haven't had one since 2010

290

00:11:45,970 --> 00:11:44,610

for NASA but we had one fine this year

291

00:11:48,980 --> 00:11:45,980

and there's some really important

292

00:11:51,949 --> 00:11:48,990

legislative or directives and

293

00:11:54,290 --> 00:11:51,959

legislative changes in this the first is

294

00:11:56,990 --> 00:11:54,300

again signaling how important searching

295

00:11:58,819 --> 00:11:57,000

for life is it's targeted all the areas

296

00:12:01,249 --> 00:11:58,829

that were interested in in terms of

297

00:12:03,019 --> 00:12:01,259

moving forward when Congress asks us to

298

00:12:04,100 --> 00:12:03,029

ask the National Academy to look at

299

00:12:07,129 --> 00:12:04,110

something that means they're really

300

00:12:09,679 --> 00:12:07,139

interested so section 508 asked the

301
00:12:11,900 --> 00:12:09,689
National Academies to do a study to

302
00:12:14,329 --> 00:12:11,910
understand how to study and explore

303
00:12:16,939 --> 00:12:14,339
extrasolar planets and in the language

304
00:12:20,389 --> 00:12:16,949
it very specifically links it to looking

305
00:12:23,199 --> 00:12:20,399
at habitability and searching for life

306
00:12:25,040 --> 00:12:23,209
five ten talks about expanding

307
00:12:28,329 --> 00:12:25,050
public/private partnerships

308
00:12:31,280 --> 00:12:28,339
looking as a tremendous amount of

309
00:12:34,189 --> 00:12:31,290
philanthropic and form a interest in

310
00:12:36,439 --> 00:12:34,199
supporting us as well as foundations

311
00:12:39,590 --> 00:12:36,449
that that want to fund the science as

312
00:12:41,689 --> 00:12:39,600
well as the technology section 509 to

313
00:12:46,040 --> 00:12:41,699

request that we go and get a strategy

314

00:12:48,710 --> 00:12:46,050

for searching for life and then the

315

00:12:49,999 --> 00:12:48,720

final line is again continued support

316

00:12:52,100 --> 00:12:50,009

for our Mars program what's the

317

00:12:54,079 --> 00:12:52,110

architecture now we've got 2020 in the

318

00:12:57,049 --> 00:12:54,089

pipeline what's going to happen after

319

00:12:58,850 --> 00:12:57,059

that we want to hear from from the

320

00:13:00,410 --> 00:12:58,860

broader science community or they want

321

00:13:02,540 --> 00:13:00,420

to hear from it and the thing that I

322

00:13:04,280 --> 00:13:02,550

think is most amazing and I'm going to

323

00:13:08,360 --> 00:13:04,290

end with this and I want a round of

324

00:13:10,429 --> 00:13:08,370

cheers and applause is within the Space

325

00:13:12,829 --> 00:13:10,439

Act there's a the first part of it

326
00:13:14,389 --> 00:13:12,839
outlines what exactly NASA is supposed

327
00:13:18,949 --> 00:13:14,399
to do and there's a section called

328
00:13:21,139 --> 00:13:18,959
policy and purpose and since this year

329
00:13:23,240 --> 00:13:21,149
there have been nine of them and I want

330
00:13:26,569 --> 00:13:23,250
you to look at number 10 we are in the

331
00:13:28,699 --> 00:13:26,579
top 10 we're number 10 the search for

332
00:13:29,960 --> 00:13:28,709
life's origin evolution distribution and

333
00:13:35,560 --> 00:13:29,970
future in the universe

334
00:13:40,130 --> 00:13:38,329
so all I can say is we have public

335
00:13:42,110 --> 00:13:40,140
support we have their representative in

336
00:13:43,610 --> 00:13:42,120
Congress that you know somewhat control

337
00:13:46,730 --> 00:13:43,620
the purse strings so we've got support

338
00:13:49,940 --> 00:13:46,740

there we've got a fantastic work force

339

00:13:53,450 --> 00:13:49,950

ready to do the job we need to grab this

340

00:13:55,490 --> 00:13:53,460

ride this tide and expect incredible

341

00:13:58,100 --> 00:13:55,500

opportunities and an amazing future but

342

00:13:59,480 --> 00:13:58,110

we all need to be part of it so I think

343

00:14:02,360 --> 00:13:59,490

there's going to be a great I'll only

344

00:14:04,280 --> 00:14:02,370

iterate that my version of what some of

345

00:14:06,950 --> 00:14:04,290

one of the things that Brittany said was

346

00:14:09,530 --> 00:14:06,960

if we only have hammers in our toolbox

347

00:14:11,870 --> 00:14:09,540

we look for nails we need to work with

348

00:14:17,180 --> 00:14:11,880

the community develop new sets of tools

349

00:14:19,160 --> 00:14:17,190

to draw stronger conclude stronger

350

00:14:21,260 --> 00:14:19,170

advice about what the measurements are

351
00:14:23,810 --> 00:14:21,270
that should be made so we can get those

352
00:14:25,280 --> 00:14:23,820
tool designers to make those tools so

353
00:14:27,019 --> 00:14:25,290
that we're not just looking for nails

354
00:14:38,990 --> 00:14:27,029
across the universe

355
00:14:45,560 --> 00:14:39,000
thank you all right perfect so he was

356
00:14:47,060 --> 00:14:45,570
like you live not yet oh yes so so as

357
00:14:48,890 --> 00:14:47,070
Brittany mentioned my name is Stephanie

358
00:14:53,300 --> 00:14:48,900
Getty I am at NASA Goddard Space Flight

359
00:14:55,250 --> 00:14:53,310
Center and pretty kind of gave us some

360
00:14:58,670 --> 00:14:55,260
guidance on what we ought to cover for

361
00:15:01,610 --> 00:14:58,680
introductions and so in kind of the

362
00:15:03,560 --> 00:15:01,620
science realm I'm interested in how

363
00:15:06,850 --> 00:15:03,570

organics are distributed throughout our

364

00:15:10,850 --> 00:15:06,860

solar system and really what constitutes

365

00:15:13,340 --> 00:15:10,860

the the best way to differentiate

366

00:15:17,060 --> 00:15:13,350

between an abiotic signature and

367

00:15:20,750 --> 00:15:17,070

something that derives from biology and

368

00:15:24,019 --> 00:15:20,760

I do that through really instrument

369

00:15:27,199 --> 00:15:24,029

development and instrument science in

370

00:15:29,060 --> 00:15:27,209

the sense of looking at are the best

371

00:15:31,579 --> 00:15:29,070

possible terrestrial analogs that we

372

00:15:33,500 --> 00:15:31,589

have for a variety of environments that

373

00:15:35,540 --> 00:15:33,510

may be of interest to this community

374

00:15:39,800 --> 00:15:35,550

throughout the solar system including

375

00:15:42,199 --> 00:15:39,810

Mars and and ocean worlds analogs and

376

00:15:45,440 --> 00:15:42,209

and then a large component of what I do

377

00:15:46,650 --> 00:15:45,450

is in in really the instrument science

378

00:15:48,720 --> 00:15:46,660

and how you do

379

00:15:54,300 --> 00:15:48,730

how you make the best measurements to

380

00:15:57,750 --> 00:15:54,310

get at those answers so in terms of my

381

00:15:59,220 --> 00:15:57,760

involvement in flight instruments I'm on

382

00:16:01,500 --> 00:15:59,230

the moma science team and part of the

383

00:16:04,170 --> 00:16:01,510

moma mass spectrometer development team

384

00:16:06,900 --> 00:16:04,180

at Goddard that's one component of a

385

00:16:12,060 --> 00:16:06,910

German lead instrument moma that will go

386

00:16:14,580 --> 00:16:12,070

to Mars in 2020 and Rove around and then

387

00:16:17,580 --> 00:16:14,590

get at the deep subsurface deep deep is

388

00:16:23,310 --> 00:16:17,590

a relative term here two meters down and

389

00:16:26,160 --> 00:16:23,320

so so thinking about drawing parallels

390

00:16:28,200 --> 00:16:26,170

or conclusions from what Mars Science

391

00:16:31,560 --> 00:16:28,210

Laboratory has measured and some of the

392

00:16:36,170 --> 00:16:31,570

predecessor missions have measured and

393

00:16:38,520 --> 00:16:36,180

and how do we extrapolate to do now the

394

00:16:40,530 --> 00:16:38,530

science that needs to be done to inform

395

00:16:43,200 --> 00:16:40,540

our expectations and our data

396

00:16:46,740 --> 00:16:43,210

interpretation when we do get there with

397

00:16:49,800 --> 00:16:46,750

MoMA so that's an example of an

398

00:16:51,180 --> 00:16:49,810

instrument that has really not flown

399

00:16:52,950 --> 00:16:51,190

before the mass spectrometer is a new

400

00:16:55,650 --> 00:16:52,960

type of mass spec talk spectrometer that

401
00:16:57,390 --> 00:16:55,660
has not flown before and it has you know

402
00:17:00,270 --> 00:16:57,400
some new capabilities so if you're

403
00:17:03,030 --> 00:17:00,280
looking for you know pushing the

404
00:17:05,880 --> 00:17:03,040
envelope on the science questions that

405
00:17:08,069 --> 00:17:05,890
you want to ask you know sometimes you

406
00:17:09,809 --> 00:17:08,079
really really need to go after new

407
00:17:11,850 --> 00:17:09,819
things that really match the

408
00:17:13,410 --> 00:17:11,860
requirements that you're going after and

409
00:17:16,470 --> 00:17:13,420
so MoMA is a good example it's a very

410
00:17:18,000 --> 00:17:16,480
sensitive mass spectrometer and it

411
00:17:20,340 --> 00:17:18,010
overlaps with some of the capabilities

412
00:17:22,949 --> 00:17:20,350
that we have flown previously and it's

413
00:17:25,860 --> 00:17:22,959

gas chromatography but it also uses

414

00:17:28,620 --> 00:17:25,870

laser desorption/ionization to look at

415

00:17:32,430 --> 00:17:28,630

unprepared samples for high molecular

416

00:17:34,080 --> 00:17:32,440

weight organics which is interesting now

417

00:17:36,600 --> 00:17:34,090

as an instrument that hasn't flown

418

00:17:38,640 --> 00:17:36,610

before you know it's been an educational

419

00:17:42,000 --> 00:17:38,650

experience particularly for me coming

420

00:17:45,420 --> 00:17:42,010

from more of a lower TRL instrument

421

00:17:47,580 --> 00:17:45,430

development career to this point and

422

00:17:51,420 --> 00:17:47,590

then you know watching what it really

423

00:17:53,460 --> 00:17:51,430

means to get something new developed and

424

00:17:55,560 --> 00:17:53,470

matured and ready for flight and it's

425

00:17:57,660 --> 00:17:55,570

been an incredible experience and

426

00:18:02,120 --> 00:17:57,670

incredible effort by you know a really

427

00:18:04,650 --> 00:18:02,130

talented team at Goddard which is

428

00:18:07,530 --> 00:18:04,660

you want me to stop there do you want me

429

00:18:10,620 --> 00:18:07,540

answer your third question okay

430

00:18:13,290 --> 00:18:10,630

I probably the third question but the

431

00:18:17,930 --> 00:18:13,300

third question was describe a recent

432

00:18:21,390 --> 00:18:17,940

challenge in getting something with

433

00:18:25,530 --> 00:18:21,400

astrobiology capabilities Sloane and I

434

00:18:29,880 --> 00:18:25,540

think I rather than answer that directly

435

00:18:32,610 --> 00:18:29,890

what I will say is you know I was trying

436

00:18:34,950 --> 00:18:32,620

to think from from NASA's point of view

437

00:18:38,910 --> 00:18:34,960

from headquarters point of view what it

438

00:18:43,110 --> 00:18:38,920

means to develop a portfolio of

439

00:18:45,180 --> 00:18:43,120

instrumentation and I think the

440

00:18:47,310 --> 00:18:45,190

possibilities for making measurements

441

00:18:49,020 --> 00:18:47,320

that can really get at very important

442

00:18:55,110 --> 00:18:49,030

science questions particularly in the

443

00:18:57,270 --> 00:18:55,120

search for life requires you know a lot

444

00:19:00,540 --> 00:18:57,280

of a lot of parallel efforts and really

