



1
00:00:05,990 --> 00:00:03,030
good morning welcome to the jet

2
00:00:08,390 --> 00:00:06,000
propulsion laboratory i'm cynthia zufada

3
00:00:11,350 --> 00:00:08,400
the associate chief scientist

4
00:00:12,390 --> 00:00:11,360
we are thrilled by the presence of so

5
00:00:15,669 --> 00:00:12,400
many

6
00:00:18,470 --> 00:00:15,679
college students with us today

7
00:00:21,590 --> 00:00:18,480
to celebrate women history month

8
00:00:24,630 --> 00:00:21,600
across the nasa family events are taking

9
00:00:28,070 --> 00:00:24,640
place to recognize the key role women

10
00:00:29,669 --> 00:00:28,080
are playing in the success of our nation

11
00:00:32,150 --> 00:00:29,679
space program

12
00:00:34,709 --> 00:00:32,160
in all over the world

13
00:00:37,270 --> 00:00:34,719

women day international women day is

14

00:00:40,150 --> 00:00:37,280

being celebrated

15

00:00:43,190 --> 00:00:40,160

today you will hear from women leaders

16

00:00:46,549 --> 00:00:43,200

in science and engineering who want to

17

00:00:49,350 --> 00:00:46,559

share a bit of their stories and also

18

00:00:52,869 --> 00:00:49,360

want to hear from you

19

00:00:54,950 --> 00:00:52,879

and now to tell you about who we are

20

00:00:57,750 --> 00:00:54,960

let me invite the director of the

21

00:01:03,990 --> 00:00:57,760

laboratory dr charles celachi to the

22

00:01:10,310 --> 00:01:07,270

thank you cynthia and i want to welcome

23

00:01:11,350 --> 00:01:10,320

all of you to jpl on this great event to

24

00:01:13,830 --> 00:01:11,360

talk about

25

00:01:15,830 --> 00:01:13,840

history of women in science i need to

26

00:01:17,670 --> 00:01:15,840

tell you from the beginning i'm biased

27

00:01:20,230 --> 00:01:17,680

matter of fact i'm very biased on this

28

00:01:21,990 --> 00:01:20,240

topic because i have two daughters

29

00:01:24,230 --> 00:01:22,000

i think they are the smartest human

30

00:01:27,109 --> 00:01:24,240

being in the world even i sometimes i

31

00:01:29,830 --> 00:01:27,119

see them walking on water so so i'm a

32

00:01:31,429 --> 00:01:29,840

little bit biased on this topic

33

00:01:33,109 --> 00:01:31,439

matter of fact

34

00:01:35,510 --> 00:01:33,119

i know they are smarter even than their

35

00:01:38,149 --> 00:01:35,520

dad i want to tell you a little anecdote

36

00:01:41,030 --> 00:01:38,159

about four or five years ago when our

37

00:01:42,310 --> 00:01:41,040

younger daughter was in college uh you

38

00:01:46,149 --> 00:01:42,320

know we bought one of this very

39

00:01:48,550 --> 00:01:46,159

sophisticated tv dvd cd you know

40

00:01:50,069 --> 00:01:48,560

electronic and she was at home so of

41

00:01:51,910 --> 00:01:50,079

course i opened the manual trying to

42

00:01:53,270 --> 00:01:51,920

figure out how to put it together she

43

00:01:54,789 --> 00:01:53,280

didn't even look at the manual she

44

00:01:56,230 --> 00:01:54,799

helped me she put it all together and

45

00:01:58,069 --> 00:01:56,240

then she went back

46

00:01:59,830 --> 00:01:58,079

back to college and the following day i

47

00:02:01,590 --> 00:01:59,840

was trying to turn on

48

00:02:03,270 --> 00:02:01,600

uh and and watch something and i

49

00:02:04,950 --> 00:02:03,280

couldn't figure it out you know i looked

50

00:02:06,870 --> 00:02:04,960

at the

51
00:02:08,229 --> 00:02:06,880
guide i couldn't figure out so i said so

52
00:02:10,150 --> 00:02:08,239
i picked the phone and called lauren and

53
00:02:12,070 --> 00:02:10,160
said lauren how do you do this

54
00:02:14,309 --> 00:02:12,080
and there was this few second silence

55
00:02:16,070 --> 00:02:14,319
and she and she said and that and you

56
00:02:18,309 --> 00:02:16,080
run jpl

57
00:02:21,670 --> 00:02:18,319
so that's one her nice way of saying

58
00:02:24,229 --> 00:02:21,680
she's smarter than me on doing that

59
00:02:27,270 --> 00:02:24,239
now no question we have come a long long

60
00:02:29,270 --> 00:02:27,280
way in the role of women in in science i

61
00:02:31,510 --> 00:02:29,280
remember when i was a student at caltech

62
00:02:33,190 --> 00:02:31,520
that was the first year that women were

63
00:02:36,390 --> 00:02:33,200

accepted at caltech

64

00:02:39,270 --> 00:02:36,400

today the freshman class is 44 percent

65

00:02:42,790 --> 00:02:39,280

you know are women you know at caltech

66

00:02:44,309 --> 00:02:42,800

when in the early days of jpl in the 60s

67

00:02:46,790 --> 00:02:44,319

uh even that there were women their

68

00:02:48,949 --> 00:02:46,800

technical role was very limited uh the

69

00:02:51,509 --> 00:02:48,959

main thing uh technical work that the

70

00:02:53,589 --> 00:02:51,519

women were doing was we were relying on

71

00:02:55,030 --> 00:02:53,599

them to do calculation of trajectories i

72

00:02:56,550 --> 00:02:55,040

guess they were more they were more

73

00:02:58,550 --> 00:02:56,560

conscientious about doing proper

74

00:03:01,110 --> 00:02:58,560

calculation you know than the rest of

75

00:03:03,350 --> 00:03:01,120

the lab well today 30 percent of our

76
00:03:04,630 --> 00:03:03,360
technical staff you know our women here

77
00:03:06,470 --> 00:03:04,640
at jpl

78
00:03:08,869 --> 00:03:06,480
uh if we can show the slide that show

79
00:03:11,030 --> 00:03:08,879
you just a montage of some of them uh

80
00:03:12,309 --> 00:03:11,040
that are here uh i'm always nervous to

81
00:03:14,390 --> 00:03:12,319
show these montages because people will

82
00:03:15,589 --> 00:03:14,400
tell me what what is my picture you know

83
00:03:18,070 --> 00:03:15,599
in that one

84
00:03:19,830 --> 00:03:18,080
uh on the executive council when i

85
00:03:22,070 --> 00:03:19,840
joined the executive council about 15

86
00:03:24,550 --> 00:03:22,080
years ago there were no women on the

87
00:03:27,509 --> 00:03:24,560
executive council or no deputies

88
00:03:29,509 --> 00:03:27,519

today we have five women including a

89

00:03:31,670 --> 00:03:29,519

woman who has all our technical

90

00:03:34,309 --> 00:03:31,680

divisions at 70 percent of the labs

91

00:03:36,309 --> 00:03:34,319

where all the engineers and scientists

92

00:03:38,149 --> 00:03:36,319

are in the organization headed by leslie

93

00:03:40,070 --> 00:03:38,159

livesay and

94

00:03:41,589 --> 00:03:40,080

we have also a woman heading our earth

95

00:03:45,430 --> 00:03:41,599

science activity which is one of the

96

00:03:47,350 --> 00:03:45,440

largest you know activity here at jpl

97

00:03:49,430 --> 00:03:47,360

and interesting enough also we have

98

00:03:51,030 --> 00:03:49,440

today a couple of the speaker also in

99

00:03:52,229 --> 00:03:51,040

those days we didn't have many women or

100

00:03:53,430 --> 00:03:52,239

matter of fact i'm not sure there were

101
00:03:55,830 --> 00:03:53,440
any women who were principal

102
00:03:57,830 --> 00:03:55,840
investigators you know on missions that

103
00:03:59,990 --> 00:03:57,840
mean for the people who are not in our

104
00:04:02,070 --> 00:04:00,000
field principal investigator is a person

105
00:04:03,990 --> 00:04:02,080
who's really in charge of a mission so

106
00:04:06,470 --> 00:04:04,000
they run that mission scientifically and

107
00:04:08,550 --> 00:04:06,480
oversee all the technical implementation

108
00:04:10,470 --> 00:04:08,560
well in the last year

109
00:04:12,390 --> 00:04:10,480
we launched two pi mission and we're

110
00:04:14,710 --> 00:04:12,400
launching one coming up literally

111
00:04:16,710 --> 00:04:14,720
hopefully this month out of those three

112
00:04:18,710 --> 00:04:16,720
two of them you know are women principal

113
00:04:20,870 --> 00:04:18,720

investigator and you'll be hearing from

114

00:04:23,110 --> 00:04:20,880

them even that they are one of them

115

00:04:24,950 --> 00:04:23,120

maria's uber is from mit and fiona

116

00:04:27,189 --> 00:04:24,960

harrison from caltech to pretty good

117

00:04:29,189 --> 00:04:27,199

schools you know that we have but we

118

00:04:31,030 --> 00:04:29,199

consider them as honorary members you

119

00:04:32,870 --> 00:04:31,040

know of jpl you know they worked with us

120

00:04:35,030 --> 00:04:32,880

for a number of years you know to make

121

00:04:36,870 --> 00:04:35,040

this mission a success

122

00:04:39,510 --> 00:04:36,880

so as you can see

123

00:04:41,189 --> 00:04:39,520

uh women have come a long way there is

124

00:04:43,749 --> 00:04:41,199

still way to go but women have come a

125

00:04:45,749 --> 00:04:43,759

long way and i think it's very important

126

00:04:47,350 --> 00:04:45,759

that all of us we reach to the young

127

00:04:49,350 --> 00:04:47,360

girls in schools

128

00:04:51,909 --> 00:04:49,360

and tell them that being in science and

129

00:04:54,230 --> 00:04:51,919

engineering is not only fun

130

00:04:56,150 --> 00:04:54,240

but also you can build a great career in

131

00:04:57,990 --> 00:04:56,160

doing that and you can make an impact

132

00:05:00,310 --> 00:04:58,000

you know in in the whole field at least

133

00:05:03,270 --> 00:05:00,320

in exploration and space science but

134

00:05:04,550 --> 00:05:03,280

also across you know across the field so

135

00:05:07,350 --> 00:05:04,560

today you are going to be hearing

136

00:05:09,749 --> 00:05:07,360

stories of challenges and accomplishment

137

00:05:11,670 --> 00:05:09,759

that women have accomplished here at jpl

138

00:05:13,749 --> 00:05:11,680

and have experienced you know here at

139

00:05:15,270 --> 00:05:13,759

jpl and the kind of things that they are

140

00:05:17,270 --> 00:05:15,280

working on today

141

00:05:18,710 --> 00:05:17,280

and we look forward at least i look

142

00:05:21,830 --> 00:05:18,720

forward and i know many people look

143

00:05:24,950 --> 00:05:21,840

forward uh you know uh for the impact

144

00:05:27,270 --> 00:05:24,960

and the accomplishment and uh and the

145

00:05:30,550 --> 00:05:27,280

advancement that women will do in an

146

00:05:32,550 --> 00:05:30,560

organization like jpl and hopefully few

147

00:05:33,749 --> 00:05:32,560

years from now not too far in the future

148

00:05:36,150 --> 00:05:33,759

when you come here and you are being

149

00:05:38,310 --> 00:05:36,160

welcomed by the jpl director it will be

150

00:05:40,550 --> 00:05:38,320

a woman who will be a director of jpl

151
00:05:51,029 --> 00:05:40,560
thank you very much and i look forward

152
00:05:53,270 --> 00:05:52,390
so and now

153
00:05:57,510 --> 00:05:53,280
as

154
00:05:59,110 --> 00:05:57,520
we are getting ready for our first panel

155
00:06:02,670 --> 00:05:59,120
of the speakers

156
00:06:07,270 --> 00:06:02,680
uh let me say a few more things about

157
00:06:09,830 --> 00:06:07,280
participation here we have over 200

158
00:06:11,350 --> 00:06:09,840
students from

159
00:06:14,070 --> 00:06:11,360
many many

160
00:06:17,110 --> 00:06:14,080
local area schools

161
00:06:21,510 --> 00:06:17,120
universities colleges who

162
00:06:27,110 --> 00:06:21,520
have been invited to be here and we want

163
00:06:30,070 --> 00:06:27,120

to bring you into our family here at jpl

164

00:06:34,230 --> 00:06:30,080

and hopefully make this a

165

00:06:36,070 --> 00:06:34,240

a good experience for you a way of

166

00:06:38,790 --> 00:06:36,080

sharing what we do

167

00:06:40,309 --> 00:06:38,800

a way of

168

00:06:47,590 --> 00:06:40,319

making

169

00:06:50,710 --> 00:06:47,600

so for our first panel we have assembled

170

00:06:54,390 --> 00:06:50,720

a truly unique group of distinguished

171

00:06:56,550 --> 00:06:54,400

women as charles has alluded to

172

00:07:00,629 --> 00:06:56,560

who have achieved

173

00:07:03,909 --> 00:07:00,639

leadership positions in space missions

174

00:07:05,830 --> 00:07:03,919

pat morrison a journalist with the los

175

00:07:08,870 --> 00:07:05,840

angeles times

176

00:07:12,710 --> 00:07:08,880

in the southern california public radio

177

00:07:14,309 --> 00:07:12,720

has generously lent her time to be here

178

00:07:17,749 --> 00:07:14,319

with us today

179

00:07:19,990 --> 00:07:17,759

to engage them in a conversation

180

00:07:26,710 --> 00:07:20,000

about what they do

181

00:07:30,469 --> 00:07:28,629

we're going to be hearing from each of

182

00:07:32,309 --> 00:07:30,479

our panelists i'll be asking them some

183

00:07:33,830 --> 00:07:32,319

questions and and then taking some

184

00:07:35,909 --> 00:07:33,840

questions of course from you in the

185

00:07:38,230 --> 00:07:35,919

audience so be thinking of good ones as

186

00:07:42,230 --> 00:07:38,240

i'm sure you will these ladies have done

187

00:07:44,070 --> 00:07:42,240

the vital work of uh of space work um me

188

00:07:45,110 --> 00:07:44,080

i've covered a few space shuttles from a

189

00:07:49,430 --> 00:07:45,120

distance

190

00:07:51,589 --> 00:07:49,440

extent of it i was watching a public

191

00:07:54,070 --> 00:07:51,599

access channel today which is to tell

192

00:07:56,230 --> 00:07:54,080

you how basic my basic cable is and

193

00:07:58,070 --> 00:07:56,240

there was a high school science quiz

194

00:08:00,550 --> 00:07:58,080

competition for los angeles and it was

195

00:08:02,950 --> 00:08:00,560

the finals and there were two teams

196

00:08:04,950 --> 00:08:02,960

four members each and not a one of those

197

00:08:07,830 --> 00:08:04,960

eight was female

198

00:08:09,909 --> 00:08:07,840

now if you step up to post k through 12

199

00:08:11,589 --> 00:08:09,919

education more than half of the students

200

00:08:13,189 --> 00:08:11,599

enrolled at many colleges and

201
00:08:15,270 --> 00:08:13,199
universities are women but in the

202
00:08:17,670 --> 00:08:15,280
sciences enrollment is a fraction of

203
00:08:20,230 --> 00:08:17,680
that and in academic positions you find

204
00:08:22,550 --> 00:08:20,240
even fewer my friend francis arnold is

205
00:08:24,230 --> 00:08:22,560
doing stupendous things at cal tech of

206
00:08:26,550 --> 00:08:24,240
course sandra singh lowe is doing great

207
00:08:28,950 --> 00:08:26,560
science on the radio my sister-in-law

208
00:08:30,710 --> 00:08:28,960
teaches physics my niece went to mit i

209
00:08:32,389 --> 00:08:30,720
left a couple of seconds there for all

210
00:08:34,149 --> 00:08:32,399
the caltech people to boo if they wanted

211
00:08:35,750 --> 00:08:34,159
to

212
00:08:37,350 --> 00:08:35,760
but see i'm running out of women before

213
00:08:39,589 --> 00:08:37,360

i'm running out of fingers and that's a

214

00:08:42,550 --> 00:08:39,599

bit of a problem in our society

215

00:08:43,990 --> 00:08:42,560

women make up half the workforce overall

216

00:08:47,269 --> 00:08:44,000

but in science technology and

217

00:08:48,790 --> 00:08:47,279

engineering they're barely 25 percent

218

00:08:50,790 --> 00:08:48,800

why is that the case

219

00:08:52,470 --> 00:08:50,800

is it scientific illiteracy we certainly

220

00:08:54,150 --> 00:08:52,480

have that neil degrasse tyson was

221

00:08:56,630 --> 00:08:54,160

telling me the other day that about one

222

00:08:59,509 --> 00:08:56,640

in five americans still believes that

223

00:09:01,509 --> 00:08:59,519

the sun revolves around the earth

224

00:09:03,110 --> 00:09:01,519

is it cultural pressure some of you

225

00:09:05,430 --> 00:09:03,120

won't remember this because you weren't

226

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

even born then but 20 years ago

227

00:09:11,430 --> 00:09:08,240

teen talk barbie doll said things like

228

00:09:12,550 --> 00:09:11,440

party dresses are fun and math class is

229

00:09:14,150 --> 00:09:12,560

tough

230

00:09:16,070 --> 00:09:14,160

well there was an outcry from women's

231

00:09:18,070 --> 00:09:16,080

groups and mattel recalled the math

232

00:09:19,350 --> 00:09:18,080

challenge barbie but that sensibility is

233

00:09:21,030 --> 00:09:19,360

still out there

234

00:09:23,269 --> 00:09:21,040

if you were to ask the average american

235

00:09:25,990 --> 00:09:23,279

to name one woman scientist he would

236

00:09:27,990 --> 00:09:26,000

probably name marie curie if you ask the

237

00:09:30,389 --> 00:09:28,000

average american to name two women

238

00:09:32,470 --> 00:09:30,399

scientists he would probably be stumped

239

00:09:34,550 --> 00:09:32,480

he might name the amy character on the

240

00:09:36,470 --> 00:09:34,560

big bang theory

241

00:09:38,230 --> 00:09:36,480

or he might know roslyn franklin who was

242

00:09:40,150 --> 00:09:38,240

the woman who died before she could be

243

00:09:42,710 --> 00:09:40,160

considered for her work on the structure

244

00:09:44,150 --> 00:09:42,720

of dna for a nobel prize it could have

245

00:09:46,550 --> 00:09:44,160

carolyn herschel who was half of the

246

00:09:48,230 --> 00:09:46,560

brother and sister astronomer team now i

247

00:09:50,310 --> 00:09:48,240

have a couple of favorites you'll find

248

00:09:53,269 --> 00:09:50,320

out why in a second nancy johnson of

249

00:09:57,750 --> 00:09:53,279

philadelphia about 150 years ago she got

250

00:10:02,070 --> 00:10:00,150

and a young british food chemist named

251
00:10:04,230 --> 00:10:02,080
margaret roberts was in on the creation

252
00:10:05,670 --> 00:10:04,240
of the soft serve ice cream you may know

253
00:10:08,710 --> 00:10:05,680
her better by the name in her other

254
00:10:11,269 --> 00:10:08,720
career margaret thatcher

255
00:10:13,030 --> 00:10:11,279
as for women in space well some people

256
00:10:15,110 --> 00:10:13,040
would say the first one was alice

257
00:10:16,790 --> 00:10:15,120
kramden on the tv show the honeymooners

258
00:10:19,190 --> 00:10:16,800
because her bus driver husband kept

259
00:10:21,190 --> 00:10:19,200
threatening to soccer and send her to

260
00:10:22,150 --> 00:10:21,200
the moon alice

261
00:10:24,069 --> 00:10:22,160
but

262
00:10:25,670 --> 00:10:24,079
there have been still so few women in

263
00:10:27,269 --> 00:10:25,680

space that if i were asked the question

264

00:10:29,030 --> 00:10:27,279

on jeopardy of course that isn't a

265

00:10:31,670 --> 00:10:29,040

question they'd say

266

00:10:33,750 --> 00:10:31,680

first woman in space i'd say alex who is

267

00:10:35,190 --> 00:10:33,760

valentina taraskova

268

00:10:36,630 --> 00:10:35,200

one of those pieces of information that

269

00:10:37,829 --> 00:10:36,640

you keep in your head because there are

270

00:10:39,269 --> 00:10:37,839

so few

271

00:10:41,670 --> 00:10:39,279

but women in space science are what

272

00:10:44,550 --> 00:10:41,680

we're hearing about today these women up

273

00:10:46,550 --> 00:10:44,560

here have overcome myriad obstacles to

274

00:10:48,230 --> 00:10:46,560

make it to the top of their disciplines

275

00:10:49,190 --> 00:10:48,240

and how they did it you're going to hear

276

00:10:51,430 --> 00:10:49,200

from them

277

00:10:53,509 --> 00:10:51,440

the first is margaret kibbleson phd in

278

00:10:55,430 --> 00:10:53,519

theoretical physics in the 1950s

279

00:10:58,550 --> 00:10:55,440

professor of space science space physics

280

00:11:00,470 --> 00:10:58,560

at ucla team leader on two pioneer

281

00:11:02,310 --> 00:11:00,480

missions for jupiter the rest she's

282

00:11:09,190 --> 00:11:02,320

going to tell you herself

283

00:11:14,389 --> 00:11:11,670

so today i'm talking about working in a

284

00:11:17,430 --> 00:11:14,399

man's world because that's where i

285

00:11:20,710 --> 00:11:17,440

started at a time when space science

286

00:11:23,030 --> 00:11:20,720

didn't exist so i did not do my phd in

287

00:11:25,829 --> 00:11:23,040

space physics but that's a nice thing

288

00:11:27,910 --> 00:11:25,839

about physics is that once you learn it

289

00:11:30,310 --> 00:11:27,920

you can use it for space or ice cream

290

00:11:32,389 --> 00:11:30,320

makers

291

00:11:35,350 --> 00:11:32,399

so next

292

00:11:37,509 --> 00:11:35,360

anyhow my first message is that if you

293

00:11:41,350 --> 00:11:37,519

get yourself in an environment where

294

00:11:43,590 --> 00:11:41,360

it's mostly men pretend not to notice

295

00:11:46,150 --> 00:11:43,600

next but today

296

00:11:48,790 --> 00:11:46,160

the point is to notice so we're going to

297

00:11:50,310 --> 00:11:48,800

start with that

298

00:11:52,230 --> 00:11:50,320

next

299

00:11:54,790 --> 00:11:52,240

so when i started

300

00:11:57,190 --> 00:11:54,800

in physics at harvard

301

00:11:59,670 --> 00:11:57,200

it was immediately after world war ii

302

00:12:00,790 --> 00:11:59,680

and physics was quite glamorous i think

303

00:12:03,509 --> 00:12:00,800

perhaps

304

00:12:06,230 --> 00:12:03,519

it was the most glamorous state that it

305

00:12:07,430 --> 00:12:06,240

had held in my lifetime

306

00:12:10,550 --> 00:12:07,440

uh

307

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

and i decided i want to be a physicist i

308

00:12:13,910 --> 00:12:12,720

started in my freshman year in a class

309

00:12:16,629 --> 00:12:13,920

with 10

310

00:12:19,750 --> 00:12:16,639

women and 400 men

311

00:12:23,829 --> 00:12:19,760

i then went on for phd

312

00:12:27,590 --> 00:12:23,839

and roughly one woman in every class of

313

00:12:29,910 --> 00:12:27,600

about 60 phd graduate students

314

00:12:31,430 --> 00:12:29,920

was a woman

315

00:12:34,629 --> 00:12:31,440

of the roughly

316

00:12:37,990 --> 00:12:34,639

one a year who was admitted roughly one

317

00:12:41,829 --> 00:12:38,000

got a phd every other year and there was

318

00:12:44,230 --> 00:12:41,839

always somebody who was dropping out

319

00:12:45,190 --> 00:12:44,240

before they completed their degree

320

00:12:46,710 --> 00:12:45,200

so

321

00:12:48,949 --> 00:12:46,720

next

322

00:12:53,190 --> 00:12:48,959

the the image you see was the

323

00:12:55,670 --> 00:12:53,200

celebration of the 60th birthday of my

324

00:12:58,150 --> 00:12:55,680

advisor julian schwinger who was a nobel

325

00:13:00,710 --> 00:12:58,160

laureate and you notice the

326

00:13:02,629 --> 00:13:00,720

significant lack of women if it

327

00:13:04,150 --> 00:13:02,639

hadn't been for me there would have been

328

00:13:05,269 --> 00:13:04,160

none

329

00:13:06,470 --> 00:13:05,279

next

330

00:13:09,190 --> 00:13:06,480

so

331

00:13:11,990 --> 00:13:09,200

what you can see is in this beginning of

332

00:13:15,670 --> 00:13:12,000

my career it went from 1 in 40

333

00:13:17,430 --> 00:13:15,680

undergraduates 1 in 60 graduate students

334

00:13:20,470 --> 00:13:17,440

120

335

00:13:23,990 --> 00:13:20,480

phds definitely an example of the

336

00:13:25,509 --> 00:13:24,000

narrowing pipeline and pat has mentioned

337

00:13:26,710 --> 00:13:25,519

that next

338

00:13:32,150 --> 00:13:26,720

so

339

00:13:35,190 --> 00:13:32,160

plots to show you

340

00:13:36,069 --> 00:13:35,200

the changes in the number of women and

341

00:13:37,430 --> 00:13:36,079

the

342

00:13:39,670 --> 00:13:37,440

red curve

343

00:13:42,550 --> 00:13:39,680

is engineering the blue curve near the

344

00:13:45,110 --> 00:13:42,560

bottom is physics and what you can see

345

00:13:49,269 --> 00:13:45,120

is that between 1950

346

00:13:51,990 --> 00:13:49,279

and 200 1998 there was a slow increase

347

00:13:53,509 --> 00:13:52,000

up to about 20 percent of bachelor's

348