445

00:19:04,230 --> 00:19:00,550

a broad portfolio and so from

446

00:19:07,560 --> 00:19:04,240

headquarters point of view I I don't

447

00:19:10,650 --> 00:19:07,570

know but I presume there's useful if you

448

00:19:12,360 --> 00:19:10,660

have a number of possibilities at the

449

00:19:14,850 --> 00:19:12,370

ready when you are

450

00:19:16,950 --> 00:19:14,860

when you are trying to put together your

451

00:19:19,140 --> 00:19:16,960

next mission from an instrument

452

00:19:22,110 --> 00:19:19,150

developers point of view there are never

453

00:19:24,600 --> 00:19:22,120

enough missions to get everything flown

454

00:19:28,830 --> 00:19:24,610

so there's a there's an inherent tension

455

00:19:30,930 --> 00:19:28,840

there but I would say that you know

456

00:19:33,600 --> 00:19:30,940

there there are a lot of instrument

457

00:19:36,090 --> 00:19:33,610

capabilities there in development and

458

00:19:39,080 --> 00:19:36,100

really at the conception phase right now

459

00:19:41,280 --> 00:19:39,090

even that would be very deserving of

460

00:19:44,600 --> 00:19:41,290

finding their way onto the mission and

461

00:19:48,420 --> 00:19:44,610

hopefully we can continue to work as a

462

00:19:50,640 --> 00:19:48,430

you know good citizens to to try to

463

00:19:51,690 --> 00:19:50,650

increase the number of missions that we

464

00:19:59,160 --> 00:19:51,700

can get out there so that we can make

465

00:20:03,150 --> 00:19:59,170

those measurements yep I'm I'm Erin Noel

466

00:20:04,860 --> 00:20:03,160

and I work at JPL and so my my

467

00:20:09,660 --> 00:20:04,870

background is as a physical and

468

00:20:11,160 --> 00:20:09,670

analytical chemist and so I guess I like

469

00:20:13,770 --> 00:20:11,170

everyone was we were discussing work on

470

00:20:14,190 --> 00:20:13,780

many things but you know one of one of

471

00:20:15,780 --> 00:20:14,200

my

472

00:20:18,810 --> 00:20:15,790

interests in astrobiology and

473

00:20:21,000 --> 00:20:18,820

instrumentation is on really doing sort

474

00:20:22,680 --> 00:20:21,010

of contextual habitability measurements

475

00:20:25,440 --> 00:20:22,690

and specifically through sort of

476
00:20:28,320 --> 00:20:25,450
measurements involving soluble ions so

477
00:20:30,060 --> 00:20:28,330
I've put a lot of time into trying to

478
00:20:33,470 --> 00:20:30,070
develop microfluidic instruments that

479
00:20:36,300 --> 00:20:33,480
can separate and detect a variety of

480
00:20:38,640 --> 00:20:36,310
markers related to habitability and so

481
00:20:40,500 --> 00:20:38,650
trying to miniaturize techniques like

482
00:20:44,580 --> 00:20:40,510
capillary electrophoresis or ion

483
00:20:48,120 --> 00:20:44,590
chromatography and so continuing doing

484
00:20:50,190 --> 00:20:48,130
also a lot of work at low TRL I guess my

485
00:20:53,850 --> 00:20:50,200
mission experience is pretty limited

486
00:20:55,560 --> 00:20:53,860
it's in the proposal process so but you

487
00:20:58,530 --> 00:20:55,570
know working on that has showed me a lot

488
00:21:00,750 --> 00:20:58,540

about what you need to do to try to take

489

00:21:02,850 --> 00:21:00,760

things all the way and really propose

490

00:21:06,920 --> 00:21:02,860

them as credible instruments and have it

491

00:21:09,780 --> 00:21:06,930

be a strong part of the science case so

492

00:21:12,060 --> 00:21:09,790

and my experience and that is with sort

493

00:21:13,740 --> 00:21:12,070

of the the wet chemistry lab team and

494

00:21:15,990 --> 00:21:13,750

the and the heritage of that instrument

495

00:21:18,180 --> 00:21:16,000

which was in a electrochemical an array

496

00:21:21,180 --> 00:21:18,190

of electrochemical sensors designed to

497

00:21:24,330 --> 00:21:21,190

search for soluble ions and so we're

498

00:21:27,510 --> 00:21:24,340

continuing to try to develop those tools

499

00:21:31,320 --> 00:21:27,520

for for discovery and now new frontiers

500

00:21:33,570 --> 00:21:31,330

proposals so I guess and challenges well

501
00:21:35,700 --> 00:21:33,580
you know there are always a lot of

502
00:21:38,880 --> 00:21:35,710
challenges but I think in a way Brittany

503
00:21:40,970 --> 00:21:38,890
hit on one of the the biggest which is I

504
00:21:43,470 --> 00:21:40,980
think it comes down to perseverance I

505
00:21:46,830 --> 00:21:43,480
don't know if any of you were at the IPM

506
00:21:48,750 --> 00:21:46,840
meeting a few months ago but both Chris

507
00:21:50,670 --> 00:21:48,760
Webster from the tunable laser

508
00:21:53,250 --> 00:21:50,680
spectrometer and and Luther Beagle of

509
00:21:55,170 --> 00:21:53,260
Sherlock give really great talks about

510
00:21:57,270 --> 00:21:55,180
sort of what it takes to go through the

511
00:22:00,030 --> 00:21:57,280
process of developing an instrument and

512
00:22:02,040 --> 00:22:00,040
getting all the way to the end you know

513
00:22:04,020 --> 00:22:02,050

the end goal of being included on a

514

00:22:06,030 --> 00:22:04,030

mission and and in the case of TLS

515

00:22:09,030 --> 00:22:06,040

delivering you know incredible results

516

00:22:11,640 --> 00:22:09,040

so and you know it's basically a

517

00:22:13,890 --> 00:22:11,650

nonlinear story of keeping at it and I

518

00:22:20,030 --> 00:22:13,900

think you know I haven't solved it yet

519

00:22:24,120 --> 00:22:22,320

just one yeah excellent

520

00:22:25,500 --> 00:22:24,130

I'm Amanda Stockton I'm an assistant

521

00:22:27,720 --> 00:22:25,510

professor at the Georgia Institute of

522

00:22:30,600 --> 00:22:27,730

Technology I've been there for about two

523

00:22:32,310 --> 00:22:30,610

and a half years now and my interests

524

00:22:35,910 --> 00:22:32,320

are pretty much all of the questions of

525

00:22:37,950 --> 00:22:35,920

astrobiology is there life beyond what

526
00:22:39,870 --> 00:22:37,960
are the limits of life on Earth how does

527
00:22:42,000 --> 00:22:39,880
life begin and evolving my group tries

528
00:22:43,560 --> 00:22:42,010
to tackle all of these questions in a

529
00:22:45,290 --> 00:22:43,570
number of different ways but we use

530
00:22:47,190 --> 00:22:45,300
micro fluidics as our core technology

531
00:22:48,960 --> 00:22:47,200
for all of these things and I think

532
00:22:52,470 --> 00:22:48,970
micro fluidics has a lot of strengths

533
00:22:53,700 --> 00:22:52,480
for Space Flight because it allows you

534
00:22:55,260 --> 00:22:53,710
to do some of these white chemical

535
00:22:57,600 --> 00:22:55,270
analyses that are otherwise rather

536
00:23:01,320 --> 00:22:57,610
challenging to do down at the small

537
00:23:02,970 --> 00:23:01,330
scale my experience working on missions

538
00:23:05,130 --> 00:23:02,980

began whenever I was a graduate student

539

00:23:07,920 --> 00:23:05,140

with rich Mathies at the University of

540

00:23:09,420 --> 00:23:07,930

California Berkeley working on the

541

00:23:11,490 --> 00:23:09,430

microchip capillary electrophoresis

542

00:23:14,130 --> 00:23:11,500

system with laser induced fluorescence

543

00:23:16,740 --> 00:23:14,140

detection as part of the URI instrument

544

00:23:20,640 --> 00:23:16,750

package onboard the ExoMars Rover

545

00:23:22,230 --> 00:23:20,650

a lot of words to say but I was kind of

546

00:23:23,700 --> 00:23:22,240

forced into early graduation when the

547

00:23:27,960 --> 00:23:23,710

instrument was be scoped from the

548

00:23:31,140 --> 00:23:27,970

ExoMars Rover at that point I went down

549

00:23:32,760 --> 00:23:31,150

to JPL and worked with Peter Willis as a

550

00:23:35,640 --> 00:23:32,770

postdoc and kind of helped get that

551
00:23:38,610 --> 00:23:35,650
program up and it has been incredibly

552
00:23:41,430 --> 00:23:38,620
successful since then so I like

553
00:23:42,930 --> 00:23:41,440
microchip capillary electrophoresis with

554
00:23:45,510 --> 00:23:42,940
laser induced fluorescence detection for

555
00:23:47,960 --> 00:23:45,520
a number of reasons LIF is incredibly

556
00:23:50,310 --> 00:23:47,970
sensitive you can't hardly beat it as a

557
00:23:51,780 --> 00:23:50,320
concentration sensitive method we're

558
00:23:53,010 --> 00:23:51,790
looking at the capability to detect

559
00:23:55,620 --> 00:23:53,020
seventy picomolar

560
00:23:57,540 --> 00:23:55,630
of an amino acid from a sample plug as

561
00:23:59,880 --> 00:23:57,550
it passes a detector that's 35 microns

562
00:24:04,860 --> 00:23:59,890
by 35 microns by a hundred microns

563
00:24:06,330 --> 00:24:04,870

that's a de moles of sample and I like

564

00:24:07,410 --> 00:24:06,340

microchip capillary electrophoresis

565

00:24:08,760 --> 00:24:07,420

because you just can't beat the

566

00:24:11,670 --> 00:24:08,770

resolution and you can get chiral

567

00:24:13,350 --> 00:24:11,680

separations as well so that's one of the

568

00:24:18,690 --> 00:24:13,360

technologies I continue to work on and

569

00:24:21,180 --> 00:24:18,700

have been involved in various instrument

570

00:24:23,310 --> 00:24:21,190

proposals including to Mars 2020 with

571

00:24:27,090 --> 00:24:23,320

the Mars organic analyzer out of UC

572

00:24:29,910 --> 00:24:27,100

Berkeley PID by rich Matthews and we

573

00:24:31,890 --> 00:24:29,920

continue to attempt to get this type of

574

00:24:34,320 --> 00:24:31,900

technology on a mission because we just

575

00:24:36,180 --> 00:24:34,330

believe that it is so powerful currently

576

00:24:38,340 --> 00:24:36,190

in my group however we're focusing on

577

00:24:40,260 --> 00:24:38,350

the low TRL development of various

578

00:24:41,280 --> 00:24:40,270

instruments still focusing on micro

579

00:24:43,430 --> 00:24:41,290

fluidics and

580

00:24:45,870 --> 00:24:43,440

laser induced fluorescence detection and

581

00:24:48,060 --> 00:24:45,880

continuing a little bit of microchips EE

582

00:24:51,300 --> 00:24:48,070

as well so one of our projects has no

583

00:24:54,150 --> 00:24:51,310

separations but it is capable of

584

00:24:57,290 --> 00:24:54,160

withstanding a hard landing with an icy

585

00:24:59,940 --> 00:24:57,300

moon slowing down from approximately 5

586

00:25:02,820 --> 00:24:59,950

km/s and a 50 millisecond pulse that's

587

00:25:05,010 --> 00:25:02,830

50,000 GS that's our design limit we've

588

00:25:07,050 --> 00:25:05,020

tested up to 12,000 GS so far but

589

00:25:10,050 --> 00:25:07,060

hopefully we'll be able to get the rest

590

00:25:12,060 --> 00:25:10,060

of the way there and also have a little

591

00:25:15,300 --> 00:25:12,070

bit of work developing microchips EE

592

00:25:17,700 --> 00:25:15,310

with mass spectrometry detection so that

593

00:25:20,310 --> 00:25:17,710

we can not have to do derivatives ation

594

00:25:23,430 --> 00:25:20,320

in order to detect and Kyra Lee resolve

595

00:25:26,190 --> 00:25:23,440

amino acids so I think one of the big

596

00:25:28,410 --> 00:25:26,200

challenges that we're looking at here

597

00:25:29,820 --> 00:25:28,420

was hit 1 by Mary Wojtek here where if

598

00:25:32,520 --> 00:25:29,830

we only have hammers we're looking for

599

00:25:34,230 --> 00:25:32,530

nails and Stephanie said we don't have

600

00:25:35,730 --> 00:25:34,240