00:13:56,310 --> 00:13:53,519

degrees i'm just talking about

349

00:13:59,430 --> 00:13:56,320

bachelor's degrees uh i want to call

350

00:14:02,870 --> 00:13:59,440

next call your attention though to the

351
00:14:04,710 --> 00:14:02,880
up the second red curve which is the

352
00:14:07,829 --> 00:14:04,720
number of women getting bachelor's

353
00:14:11,189 --> 00:14:07,839
degrees in computer sciences and

354
00:14:13,590 --> 00:14:11,199
puzzlingly it increased very rapidly in

355
00:14:15,829 --> 00:14:13,600
the beginning of this period and then it

356
00:14:17,430 --> 00:14:15,839
began to decrease and it wasn't clear

357
00:14:19,150 --> 00:14:17,440
what was happening

358
00:14:22,150 --> 00:14:19,160
you can see i was trying to make an

359
00:14:25,590 --> 00:14:22,160
extrapolation to 2003

360
00:14:26,389 --> 00:14:25,600
with the physics line there next

361
00:14:29,110 --> 00:14:26,399
uh

362
00:14:31,030 --> 00:14:29,120
i finally found some the next decade

363
00:14:34,710 --> 00:14:31,040

although there's a gap of a couple of

364

00:14:37,350 --> 00:14:34,720

years and what you can see is that the

365

00:14:38,629 --> 00:14:37,360

computer sciences that's the dashed red

366

00:14:41,350 --> 00:14:38,639

curve

367

00:14:44,710 --> 00:14:41,360

flattened and continued down

368

00:14:47,189 --> 00:14:44,720

so it is not always next it is not

369

00:14:50,389 --> 00:14:47,199

always the case that things keep going

370

00:14:52,629 --> 00:14:50,399

up they can go up and they can go down

371

00:14:54,550 --> 00:14:52,639

uh the they didn't

372

00:14:57,269 --> 00:14:54,560

record physics separately but

373

00:14:59,990 --> 00:14:57,279

engineering was recorded separately in

374

00:15:02,230 --> 00:15:00,000

this and what you can see

375

00:15:04,470 --> 00:15:02,240

the flat line near the bottom

376

00:15:08,550 --> 00:15:04,480

is that engineering has remained fairly

377

00:15:11,750 --> 00:15:10,389

for bachelor's degree

378

00:15:13,750 --> 00:15:11,760

candidates

379

00:15:15,269 --> 00:15:13,760

next

380

00:15:17,590 --> 00:15:15,279

so i've

381

00:15:20,870 --> 00:15:17,600

gone through my

382

00:15:23,750 --> 00:15:20,880

albums and looked for

383

00:15:26,470 --> 00:15:23,760

women at in

384

00:15:30,310 --> 00:15:26,480

photographs i have of workshops and

385

00:15:31,350 --> 00:15:30,320

meetings and at the top you can see on

386

00:15:33,110 --> 00:15:31,360

the

387

00:15:35,590 --> 00:15:33,120

left you can see

388

00:15:37,990 --> 00:15:35,600

me with the galileo

389

00:15:40,710 --> 00:15:38,000

magnetometer team

390

00:15:42,629 --> 00:15:40,720

after one meeting and i think we have

391

00:15:45,110 --> 00:15:42,639

two women there

392

00:15:46,949 --> 00:15:45,120

then there's to the right of that is a

393

00:15:48,550 --> 00:15:46,959

turbulence workshop

394

00:15:51,509 --> 00:15:48,560

and again

395

00:15:55,269 --> 00:15:51,519

absence of women at the bottom

396

00:15:58,230 --> 00:15:55,279

is a group photograph of some of my

397

00:15:59,590 --> 00:15:58,240

students who came for a celebration

398

00:16:02,150 --> 00:15:59,600

and

399

00:16:05,189 --> 00:16:02,160

there is one woman among them now that

400

00:16:06,949 --> 00:16:05,199

was about a decade ago and

401
00:16:08,949 --> 00:16:06,959
happily now

402
00:16:11,189 --> 00:16:08,959
i have quite a few women graduate

403
00:16:12,470 --> 00:16:11,199
students so i'm very pleased with the

404
00:16:14,870 --> 00:16:12,480
change

405
00:16:17,910 --> 00:16:14,880
next

406
00:16:19,910 --> 00:16:17,920
i looked for photographs of award

407
00:16:21,110 --> 00:16:19,920
ceremonies

408
00:16:29,110 --> 00:16:21,120
one

409
00:16:29,910 --> 00:16:29,120
a lot of tuxedoed men up on the platform

410
00:16:33,269 --> 00:16:29,920
it's

411
00:16:36,430 --> 00:16:33,279
still a long long way to go before we

412
00:16:38,550 --> 00:16:36,440
will find women being honored

413
00:16:43,110 --> 00:16:38,560

proportionately to their

414

00:16:46,870 --> 00:16:43,120
representation even in the

415

00:16:53,430 --> 00:16:50,470
at ucla we've been making a very serious

416

00:16:55,670 --> 00:16:53,440
effort to recruit women and we've done a

417

00:16:58,150 --> 00:16:55,680
very good job of recruiting and we often

418

00:17:00,550 --> 00:16:58,160
lose them very quickly thereafter we're

419

00:17:05,110 --> 00:17:00,560
good at identifying people who are going

420

00:17:08,069 --> 00:17:06,789
next

421

00:17:11,270 --> 00:17:08,079
so

422

00:17:13,270 --> 00:17:11,280
to to end i wanted to show a few more

423

00:17:16,069 --> 00:17:13,280
pictures where you could see the

424

00:17:18,549 --> 00:17:16,079
progress in a little area of space

425

00:17:19,510 --> 00:17:18,559
physics these are group photographs

426
00:17:23,189 --> 00:17:19,520
taken

427
00:17:25,350 --> 00:17:23,199
at some of the roughly biennial meetings

428
00:17:27,750 --> 00:17:25,360
on magnetospheres of outer planets it's

429
00:17:30,310 --> 00:17:27,760
an international group so this is not

430
00:17:33,190 --> 00:17:30,320
just women in the u.s we're looking at

431
00:17:35,830 --> 00:17:33,200
but women from all over the world doing

432
00:17:37,270 --> 00:17:35,840
magnetospheres of the outer planets so

433
00:17:40,669 --> 00:17:37,280
next

434
00:17:44,870 --> 00:17:40,679
this is the first uh image i could find

435
00:17:48,549 --> 00:17:44,880
1977 in lindau germany i put a

436
00:17:52,630 --> 00:17:48,559
a red oval around every face that looked

437
00:17:57,590 --> 00:17:54,950
and it's not an accident that i'm in

438
00:18:00,150 --> 00:17:57,600

most of these photographs

439

00:18:02,470 --> 00:18:00,160

next please she's skewing the curve you

440

00:18:06,870 --> 00:18:02,480

know yeah i'm skewing the curve so

441

00:18:09,909 --> 00:18:06,880

here's 1986 in iowa i had left already

442

00:18:12,230 --> 00:18:09,919

so you could add one more circle next

443

00:18:16,310 --> 00:18:12,240

88 back to one

444

00:18:18,870 --> 00:18:16,320

uh next one uh the meeting at ucla we

445

00:18:21,990 --> 00:18:18,880

begin to see a sprinkling of maybe it's

446

00:18:23,590 --> 00:18:22,000

because i was running that meeting

447

00:18:27,029 --> 00:18:23,600

next

448

00:18:31,470 --> 00:18:27,039

uh so 2005 this is in leicester and we

449

00:18:34,870 --> 00:18:31,480

see more of the ovals red ovals next

450

00:18:36,710 --> 00:18:34,880

2007 in san antonio texas we're seeing

451
00:18:39,110 --> 00:18:36,720
even more next

452
00:18:41,430 --> 00:18:39,120
2009

453
00:18:44,390 --> 00:18:41,440
that was in cologne germany and the next

454
00:18:45,510 --> 00:18:44,400
one is last summer at

455
00:18:48,390 --> 00:18:45,520
bu

456
00:18:50,950 --> 00:18:48,400
so let's go to the next i decided to

457
00:18:53,190 --> 00:18:50,960
plot the fraction

458
00:18:54,310 --> 00:18:53,200
or percentage of women

459
00:18:57,190 --> 00:18:54,320
next

460
00:18:59,590 --> 00:18:57,200
and it does look as if it's going up

461
00:19:02,230 --> 00:18:59,600
but remember that

462
00:19:03,430 --> 00:19:02,240
computer science next

463
00:19:07,110 --> 00:19:03,440

next

464

00:19:10,710 --> 00:19:07,120

maybe it's going down i don't know

465

00:19:15,110 --> 00:19:10,720

it's not obvious what's happening next

466

00:19:21,510 --> 00:19:17,350

well done

467

00:19:27,990 --> 00:19:23,029

next

468

00:19:29,110 --> 00:19:28,000

nowhere but maybe they'll get you

469

00:19:30,230 --> 00:19:29,120

somewhere

470

00:19:32,789 --> 00:19:30,240

next

471

00:19:34,789 --> 00:19:32,799

this is one of my favorites you never

472

00:19:36,830 --> 00:19:34,799

can tell who's going to be looking in

473

00:19:39,510 --> 00:19:36,840

the right

474

00:19:47,190 --> 00:19:39,520

place thank you

475

00:19:50,470 --> 00:19:48,470

you've gone from sitting in the

476

00:19:53,190 --> 00:19:50,480

classroom at radcliffe to teaching in

477

00:19:56,230 --> 00:19:53,200

the classroom at ucla what's changed in

478

00:19:57,750 --> 00:19:56,240

the classroom has anything changed

479

00:19:59,590 --> 00:19:57,760

well i think there are a lot of things

480

00:20:01,750 --> 00:19:59,600

that have changed

481

00:20:06,230 --> 00:20:01,760

i think students are less polite than

482

00:20:10,549 --> 00:20:08,630

and there are more women there are more

483

00:20:12,710 --> 00:20:10,559

women

484

00:20:15,909 --> 00:20:12,720

in at ucla

485

00:20:18,310 --> 00:20:15,919

i in my department which is earth and

486

00:20:21,029 --> 00:20:18,320

space sciences

487

00:20:24,070 --> 00:20:21,039

a very large fraction of our students

488

00:20:26,070 --> 00:20:24,080

both male and female are from china and

489

00:20:29,029 --> 00:20:26,080

there we're bringing in a lot of

490

00:20:30,310 --> 00:20:29,039

terrific chinese women i would love to

491

00:20:32,950 --> 00:20:30,320

see more

492

00:20:34,950 --> 00:20:32,960

uh who uh women in my classroom have

493

00:20:37,909 --> 00:20:34,960

gone through the american education

494

00:20:38,789 --> 00:20:37,919

system i think there's a worry that we

495

00:20:40,470 --> 00:20:38,799

still

496

00:20:42,950 --> 00:20:40,480

don't

497

00:20:44,870 --> 00:20:42,960

attract women through whatever it is we

498

00:20:46,870 --> 00:20:44,880

do in education what is it that the

499

00:20:48,310 --> 00:20:46,880

women the american-born women who come

500

00:20:49,510 --> 00:20:48,320

into your class tell you about the

501
00:20:50,950 --> 00:20:49,520
education they've gotten the

502
00:20:53,590 --> 00:20:50,960
encouragement or the lack of it they've

503
00:20:56,070 --> 00:20:53,600
gotten i don't hear complaints i mean

504
00:20:57,590 --> 00:20:56,080
you know whatever it is that's going on

505
00:21:00,789 --> 00:20:57,600
is very subtle

506
00:21:03,669 --> 00:21:00,799
it's uh it's women are being

507
00:21:06,789 --> 00:21:03,679
are discouraged in ways that are very

508
00:21:08,470 --> 00:21:06,799
hard to to identify we had the president

509
00:21:10,310 --> 00:21:08,480
of harvard larry summers get himself in

510
00:21:13,909 --> 00:21:10,320
hot water by disparaging the abilities

511
00:21:15,990 --> 00:21:13,919
of women in science yeah and

512
00:21:19,909 --> 00:21:16,000
that was the lesson for larry summers

513
00:21:22,310 --> 00:21:19,919

but i'm not sure it was a lesson for me

514

00:21:24,390 --> 00:21:22,320

when you talk about that recruiting is

515

00:21:26,310 --> 00:21:24,400

good but retention is bad where are

516

00:21:28,149 --> 00:21:26,320

these women going the women who may come

517

00:21:31,029 --> 00:21:28,159

in with such enthusiasm

518

00:21:33,830 --> 00:21:31,039

the two things that uh two ways in which

519

00:21:36,789 --> 00:21:33,840

we lose women one is

520

00:21:38,870 --> 00:21:36,799

from uh they get offers from places that

521

00:21:39,830 --> 00:21:38,880

they find more attractive

522

00:21:40,870 --> 00:21:39,840

um

523

00:21:42,950 --> 00:21:40,880

and

524

00:21:46,070 --> 00:21:42,960

they're not many but there are a few

525

00:21:47,669 --> 00:21:46,080

places that can pull women away from

526
00:21:50,870 --> 00:21:47,679
ucla

527
00:21:53,669 --> 00:21:50,880
the ivy league colleges can

528
00:21:56,230 --> 00:21:53,679
berkeley stanford caltech

529
00:21:57,270 --> 00:21:56,240
and the other problem is the two career

530
00:22:00,149 --> 00:21:57,280
family

531
00:22:02,470 --> 00:22:00,159
and we lose quite a few we have lost

532
00:22:04,789 --> 00:22:02,480
quite a few women because they went

533
00:22:08,310 --> 00:22:04,799
somewhere where there were jobs for