enough missions as instrument developers

601
00:25:40,020 --> 00:25:35,740
as I think that's hits on something

602
00:25:41,670 --> 00:25:40,030
where heritage is such a primary

603
00:25:46,250 --> 00:25:41,680
selector and what instrument gets

604
00:25:48,900 --> 00:25:46,260
selected for a mission and not all

605
00:25:51,060 --> 00:25:48,910
heritage is equal there's a difference

606
00:25:53,070 --> 00:25:51,070
between an instrument that performs

607
00:25:55,290 --> 00:25:53,080
beautifully gives you the data that

608
00:25:57,480 --> 00:25:55,300
you're looking for quite easily and one

609
00:25:58,920 --> 00:25:57,490
where the data comes back and it's messy

610
00:26:03,750 --> 00:25:58,930
and confusing and challenging to figure

611
00:26:07,470 --> 00:26:03,760
out and so perhaps we could have more

612
00:26:09,450 --> 00:26:07,480
missions and be able to select some of

613
00:26:11,520 --> 00:26:09,460

these instruments that are very very

614

00:26:19,500 --> 00:26:11,530

promising but don't yet have the

615

00:26:22,260 --> 00:26:19,510

heritage ok sis on good morning hey I'm

616

00:26:23,880 --> 00:26:22,270

Jim Bell I'm a professor here at ASU in

617

00:26:26,940 --> 00:26:23,890

school of Earth and space exploration

618

00:26:28,260 --> 00:26:26,950

and I work with the spectacular Brittany

619

00:26:33,080 --> 00:26:28,270

Schmidt on the board of the Planetary

620

00:26:36,120 --> 00:26:33,090

Society big friend of astrobiology and

621

00:26:38,760 --> 00:26:36,130

Mary called me the old man on the panel

622

00:26:43,980 --> 00:26:38,770

so I guess I'll take that role but

623

00:26:46,020 --> 00:26:43,990

you're the old lady I guess so I'm not a

624

00:26:49,860 --> 00:26:46,030

real Astro biologist but I play one at

625

00:26:53,040 --> 00:26:49,870

work I'm a camera guy for the most part

626
00:26:54,870 --> 00:26:53,050
been involved in imaging investigations

627
00:26:57,410 --> 00:26:54,880
Mars imaging investigation

628
00:27:00,720 --> 00:26:57,420
from Pathfinder and spirit opportunity

629
00:27:03,390 --> 00:27:00,730
curiosity and I'm the PI of the mask NZ

630
00:27:07,050 --> 00:27:03,400
cameras on 2020 so think a lot about

631
00:27:10,470 --> 00:27:07,060
about cameras and as an imaging person

632
00:27:12,390 --> 00:27:10,480
and primarily a geologist a little bit

633
00:27:13,230 --> 00:27:12,400
of a mineralogist I think about the ways

634
00:27:15,990 --> 00:27:13,240
that we can do

635
00:27:18,480 --> 00:27:16,000
astrobiology with those those kinds of

636
00:27:20,490 --> 00:27:18,490
imaging systems of course we could take

637
00:27:22,590 --> 00:27:20,500
pictures of things walking around on the

638
00:27:25,140 --> 00:27:22,600

surface I would be spectacular but more

639

00:27:26,760 --> 00:27:25,150

more realistically what what we do ask

640

00:27:28,500 --> 00:27:26,770

for biologically with the imaging is

641

00:27:30,990 --> 00:27:28,510

under try to understand the context in

642

00:27:32,280 --> 00:27:31,000

the history and you know what was this

643

00:27:34,700 --> 00:27:32,290

environment like what were the

644

00:27:40,350 --> 00:27:34,710

conditions like that could have enabled

645

00:27:45,480 --> 00:27:40,360

astrobiology and so you know in that

646

00:27:47,400 --> 00:27:45,490

sense it's a it's a simple instrument in

647

00:27:49,380 --> 00:27:47,410

the sense of not having to you know

648

00:27:50,490 --> 00:27:49,390

invoke all the complexity of many of the

649

00:27:52,050 --> 00:27:50,500

things that I didn't understand half of

650

00:27:55,860 --> 00:27:52,060

what you were saying but it was sounds

651
00:27:58,170 --> 00:27:55,870
really complex and and that's a theme

652
00:28:03,260 --> 00:27:58,180
and heritage is a real theme to come

653
00:28:05,910 --> 00:28:03,270
back to I wanted to touch on a couple of

654
00:28:07,650 --> 00:28:05,920
recommendations or ideas to pass along

655
00:28:09,690 --> 00:28:07,660
Brittany I completely agree with you the

656
00:28:13,530 --> 00:28:09,700
eggs are sort of where it's at for

657
00:28:17,850 --> 00:28:13,540
getting input into the the machine that

658
00:28:19,950 --> 00:28:17,860
cranks out mission requirements and you

659
00:28:23,340 --> 00:28:19,960
know there's you mentioned me peg and s

660
00:28:26,850 --> 00:28:23,350
bag and Oh peg you know why isn't there

661
00:28:29,220 --> 00:28:26,860
an ABS AG right I mean whatever whatever

662
00:28:30,600 --> 00:28:29,230
we call it right you know this this

663
00:28:33,300 --> 00:28:30,610

community is getting to the critical

664

00:28:36,570 --> 00:28:33,310

mass of where you know some advocacy

665

00:28:38,070 --> 00:28:36,580

with the right people would would you

666

00:28:41,280 --> 00:28:38,080

know maybe push that over the limit and

667

00:28:43,770 --> 00:28:41,290

so instead of having to to be you know

668

00:28:45,690 --> 00:28:43,780

piecemeal in these other groups maybe

669

00:28:49,470 --> 00:28:45,700

maybe this this community could have its

670

00:28:53,310 --> 00:28:49,480

voice heard uniformly that's a community

671

00:28:57,480 --> 00:28:53,320

kind of thing as individuals what I try

672

00:28:59,370 --> 00:28:57,490

to tell my own students and other young

673

00:29:00,800 --> 00:28:59,380

career professionals is you know get

674

00:29:04,500 --> 00:29:00,810

yourself on a science definition team

675

00:29:07,020 --> 00:29:04,510

get yourself on an NRC report like the

676
00:29:07,770 --> 00:29:07,030
ones that Mary Preview they're coming up

677
00:29:09,630 --> 00:29:07,780
right

678
00:29:11,760 --> 00:29:09,640
get yourself on a review panels I mean

679
00:29:12,840 --> 00:29:11,770
people can volunteer for review panel

680
00:29:14,340 --> 00:29:12,850
how often does that happen

681
00:29:17,010 --> 00:29:14,350
you guys are giddy when they do right

682
00:29:20,130 --> 00:29:17,020
yeah I see people volunteer they don't

683
00:29:23,460 --> 00:29:20,140
but they don't come okay okay you show

684
00:29:29,210 --> 00:29:23,470
up but the point is to become part of

685
00:29:32,010 --> 00:29:29,220
the process and what what comes out of

686
00:29:33,750 --> 00:29:32,020
assessment group white papers and

687
00:29:37,020 --> 00:29:33,760
consensus reports what comes out of

688
00:29:39,030 --> 00:29:37,030

science definition team reports folds

689

00:29:42,330 --> 00:29:39,040

right into what the mission will need

690

00:29:45,000 --> 00:29:42,340

and so you know if you are a strong

691

00:29:46,560 --> 00:29:45,010

advocate and believer of methodology X

692

00:29:48,240 --> 00:29:46,570

and think that that is going to make a

693

00:29:49,710 --> 00:29:48,250

huge difference get your voice heard

694

00:29:52,790 --> 00:29:49,720

pull your friends and colleagues

695

00:29:55,140 --> 00:29:52,800

together point to your papers and

696

00:29:57,480 --> 00:29:55,150

abstracts and presentations and try to

697

00:29:59,940 --> 00:29:57,490

convince groups like that hey this is

698

00:30:02,790 --> 00:29:59,950

really important and of course you never

699

00:30:04,680 --> 00:30:02,800

know what comes out of the other side in

700

00:30:06,360 --> 00:30:04,690

these sausage-making exercises but

701
00:30:08,730 --> 00:30:06,370
sometimes what comes out of the other

702
00:30:10,530 --> 00:30:08,740
side is a requirement for a mission

703
00:30:14,040 --> 00:30:10,540
investigation then you say oh I do that

704
00:30:17,370 --> 00:30:14,050
or I can do that so that's that's a way

705
00:30:20,790 --> 00:30:17,380
to to get into it the topic of heritage

706
00:30:22,650 --> 00:30:20,800
came up the this I think the simplest

707
00:30:24,360 --> 00:30:22,660
way and I've had both kinds of

708
00:30:26,340 --> 00:30:24,370
experimental --zz that have gotten

709
00:30:29,550 --> 00:30:26,350
rejected and I've written some proposals

710
00:30:31,770 --> 00:30:29,560
I've gotten accepted and it seems like

711
00:30:33,630 --> 00:30:31,780
from my case the common theme of the

712
00:30:35,460 --> 00:30:33,640
ones that have been accepted are the

713
00:30:37,080 --> 00:30:35,470

ones that had the highest heritage you

714

00:30:38,790 --> 00:30:37,090

know it's sort of natural human nature

715

00:30:42,120 --> 00:30:38,800

conservative review panels they're

716

00:30:45,660 --> 00:30:42,130

looking for incremental advances not

717

00:30:47,460 --> 00:30:45,670

leaps because leaps are risky and you

718

00:30:49,140 --> 00:30:47,470

can take that risk it's okay to take

719

00:30:50,760 --> 00:30:49,150

that risk but just know that you're

720

00:30:53,670 --> 00:30:50,770

going to be competing with others who

721

00:30:55,080 --> 00:30:53,680

aren't and so when the review panel is

722

00:30:57,780 --> 00:30:55,090

kind of biting their nails and saying

723

00:31:00,360 --> 00:30:57,790

who how do we how do we really guarantee

724

00:31:02,130 --> 00:31:00,370

success here or do our part in

725

00:31:03,660 --> 00:31:02,140

guaranteeing success they're looking for

726

00:31:06,000 --> 00:31:03,670

lowest risk they're often looking for

727

00:31:08,340 --> 00:31:06,010

highest heritage so but but that's not a

728

00:31:11,630 --> 00:31:08,350

killer right you can take your your

729

00:31:14,460 --> 00:31:11,640

novel idea and I think it's possible to

730

00:31:16,530 --> 00:31:14,470

sort of incrementally tack novel ideas

731

00:31:19,540 --> 00:31:16,540

into high heritage instrumental

732

00:31:21,550 --> 00:31:19,550

solutions I think you know with

733

00:31:23,620 --> 00:31:21,560

Stephanie talked about with the moment

734

00:31:25,240 --> 00:31:23,630

instrument building on things that have

735

00:31:27,130 --> 00:31:25,250

been done for Sam or others and has a

736

00:31:29,110 --> 00:31:27,140

great example sneaking a capability

737

00:31:31,690 --> 00:31:29,120

maybe not sneak in but get it get in a

738

00:31:33,850 --> 00:31:31,700

capability that is not going to scare

739

00:31:36,310 --> 00:31:33,860

away reviewers or headquarters in terms

740

00:31:37,900 --> 00:31:36,320

of risk but it's doing something new and

741

00:31:39,880 --> 00:31:37,910

different some aspects of Sherlock you

742

00:31:43,150 --> 00:31:39,890

which mentioned up here on 20/20 same

743

00:31:45,970 --> 00:31:43,160

kind of thing you know using some high

744

00:31:48,550 --> 00:31:45,980

heritage components imaging etc but

745

00:31:51,610 --> 00:31:48,560

getting in this this UV capability that

746

00:31:54,580 --> 00:31:51,620

a lot of astrobiology people want so so

747

00:31:56,710 --> 00:31:54,590

think about you know not hitting the

748

00:31:59,920 --> 00:31:56,720

review panel or NASA over the head with

749

00:32:01,810 --> 00:31:59,930

a 2x4 and saying you guys got to you got

750

00:32:04,120 --> 00:32:01,820

to pick this this is the way but instead

751
00:32:06,460 --> 00:32:04,130
you know use little toothpicks and kind

752
00:32:11,950 --> 00:32:06,470
of poke at it right bytes of a thousand

753
00:32:14,950 --> 00:32:11,960
ducks and then so find those increments

754
00:32:16,270 --> 00:32:14,960
like support from a center or your

755
00:32:18,550 --> 00:32:16,280
institution or your university

756
00:32:20,590 --> 00:32:18,560
absolutely critical if you can if you

757
00:32:24,640 --> 00:32:20,600
can partner with a with a Goddard with a

758
00:32:26,380 --> 00:32:24,650
JPL with an APL with ass weary or you

759
00:32:27,550 --> 00:32:26,390
know here at ASU we get an enormous

760
00:32:30,250 --> 00:32:27,560
amount of support from our own

761
00:32:32,380 --> 00:32:30,260
administration for for proposal writing

762
00:32:34,780 --> 00:32:32,390
and for facilities that can support

763
00:32:36,670 --> 00:32:34,790

instruments that people like Phil

764

00:32:39,490 --> 00:32:36,680

Christensen Mark Robinson myself and

765

00:32:40,690 --> 00:32:39,500

others have put together so go you know

766

00:32:43,090 --> 00:32:40,700

go to bat for yourself with your own

767

00:32:46,210 --> 00:32:43,100

institution or make a connection to a

768

00:32:48,340 --> 00:32:46,220

center and then I guess the last little

769

00:32:49,840 --> 00:32:48,350

piece of advice thing and maybe a lot of

770

00:32:51,340 --> 00:32:49,850

I know a lot of especially young people

771

00:32:52,330 --> 00:32:51,350

don't realize this but if you really

772

00:32:53,350 --> 00:32:52,340

want to head down this path you're

773

00:32:55,930 --> 00:32:53,360

probably going to have to put your

774

00:32:57,940 --> 00:32:55,940

science career on hold and that can be

775

00:33:00,430 --> 00:32:57,950

challenging you're trying to get tenure

776

00:33:01,990 --> 00:33:00,440

or you know and the rest of the people

777

00:33:03,850 --> 00:33:02,000

in your department or your group or like

778

00:33:05,230 --> 00:33:03,860

where your great science papers and say

779

00:33:08,290 --> 00:33:05,240

oh I'm working on this instrument and

780

00:33:10,690 --> 00:33:08,300

they may not understand you know so it's

781

00:33:13,810 --> 00:33:10,700

it's sort of common in the engineering

782

00:33:16,570 --> 00:33:13,820

world or the astronomical instrument

783

00:33:18,520 --> 00:33:16,580

world that you know you sort of people

784

00:33:20,430 --> 00:33:18,530

in your in your world understand you're

785

00:33:23,050 --> 00:33:20,440

building this thing to do great science

786

00:33:25,000 --> 00:33:23,060

but make sure your own community it's

787

00:33:27,370 --> 00:33:25,010

your own institution University Center

788

00:33:30,460 --> 00:33:27,380

or whatever understands that as well and

789

00:33:32,000 --> 00:33:30,470

then my own challenge is just ignoring

790

00:33:35,580 --> 00:33:32,010

all of my own advice

791

00:33:38,010 --> 00:33:35,590

so I mean I you get enamored of some

792

00:33:41,160 --> 00:33:38,020

cool idea some interesting new detectors

793

00:33:43,320 --> 00:33:41,170

some new riff on on a way to do an

794

00:33:45,750 --> 00:33:43,330

imaging or spectroscopy investigation is

795

00:33:46,920 --> 00:33:45,760

I got to write that proposal and back in

796

00:33:50,670 --> 00:33:46,930

my mind it's like man they're not going

797

00:33:52,460 --> 00:33:50,680

to pick this but you can't stop so so

798

00:33:55,080 --> 00:33:52,470

part of that is just write the proposal

799

00:33:59,780 --> 00:33:55,090

write the proposal get the feedback go

800

00:34:00,960 --> 00:33:59,790

through the process and then persevere

801
00:34:04,380 --> 00:34:00,970

Thanks

802
00:34:07,080 --> 00:34:04,390

so hopefully um this is kind of a range

803
00:34:09,570 --> 00:34:07,090

of perspectives from aspiring from

804
00:34:11,850 --> 00:34:09,580

policy and everything my own experience

805
00:34:14,550 --> 00:34:11,860

is that I'm on the instrument team for

806
00:34:16,800 --> 00:34:14,560

the ice-penetrating radar on Europa

807
00:34:18,750 --> 00:34:16,810

clipper I'm not a radar person it's

808
00:34:20,220 --> 00:34:18,760

really funny because we tend to as think

809
00:34:22,530 --> 00:34:20,230

it's planetary science be like oh you

810
00:34:24,270 --> 00:34:22,540

are a camera person and you are a

811
00:34:25,980 --> 00:34:24,280

spectrometer person and I apparently am

812
00:34:26,910 --> 00:34:25,990

a radar person which is hilarious

813
00:34:29,550 --> 00:34:26,920

because I've never actually worked on

814

00:34:31,200 --> 00:34:29,560

the data from such a thing so but I

815

00:34:32,640 --> 00:34:31,210

think that's the other way to think

816

00:34:35,010 --> 00:34:32,650

about it is that there's opportunities

817

00:34:36,480 --> 00:34:35,020

to figure out what's out there and how

818

00:34:39,690 --> 00:34:36,490

you can make it an instrument that you

819

00:34:41,820 --> 00:34:39,700

could use and that's another tack you

820

00:34:43,680 --> 00:34:41,830

might take in the short term before the

821

00:34:45,600 --> 00:34:43,690

instrument development processes so I

822

00:34:48,570 --> 00:34:45,610

got interested in nice penetrating radar

823

00:34:50,480 --> 00:34:48,580

because I really wanted to understand

824

00:34:52,950 --> 00:34:50,490

how the ice shell works on Europa

825

00:34:55,470 --> 00:34:52,960

because I wanted to figure out how long

826

00:34:58,500 --> 00:34:55,480

it took for biomarkers or something like

827

00:35:00,420 --> 00:34:58,510

that to end up at the surface or really

828

00:35:01,800 --> 00:35:00,430

what's the context for that thing so

829

00:35:03,690 --> 00:35:01,810

that we can interpret it appropriately

830

00:35:07,520 --> 00:35:03,700

and that's a journey that started a long

831

00:35:11,460 --> 00:35:07,530

time ago and so when I finished my as an

832

00:35:16,020 --> 00:35:11,470

undergrad student I heard that the then

833

00:35:18,180 --> 00:35:16,030

2007 Jupiter Europa mission and Jupiter

834

00:35:20,910 --> 00:35:18,190

Europa orbiter was starting up the study

835

00:35:24,840 --> 00:35:20,920

and I told Bob Pappalardo I was like I

836

00:35:27,360 --> 00:35:24,850

will I will shine shoes make coffee do

837

00:35:29,010 --> 00:35:27,370

anything and Italy I put also take notes

838

00:35:31,380 --> 00:35:29,020

in this list of things that I would be

839

00:35:34,350 --> 00:35:31,390

willing to do in order to help with that

840

00:35:35,940 --> 00:35:34,360

mission study as a person who was too

841

00:35:38,190 --> 00:35:35,950

early to have applied to be on the

842

00:35:40,020 --> 00:35:38,200

science definition team and so Bob was

843

00:35:41,550 --> 00:35:40,030

like oh we don't have anyone taking

844

00:35:43,890 --> 00:35:41,560

notes who's actually done science before

845

00:35:44,070 --> 00:35:43,900

so that sounds like a great idea and so

846

00:35:46,920 --> 00:35:44,080

in

847

00:35:48,090 --> 00:35:46,930

2007 I also had a thesis advisor even

848

00:35:50,940 --> 00:35:48,100

though I wasn't working on Europa that

849

00:35:52,530 --> 00:35:50,950

would pay for me because I really

850

00:35:55,080 --> 00:35:52,540

couldn't afford to drive from Santa

851

00:35:58,050 --> 00:35:55,090

Monica to LA all or to Pasadena all the

852

00:35:59,220 --> 00:35:58,060

time you know four days a week for you

853

00:36:01,410 --> 00:35:59,230

know five meetings a year or six

854

00:36:03,900 --> 00:36:01,420

meetings a year and so he was like very

855

00:36:06,210 --> 00:36:03,910

supportive of this activity and so like

856

00:36:08,070 --> 00:36:06,220

of course we'll cover your you will

857

00:36:09,660 --> 00:36:08,080

cover your gas mileage you know i gas

858

00:36:11,670 --> 00:36:09,670

mileage back and forth so great this is

859

00:36:13,560 --> 00:36:11,680

fantastic and and all I did was take

860

00:36:16,230 --> 00:36:13,570

notes and but one of the things that I

861

00:36:17,970 --> 00:36:16,240

got very very fast at was being able to

862

00:36:19,830 --> 00:36:17,980

write something down think about it and

863

00:36:22,020 --> 00:36:19,840

then discuss it and it was a really

864

00:36:24,450 --> 00:36:22,030

great environment to do that and so then

865

00:36:25,590 --> 00:36:24,460

it also allowed me to talk to people who

866

00:36:27,780 --> 00:36:25,600

were in the room and listen to the

867

00:36:29,850 --> 00:36:27,790

science cases from people who had been

868

00:36:33,600 --> 00:36:29,860

you know elected to this position by a

869

00:36:35,730 --> 00:36:33,610

NASA headquarters and what it gave me an

870

00:36:38,250 --> 00:36:35,740

opportunity to do is say I want to work

871

00:36:40,050 --> 00:36:38,260

on that instrument with that person I

872

00:36:41,340 --> 00:36:40,060

made a list of five people and then I

873

00:36:43,650 --> 00:36:41,350

just made a really hard case at the

874

00:36:44,730 --> 00:36:43,660

first one and luckily they said yes but

875

00:36:46,320 --> 00:36:44,740

when I decided I was going to go to

876

00:36:48,750 --> 00:36:46,330

Texas and work on ice penetrating radar

877

00:36:51,950 --> 00:36:48,760

as a person who had just done their PhD

878

00:36:53,910 --> 00:36:51,960

on Hubble observations of an asteroid

879

00:36:56,220 --> 00:36:53,920

people were like why would you do that

880

00:36:58,380 --> 00:36:56,230

you're the asteroid person that seems

881

00:37:00,720 --> 00:36:58,390

crazy and then it was a little crazy but

882

00:37:03,600 --> 00:37:00,730

it also worked out really well and so I

883

00:37:05,370 --> 00:37:03,610

went and I started working with folks

884

00:37:07,470 --> 00:37:05,380

that were building radars and flying

885

00:37:09,120 --> 00:37:07,480

them around in Antarctica which is not

886

00:37:10,770 --> 00:37:09,130

exactly what I'm doing now I'm building

887

00:37:12,570 --> 00:37:10,780

other types of instruments that go to

888

00:37:14,220 --> 00:37:12,580

Antarctica but I wouldn't have gotten a

889

00:37:16,650 --> 00:37:14,230

chance to do that if I hadn't done that

890

00:37:18,450 --> 00:37:16,660

you know I hadn't been in the room and

891

00:37:20,550 --> 00:37:18,460

and been watching how people were

892

00:37:23,310 --> 00:37:20,560

discussing their science and what they

893

00:37:24,480 --> 00:37:23,320

wanted to do and then just tried really

894

00:37:26,910 --> 00:37:24,490

hard to convince someone that I could

895

00:37:28,710 --> 00:37:26,920

get that I could turn a radar or help

896

00:37:31,410 --> 00:37:28,720

turn a radar into an astrobiology

897

00:37:34,230 --> 00:37:31,420

instrument and so that was a really fun

898

00:37:37,560 --> 00:37:34,240

and and different way of looking at a

899

00:37:39,390 --> 00:37:37,570

career path and and so then that's the

900

00:37:42,270 --> 00:37:39,400

same way it was getting getting involved

901
00:37:44,490 --> 00:37:42,280
in being a faculty member was I need

902
00:37:46,890 --> 00:37:44,500
some space to think about these ideas

903
00:37:48,720 --> 00:37:46,900
myself so it's a very there's a lot of

904
00:37:50,010 --> 00:37:48,730
different I think experience up here but

905
00:37:51,300 --> 00:37:50,020
that's why I wanted to kind of highlight

906
00:37:53,190 --> 00:37:51,310
the ways that you might think about

907
00:37:55,450 --> 00:37:53,200
getting involved in missions so that we

908
00:37:58,030 --> 00:37:55,460
can make this life detection thing so

909
00:38:01,180 --> 00:37:58,040