534
00:22:10,549 --> 00:22:08,320
for the woman and her husband

535
00:22:12,470 --> 00:22:10,559
whose job consideration led that it was

536
00:22:14,870 --> 00:22:12,480
usually i mean

537
00:22:17,669 --> 00:22:14,880
i can't they're the statistics are small

538
00:22:20,549 --> 00:22:17,679

numbers of small numbers so there was

539

00:22:23,430 --> 00:22:20,559

one case where a woman went to a lesser

540

00:22:26,870 --> 00:22:23,440

university because they would also hire

541

00:22:29,669 --> 00:22:26,880

her husband who whom we were unable to

542

00:22:31,990 --> 00:22:29,679

hire at ucla and there have been other

543

00:22:33,029 --> 00:22:32,000

cases where the woman has followed her

544

00:22:34,070 --> 00:22:33,039

husband

545

00:22:39,669 --> 00:22:34,080

and

546

00:22:41,190 --> 00:22:39,679

encourage the other university to give

547

00:22:43,270 --> 00:22:41,200

the woman a job

548

00:22:45,669 --> 00:22:43,280

it occurs to me that american schools

549

00:22:47,190 --> 00:22:45,679

can take mao zedong saying women hold up

550

00:22:49,350 --> 00:22:47,200

half the sky and turn it into women

551
00:22:51,029 --> 00:22:49,360
explore the whole sky

552
00:22:52,950 --> 00:22:51,039
maybe we can take that and make make

553
00:23:00,310 --> 00:22:52,960
something out of it thank you

554
00:23:05,350 --> 00:23:03,190
let's hear next from maria zuber let me

555
00:23:08,710 --> 00:23:05,360
find out her information here

556
00:23:11,350 --> 00:23:08,720
or she can jump in and tell us herself

557
00:23:13,110 --> 00:23:11,360
oh how bad of me not to have this uh and

558
00:23:15,190 --> 00:23:13,120
of course we'll be taking your questions

559
00:23:17,750 --> 00:23:15,200
at the end here she's a professor of

560
00:23:19,350 --> 00:23:17,760
geophysics at mit principal investigator

561
00:23:22,390 --> 00:23:19,360
pi in my world means private

562
00:23:24,149 --> 00:23:22,400
investigator like humphrey bogart pi

563
00:23:25,830 --> 00:23:24,159

very different in this world the grail

564

00:23:27,909 --> 00:23:25,840

mission measuring the gravitational

565

00:23:31,990 --> 00:23:27,919

field of the moon she studied the

566

00:23:34,310 --> 00:23:32,000

asteroid series and vesta and working on

567

00:23:36,390 --> 00:23:34,320

the laser altimeter that she created for

568

00:23:38,789 --> 00:23:36,400

the mars global surveyor spacecraft

569

00:23:40,149 --> 00:23:38,799

to check the topography for any planet

570

00:23:42,230 --> 00:23:40,159

including earth i think i've heard of

571

00:23:43,909 --> 00:23:42,240

earth thank you so much tell us about

572

00:23:45,830 --> 00:23:43,919

your work and how you got there and what

573

00:23:47,830 --> 00:23:45,840

you had to do to get there okay thanks

574

00:23:49,830 --> 00:23:47,840

so i i am i'm going to tell you a little

575

00:23:52,549 --> 00:23:49,840

bit about the the grail mission which is

576

00:23:54,950 --> 00:23:52,559

uh just started uh taking data around

577

00:23:57,990 --> 00:23:54,960

the moon in the last week so um if we

578

00:23:59,430 --> 00:23:58,000

could have uh let's see the next slide

579

00:24:01,110 --> 00:23:59,440

so um

580

00:24:03,190 --> 00:24:01,120

so that's uh what you see up there

581

00:24:05,029 --> 00:24:03,200

that's an image of the topography of the

582

00:24:07,029 --> 00:24:05,039

moon which is actually

583

00:24:09,350 --> 00:24:07,039

been measured with another instrument

584

00:24:11,990 --> 00:24:09,360

that we have that's uh measuring the

585

00:24:13,990 --> 00:24:12,000

moon right now the lunar orbiter laser

586

00:24:16,149 --> 00:24:14,000

altimeter and um

587

00:24:19,110 --> 00:24:16,159

and what you see there on

588

00:24:20,710 --> 00:24:19,120

i guess on the left-hand side is uh the

589

00:24:23,029 --> 00:24:20,720

the near side of the moon that we see

590

00:24:25,750 --> 00:24:23,039

from earth and the back is the far side

591

00:24:27,590 --> 00:24:25,760

of the moon um that we don't see ever

592

00:24:30,710 --> 00:24:27,600

from earth because the moon rotates

593

00:24:32,789 --> 00:24:30,720

synchronously and and what you notice is

594

00:24:34,390 --> 00:24:32,799

that the the near side and the far side

595

00:24:37,110 --> 00:24:34,400

of the moon are different

596

00:24:39,990 --> 00:24:37,120

and um and we don't know why

597

00:24:42,070 --> 00:24:40,000

and uh it was what's very interesting is

598

00:24:44,830 --> 00:24:42,080

that collectively

599

00:24:47,830 --> 00:24:44,840

the nations of earth have sent

600

00:24:49,990 --> 00:24:47,840

109 spacecraft to the moon to orbit the

601
00:24:52,310 --> 00:24:50,000
moon to land on the moon

602
00:24:54,390 --> 00:24:52,320
bring back samples

603
00:24:56,230 --> 00:24:54,400
and we don't know why the near side of

604
00:24:57,590 --> 00:24:56,240
the moon is different than the far side

605
00:24:59,190 --> 00:24:57,600
of the moon

606
00:25:02,149 --> 00:24:59,200
so

607
00:25:03,590 --> 00:25:02,159
it occurred to me that um the answer is

608
00:25:06,149 --> 00:25:03,600
not on the surface

609
00:25:07,669 --> 00:25:06,159
because if the answer was on the surface

610
00:25:10,149 --> 00:25:07,679
we would have known it by now because

611
00:25:12,549 --> 00:25:10,159
the previous missions have focused on

612
00:25:15,590 --> 00:25:12,559
the surface so if you go to the next uh

613
00:25:17,590 --> 00:25:15,600

the next slide there

614

00:25:19,990 --> 00:25:17,600

we decided to

615

00:25:21,909 --> 00:25:20,000

take a dedicated mission

616

00:25:23,990 --> 00:25:21,919

um to measure

617

00:25:27,029 --> 00:25:24,000

the gravity field of the moon to study

618

00:25:28,549 --> 00:25:27,039

the mass distribution of of the lunar

619

00:25:31,029 --> 00:25:28,559

interior

620

00:25:32,789 --> 00:25:31,039

that we could use this information

621

00:25:34,549 --> 00:25:32,799

in concert

622

00:25:37,110 --> 00:25:34,559

with the information from those other

623

00:25:38,950 --> 00:25:37,120

109 spacecraft

624

00:25:41,750 --> 00:25:38,960

that have been to the moon and are at

625

00:25:44,950 --> 00:25:41,760

the moon now and put together

626

00:25:46,710 --> 00:25:44,960

a holistic picture of uh

627

00:25:47,830 --> 00:25:46,720

of what the moon is like and how it

628

00:25:51,590 --> 00:25:47,840

evolved

629

00:25:53,590 --> 00:25:51,600

and uh and um we got together uh there

630

00:25:55,830 --> 00:25:53,600

was a group of us

631

00:25:56,950 --> 00:25:55,840

if uh if you study the physics of the

632

00:25:58,230 --> 00:25:56,960

planets

633

00:26:00,870 --> 00:25:58,240

um

634

00:26:02,390 --> 00:26:00,880

uh the gravity field of the moon

635

00:26:04,470 --> 00:26:02,400

is um

636

00:26:06,390 --> 00:26:04,480

it's one of these uh

637

00:26:09,350 --> 00:26:06,400

it's a trophy that you want to have on

638

00:26:12,789 --> 00:26:09,360

your mantelpiece okay uh

639

00:26:15,430 --> 00:26:12,799

and and so for uh

640

00:26:16,789 --> 00:26:15,440

decades some of us have wanted to do

641

00:26:18,230 --> 00:26:16,799

this but

642

00:26:19,909 --> 00:26:18,240

but to measure gravity you have to

643

00:26:22,630 --> 00:26:19,919

measure

644

00:26:25,590 --> 00:26:22,640

very tiny changes in the frequency of

645

00:26:28,149 --> 00:26:25,600

radio signals and and you need to track

646

00:26:29,430 --> 00:26:28,159

those um from earth and the problem with

647

00:26:32,549 --> 00:26:29,440

the moon is

648

00:26:34,390 --> 00:26:32,559

uh you never see the back side okay

649

00:26:37,110 --> 00:26:34,400

so um

650

00:26:38,549 --> 00:26:37,120

so lunar gravity has been interesting

651
00:26:40,310 --> 00:26:38,559
since

652
00:26:43,029 --> 00:26:40,320
the initial spacecraft went to the moon

653
00:26:45,269 --> 00:26:43,039
the lunar mascons they were worried

654
00:26:47,830 --> 00:26:45,279
about being able to land astronauts

655
00:26:50,149 --> 00:26:47,840
safely in the moon because of how the

656
00:26:51,830 --> 00:26:50,159
spacecraft would bump around

657
00:26:55,750 --> 00:26:51,840
due to the lumpiness of the lunar

658
00:26:57,110 --> 00:26:55,760
gravity field and so uh so for 40 years

659
00:26:59,350 --> 00:26:57,120
this has been

660
00:27:02,630 --> 00:26:59,360
you know what i'll call a a low hanging

661
00:27:04,470 --> 00:27:02,640
apple on the tree that we have not been

662
00:27:08,630 --> 00:27:04,480
able to grasp

663
00:27:10,710 --> 00:27:08,640

but um technology um came to our uh aid

664

00:27:12,070 --> 00:27:10,720

because the way that you measure gravity

665

00:27:13,909 --> 00:27:12,080

on the backside of the moon if you don't

666

00:27:16,549 --> 00:27:13,919

track is you take two spacecraft and you

667

00:27:19,110 --> 00:27:16,559

let them make measurements to each other

668

00:27:22,950 --> 00:27:19,120

and um and so our mission is is all

669

00:27:24,470 --> 00:27:22,960

about uh taking radio signals and and uh

670

00:27:26,789 --> 00:27:24,480

having the two spacecraft track each

671

00:27:29,909 --> 00:27:26,799

other than tracking them from earth

672

00:27:32,630 --> 00:27:29,919

and uh and there was a mission um called

673

00:27:33,590 --> 00:27:32,640

grace that's in orbit around uh earth

674

00:27:35,590 --> 00:27:33,600

right now

675

00:27:38,310 --> 00:27:35,600

and the instrumentation was built here

676
00:27:41,029 --> 00:27:38,320
at the jet propulsion laboratory

677
00:27:42,870 --> 00:27:41,039
and um and so uh

678
00:27:44,230 --> 00:27:42,880
that the demonstration of that

679
00:27:47,430 --> 00:27:44,240
technology

680
00:27:48,870 --> 00:27:47,440
is what allowed us to finally propose uh

681
00:27:49,990 --> 00:27:48,880
this mission

682
00:27:51,190 --> 00:27:50,000
to the moon

683
00:27:54,149 --> 00:27:51,200
so the next

684
00:27:56,870 --> 00:27:54,159
the next slide if we look at that

685
00:27:58,389 --> 00:27:56,880
this is uh this is some pictures of the

686
00:27:59,990 --> 00:27:58,399
hardware so there's the the two

687
00:28:02,070 --> 00:28:00,000
spacecraft

688
00:28:04,070 --> 00:28:02,080

when you work in this business you know

689

00:28:05,669 --> 00:28:04,080

uh i'm a parent and

690

00:28:07,430 --> 00:28:05,679

uh

691

00:28:09,029 --> 00:28:07,440

i think of the spacecraft and the

692

00:28:12,310 --> 00:28:09,039

instruments that i built almost as my

693

00:28:13,269 --> 00:28:12,320

children okay and um so i got these

694

00:28:14,630 --> 00:28:13,279

these

695

00:28:16,389 --> 00:28:14,640

two guys that are in orbit right now

696

00:28:17,830 --> 00:28:16,399

there's a terrible solar storm and it's

697

00:28:19,830 --> 00:28:17,840

like when you're a parent and you send

698

00:28:21,190 --> 00:28:19,840

your kids off to school and you wonder

699

00:28:24,070 --> 00:28:21,200

oh my god i didn't know it was gonna

700

00:28:25,110 --> 00:28:24,080

rain today and um so so they're

701

00:28:27,830 --> 00:28:25,120

essentially up there with their

702

00:28:30,310 --> 00:28:27,840

sunglasses on you know waiting for the

703

00:28:32,149 --> 00:28:30,320

solar shocks to pass through but uh but

704

00:28:33,830 --> 00:28:32,159

there's a um

705

00:28:36,470 --> 00:28:33,840

there's uh there's the hardware and

706

00:28:39,430 --> 00:28:36,480

there's um there's the instrumentation

707

00:28:42,470 --> 00:28:39,440

um and uh and what i wanted to

708

00:28:43,990 --> 00:28:42,480

point out by this is um

709

00:28:46,149 --> 00:28:44,000

is just if you're if you're thinking

710

00:28:47,510 --> 00:28:46,159

about a field like this

711

00:28:49,430 --> 00:28:47,520

um

712

00:28:52,389 --> 00:28:49,440

uh

713

00:28:55,029 --> 00:28:52,399

working on a team and also making an

714

00:28:56,789 --> 00:28:55,039

individual contribution this is really a

715

00:28:58,950 --> 00:28:56,799

wonderful field to be in

716

00:29:03,430 --> 00:28:58,960

um because if you look at all those

717

00:29:09,350 --> 00:29:06,149

everybody involved in working on every

718

00:29:10,789 --> 00:29:09,360

aspect of those has to do their job

719

00:29:13,350 --> 00:29:10,799

perfectly

720

00:29:15,190 --> 00:29:13,360

or else this mission is going to fail

721

00:29:17,110 --> 00:29:15,200

so everybody

722

00:29:18,950 --> 00:29:17,120

everybody on the whole team

723

00:29:20,389 --> 00:29:18,960

has an extremely

724

00:29:23,110 --> 00:29:20,399

important job

725

00:29:26,549 --> 00:29:23,120

and and there is a great deal of

726

00:29:29,269 --> 00:29:26,559

mutual concern and mutual respect for

727

00:29:31,029 --> 00:29:29,279

the work that everybody does so one of

728

00:29:32,310 --> 00:29:31,039

the things that that you know from

729

00:29:34,070 --> 00:29:32,320

psychologically looking at the

730

00:29:36,710 --> 00:29:34,080

literature is that uh

731

00:29:39,110 --> 00:29:36,720

is that women tend to be more social and

732

00:29:41,669 --> 00:29:39,120

like to work in groups and so one of the

733

00:29:43,510 --> 00:29:41,679

things that i've just really enjoyed

734

00:29:45,990 --> 00:29:43,520

about working on space instruments and

735

00:29:49,350 --> 00:29:46,000

space missions is getting together with

736

00:29:51,750 --> 00:29:49,360

a wonderful smart dedicated group of

737

00:29:53,510 --> 00:29:51,760

like-minded people and creating

738

00:29:56,149 --> 00:29:53,520

something much bigger

739

00:29:57,909 --> 00:29:56,159

than i myself or any of my colleagues

740

00:30:00,070 --> 00:29:57,919

can do in isolation

741

00:30:01,750 --> 00:30:00,080

and and i i think this this just

742

00:30:03,510 --> 00:30:01,760

illustrates that so where if i can ask

743

00:30:05,830 --> 00:30:03,520

you is that an advantage and where is it

744

00:30:08,950 --> 00:30:05,840

a disadvantage where is it where is that

745

00:30:11,909 --> 00:30:08,960

sense of the team work that well it's um

746

00:30:14,950 --> 00:30:11,919

you know on on the team um

747

00:30:16,870 --> 00:30:14,960

everybody shares the credit okay so if

748

00:30:18,630 --> 00:30:16,880

if you are a person

749

00:30:22,470 --> 00:30:18,640

who likes to

750

00:30:25,110 --> 00:30:22,480

or needs to get all of the attention um

751
00:30:26,230 --> 00:30:25,120
that doesn't happen on space missions

752
00:30:31,350 --> 00:30:26,240
because

753
00:30:33,669 --> 00:30:31,360
everybody needs to um share credit okay

754
00:30:34,549 --> 00:30:33,679
and and i think that's a wonderful thing

755
00:30:38,789 --> 00:30:34,559
because

756
00:30:41,350 --> 00:30:38,799
one succeeds

757
00:30:44,310 --> 00:30:41,360
there's plenty of credit to go around so

758
00:30:46,630 --> 00:30:44,320
everyone can have credit um

759
00:30:49,190 --> 00:30:46,640
but but you know it's it's not the right

760
00:30:51,110 --> 00:30:49,200
thing to do if if you want to call all

761
00:30:54,470 --> 00:30:51,120
the shots yourself you can't know enough

762
00:30:57,510 --> 00:30:54,480
nobody can know enough um to do all of

763
00:30:58,389 --> 00:30:57,520

uh all of this work on their own

764

00:30:59,510 --> 00:30:58,399

so

765

00:31:02,830 --> 00:30:59,520

okay

766

00:31:05,269 --> 00:31:02,840

all right the next uh the next chart

767

00:31:06,549 --> 00:31:05,279

um we

768

00:31:10,470 --> 00:31:06,559

we did a lot

769

00:31:13,110 --> 00:31:10,480

i i have a just a wonderful um wonderful

770

00:31:17,110 --> 00:31:13,120

wonderful smart group of uh people that

771

00:31:19,830 --> 00:31:17,120

i work with um on this mission and uh

772

00:31:21,909 --> 00:31:19,840

and uh and they just did came up with so

773

00:31:24,310 --> 00:31:21,919

many so many clever ideas and sitting

774

00:31:27,590 --> 00:31:24,320

around and brainstorming um

775

00:31:30,310 --> 00:31:27,600

uh how you can do uh things uh clever

776

00:31:32,470 --> 00:31:30,320

and and sometimes um clever can mean

777

00:31:33,669 --> 00:31:32,480

inexpensive

778

00:31:35,350 --> 00:31:33,679

but of course you don't want to be too

779

00:31:37,590 --> 00:31:35,360

inexpensive because it doesn't work it

780

00:31:38,950 --> 00:31:37,600

doesn't matter how much it costs or

781

00:31:40,870 --> 00:31:38,960

doesn't cost

782

00:31:43,110 --> 00:31:40,880

and uh and if you notice with those two

783

00:31:44,630 --> 00:31:43,120

spacecraft they're they're pretty small

784

00:31:46,950 --> 00:31:44,640

actually they're about the size of i

785

00:31:50,630 --> 00:31:46,960

like to say they're about the size of a

786

00:31:51,669 --> 00:31:50,640

apartment sized washer and dryer okay

787

00:31:55,190 --> 00:31:51,679

and

788

00:31:58,070 --> 00:31:55,200

we made them small so that they could

789

00:32:00,549 --> 00:31:58,080

fit on they could both fit on one rocket

790

00:32:02,950 --> 00:32:00,559

so we actually by making them small

791

00:32:04,870 --> 00:32:02,960

instead of big we saved 150 million

792

00:32:06,710 --> 00:32:04,880

dollars because we could use one rocket

793

00:32:07,909 --> 00:32:06,720

instead of two rockets

794

00:32:11,509 --> 00:32:07,919

and um

795

00:32:15,029 --> 00:32:11,519

one of the one of the main ways that we

796

00:32:16,630 --> 00:32:15,039

were able to use small spacecraft is

797

00:32:19,110 --> 00:32:16,640

that we took a very innovative

798

00:32:21,190 --> 00:32:19,120

trajectory to the moon

799

00:32:23,750 --> 00:32:21,200

and uh so you know the apollo astronauts

800

00:32:26,070 --> 00:32:23,760

got to the moon in three days okay

801
00:32:27,909 --> 00:32:26,080
and uh so if you and you can do this you

802
00:32:30,230 --> 00:32:27,919
know you send a rocket to the moon you

803
00:32:32,310 --> 00:32:30,240
go barreling towards the moon and in

804
00:32:34,149 --> 00:32:32,320
order to get into orbit around a planet

805
00:32:36,470 --> 00:32:34,159
what you've basically got to do

806
00:32:38,389 --> 00:32:36,480
is slow down enough for the gravity

807
00:32:39,830 --> 00:32:38,399
field of the planet to capture the

808
00:32:42,230 --> 00:32:39,840
spacecraft okay

809
00:32:44,630 --> 00:32:42,240
so if you go shooting towards the moon

810
00:32:46,470 --> 00:32:44,640
you gotta really hit the brakes

811
00:32:49,350 --> 00:32:46,480
in order for the the lunar gravity field

812
00:32:51,029 --> 00:32:49,360
to capture you okay so we instead of

813
00:32:54,230 --> 00:32:51,039

going towards the moon

814

00:32:55,830 --> 00:32:54,240

uh we went towards the sun

815

00:32:58,070 --> 00:32:55,840

okay and that's a picture of the

816

00:32:59,590 --> 00:32:58,080

trajectory up there uh we didn't go to

817

00:33:01,110 --> 00:32:59,600

the moon in three days we went three and

818

00:33:04,230 --> 00:33:01,120

a half months

819

00:33:06,230 --> 00:33:04,240

um but when we it's what's called a low

820

00:33:07,590 --> 00:33:06,240

energy trajectory and we use something

821

00:33:09,269 --> 00:33:07,600

called the earth

822

00:33:11,509 --> 00:33:09,279

earth sun lagrange point which is

823

00:33:13,669 --> 00:33:11,519

essentially the place where gravity

824

00:33:14,950 --> 00:33:13,679

balances between the earth

825

00:33:18,389 --> 00:33:14,960

and the sun

826

00:33:20,789 --> 00:33:18,399

and essentially use that point as a boy

827

00:33:22,389 --> 00:33:20,799

to go around and so we but when we got

828

00:33:24,389 --> 00:33:22,399

to the moon when the two spacecraft got

829

00:33:27,350 --> 00:33:24,399

to the moon we only had to slow down by

830

00:33:29,669 --> 00:33:27,360

170 meters per second to get into orbit

831

00:33:31,350 --> 00:33:29,679

so we were able to use very small fuel

832

00:33:32,230 --> 00:33:31,360

tanks

833

00:33:36,549 --> 00:33:32,240

and

834

00:33:37,590 --> 00:33:36,559

clever thing that the team

835

00:33:39,750 --> 00:33:37,600

thought of

836

00:33:42,070 --> 00:33:39,760

to do this it sounds like a good analogy

837

00:33:44,389 --> 00:33:42,080

for a career trajectory too because once

838

00:33:46,789 --> 00:33:44,399

you get up to a certain level it's

839

00:33:48,950 --> 00:33:46,799

pretty easy to get that last little bit

840

00:33:51,909 --> 00:33:48,960

because the gravity may be helping you

841

00:33:53,909 --> 00:33:51,919

out but but to get that far to as a

842

00:33:55,750 --> 00:33:53,919

woman to get to the point that you have

843

00:33:58,230 --> 00:33:55,760

i mean that's where the energy that's

844

00:34:01,509 --> 00:33:58,240

that's actually a really

845

00:34:04,710 --> 00:34:01,519

good point because um because i

846

00:34:07,430 --> 00:34:04,720

i think in general

847

00:34:09,430 --> 00:34:07,440

for a woman early in a career

848

00:34:11,669 --> 00:34:09,440

it's maybe a little bit more difficult

849

00:34:15,669 --> 00:34:11,679

to get noticed okay

850

00:34:18,470 --> 00:34:15,679

um but once uh once you get over that

851
00:34:20,629 --> 00:34:18,480
gravitational well so to speak

852
00:34:22,069 --> 00:34:20,639
because there are fewer it's

853
00:34:25,750 --> 00:34:22,079
you get noticed

854
00:34:27,829 --> 00:34:25,760
um so um good notice or bad notice uh

855
00:34:29,270 --> 00:34:27,839
well i you know at some point you know

856
00:34:30,710 --> 00:34:29,280
you've got to stand on your own because

857
00:34:33,990 --> 00:34:30,720
of your work

858
00:34:35,270 --> 00:34:34,000
so um so once once you get to the point

859
00:34:37,349 --> 00:34:35,280
where

860
00:34:39,510 --> 00:34:37,359
you're established scientifically i

861
00:34:41,829 --> 00:34:39,520
think you can be judged more

862
00:34:43,190 --> 00:34:41,839
easily on the quality of your work do

863
00:34:44,790 --> 00:34:43,200

you agree with margaret that once you

864

00:34:46,149 --> 00:34:44,800

get in a work circumstance or even a

865

00:34:47,750 --> 00:34:46,159

class that's all men you just have to

866

00:34:50,629 --> 00:34:47,760

pretend not to notice

867

00:34:52,629 --> 00:34:50,639

well i never did notice okay that's uh

868

00:34:54,310 --> 00:34:52,639

this uh

869

00:34:55,909 --> 00:34:54,320

you know somebody told me this once and

870

00:34:58,870 --> 00:34:55,919

it was actually a great piece of advice

871

00:35:02,630 --> 00:34:58,880

ignorance can be an enabler and um

872

00:35:05,030 --> 00:35:02,640

and um and and i've i just i was

873

00:35:07,670 --> 00:35:05,040

usually the only woman in class and i

874

00:35:09,510 --> 00:35:07,680

just most of the time would never notice

875

00:35:11,190 --> 00:35:09,520

and in fact when i was on my

876

00:35:13,750 --> 00:35:11,200

first space mission it was a mission

877

00:35:15,510 --> 00:35:13,760

called mars observer i got a i got a

878

00:35:17,430 --> 00:35:15,520

phone call from a reporter that said you

879

00:35:19,670 --> 00:35:17,440

know there are 87

880

00:35:20,790 --> 00:35:19,680

sign investigators science investigators

881

00:35:24,470 --> 00:35:20,800

on this mission and you're the only

882

00:35:25,750 --> 00:35:24,480

woman and i said no way

883

00:35:27,589 --> 00:35:25,760

and uh

884

00:35:28,870 --> 00:35:27,599

and after i hung up i pulled out the

885

00:35:31,510 --> 00:35:28,880

list and started going through it and

886

00:35:33,430 --> 00:35:31,520

went oh wow you know

887

00:35:35,349 --> 00:35:33,440

so it was true and i had never

888