anyway so I wanted to start off and then

910
00:38:04,030 --> 00:38:01,190
we've got about half an hour as 20

911
00:38:06,339 --> 00:38:04,040
minutes or so and to just kind of have a

912
00:38:08,829 --> 00:38:06,349
conversation so if folks have questions

913
00:38:11,280 --> 00:38:08,839

please come up to the mic and I'll just

914

00:38:14,710 --> 00:38:11,290

kind of give this get us started so

915

00:38:17,099 --> 00:38:14,720

anyhow so what I wanted to know actually

916

00:38:20,770 --> 00:38:17,109

was so we talked a little bit about

917

00:38:23,680 --> 00:38:20,780

heritage and TRL and things like that

918

00:38:25,480 --> 00:38:23,690

how do we some of these instruments that

919

00:38:27,190 --> 00:38:25,490

might be possible a new type of mass

920

00:38:29,290 --> 00:38:27,200

spectrometer there's a lot of heritage

921

00:38:31,750 --> 00:38:29,300

parts a new type of camera with another

922

00:38:33,190 --> 00:38:31,760

another filter system or something you

923

00:38:35,890 --> 00:38:33,200

could imagine being asked for biology

924

00:38:38,620 --> 00:38:35,900

astrobiological irrelevant but how do

925

00:38:44,020 --> 00:38:38,630

you get around the fact that for

926

00:38:46,480 --> 00:38:44,030

instance Kapil my own sorry micro

927

00:38:48,430 --> 00:38:46,490

fluidics devices haven't really been

928

00:38:50,710 --> 00:38:48,440

flown how do you how do we get to that

929

00:38:53,799 --> 00:38:50,720

point so I was just wondering if someone

930

00:38:55,960 --> 00:38:53,809

would like to take the the point on how

931

00:38:57,370 --> 00:38:55,970

do we get those things that aren't don't

932

00:38:59,799 --> 00:38:57,380

have heritage and don't have a pathway

933

00:39:02,010 --> 00:38:59,809

how do we create a pathway for that to

934

00:39:07,450 --> 00:39:05,049

well I guess I can I can speak to that

935

00:39:08,740 --> 00:39:07,460

sort of in the sense that that's not

936

00:39:11,440 --> 00:39:08,750

entirely true I think that's a

937

00:39:14,740 --> 00:39:11,450

misconception and I'm going to promote a

938

00:39:16,960 --> 00:39:14,750

you know colleague Tony Rico's work out

939

00:39:19,930 --> 00:39:16,970

of NASA Ames where they've been among

940

00:39:22,180 --> 00:39:19,940

the first to do some amazing small Sat

941

00:39:26,650 --> 00:39:22,190

payloads using microfluidics to do

942

00:39:29,799 --> 00:39:26,660

biology experiments so you know in fact

943

00:39:32,380 --> 00:39:29,809

they're there you know and and so hey

944

00:39:34,870 --> 00:39:32,390

that's a great template you know there

945

00:39:36,880 --> 00:39:34,880

are a lot of sort of nooks and crannies

946

00:39:38,109 --> 00:39:36,890

to try to put things into space and as

947

00:39:40,030 --> 00:39:38,119

soon as you're in space you have

948

00:39:42,190 --> 00:39:40,040

heritage and it may not be perfect

949

00:39:45,609 --> 00:39:42,200

heritage but then you're sort of maybe

950

00:39:47,829 --> 00:39:45,619

closer to I take a piece of this and a

951
00:39:50,470 --> 00:39:47,839
piece of that and and you can start to

952
00:39:52,630 --> 00:39:50,480
build it up so I guess for micro

953
00:39:55,299 --> 00:39:52,640
fluidics I think it's slow but it is

954
00:39:57,010 --> 00:39:55,309
actually happening and that's taking

955
00:39:59,460 --> 00:39:57,020
those opportunities and putting them

956
00:40:03,940 --> 00:39:59,470
together is what we need to keep doing

957
00:40:05,140 --> 00:40:03,950
yeah ok I was just going to add on you

958
00:40:06,970 --> 00:40:05,150
were talking about the small sets but

959
00:40:09,430 --> 00:40:06,980
there are a number of other flight

960
00:40:12,309 --> 00:40:09,440
opportunities that you can take it

961
00:40:15,730 --> 00:40:12,319
Vantage of through the Meza proposal

962
00:40:17,170 --> 00:40:15,740
system yeah that's I would just say fly

963
00:40:19,569 --> 00:40:17,180

fly fly flight anywhere

964

00:40:23,620 --> 00:40:19,579

balloons high off the aircraft small

965

00:40:24,819 --> 00:40:23,630

SATs CubeSat sounding rockets and also

966

00:40:27,040 --> 00:40:24,829

try to take advantage of the technology

967

00:40:28,780 --> 00:40:27,050

development programs they're crazy

968

00:40:31,450 --> 00:40:28,790

competitive they're crazy competitive

969

00:40:32,829 --> 00:40:31,460

but you got to write the proposals and

970

00:40:34,569 --> 00:40:32,839

realize maybe it's going to take you to

971

00:40:36,069 --> 00:40:34,579

three times you can get feedback in the

972

00:40:39,970 --> 00:40:36,079

review panel the proposals going to get

973

00:40:45,609 --> 00:40:39,980

better but you you know that's that is a

974

00:40:47,050 --> 00:40:45,619

path to move it up but I guess I do kind

975

00:40:49,800 --> 00:40:47,060

of agree though there is there's this

976
00:40:53,230 --> 00:40:49,810
wall that you're trying to jump over and

977
00:40:56,740 --> 00:40:53,240
once in a while you do see just a really

978
00:40:58,150 --> 00:40:56,750
new thing appear on a mission and for

979
00:41:01,050 --> 00:40:58,160
whatever reason it's you know the time

980
00:41:04,930 --> 00:41:01,060
is right for that that measurement the

981
00:41:06,550 --> 00:41:04,940
risk posture is lower the review

982
00:41:10,180 --> 00:41:06,560
panelists all went out and got drunk the

983
00:41:12,220 --> 00:41:10,190
night before whatever you know and and

984
00:41:17,160 --> 00:41:12,230
so I think it also comes back to

985
00:41:22,089 --> 00:41:17,170
perseverance with those new technology

986
00:41:23,680 --> 00:41:22,099
do they tend to have widespread adoption

987
00:41:27,910 --> 00:41:23,690
in the scientific community ahead of

988
00:41:30,040 --> 00:41:27,920

time well I mean some you know some are

989

00:41:32,260 --> 00:41:30,050
coming from summer kind of a

990

00:41:33,640 --> 00:41:32,270
manifestation of that that the

991

00:41:35,170 --> 00:41:33,650
scientific community is working with the

992

00:41:38,010 --> 00:41:35,180
commercial world and these things are

993

00:41:40,420 --> 00:41:38,020
becoming benchtop desktop devices

994

00:41:42,490 --> 00:41:40,430
they're just becoming more reliable the

995

00:41:44,620 --> 00:41:42,500
perception of the risk of some of these

996

00:41:46,750 --> 00:41:44,630
methodologies goes down as they're but

997

00:41:49,809 --> 00:41:46,760
more widely adopted in the community and

998

00:41:52,150 --> 00:41:49,819
in the commercial world as well as I

999

00:41:55,030 --> 00:41:52,160
speak to the entry level so Jim

1000

00:41:58,079 --> 00:41:55,040
mentioned the the various calls that we

1001
00:42:02,020 --> 00:41:58,089
have and very recently reorganized our

1002
00:42:05,380 --> 00:42:02,030
technology development to separate and

1003
00:42:08,260 --> 00:42:05,390
refocus some attention on early ideas

1004
00:42:09,910 --> 00:42:08,270
and what they call TRL level one through

1005
00:42:13,390 --> 00:42:09,920
three and then things that actually

1006
00:42:16,059 --> 00:42:13,400
start getting developed to get closer to

1007
00:42:18,069 --> 00:42:16,069
to flight and I think that for many in

1008
00:42:19,450 --> 00:42:18,079
the room you're not worried about flying

1009
00:42:21,790 --> 00:42:19,460
something you're probably worried about

1010
00:42:23,680 --> 00:42:21,800
that entry level and so

1011
00:42:26,560 --> 00:42:23,690
if you have an idea you should look at

1012
00:42:27,850 --> 00:42:26,570
the sorts of calls like it so we're

1013
00:42:30,430 --> 00:42:27,860

really we think we're clever at

1014

00:42:31,930 --> 00:42:30,440

headquarters we like acronyms and one of

1015

00:42:34,510 --> 00:42:31,940

them is Picasso and that's the

1016

00:42:36,820 --> 00:42:34,520

entry-level one and the one that's more

1017

00:42:38,290 --> 00:42:36,830

towards maturation is Matisse and that's

1018

00:42:41,440 --> 00:42:38,300

no comment on the talents of those

1019

00:42:44,830 --> 00:42:41,450

artists and and so I think that you're

1020

00:42:47,200 --> 00:42:44,840

the entry level for this group is at for

1021

00:42:49,150 --> 00:42:47,210

many of you with Picasso and perhaps if

1022

00:42:51,700 --> 00:42:49,160

you don't have an idea Jim also

1023

00:42:55,060 --> 00:42:51,710

mentioned you if someone tagged you to

1024

00:42:58,840 --> 00:42:55,070

review we do get people who review on

1025

00:43:00,370 --> 00:42:58,850

our technology that also technology

1026

00:43:02,500 --> 00:43:00,380

panels that also are focused on the

1027

00:43:05,740 --> 00:43:02,510

science on our valuating how important

1028

00:43:10,180 --> 00:43:05,750

is this method starting to give feedback

1029

00:43:13,030 --> 00:43:10,190

to proposers about what kind of you know

1030

00:43:14,920 --> 00:43:13,040

handling what kind of limitations you've

1031

00:43:17,590 --> 00:43:14,930

experienced yourself even when you're in

1032

00:43:19,570 --> 00:43:17,600

the laboratory or in the field using

1033

00:43:21,310 --> 00:43:19,580

instruments as they're proposing so I

1034

00:43:23,590 --> 00:43:21,320

think for this group you know getting

1035

00:43:24,820 --> 00:43:23,600

involved in at that level and then I

1036

00:43:28,120 --> 00:43:24,830

would just reiterate that they've

1037

00:43:29,350 --> 00:43:28,130

identified we know that there's we first

1038

00:43:30,010 --> 00:43:29,360

realizes they're powerful there was

1039

00:43:31,510 --> 00:43:30,020

something called

1040

00:43:33,070 --> 00:43:31,520

I guess the valley of death is used for

1041

00:43:35,890 --> 00:43:33,080

lots of things but there is a valley of

1042

00:43:38,500 --> 00:43:35,900

death for technology in the jumped from

1043

00:43:40,990 --> 00:43:38,510

one one to four maybe and then to get

1044

00:43:43,090 --> 00:43:41,000

five and six and ready for flight and so

1045

00:43:44,530 --> 00:43:43,100

we just took four that we also know

1046

00:43:47,170 --> 00:43:44,540

there's this problem with getting access

1047

00:43:48,820 --> 00:43:47,180

and developing heritage and as these

1048

00:43:52,090 --> 00:43:48,830

guys mentioned their balloons there's

1049

00:43:54,160 --> 00:43:52,100

the ISS there's small fats there's a

1050

00:43:56,650 --> 00:43:54,170

bunch of different programs that are

1051

00:43:59,220 --> 00:43:56,660

likely to because they're relatively

1052

00:44:03,160 --> 00:43:59,230

inexpensive to provide opportunities for

1053

00:44:05,230 --> 00:44:03,170

flight let me also offer the piece of

1054

00:44:06,940 --> 00:44:05,240

advice to to really get to know the

1055

00:44:08,320 --> 00:44:06,950

heritage instruments because when you

1056

00:44:11,050 --> 00:44:08,330

when you know what the inherited

1057

00:44:13,440 --> 00:44:11,060

instruments can do then you know you can

1058

00:44:16,360 --> 00:44:13,450

use your thinking self to actually

1059

00:44:19,540 --> 00:44:16,370

understand where the gaps are and what

1060

00:44:21,130 --> 00:44:19,550

naturally falls out of the bias

1061

00:44:23,380 --> 00:44:21,140

requirements and maybe meets the fire

1062

00:44:28,450 --> 00:44:23,390

size requirements best and so I really

1063

00:44:30,220 --> 00:44:28,460

like what Jim said about you know maybe

1064

00:44:32,110 --> 00:44:30,230

taking a hybrid approach where you let

1065

00:44:33,880 --> 00:44:32,120

the hot the heritage instrument do what

1066

00:44:34,750 --> 00:44:33,890

it does best but take a look at maybe

1067

00:44:38,170 --> 00:44:34,760

the science

1068

00:44:40,210 --> 00:44:38,180

is really best done by by something that

1069

00:44:41,830 --> 00:44:40,220

might be a little bit new yeah that's

1070

00:44:44,770 --> 00:44:41,840

not a great example of that too is

1071

00:44:47,230 --> 00:44:44,780

actually the the ice penetrating radar

1072

00:44:48,730 --> 00:44:47,240

system that we're now sending to Europa

1073

00:44:50,440 --> 00:44:48,740

was actually first proposed for Europa

1074

00:44:52,810 --> 00:44:50,450

it was really difficult we didn't get

1075

00:44:54,700 --> 00:44:52,820

any missions and what ended up being the

1076

00:44:57,100 --> 00:44:54,710

first ice-penetrating radar was actually

1077

00:44:58,570 --> 00:44:57,110

an ionospheric founder and so they were

1078

00:45:01,930 --> 00:44:58,580

like this could be used as an ice

1079

00:45:04,300 --> 00:45:01,940

penetrating radar but we're sending this

1080

00:45:06,370 --> 00:45:04,310

as an ionospheric sounding instrument

1081

00:45:08,380 --> 00:45:06,380

it's called Marcy's and so it's

1082

00:45:09,610 --> 00:45:08,390

relatively low resolution but it what's

1083

00:45:12,520 --> 00:45:09,620

turned out to do is absolutely

1084

00:45:14,470 --> 00:45:12,530

spectacular subsurface sounding and icy

1085

00:45:15,670 --> 00:45:14,480

areas and so it's a perfect example of

1086

00:45:17,350 --> 00:45:15,680

being like this is an ice penetrating

1087

00:45:20,140 --> 00:45:17,360

radar we know what tonight ionospheric

1088

00:45:21,580 --> 00:45:20,150

sounder and so it sounded like a thing

1089

00:45:23,740 --> 00:45:21,590

that people had sent before and it was

1090

00:45:25,540 --> 00:45:23,750

because those technologies are similar

1091

00:45:26,650 --> 00:45:25,550

so anyway so I think that there's lots

1092

00:45:31,210 --> 00:45:26,660

of pathways I know there was at least

1093

00:45:33,940 --> 00:45:31,220

one question yeah just just building a

1094

00:45:36,250 --> 00:45:33,950

little bit on the entry I would be

1095

00:45:38,080 --> 00:45:36,260

remiss representing I act if I didn't

1096

00:45:40,540 --> 00:45:38,090

point out there's another path for entry

1097

00:45:42,010 --> 00:45:40,550

into you know trying to understand

1098

00:45:42,730 --> 00:45:42,020

whether your instrument is ready for

1099

00:45:45,970 --> 00:45:42,740

primetime

1100

00:45:49,690 --> 00:45:45,980

meri talked about the TRL level one to

1101
00:45:53,500 --> 00:45:49,700
the Picasso Matisse pathway if your TRL

1102
00:45:55,750 --> 00:45:53,510
zero then Nyack is the right place to

1103
00:45:58,330 --> 00:45:55,760
try to suggest that maybe you have a

1104
00:46:02,920 --> 00:45:58,340
concept that isn't ready for primetime

1105
00:46:05,230 --> 00:46:02,930
but should be and penny Boston is a is a

1106
00:46:08,380 --> 00:46:05,240
fellow of Myakka Lynn Rothschild a

1107
00:46:10,930 --> 00:46:08,390
fellow of Nyack so we have astrobiology

1108
00:46:15,520 --> 00:46:10,940
types that are well represented in our

1109
00:46:19,060 --> 00:46:15,530
cast of fellows but the real difference

1110
00:46:21,400 --> 00:46:19,070
in Nyack from a technology development

1111
00:46:24,460 --> 00:46:21,410
program is we really don't pay you to

1112
00:46:28,240 --> 00:46:24,470
develop your technology what we do is we

1113
00:46:30,880 --> 00:46:28,250

we give you a grant of about 125 K for a

1114

00:46:36,010 --> 00:46:30,890

year to show us that your technology

1115

00:46:38,320 --> 00:46:36,020

should be considered for for NASA and by

1116

00:46:42,070 --> 00:46:38,330

putting your by putting it in a mission

1117

00:46:44,230 --> 00:46:42,080

context and if you are interested in

1118

00:46:45,760 --> 00:46:44,240

this at all it's highly recommended that

1119

00:46:47,320 --> 00:46:45,770

you talk to one of us in the program

1120

00:46:48,050 --> 00:46:47,330

office before you submit your bid

1121

00:46:49,910 --> 00:46:48,060

because

1122

00:46:52,790 --> 00:46:49,920

the hard part for communities like this

1123

00:46:54,440 --> 00:46:52,800

is taking their technology which is what

1124

00:46:56,630 --> 00:46:54,450

they really love the instrument that

1125

00:46:59,990 --> 00:46:56,640

they really love and putting it in a

1126

00:47:01,490 --> 00:47:00,000

mission context to show that it's

1127

00:47:04,850 --> 00:47:01,500

something that NASA would want to do

1128

00:47:06,530 --> 00:47:04,860

someday so you know this is for all of

1129

00:47:10,040 --> 00:47:06,540

you dreamers out there both the

1130

00:47:11,660 --> 00:47:10,050

entry-level postdoc graduate students

1131

00:47:14,180 --> 00:47:11,670

and all the way up through the seasoned

1132

00:47:16,010 --> 00:47:14,190

guys that have had this same banging at

1133

00:47:17,540 --> 00:47:16,020

the back of their head for decades but

1134

00:47:21,920 --> 00:47:17,550

they just didn't know what to do with it

1135

00:47:24,470 --> 00:47:21,930

so we found about 15 to 16 grants a year

1136

00:47:26,660 --> 00:47:24,480

at the phase one something to consider

1137

00:47:28,460 --> 00:47:26,670

and we in the program office are happy

1138

00:47:31,160 --> 00:47:28,470

to help you understand what the

1139

00:47:33,710 --> 00:47:31,170

constraints of the program are and since

1140

00:47:37,670 --> 00:47:33,720

it is different from a formal technology

1141

00:47:40,310 --> 00:47:37,680

development program thanks are there

1142

00:47:42,200 --> 00:47:40,320

anyone else nobody has questions for how

1143

00:47:47,030 --> 00:47:42,210

to get an instrument on a spacecraft

1144

00:47:48,770 --> 00:47:47,040

come on man oh yeah this might be kind

1145

00:47:51,770 --> 00:47:48,780

of a wide-ranging question and I welcome

1146

00:47:54,230 --> 00:47:51,780

responses from anyone about this but it

1147

00:47:56,690 --> 00:47:54,240

seems as though on the launch services

1148

00:47:58,820 --> 00:47:56,700

side in the commercial side there's a

1149

00:48:01,850 --> 00:47:58,830

changing relationship of risk with

1150

00:48:04,970 --> 00:48:01,860

launch vehicles itself and I wondered if

1151

00:48:07,220 --> 00:48:04,980

there's any sense that the TRL

1152

00:48:09,620 --> 00:48:07,230

development program itself might have to

1153

00:48:11,030 --> 00:48:09,630

anticipate and evolve with the increased

1154

00:48:12,710 --> 00:48:11,040

amount of risk that a lot of these

1155

00:48:15,260 --> 00:48:12,720

launch service providers seem to be

1156

00:48:17,720 --> 00:48:15,270

accepting for themselves Blue Origin and

1157

00:48:19,580 --> 00:48:17,730

SpaceX for example and in the satellite

1158

00:48:22,400 --> 00:48:19,590

development and the rapid testing rapid

1159

00:48:23,900 --> 00:48:22,410

prototyping rapid flying kind of regime

1160

00:48:25,880 --> 00:48:23,910

that they're entering is there an

1161

00:48:28,490 --> 00:48:25,890

anticipation that the TRL development

1162

00:48:30,920 --> 00:48:28,500

program will evolve to be more like this

1163

00:48:33,860 --> 00:48:30,930

or on the other side that there might be

1164

00:48:36,050 --> 00:48:33,870

some dialogue for mirroring the TRL

1165

00:48:38,750 --> 00:48:36,060

Development Program with some of these

1166

00:48:43,580 --> 00:48:38,760

private people and try to find some some

1167

00:48:45,920 --> 00:48:43,590

areas of overlap so that's that's a

1168

00:48:47,630 --> 00:48:45,930

great question and you're right the

1169

00:48:50,900 --> 00:48:47,640

commercial world is really starting to

1170

00:48:53,270 --> 00:48:50,910

come online with opportunities for for

1171

00:48:56,810 --> 00:48:53,280

science which is spectacular

1172

00:48:58,310 --> 00:48:56,820

I could personal experience I don't see

1173

00:48:59,950 --> 00:48:58,320

them thinking that way and I think they

1174

00:49:03,670 --> 00:48:59,960

think like NASA

1175

00:49:06,040 --> 00:49:03,680

you want to launch a small sad with a

1176

00:49:07,840 --> 00:49:06,050

crazy risky experiment that you're not

1177

00:49:09,550 --> 00:49:07,850

sure it'll work and it's got some moving

1178

00:49:10,690 --> 00:49:09,560

parts would survive the shock a launch

1179

00:49:13,240 --> 00:49:10,700

will it work in the right environment

1180

00:49:15,910 --> 00:49:13,250

but boy if it does then it's got that

1181

00:49:19,240 --> 00:49:15,920

heritage and you know you can make the

1182

00:49:21,580 --> 00:49:19,250

case to get it on you know a SpaceX or

1183

00:49:24,190 --> 00:49:21,590

another launch company I don't care

1184

00:49:27,070 --> 00:49:24,200

are you paying for the ride you buying

1185

00:49:29,740 --> 00:49:27,080

the ride okay go have a good time you

1186

00:49:33,280 --> 00:49:29,750

know and so it comes down to having to

1187

00:49:36,940 --> 00:49:33,290

talk Mary into paying for your launch or

1188

00:49:39,460 --> 00:49:36,950

your university president or your Center

1189

00:49:42,520 --> 00:49:39,470

Director or you're independently wealthy

1190

00:49:44,170 --> 00:49:42,530

and you just pay it out of pocket but

1191

00:49:46,390 --> 00:49:44,180

that's incredible that you could do that

1192

00:49:49,750 --> 00:49:46,400

any of us could do that now that's

1193

00:49:51,010 --> 00:49:49,760

totally new what what's happening I

1194

00:49:52,690 --> 00:49:51,020

think is there's there's going to be

1195

00:49:54,550 --> 00:49:52,700

this there's already this developing

1196

00:49:56,050 --> 00:49:54,560

relationship between NASA and other

1197

00:49:58,900 --> 00:49:56,060

space agencies with the commercial

1198

00:50:01,240 --> 00:49:58,910

sector and buy and launch opportunities

1199

00:50:04,000 --> 00:50:01,250

and then it won't be a free-for-all

1200

00:50:06,010 --> 00:50:04,010

there'll be a competition but NASA is

1201
00:50:08,770 --> 00:50:06,020
providing these these opportunities and

1202
00:50:11,170 --> 00:50:08,780
and then you're back to competing and

1203
00:50:13,990 --> 00:50:11,180
trying to make the case that this

1204
00:50:15,130 --> 00:50:14,000
deserves a shot at this but it is the

1205
00:50:22,140 --> 00:50:15,140
case that you could just do it on your

1206
00:50:27,190 --> 00:50:24,850
so this might be a I guess a no-brainer

1207
00:50:29,260 --> 00:50:27,200
but I kind of I sometimes get an

1208
00:50:31,810 --> 00:50:29,270
impression that we as astrobiologists

1209
00:50:35,470 --> 00:50:31,820
gavotte tunnel vision upwards and there

1210
00:50:37,090 --> 00:50:35,480
um I guess comments from you about you

1211
00:50:38,590 --> 00:50:37,100
know their science still to do on here

1212
00:50:41,500 --> 00:50:38,600
on earth and I'm sure the people who

1213
00:50:43,510 --> 00:50:41,510

were in the hydrothermal vent sessions

1214

00:50:45,960 --> 00:50:43,520

here at the conference would love better

1215

00:50:48,490 --> 00:50:45,970