00:35:38,790 --> 00:35:35,359

noticed that then it became a strength i

889

00:35:41,349 --> 00:35:38,800

would think um well um you know now when

890

00:35:42,630 --> 00:35:41,359

there are conferences uh

891

00:35:45,349 --> 00:35:42,640

you know in a lot of cases there are

892

00:35:47,349 --> 00:35:45,359

attempts to make that are made to

893

00:35:48,870 --> 00:35:47,359

have some balance and you know make sure

894

00:35:50,710 --> 00:35:48,880

that you invite one so if you're the

895

00:35:52,470 --> 00:35:50,720

only woman out of 87 investigators you

896

00:35:54,790 --> 00:35:52,480

get asked to

897

00:36:02,950 --> 00:35:54,800

speak in public a lot

898

00:36:06,950 --> 00:36:04,710

amy manser is a research scientist here

899

00:36:08,870 --> 00:36:06,960

at jpl principal principal investigator

900

00:36:10,790 --> 00:36:08,880

of the neo-wise project which is an

901
00:36:12,550 --> 00:36:10,800
outgrowth of the project she conceived

902
00:36:14,150 --> 00:36:12,560
to enhance the ability to find new

903
00:36:15,670 --> 00:36:14,160
near-earth asteroids if she doesn't have

904
00:36:17,510 --> 00:36:15,680
a hollywood agent for that kind of line

905
00:36:19,430 --> 00:36:17,520
of work you really should she says the

906
00:36:21,030 --> 00:36:19,440
universe is weirder more wonderful place

907
00:36:22,310 --> 00:36:21,040
than any science fiction i've ever read

908
00:36:25,270 --> 00:36:22,320
but i'm sure that she'll have some good

909
00:36:30,870 --> 00:36:28,710
so we can take us look at the next slide

910
00:36:33,190 --> 00:36:30,880
we will uh get started and

911
00:36:35,109 --> 00:36:33,200
so basically what we did is uh with the

912
00:36:37,910 --> 00:36:35,119
the wise mission this is the whitefield

913
00:36:40,470 --> 00:36:37,920

infrared survey explorer project

914

00:36:42,870 --> 00:36:40,480

and the goal of this project

915

00:36:44,470 --> 00:36:42,880

got a bad mic sorry hope you can hear me

916

00:36:47,750 --> 00:36:44,480

the goal of this project that i worked

917

00:36:50,630 --> 00:36:47,760

on uh is was to survey the entire sky in

918

00:36:52,710 --> 00:36:50,640

infrared light in one year

919

00:36:54,950 --> 00:36:52,720

so it was really a whirlwind trip

920

00:36:57,270 --> 00:36:54,960

i have to say it was a phenomenal

921

00:36:59,510 --> 00:36:57,280

experience to get to do this and one of

922

00:37:01,109 --> 00:36:59,520

the things that we got to do is find a

923

00:37:02,710 --> 00:37:01,119

lot of asteroids

924

00:37:05,349 --> 00:37:02,720

and that's that was a kind of an

925

00:37:06,950 --> 00:37:05,359

unexpected bonus to this this project so

926
00:37:08,150 --> 00:37:06,960
if we could have the next slide

927
00:37:10,790 --> 00:37:08,160
i'll tell you a little bit about

928
00:37:12,390 --> 00:37:10,800
infrared light and why astronomers would

929
00:37:14,230 --> 00:37:12,400
care about it i mean you'd think well

930
00:37:15,430 --> 00:37:14,240
isn't the visible light that my eyes see

931
00:37:17,829 --> 00:37:15,440
good enough

932
00:37:20,390 --> 00:37:17,839
and it turns out that your eyes only see

933
00:37:22,230 --> 00:37:20,400
a tiny tiny fraction of the of the whole

934
00:37:23,589 --> 00:37:22,240
electromagnetic spectrum of light that's

935
00:37:25,430 --> 00:37:23,599
actually out there

936
00:37:27,589 --> 00:37:25,440
so astronomers sometimes use other

937
00:37:29,750 --> 00:37:27,599
wavelengths like infrared ultraviolet

938
00:37:31,829 --> 00:37:29,760

x-ray and in particular with infrared

939

00:37:33,589 --> 00:37:31,839

you've got certain benefits

940

00:37:34,870 --> 00:37:33,599

you can see these pictures of coffee

941

00:37:37,510 --> 00:37:34,880

cups there that i'm holding two

942

00:37:39,109 --> 00:37:37,520

identical coffee cups and to your eyes

943

00:37:41,270 --> 00:37:39,119

which are sensing the visible light

944

00:37:43,349 --> 00:37:41,280

that's reflected off of the coffee cups

945

00:37:45,030 --> 00:37:43,359

they look exactly the same you can't

946

00:37:47,349 --> 00:37:45,040

really tell anything about the contents

947

00:37:49,190 --> 00:37:47,359

of the of what's inside these cups

948

00:37:51,910 --> 00:37:49,200

but if you have an infrared sensor

949

00:37:54,069 --> 00:37:51,920

that's capable of measuring heat you can

950

00:37:55,829 --> 00:37:54,079

very clearly see which coffee cup has

951
00:37:56,870 --> 00:37:55,839
the hot water and which one has ice

952
00:37:58,310 --> 00:37:56,880
water

953
00:38:00,550 --> 00:37:58,320
and you can also see that my nose is

954
00:38:02,950 --> 00:38:00,560
cold in that picture

955
00:38:05,750 --> 00:38:02,960
so it gives you an idea of what the

956
00:38:07,510 --> 00:38:05,760
utility is of these other wavelengths

957
00:38:09,670 --> 00:38:07,520
and in particular when we use them to

958
00:38:10,870 --> 00:38:09,680
look at say for example asteroids

959
00:38:12,870 --> 00:38:10,880
they're very good at telling the

960
00:38:13,990 --> 00:38:12,880
temperature of these objects and from

961
00:38:16,150 --> 00:38:14,000
that we can learn physical

962
00:38:17,990 --> 00:38:16,160
characteristics such as their diameters

963
00:38:19,910 --> 00:38:18,000

how big they are and get a little bit of

964

00:38:21,109 --> 00:38:19,920

a glimmer about what they're made out of

965

00:38:22,310 --> 00:38:21,119

so if we could have the next slide

966

00:38:23,670 --> 00:38:22,320

please

967

00:38:25,670 --> 00:38:23,680

okay so let me tell you a little bit

968

00:38:27,430 --> 00:38:25,680

about the telescope that we used like i

969

00:38:29,910 --> 00:38:27,440

said it's the wide field infrared survey

970

00:38:31,510 --> 00:38:29,920

explorer and it was a small telescope it

971

00:38:33,750 --> 00:38:31,520

would sort of fit under your arm it's

972

00:38:36,950 --> 00:38:33,760

about 40 centimeters it launched in late

973

00:38:38,470 --> 00:38:36,960

2009 uh out of california vanderberg

974

00:38:39,990 --> 00:38:38,480

and it was hundreds of times more

975

00:38:41,349 --> 00:38:40,000

sensitive than the predecessor

976
00:38:43,349 --> 00:38:41,359
satellites

977
00:38:45,270 --> 00:38:43,359
so one of the main things that we did is

978
00:38:47,349 --> 00:38:45,280
we came up with a little enhancement to

979
00:38:49,430 --> 00:38:47,359
the the wise data processing pipeline

980
00:38:52,230 --> 00:38:49,440
and we call it neowise which stands for

981
00:38:54,310 --> 00:38:52,240
near-earth object plus wise and in nasa

982
00:38:56,230 --> 00:38:54,320
we love our acronyms so i get double

983
00:38:58,950 --> 00:38:56,240
points because it's two acronyms in one

984
00:39:00,310 --> 00:38:58,960
which is really kind of cool

985
00:39:02,470 --> 00:39:00,320
but if we have the next slide i can show

986
00:39:03,349 --> 00:39:02,480
you a little bit about what wise is all

987
00:39:05,190 --> 00:39:03,359
about

988
00:39:07,109 --> 00:39:05,200

so the goal of the mission was to survey

989

00:39:09,190 --> 00:39:07,119

the whole sky like i said in just six

990

00:39:11,990 --> 00:39:09,200

months and the way we did that is by

991

00:39:15,030 --> 00:39:12,000

taking a picture with a four megapixel

992

00:39:16,310 --> 00:39:15,040

infrared camera every 11 seconds for an

993

00:39:17,750 --> 00:39:16,320

entire year

994

00:39:20,069 --> 00:39:17,760

so you can imagine if you sat there

995

00:39:21,430 --> 00:39:20,079

taking pictures every 11 seconds for a

996

00:39:23,990 --> 00:39:21,440

year it would build up quite a lot of

997

00:39:25,670 --> 00:39:24,000

data and quite a lot of images

998

00:39:27,349 --> 00:39:25,680

and you can see there an example of how

999

00:39:28,630 --> 00:39:27,359

we were able to cover the sky so very

1000

00:39:30,870 --> 00:39:28,640

quickly

1001

00:39:33,670 --> 00:39:30,880

okay let's have the next slide

1002

00:39:35,349 --> 00:39:33,680

and there's a picture of of wise and

1003

00:39:37,190 --> 00:39:35,359

i think it's it's like maria said i mean

1004

00:39:39,270 --> 00:39:37,200

these these things do become your babies

1005

00:39:44,150 --> 00:39:39,280

in a way and there it is all packed up

1006

00:39:48,150 --> 00:39:46,950

uh unfortunately no but you do get to

1007

00:39:50,150 --> 00:39:48,160

take some pretty cool pictures with it

1008

00:39:52,150 --> 00:39:50,160

which is good so that's that's fun but

1009

00:39:53,910 --> 00:39:52,160

uh yeah unfortunately painting slogans

1010

00:39:55,589 --> 00:39:53,920

on it would probably be bad for getting

1011

00:39:57,190 --> 00:39:55,599

to space unfortunately probably have

1012

00:39:58,790 --> 00:39:57,200

some bad side effect

1013

00:40:00,150 --> 00:39:58,800

so you can see it there in the rocket in

1014

00:40:02,710 --> 00:40:00,160

the nose cone and that's a picture of

1015

00:40:04,230 --> 00:40:02,720

the of the spacecraft uh they're

1016

00:40:06,069 --> 00:40:04,240

sitting in the high bay just before it

1017

00:40:08,550 --> 00:40:06,079

was packed into the rocket

1018

00:40:11,030 --> 00:40:08,560

and if you have the next slide

1019

00:40:12,710 --> 00:40:11,040

so this is our previous picture of the

1020

00:40:14,069 --> 00:40:12,720

whole sky in infrared light from a

1021

00:40:16,230 --> 00:40:14,079

mission that was launched in the in the

1022

00:40:18,470 --> 00:40:16,240

mid 80s uh and it's one of the

1023

00:40:20,710 --> 00:40:18,480

instruments on board another acronym is

1024

00:40:22,550 --> 00:40:20,720

called derby diffuse infrared background

1025

00:40:23,829 --> 00:40:22,560

explorer i think and there's a picture

1026
00:40:25,349 --> 00:40:23,839
of the full moon just to give you a

1027
00:40:27,430 --> 00:40:25,359
sense of the scale

1028
00:40:30,310 --> 00:40:27,440
uh so this is what our best view of the

1029
00:40:32,310 --> 00:40:30,320
sky at these wavelengths was like in in

1030
00:40:33,109 --> 00:40:32,320
the past now if we have the next slide

1031
00:40:34,790 --> 00:40:33,119
there

1032
00:40:37,349 --> 00:40:34,800
okay again

1033
00:40:39,190 --> 00:40:37,359
okay so now if we go to slightly longer

1034
00:40:40,950 --> 00:40:39,200
infrared wavelengths this is another

1035
00:40:43,589 --> 00:40:40,960
mission called the infrared astronomical

1036
00:40:46,390 --> 00:40:43,599
satellite and it was launched in 1983 it

1037
00:40:47,670 --> 00:40:46,400
had 62 pixels on board its digital

1038
00:40:50,870 --> 00:40:47,680

camera

1039

00:40:52,150 --> 00:40:50,880

and so with wise we have 4 million so we

1040

00:40:53,990 --> 00:40:52,160

were able to bring a lot of new

1041

00:40:55,430 --> 00:40:54,000

technology to bear on this and you can

1042

00:40:56,790 --> 00:40:55,440

definitely see that there's a star there

1043

00:40:59,109 --> 00:40:56,800

in this image but it's still very

1044

00:41:01,109 --> 00:40:59,119

pixelated and rather crude if you have

1045

00:41:02,470 --> 00:41:01,119

the next slide

1046

00:41:04,710 --> 00:41:02,480

this is the view of the same part of the

1047

00:41:05,829 --> 00:41:04,720

sky from wise and this was our first

1048

00:41:07,750 --> 00:41:05,839

light image

1049

00:41:10,069 --> 00:41:07,760

which we managed to take on new year's

1050

00:41:11,670 --> 00:41:10,079

day or new year's eve actually

1051
00:41:13,829 --> 00:41:11,680
about a couple years ago now so that was

1052
00:41:15,109 --> 00:41:13,839
a great new year's present and it was a

1053
00:41:17,109 --> 00:41:15,119
lot of fun

1054
00:41:19,190 --> 00:41:17,119
so if we have the next slide

1055
00:41:21,270 --> 00:41:19,200
okay so moving on this is one of my

1056
00:41:22,790 --> 00:41:21,280
favorite pictures from the mission and

1057
00:41:24,950 --> 00:41:22,800
it just illustrates what wise was all

1058
00:41:26,710 --> 00:41:24,960
about an all-sky survey in four infrared

1059
00:41:29,030 --> 00:41:26,720
wavelengths beautiful nebula there

1060
00:41:30,870 --> 00:41:29,040
beautiful beautiful star-forming region

1061
00:41:32,230 --> 00:41:30,880
but there are some little dots and if we

1062
00:41:34,150 --> 00:41:32,240
have the next slide

1063
00:41:36,950 --> 00:41:34,160

you can see i've highlighted them there

1064

00:41:39,030 --> 00:41:36,960

those are asteroids those little dots

1065

00:41:40,870 --> 00:41:39,040

and what we did with the neowise project

1066

00:41:42,870 --> 00:41:40,880

is come up with a way of finding these

1067

00:41:44,630 --> 00:41:42,880

little dots automatically with with

1068

00:41:46,230 --> 00:41:44,640

computers instead of having to go

1069

00:41:47,270 --> 00:41:46,240

through these millions of images by hand

1070

00:41:48,630 --> 00:41:47,280

which would have been absolutely

1071

00:41:50,230 --> 00:41:48,640

impossible

1072

00:41:51,510 --> 00:41:50,240

so the pipeline automatically found

1073

00:41:53,349 --> 00:41:51,520

these objects even though they're in the

1074

00:41:55,829 --> 00:41:53,359

middle of this huge cloud

1075

00:41:57,910 --> 00:41:55,839

and so let's go on to the next slide

1076

00:41:59,990 --> 00:41:57,920

now i've talked a little bit about what

1077

00:42:01,990 --> 00:42:00,000

infrared is good for taking temperatures

1078

00:42:04,470 --> 00:42:02,000

and i've mentioned that it's good for

1079

00:42:06,069 --> 00:42:04,480

measuring sizes of asteroids and if what

1080

00:42:08,069 --> 00:42:06,079

you care about is the frequency with

1081

00:42:09,829 --> 00:42:08,079

which they impact the earth

1082

00:42:11,510 --> 00:42:09,839

this is a good thing to know

1083

00:42:13,829 --> 00:42:11,520

so this graphic here just gives you an

1084

00:42:15,349 --> 00:42:13,839

idea with visible light it's very hard

1085

00:42:17,430 --> 00:42:15,359

to tell the difference between an object

1086

00:42:19,510 --> 00:42:17,440

that's small but very shiny and

1087

00:42:21,589 --> 00:42:19,520

reflective and an object that's very

1088

00:42:23,670 --> 00:42:21,599

large but dark like a piece of charcoal

1089

00:42:25,510 --> 00:42:23,680

it's like tsa in other words yes it's

1090

00:42:27,030 --> 00:42:25,520

kind of it's kind of a special sensor

1091

00:42:28,069 --> 00:42:27,040

for figuring out what's really going on

1092

00:42:29,510 --> 00:42:28,079

there because you know when we see

1093

00:42:30,390 --> 00:42:29,520

asteroids far away they just look like

1094

00:42:32,069 --> 00:42:30,400

dots

1095

00:42:34,069 --> 00:42:32,079

most of the time we don't have beautiful

1096

00:42:35,910 --> 00:42:34,079

up close images like what carol is going

1097

00:42:37,589 --> 00:42:35,920

to show you so when we see them from far

1098

00:42:39,510 --> 00:42:37,599

away they look like dots and into a

1099

00:42:41,589 --> 00:42:39,520

visible light telescope it's very hard

1100

00:42:43,109 --> 00:42:41,599

to tell the size so you have to infer a

1101

00:42:44,790 --> 00:42:43,119

lot that's right and with the infrared

1102

00:42:46,790 --> 00:42:44,800

telescope you can get a much more direct

1103

00:42:49,190 --> 00:42:46,800

measurement of how big the object is and

1104

00:42:51,750 --> 00:42:49,200

that's important also too we tend not to

1105

00:42:55,030 --> 00:42:51,760

miss the smaller darker objects that are

1106

00:42:56,790 --> 00:42:55,040

out there so if we have the next slide

1107

00:42:58,470 --> 00:42:56,800

uh okay so go ahead and click on the

1108

00:43:00,150 --> 00:42:58,480

movie there

1109

00:43:01,990 --> 00:43:00,160

and we will give you

1110

00:43:04,470 --> 00:43:02,000

this is a it's a top-down view of the

1111

00:43:05,990 --> 00:43:04,480

solar system as it was observed by by

1112

00:43:09,030 --> 00:43:06,000

our spacecraft

1113

00:43:11,109 --> 00:43:09,040

and let's give it a there you go

1114

00:43:12,630 --> 00:43:11,119

okay so that is the orbit of jupiter is

1115

00:43:14,470 --> 00:43:12,640

that working

1116

00:43:16,630 --> 00:43:14,480

oops looks like we may have a technical

1117

00:43:17,670 --> 00:43:16,640

failure okay well i'm just going to go

1118

00:43:19,750 --> 00:43:17,680

ahead and talk about it so what you

1119

00:43:21,430 --> 00:43:19,760

would have seen there is basically lots

1120

00:43:23,430 --> 00:43:21,440

and lots of dots

1121

00:43:26,470 --> 00:43:23,440

and each one was an asteroid that was

1122

00:43:28,790 --> 00:43:26,480

observed by the project by neowise

1123

00:43:30,710 --> 00:43:28,800

in total we observed something like 158

1124

00:43:33,510 --> 00:43:30,720

000 asteroids and we're still digging

1125

00:43:34,950 --> 00:43:33,520

them out of the data as we speak and

1126

00:43:36,950 --> 00:43:34,960

we found a bunch of them that actually

1127

00:43:39,030 --> 00:43:36,960

get close to the earth and these are the

1128

00:43:41,750 --> 00:43:39,040

near-earth objects so what we've been

1129

00:43:44,710 --> 00:43:41,760

able to do is use our sample from wise

1130

00:43:46,710 --> 00:43:44,720

and from neowise to extrapolate how many

1131

00:43:48,630 --> 00:43:46,720

are out there in total and how big they

1132

00:43:51,349 --> 00:43:48,640

are and also learn something about their

1133

00:43:53,349 --> 00:43:51,359

orbits which for purposes of calculating

1134

00:43:55,510 --> 00:43:53,359

uh the actual impact frequency to earth

1135

00:43:57,349 --> 00:43:55,520

these are things we need to know

1136

00:43:58,550 --> 00:43:57,359

okay so let's just ditch the movie and

1137

00:43:59,910 --> 00:43:58,560

move on

1138

00:44:02,309 --> 00:43:59,920

all right so one of the things we were

1139

00:44:03,990 --> 00:44:02,319

able to find is that we've actually done

1140

00:44:05,910 --> 00:44:04,000

a pretty good job the whole worldwide

1141

00:44:08,150 --> 00:44:05,920

community of both amateur and

1142

00:44:09,910 --> 00:44:08,160

professional astronomers has actually

1143

00:44:11,829 --> 00:44:09,920

cleaned up pretty nicely on the really

1144

00:44:13,670 --> 00:44:11,839

big asteroids the really big near earth

1145

00:44:15,829 --> 00:44:13,680

objects these are sort of the planet

1146

00:44:17,190 --> 00:44:15,839

buster size things the things that are

1147

00:44:19,030 --> 00:44:17,200

thought to have been responsible for the

1148

00:44:20,950 --> 00:44:19,040

extinction of the dinosaurs

1149

00:44:22,870 --> 00:44:20,960

and there are roughly a thousand of them

1150

00:44:25,270 --> 00:44:22,880

and with neowise because we were able to

1151
00:44:26,950 --> 00:44:25,280
gain new information about their sizes

1152
00:44:29,109 --> 00:44:26,960
we were able to confirm that at this

1153
00:44:30,550 --> 00:44:29,119
point more than 90 percent of all these

1154
00:44:31,670 --> 00:44:30,560
really large near-earth objects have

1155
00:44:33,349 --> 00:44:31,680
been found

1156
00:44:34,790 --> 00:44:33,359
this was called the space guard goal and

1157
00:44:37,910 --> 00:44:34,800
i personally like it because it just

1158
00:44:39,510 --> 00:44:37,920
sounds so science fiction you know

1159
00:44:41,990 --> 00:44:39,520
so we've done pretty well on the on the

1160
00:44:43,430 --> 00:44:42,000
very large ones but on the smaller

1161
00:44:45,990 --> 00:44:43,440
objects which can still be quite

1162
00:44:48,069 --> 00:44:46,000
hazardous the picture is less rosy so if

1163
00:44:49,349 --> 00:44:48,079

we have the next slide

1164

00:44:51,109 --> 00:44:49,359

what we've been able to do is come up

1165

00:44:53,190 --> 00:44:51,119

with a new estimate of the numbers of

1166

00:44:54,790 --> 00:44:53,200

near-earth objects and in the top row

1167

00:44:57,030 --> 00:44:54,800

there are the filled in asteroids the

1168

00:44:58,950 --> 00:44:57,040

brown ones uh that represents the

1169

00:45:01,030 --> 00:44:58,960

world's knowledge of the population to

1170

00:45:02,790 --> 00:45:01,040

date how many have been discovered and

1171

00:45:04,630 --> 00:45:02,800

you can see at the one kilometer size

1172

00:45:07,109 --> 00:45:04,640

range most of these have been discovered

1173

00:45:08,950 --> 00:45:07,119

but at smaller sizes fewer and fewer

1174

00:45:11,190 --> 00:45:08,960

have been found and many more remain to

1175

00:45:12,710 --> 00:45:11,200

be found what we found with neowise was

1176

00:45:14,870 --> 00:45:12,720

actually quite surprising there are

1177

00:45:16,870 --> 00:45:14,880

somewhat fewer than we expected

1178

00:45:18,630 --> 00:45:16,880

so that's good news probably for the

1179

00:45:20,710 --> 00:45:18,640

hazard although we still have to focus

1180

00:45:22,390 --> 00:45:20,720

in on the calculations for the asteroids

1181

00:45:24,309 --> 00:45:22,400

that are actually most likely to get

1182

00:45:26,150 --> 00:45:24,319

close to the earth in the near term

1183

00:45:28,470 --> 00:45:26,160

so the blue circles represent the old

1184

00:45:30,550 --> 00:45:28,480

population estimate the green ones are

1185

00:45:32,950 --> 00:45:30,560

our new estimate with neowise

1186

00:45:35,430 --> 00:45:32,960

and we can have the last slide there

1187

00:45:37,109 --> 00:45:35,440

and this is our new estimate of what the

1188

00:45:39,109 --> 00:45:37,119

asteroid population looks like let's see

1189

00:45:40,790 --> 00:45:39,119

if we've got any joy on that movie okay

1190

00:45:42,550 --> 00:45:40,800

good right so you can see lots of

1191

00:45:44,470 --> 00:45:42,560

swirling red dots and these are a

1192

00:45:46,950 --> 00:45:44,480

simulated population of near-earth

1193

00:45:48,309 --> 00:45:46,960

objects that we think are out there

1194

00:45:49,990 --> 00:45:48,319

these little white and blue dots

1195

00:45:52,710 --> 00:45:50,000

represent the sample that we observed

1196

00:45:54,390 --> 00:45:52,720

with neowise that we actually detected

1197

00:45:56,950 --> 00:45:54,400

and this is what we used to make the

1198

00:45:58,790 --> 00:45:56,960

extrapolation to the whole population

1199

00:46:00,790 --> 00:45:58,800

and so now you can get an estimate there

1200

00:46:02,630 --> 00:46:00,800

of what the old model looked like and

1201
00:46:05,109 --> 00:46:02,640
you can see the new model on the other

1202
00:46:06,870 --> 00:46:05,119
side there so somewhat fewer but still

1203
00:46:07,829 --> 00:46:06,880
lots out there and lots remaining to be

1204
00:46:09,589 --> 00:46:07,839
found

1205
00:46:11,910 --> 00:46:09,599
obviously because this is an area that

1206
00:46:14,230 --> 00:46:11,920
science fiction and films love to

1207
00:46:16,230 --> 00:46:14,240
undertake you must have a sensibility

1208
00:46:19,109 --> 00:46:16,240
not only of how well they do the science

1209
00:46:21,670 --> 00:46:19,119
but how the women look in the sciences

1210
00:46:24,309 --> 00:46:21,680
whether it's lieutenant uhura for

1211
00:46:26,069 --> 00:46:24,319
example or the character in galaxy quest

1212
00:46:27,990 --> 00:46:26,079
that sigourney weaver played or jody

1213
00:46:29,670 --> 00:46:28,000

foster how do you assess those two

1214

00:46:32,390 --> 00:46:29,680

things both the quality of the science

1215

00:46:33,670 --> 00:46:32,400

in in t in fiction science fiction and

1216

00:46:35,589 --> 00:46:33,680

the way women are portrayed in the

1217

00:46:37,510 --> 00:46:35,599

science sure sure well so one of the

1218

00:46:39,670 --> 00:46:37,520