math specs and better and

1216

00:50:50,170 --> 00:50:48,500

electrophoresis devices to put on subs

1217

00:50:52,210 --> 00:50:50,180

and I know for certain I would love

1218

00:50:56,080 --> 00:50:52,220

better instruments that I can put under

1219

00:50:57,790 --> 00:50:56,090

harsh conditions in the lab so you know

1220

00:50:59,230 --> 00:50:57,800

there's those collaborations there with

1221

00:51:01,930 --> 00:50:59,240

colleagues who maybe might not otherwise

1222

00:51:03,850 --> 00:51:01,940

work with and things to do there so

1223

00:51:05,440 --> 00:51:03,860

maybe you have comments on that yeah

1224

00:51:09,070 --> 00:51:05,450

actually uh so Amanda and I are doing

1225

00:51:11,070 --> 00:51:09,080

exactly that I was a crazy person

1226
00:51:12,750 --> 00:51:11,080
decided to build a robot with my startup

1227
00:51:15,060 --> 00:51:12,760
having not done

1228
00:51:16,820 --> 00:51:15,070
myself before but what's awesome is that

1229
00:51:22,380 --> 00:51:16,830
since amanda is at the same institution

1230
00:51:24,780 --> 00:51:22,390
we through a microfluidic device on to

1231
00:51:25,950 --> 00:51:24,790
our our proposal for that and so we're

1232
00:51:27,600 --> 00:51:25,960
actually trying to do that like little

1233
00:51:30,510 --> 00:51:27,610
pseudo missions and it's a great

1234
00:51:32,850 --> 00:51:30,520
experience too because leading

1235
00:51:34,740 --> 00:51:32,860
technology teams even as a scientist or

1236
00:51:35,940 --> 00:51:34,750
the scientific background is a really

1237
00:51:38,040 --> 00:51:35,950
great place to cut your teeth on

1238
00:51:39,870 --> 00:51:38,050

figuring out how a mission might work on

1239

00:51:41,550 --> 00:51:39,880

a greater scale so men and I have an

1240

00:51:42,960 --> 00:51:41,560

example of that kind of thing and I

1241

00:51:45,990 --> 00:51:42,970

think that's that's very true is that

1242

00:51:48,900 --> 00:51:46,000

there's ways to to pitch the instruments

1243

00:51:50,790 --> 00:51:48,910

back and forth and get them more more

1244

00:51:53,580 --> 00:51:50,800

experienced but Amanda maybe you have a

1245

00:51:57,030 --> 00:51:53,590

couple more comments um so as you know

1246

00:52:00,330 --> 00:51:57,040

Adam a large fraction of my program does

1247

00:52:02,160 --> 00:52:00,340

do field work and so there's a lot of

1248

00:52:03,390 --> 00:52:02,170

science that you really would love to do

1249

00:52:06,120 --> 00:52:03,400

in the field and some of these new

1250

00:52:08,310 --> 00:52:06,130

technologies could possibly help you get

1251
00:52:10,550 --> 00:52:08,320
those done and it's great for the

1252
00:52:12,660 --> 00:52:10,560
instrument developers too because

1253
00:52:14,010 --> 00:52:12,670
basically you need to be able to show

1254
00:52:16,350 --> 00:52:14,020
that it would work here before you have

1255
00:52:18,120 --> 00:52:16,360
any hope of it working elsewhere in my

1256
00:52:20,580 --> 00:52:18,130
personal opinion and I think a few of

1257
00:52:22,410 --> 00:52:20,590
you may share that opinion so

1258
00:52:24,630 --> 00:52:22,420
partnerships between instrument

1259
00:52:27,420 --> 00:52:24,640
developers and and field scientists is a

1260
00:52:31,110 --> 00:52:27,430
wonderful route forward so say that

1261
00:52:33,030 --> 00:52:31,120
NASA's focus to a great extent is is yes

1262
00:52:34,590 --> 00:52:33,040
we look to the Stars and beyond Earth

1263
00:52:36,090 --> 00:52:34,600

but we know that we're only going to get

1264

00:52:38,790 --> 00:52:36,100

there if we understand how to do things

1265

00:52:41,070 --> 00:52:38,800

here on earth initially and I just like

1266

00:52:44,160 --> 00:52:41,080

to share a success story that is a prime

1267

00:52:47,490 --> 00:52:44,170

example of iteration of development

1268

00:52:50,160 --> 00:52:47,500

between funding from NASA funding from

1269

00:52:53,430 --> 00:52:50,170

NSF and and funding and development for

1270

00:52:57,660 --> 00:52:53,440

at Hui and that was we funded a group to

1271

00:52:59,580 --> 00:52:57,670

develop to further develop a mass spec

1272

00:53:02,700 --> 00:52:59,590

to develop autonomous operations of a

1273

00:53:05,010 --> 00:53:02,710

vehicle and this group at Woods Hole led

1274

00:53:08,190 --> 00:53:05,020

by Dana Gege then actually was asked to

1275

00:53:11,700 --> 00:53:08,200

deploy this to map out deep horizon

1276

00:53:14,280 --> 00:53:11,710

plume and you know that the underwater

1277

00:53:16,860 --> 00:53:14,290

vehicle had been developed by by who we

1278

00:53:19,110 --> 00:53:16,870

through independent other other funding

1279

00:53:22,080 --> 00:53:19,120

but that autonomy and that instrument

1280

00:53:23,700 --> 00:53:22,090

were instrumental in and actually being

1281

00:53:25,499 --> 00:53:23,710

able to determine what was happening

1282

00:53:27,239 --> 00:53:25,509

with that plume so you know

1283

00:53:29,249 --> 00:53:27,249

those are things that we look for we

1284

00:53:32,129 --> 00:53:29,259

really know that we have to partner we

1285

00:53:35,249 --> 00:53:32,139

know that there is a gigantic source of

1286

00:53:36,809 --> 00:53:35,259

talent and engineering capabilities and

1287

00:53:38,849 --> 00:53:36,819

instrument development going on for

1288

00:53:41,219 --> 00:53:38,859

exploring our own world and you really

1289

00:53:42,779 --> 00:53:41,229

don't want to reinvent the wheel right

1290

00:53:45,569 --> 00:53:42,789

and so Goddard hasn't lost sight of this

1291

00:53:47,939 --> 00:53:45,579

either and we have a very vigorous field

1292

00:53:49,349 --> 00:53:47,949

field work aspect or work and also

1293

00:53:50,939 --> 00:53:49,359

partner with people who go out to the

1294

00:53:53,429 --> 00:53:50,949

field and get us interesting samples

1295

00:53:55,919 --> 00:53:53,439

that we can exercise our instruments

1296

00:53:57,659 --> 00:53:55,929

with there's new Picasso in fact that

1297

00:54:02,759 --> 00:53:57,669

looking at underwater mass spectrometry

1298

00:54:04,199 --> 00:54:02,769

so definitely of interest yeah yeah I

1299

00:54:06,269 --> 00:54:04,209

just want to make a comment I think this

1300

00:54:08,429 --> 00:54:06,279

is a very good discussion on you know

1301
00:54:10,859 --> 00:54:08,439
how to make use of what we can do here

1302
00:54:14,399 --> 00:54:10,869
so your instrument looks like it's more

1303
00:54:18,179 --> 00:54:14,409
ready for spaceflight the equation is

1304
00:54:21,120 --> 00:54:18,189
not necessarily heritage and risk but

1305
00:54:23,639 --> 00:54:21,130
it's actually cost risk and so so much

1306
00:54:25,169 --> 00:54:23,649
of the review is well this looks like a

1307
00:54:26,849 --> 00:54:25,179
really interesting instrument but it

1308
00:54:29,909 --> 00:54:26,859
hasn't been flown before we don't know

1309
00:54:31,529 --> 00:54:29,919
if they can get there and as it is not

1310
00:54:34,049 --> 00:54:31,539
whether or not the instrument will work

1311
00:54:37,229 --> 00:54:34,059
it's how much money is it going to cost

1312
00:54:40,349 --> 00:54:37,239
NASA to get it to work to get it on the

1313
00:54:45,299 --> 00:54:40,359

launch pad and so doing things such as

1314

00:54:46,739 --> 00:54:45,309

getting on cube SATs or getting into the

1315

00:54:49,349 --> 00:54:46,749

field and having your instrument do

1316

00:54:52,439 --> 00:54:49,359

things in different environments helps

1317

00:54:54,899 --> 00:54:52,449

reassure the review panel that even

1318

00:54:57,439 --> 00:54:54,909

though this may not have flown it looks

1319

00:55:00,689 --> 00:54:57,449

fairly robust and it's not going to be a

1320

00:55:02,939 --> 00:55:00,699

big surprise expense to get it to the

1321

00:55:04,829 --> 00:55:02,949

launch pad so it's something to keep in

1322

00:55:06,719 --> 00:55:04,839

mind and so the other half of that

1323

00:55:08,489 --> 00:55:06,729

equation is if you have a cheap

1324

00:55:10,620 --> 00:55:08,499

instrument you'll probably have more

1325

00:55:13,159 --> 00:55:10,630

opportunities because they'll be willing

1326

00:55:16,979 --> 00:55:13,169

to take that risk because it's not that

1327

00:55:18,509 --> 00:55:16,989

big of an investment so and that kind of

1328

00:55:21,359 --> 00:55:18,519

plays also into the commercial thing

1329

00:55:23,999 --> 00:55:21,369

where mary may not want to cough up the

1330

00:55:27,349 --> 00:55:24,009

money for a launch and a hundred million

1331

00:55:29,789 --> 00:55:27,359

dollars for an instrument if there's

1332

00:55:32,459 --> 00:55:29,799

some concern about whether or not the

1333

00:55:35,819 --> 00:55:32,469

launch will be successful sure but if

1334

00:55:37,769 --> 00:55:35,829

it's a relatively cheap flight

1335

00:55:39,250 --> 00:55:37,779

instrument you might be willing to make

1336

00:55:43,050 --> 00:55:39,260

that bet because the payoffs are

1337

00:55:48,070 --> 00:55:43,060

worth the risk I would also say just

1338

00:55:49,330 --> 00:55:48,080

something to think about is figuring out

1339

00:55:53,020 --> 00:55:49,340

how to be one of those people that's

1340

00:55:55,990 --> 00:55:53,030

reviewing so there's you know kind of a

1341

00:55:58,060 --> 00:55:56,000

bank of experience and and they'll pull

1342

00:56:01,990 --> 00:55:58,070

from that to review missions the same as

1343

00:56:04,470 --> 00:56:02,000

for instrument proposals but the what's

1344

00:56:08,860 --> 00:56:04,480

that I'm going to mess up the name the

1345

00:56:11,350 --> 00:56:08,870

DMC su propia timko so the PMC panel so

1346

00:56:12,850 --> 00:56:11,360

that's the technical evaluation so

1347

00:56:14,950 --> 00:56:12,860

there's a science evaluation of missions

1348

00:56:17,260 --> 00:56:14,960

and instruments and there's a technical

1349

00:56:20,080 --> 00:56:17,270

evaluation and so those aren't those are

1350

00:56:22,330 --> 00:56:20,090

kind of separate processes so if you

1351
00:56:23,350 --> 00:56:22,340
have interest in this or experience in

1352
00:56:25,750 --> 00:56:23,360
astrobiology I think we need more

1353
00:56:28,180 --> 00:56:25,760
astrobiologists reviewing and for those

1354
00:56:30,250 --> 00:56:28,190
things so I would say you know talk to

1355
00:56:31,570 --> 00:56:30,260
talk to headquarters about how to do

1356
00:56:34,150 --> 00:56:31,580
that because having people that

1357
00:56:37,420 --> 00:56:34,160
understand the science and the

1358
00:56:39,190 --> 00:56:37,430
technology that are new and and very

1359
00:56:40,600 --> 00:56:39,200
important to this community on the

1360
00:56:43,120 --> 00:56:40,610
review panel's I think will really also

1361
00:56:44,890 --> 00:56:43,130
very much help that's a great point is

1362
00:56:47,200 --> 00:56:44,900
this at once so technical management

1363
00:56:50,200 --> 00:56:47,210

costs other I think they drop the other

1364

00:56:51,880 --> 00:56:50,210

but yeah so Brittany's right there's two

1365

00:56:55,210 --> 00:56:51,890

separate review panels essentially that

1366

00:56:58,810 --> 00:56:55,220

review these things and I will say from

1367

00:57:00,430 --> 00:56:58,820

experience you know the your instrument

1368

00:57:03,760 --> 00:57:00,440

your idea your mission could be

1369

00:57:05,830 --> 00:57:03,770

technically spectacular amazing

1370

00:57:09,010 --> 00:57:05,840

management right on the line on cost if

1371

00:57:10,720 --> 00:57:09,020

you haven't excited the engineers and

1372

00:57:11,890 --> 00:57:10,730

the managers and the cost modelers with

1373

00:57:14,350 --> 00:57:11,900

the science you're not going to get

1374

00:57:16,510 --> 00:57:14,360

selected so the science really it's it's

1375

00:57:19,630 --> 00:57:16,520

really heartwarming to me how it drives

1376

00:57:21,460 --> 00:57:19,640

that technical side of a date you want

1377

00:57:22,930 --> 00:57:21,470

those your engineering buddies to be all

1378

00:57:27,430 --> 00:57:22,940

Mike we have to do this this is

1379

00:57:29,830 --> 00:57:27,440

spectacular now let's pick it apart and

1380

00:57:31,330 --> 00:57:29,840

say one good entry to is in fact it was

1381

00:57:33,520 --> 00:57:31,340

the very first interaction I had with

1382

00:57:35,710 --> 00:57:33,530

NASA's I was on an a step panel when

1383

00:57:39,220 --> 00:57:35,720

Michael Mayer was running it and it was

1384

00:57:40,960 --> 00:57:39,230

amazing to interact with engineers I

1385

00:57:43,600 --> 00:57:40,970

actually had a little book that I kept

1386

00:57:45,130 --> 00:57:43,610

creating my own lexicon of exactly so I

1387

00:57:46,960 --> 00:57:45,140

would understand what brass board

1388

00:57:50,800 --> 00:57:46,970

breadboard and all sorts of other things

1389

00:57:51,990 --> 00:57:50,810

meant but there was it was really fun

1390

00:57:53,250 --> 00:57:52,000

trying to

1391

00:57:56,700 --> 00:57:53,260

in some of my excitement for a

1392

00:58:00,570 --> 00:57:56,710

scientific purpose for an instrument or

1393

00:58:03,840 --> 00:58:00,580

technology and then to laugh at me isn't

1394

00:58:05,850 --> 00:58:03,850

my naivete but after that I mean it you

1395

00:58:07,800 --> 00:58:05,860

know again P star is now the current a

1396

00:58:10,230 --> 00:58:07,810

step that's a great way you get a nice

1397

00:58:11,640 --> 00:58:10,240

mix you can feel relatively confident

1398

00:58:14,010 --> 00:58:11,650

that you have something to offer because

1399

00:58:16,230 --> 00:58:14,020

there's science in that but also get a

1400

00:58:22,050 --> 00:58:16,240

really great introduction to technology

1401
00:58:24,840 --> 00:58:22,060
and and mission operations yeah comment

1402
00:58:27,180 --> 00:58:24,850
on getting to the high TRL level so that

1403
00:58:28,980 --> 00:58:27,190
even a sounding rocket or cube set

1404
00:58:30,600 --> 00:58:28,990
doesn't necessarily show you flight

1405
00:58:32,580 --> 00:58:30,610
heritage if you're going to say Europa

1406
00:58:34,440 --> 00:58:32,590
Enceladus and thank you lies in

1407
00:58:36,330 --> 00:58:34,450
radiation something that everybody has

1408
00:58:37,530 --> 00:58:36,340
more control over and more access to as

1409
00:58:39,300 --> 00:58:37,540
you figure out what the environment is

1410
00:58:41,730 --> 00:58:39,310
and you can simulate it here on earth

1411
00:58:43,260 --> 00:58:41,740
and you can show that you can be TRL 6

1412
00:58:44,520 --> 00:58:43,270
without ever having gone to space

1413
00:58:46,080 --> 00:58:44,530

because you can simulate the whole

1414

00:58:48,360 --> 00:58:46,090

environment which is what we do for

1415

00:58:50,070 --> 00:58:48,370

every flight instrument anyway and so if

1416

00:58:51,900 --> 00:58:50,080

you do a mini version of that it's

1417

00:58:53,970 --> 00:58:51,910

something you can do without having to

1418

00:58:55,680 --> 00:58:53,980

go through the whole expensive process

1419

00:58:56,940 --> 00:58:55,690

of getting there so yeah we're going to

1420

00:59:01,290 --> 00:58:56,950

have confidence that it's going to make

1421

00:59:03,000 --> 00:59:01,300

it and sure yeah almost anything doesn't

1422

00:59:05,250 --> 00:59:03,010

have heritage when you go to a place

1423

00:59:07,980 --> 00:59:05,260

like Europa or i/o where the radiation

1424

00:59:09,600 --> 00:59:07,990

environment is incredibly intense so I'm

1425

00:59:12,030 --> 00:59:09,610

thinking about that and retiring risk in

1426
00:59:13,560 --> 00:59:12,040
that in that area can be a good move so

1427
00:59:15,630 --> 00:59:13,570
let's take the last question and then

1428
00:59:16,920 --> 00:59:15,640
we'll wrap it up well it's just a

1429
00:59:19,200 --> 00:59:16,930
comment I haven't heard anything said

1430
00:59:21,030 --> 00:59:19,210
about the ISS which is a way that you

1431
00:59:23,760 --> 00:59:21,040
can fly something or you can get TRL

1432
00:59:25,770 --> 00:59:23,770
it's not exactly in vacuum but it's also

1433
00:59:28,110 --> 00:59:25,780
got there's a lot of money on the hgmd

1434
00:59:31,020 --> 00:59:28,120
side and they've done biology for

1435
00:59:33,000 --> 00:59:31,030
decades now on the ISS so I did say ISS

1436
00:59:35,070 --> 00:59:33,010
I'm sorry that's ok and might we've sent

1437
00:59:37,880 --> 00:59:35,080
micro fluidics and funded stuff for that

1438
00:59:41,430 --> 00:59:37,890

we've sent ya no no that's absolutely

1439

00:59:43,350 --> 00:59:41,440

yeah but but thanks if you didn't hear

1440

00:59:45,840 --> 00:59:43,360

it and you were hoping there no one else

1441

00:59:47,460 --> 00:59:45,850

heard it so thank you yes we've said a

1442

00:59:50,040 --> 00:59:47,470

lot of acronyms so just to review a

1443

00:59:52,170 --> 00:59:50,050

couple of them PSA so those are the

1444

00:59:54,510 --> 00:59:52,180

people doing technical reviews of

1445

00:59:56,730 --> 00:59:54,520

missions and instruments we talked about

1446

00:59:58,890 --> 00:59:56,740

P stars so that's the planetary science

1447

01:00:00,550 --> 00:59:58,900

and technology for us or for analog

1448

01:00:02,920 --> 01:00:00,560

research

1449

01:00:05,740 --> 01:00:02,930

other acronyms living through a Picasso

1450

01:00:08,620 --> 01:00:05,750

that's the low TRL program and Matisse

1451

01:00:12,040 --> 01:00:08,630

is the high TRL programs maturation

1452

01:00:15,550 --> 01:00:12,050

program but I just want to go back to

1453

01:00:16,960 --> 01:00:15,560

the assessment group so Oh TRL technical

1454

01:00:21,040 --> 01:00:16,970

readiness level or technology readiness

1455

01:00:24,160 --> 01:00:21,050

level one of those no worries um we got

1456

01:00:25,750 --> 01:00:24,170

you um but uh yeah I just wanted to go

1457

01:00:28,180 --> 01:00:25,760

back because we're a science community

1458

01:00:29,590 --> 01:00:28,190

let's circle back to this idea so Jim

1459

01:00:31,030 --> 01:00:29,600

actually said something you know maybe

1460

01:00:32,830 --> 01:00:31,040

we should have an astrobiology agggghhh

1461

01:00:35,140 --> 01:00:32,840

I actually think that we should just

1462

01:00:37,270 --> 01:00:35,150

raise the noise floor in the existing

1463

01:00:38,860 --> 01:00:37,280

communities because at this point in

1464

01:00:40,540 --> 01:00:38,870

time everybody said Oh Mars has been

1465

01:00:42,130 --> 01:00:40,550

very successful let's have our own egg

1466

01:00:42,910 --> 01:00:42,140

and then we'll have ten missions that's

1467

01:00:44,560 --> 01:00:42,920

not how it works

1468

01:00:46,750 --> 01:00:44,570

the next mission isn't just ode to

1469

01:00:49,300 --> 01:00:46,760

anyone you have to get in and roll up

1470

01:00:51,280 --> 01:00:49,310

sleeves and accept the beating that will

1471

01:00:53,530 --> 01:00:51,290

come as you get through the process and

1472

01:00:55,480 --> 01:00:53,540

so those those assessment groups are

1473

01:00:58,120 --> 01:00:55,490

really important and I don't remember

1474

01:01:01,150 --> 01:00:58,130

when the next V tag one is but the next

1475

01:01:03,540 --> 01:01:01,160

outer planets assessment group meeting

1476

01:01:06,970 --> 01:01:03,550

is going to be in San Diego in September

1477

01:01:08,560 --> 01:01:06,980

and so I would highly encourage folks

1478

01:01:10,270 --> 01:01:08,570

who are interested in that if you can't

1479

01:01:13,030 --> 01:01:10,280

make it to San Diego it's sometimes hard

1480

01:01:14,770 --> 01:01:13,040

to get travel dollars to do that we've

1481

01:01:17,440 --> 01:01:14,780

been trying to get at least a few early

1482

01:01:18,400 --> 01:01:17,450

career folks there for each of those for

1483

01:01:20,620 --> 01:01:18,410

those meetings and that will again

1484

01:01:23,440 --> 01:01:20,630

happen for the September meeting but

1485

01:01:26,200 --> 01:01:23,450

they're always online as well and so

1486

01:01:27,970 --> 01:01:26,210

listen in and comment and talk on you

1487

01:01:29,410 --> 01:01:27,980

know ask questions and try to

1488

01:01:32,830 --> 01:01:29,420

participate in that process

1489

01:01:34,840 --> 01:01:32,840

because it's a long lead-time activity

1490

01:01:37,300 --> 01:01:34,850

you have to be thinking about it 10

1491

01:01:39,190 --> 01:01:37,310

years before it's going to happen so I

1492

01:01:43,030 --> 01:01:39,200

hope that that's hopefully helpful did

1493

01:01:45,460 --> 01:01:43,040

you have something when - oh there you

1494

01:01:48,160 --> 01:01:45,470

go affect the small bodies a specimen

1495

01:01:49,660 --> 01:01:48,170

group so anyway I hope this has been at

1496

01:01:51,610 --> 01:01:49,670

least informational for poor folks

1497

01:01:53,940 --> 01:01:51,620

please come to those eggs and please

1498

01:01:56,500 --> 01:01:53,950

talk to your planetary science

1499

01:01:58,810 --> 01:01:56,510

colleagues and let's just try to raise

1500

01:02:00,280 --> 01:01:58,820

the noise floor on life detection and

1501

01:02:02,200 --> 01:02:00,290

complex chemistry and all these things

1502

01:02:03,580 --> 01:02:02,210

that we care so deeply about so that in

1503

01:02:05,170 --> 01:02:03,590

10 years were having a conversation

1504

01:02:07,060 --> 01:02:05,180

about all of the detection we've made

1505

01:02:09,190 --> 01:02:07,070

instead of or maybe it'll be 20 years

1506

01:02:11,470 --> 01:02:09,200

instead of how are we going to make this

1507

01:02:13,900 --> 01:02:11,480

this time so I'm going to say that

1508

01:02:17,380 --> 01:02:13,910

TI's our sponsors here the new planetary

1509

01:02:19,300 --> 01:02:17,390

Institute hosts websites for each of the

1510

01:02:21,460 --> 01:02:19,310

eggs and so if you just want to get a

1511

01:02:22,840 --> 01:02:21,470

flavor of what sort of business gets

1512

01:02:25,210 --> 01:02:22,850

conducted there are agendas and

1513

01:02:28,740 --> 01:02:25,220

presentations so you can take a look at

1514

01:02:31,859 --> 01:02:28,750

what yes I guess they don't have to

1515

01:02:34,750 --> 01:02:31,869

technology no microphone oh just wait

1516

01:02:37,359 --> 01:02:34,760

exactly anyway so you can look there and

1517

01:02:40,180 --> 01:02:37,369

get a flavor before you you dive in and

1518

01:02:41,740 --> 01:02:40,190

see what people have been doing so yep

1519

01:02:43,020 --> 01:02:41,750

well I'd like to thank our panelists so