things that hollywood often gets wrong

1219

00:46:41,190 --> 00:46:39,680

about asteroids is that uh starting with

1220

00:46:42,550 --> 00:46:41,200

the empire strikes back which i love

1221

00:46:44,790 --> 00:46:42,560

it's a great movie

1222

00:46:46,710 --> 00:46:44,800

it's just that you very rarely would see

1223

00:46:48,390 --> 00:46:46,720

resolved asteroids in the asteroid belt

1224

00:46:50,230 --> 00:46:48,400

they would look like dots

1225

00:46:51,990 --> 00:46:50,240

so the whole cool scene of zooming

1226
00:46:54,069 --> 00:46:52,000
around through the asteroids that that

1227
00:46:55,910 --> 00:46:54,079
really wouldn't happen unfortunately

1228
00:46:57,510 --> 00:46:55,920
they'd be dots you'd be it'd be but it'd

1229
00:46:59,270 --> 00:46:57,520
be so much less exciting for a movie i

1230
00:47:01,109 --> 00:46:59,280
supposed to be zooming around whoa

1231
00:47:02,630 --> 00:47:01,119
there's a dot way over there you know

1232
00:47:03,990 --> 00:47:02,640
that wouldn't be so good uh and the

1233
00:47:06,150 --> 00:47:04,000
other thing that i think hollywood gets

1234
00:47:07,589 --> 00:47:06,160
wrong is that uh there just aren't very

1235
00:47:10,230 --> 00:47:07,599
many women

1236
00:47:11,670 --> 00:47:10,240
in leadership roles in science fiction

1237
00:47:13,190 --> 00:47:11,680
in representations i actually used to

1238
00:47:15,190 --> 00:47:13,200

read a lot of science fiction and i

1239

00:47:17,270 --> 00:47:15,200

still do but i have to admit it was a

1240

00:47:18,069 --> 00:47:17,280

real downer that some of the stories

1241

00:47:19,829 --> 00:47:18,079

were

1242

00:47:21,589 --> 00:47:19,839

just i didn't identify with many of the

1243

00:47:23,510 --> 00:47:21,599

characters or if i did they were they

1244

00:47:25,109 --> 00:47:23,520

were not women and the men wear loose

1245

00:47:26,950 --> 00:47:25,119

clothes and the women always wear really

1246

00:47:28,870 --> 00:47:26,960

tight yeah that's the other thing about

1247

00:47:30,309 --> 00:47:28,880

science is that what it's really like

1248

00:47:32,470 --> 00:47:30,319

science in the movies everybody looks

1249

00:47:34,470 --> 00:47:32,480

very glamorous science in real life i

1250

00:47:36,230 --> 00:47:34,480

wear sweatpants and i program with my

1251
00:47:37,109 --> 00:47:36,240
glasses on and my hair a mess and you

1252
00:47:38,870 --> 00:47:37,119
know

1253
00:47:40,150 --> 00:47:38,880
that's more real we'll make that movie

1254
00:47:47,910 --> 00:47:40,160
one of these yeah

1255
00:47:51,670 --> 00:47:49,829
carol raymond's also here at jpl

1256
00:47:53,510 --> 00:47:51,680
principal scientist and deputy principal

1257
00:47:55,750 --> 00:47:53,520
investigator for the dawn mission to the

1258
00:47:57,190 --> 00:47:55,760
asteroid belt specifically vesta in

1259
00:47:59,990 --> 00:47:57,200
series she's also figuring out the

1260
00:48:02,470 --> 00:48:00,000
nature of crustal magnetism on mars and

1261
00:48:03,910 --> 00:48:02,480
here she is attracting her own audience

1262
00:48:05,750 --> 00:48:03,920
thank you pat

1263
00:48:07,990 --> 00:48:05,760

well i'm really delighted to to be here

1264

00:48:09,030 --> 00:48:08,000

today to tell you a bit about dawn and

1265

00:48:10,069 --> 00:48:09,040

um

1266

00:48:12,309 --> 00:48:10,079

i'd like to start with a couple

1267

00:48:14,309 --> 00:48:12,319

anecdotes while i have my title side up

1268

00:48:16,309 --> 00:48:14,319

here when i was a graduate student at

1269

00:48:18,710 --> 00:48:16,319

columbia university

1270

00:48:22,150 --> 00:48:18,720

i was as a freshman graduate student

1271

00:48:25,190 --> 00:48:22,160

invited to organize the journal club and

1272

00:48:27,109 --> 00:48:25,200

so myself and one of my female

1273

00:48:29,589 --> 00:48:27,119

colleagues

1274

00:48:31,349 --> 00:48:29,599

who was recently elected an agu fellow

1275

00:48:32,470 --> 00:48:31,359

decided that we would

1276

00:48:35,430 --> 00:48:32,480

invite

1277

00:48:37,990 --> 00:48:35,440

50 women and 50 men

1278

00:48:39,910 --> 00:48:38,000

to speak at our friday seminar

1279

00:48:42,390 --> 00:48:39,920

so we went around to the various

1280

00:48:44,950 --> 00:48:42,400

professors and asked them for

1281

00:48:46,630 --> 00:48:44,960

ideas of who we should invite and we

1282

00:48:48,870 --> 00:48:46,640

received a lot of resistance to this

1283

00:48:49,910 --> 00:48:48,880

idea because there just weren't

1284

00:48:52,549 --> 00:48:49,920

that many

1285

00:48:54,069 --> 00:48:52,559

uh qualified women out there to fill up

1286

00:48:56,390 --> 00:48:54,079

our seminar schedule

1287

00:48:58,710 --> 00:48:56,400

but undeterred we we went forward and

1288

00:49:02,390 --> 00:48:58,720

and we did manage to uh bring a few

1289

00:49:05,190 --> 00:49:02,400

women to speak um during that semester

1290

00:49:06,230 --> 00:49:05,200

a few years later i was privileged to be

1291

00:49:08,230 --> 00:49:06,240

there when

1292

00:49:10,549 --> 00:49:08,240

a very dynamic

1293

00:49:13,990 --> 00:49:10,559

recent graduate from brown came to speak

1294

00:49:16,950 --> 00:49:14,000

to us and she's sitting to my right here

1295

00:49:19,270 --> 00:49:16,960

and and i found maria to be just a

1296

00:49:21,510 --> 00:49:19,280

wonderful role model and such an

1297

00:49:23,030 --> 00:49:21,520

accomplished scientist and i said

1298

00:49:25,990 --> 00:49:23,040

i know we were right

1299

00:49:28,470 --> 00:49:26,000

they are out there and we have to all

1300

00:49:32,069 --> 00:49:28,480

you know keep our eyes open and and

1301
00:49:33,670 --> 00:49:32,079
and and help dispel the myths that um

1302
00:49:35,910 --> 00:49:33,680
you know that women just aren't

1303
00:49:37,910 --> 00:49:35,920
contributing or haven't

1304
00:49:40,069 --> 00:49:37,920
reached the level of qualification of

1305
00:49:42,390 --> 00:49:40,079
our male colleagues

1306
00:49:44,309 --> 00:49:42,400
so um through my career i certainly kept

1307
00:49:46,309 --> 00:49:44,319
that in mind i've had the privilege of

1308
00:49:48,790 --> 00:49:46,319
working with just an amazing

1309
00:49:50,790 --> 00:49:48,800
group of scientists many of them women

1310
00:49:52,710 --> 00:49:50,800
so i'll point out that today that i'm

1311
00:49:54,950 --> 00:49:52,720
working with one of margie's colleagues

1312
00:49:56,790 --> 00:49:54,960
at ucla chris russell who is the

1313
00:49:58,390 --> 00:49:56,800

principal investigator of this mission

1314

00:50:00,950 --> 00:49:58,400

and he's been one of the

1315

00:50:02,790 --> 00:50:00,960

strongest champions for women in science

1316

00:50:05,430 --> 00:50:02,800

that i've ever come across

1317

00:50:07,670 --> 00:50:05,440

in the entire community of space science

1318

00:50:09,030 --> 00:50:07,680

so kudos to chris and one of his

1319

00:50:10,150 --> 00:50:09,040

graduate students is in the audience

1320

00:50:12,390 --> 00:50:10,160

today

1321

00:50:13,910 --> 00:50:12,400

who i am working with as well

1322

00:50:14,790 --> 00:50:13,920

so one more point before i get off this

1323

00:50:16,309 --> 00:50:14,800

slide

1324

00:50:19,349 --> 00:50:16,319

this mission is an international

1325

00:50:22,069 --> 00:50:19,359

collaboration um we have instruments and

1326
00:50:25,190 --> 00:50:22,079
uh scientists from italy and germany who

1327
00:50:28,150 --> 00:50:25,200
are uh intimately integrally uh involved

1328
00:50:29,589 --> 00:50:28,160
in the mission and the italian team in

1329
00:50:33,270 --> 00:50:29,599
particular

1330
00:50:34,630 --> 00:50:33,280
is led by a woman and her deputy is a

1331
00:50:37,750 --> 00:50:34,640
woman

1332
00:50:40,150 --> 00:50:37,760
and they have produced a amazing

1333
00:50:42,390 --> 00:50:40,160
spectrometer instrument

1334
00:50:44,549 --> 00:50:42,400
there are many other women on the team

1335
00:50:46,790 --> 00:50:44,559
as well and the reason is that the

1336
00:50:49,910 --> 00:50:46,800
italian government

1337
00:50:52,150 --> 00:50:49,920
invested in a proactive approach many

1338
00:50:53,670 --> 00:50:52,160

years ago to bring women into science

1339

00:50:54,390 --> 00:50:53,680

they really made an effort to attract

1340

00:50:58,950 --> 00:50:54,400

them

1341

00:51:01,109 --> 00:50:58,960

need and the the results are nothing

1342

00:51:02,790 --> 00:51:01,119

less than amazing um

1343

00:51:05,910 --> 00:51:02,800

amazing group of people

1344

00:51:08,470 --> 00:51:05,920

so now i'll turn to the amazing mission

1345

00:51:10,390 --> 00:51:08,480

that i've been working on

1346

00:51:13,589 --> 00:51:10,400

the dawn mission which is a launch in

1347

00:51:15,589 --> 00:51:13,599

2007 it's uh in the asteroid belt

1348

00:51:18,470 --> 00:51:15,599

in orbit around vesta

1349

00:51:20,710 --> 00:51:18,480

um its targets vest and ceres are really

1350

00:51:22,630 --> 00:51:20,720

special places because um in the

1351
00:51:24,710 --> 00:51:22,640
asteroid belt which amy has already

1352
00:51:26,549 --> 00:51:24,720
given a good introduction to the main

1353
00:51:28,870 --> 00:51:26,559
asteroid belt has over a half a million

1354
00:51:29,910 --> 00:51:28,880
objects in it probably upwards of a

1355
00:51:32,390 --> 00:51:29,920
million

1356
00:51:35,030 --> 00:51:32,400
and uh these are the fragments left over

1357
00:51:37,589 --> 00:51:35,040
from the planet building process

1358
00:51:39,589 --> 00:51:37,599
vesta and ceres comprise about 40 of the

1359
00:51:41,750 --> 00:51:39,599
mass of the belt so these two objects

1360
00:51:43,670 --> 00:51:41,760
are obviously very special we call them

1361
00:51:45,750 --> 00:51:43,680
protoplanets they're remnants of the

1362
00:51:47,910 --> 00:51:45,760
planet building process

1363
00:51:49,670 --> 00:51:47,920

equally as special as our spacecraft

1364

00:51:50,710 --> 00:51:49,680

because it also launched on a very small

1365

00:51:51,910 --> 00:51:50,720

rocket

1366

00:51:54,470 --> 00:51:51,920

it's the first

1367

00:51:56,069 --> 00:51:54,480

spacecraft ever to go into orbit about

1368

00:51:57,750 --> 00:51:56,079

an object in the main belt it's the

1369

00:51:59,829 --> 00:51:57,760

first spacecraft that will ever orbit

1370

00:52:02,150 --> 00:51:59,839

one object leave it and then go into

1371

00:52:04,230 --> 00:52:02,160

orbit around another object and it'll be

1372

00:52:07,829 --> 00:52:04,240

the first to visit a dwarf planet which

1373

00:52:09,829 --> 00:52:07,839

series was named recently

1374

00:52:11,109 --> 00:52:09,839

so let's uh get an idea of what these

1375

00:52:12,309 --> 00:52:11,119

things look like and why they're so

1376

00:52:14,710 --> 00:52:12,319

special

1377

00:52:16,150 --> 00:52:14,720

i've given you pictures of s in series

1378

00:52:19,349 --> 00:52:16,160

next to some objects you're familiar

1379

00:52:21,510 --> 00:52:19,359

with pluto the sibling dwarf planet to

1380

00:52:23,589 --> 00:52:21,520

series and the earth's moon

1381

00:52:26,309 --> 00:52:23,599

you also see pictures of two asteroids

1382

00:52:28,230 --> 00:52:26,319

that have been visited by spacecraft

1383

00:52:29,990 --> 00:52:28,240

which are considered large but as you

1384

00:52:32,790 --> 00:52:30,000

can see they're very tiny compared to

1385

00:52:36,870 --> 00:52:32,800

vesta and series these are really

1386

00:52:38,309 --> 00:52:36,880

small planets not just asteroids

1387

00:52:41,190 --> 00:52:38,319

so vesta

1388

00:52:43,670 --> 00:52:41,200

is a tiny planet that formed just after

1389

00:52:45,589 --> 00:52:43,680

the birth of our sun it's actually quite

1390

00:52:47,750 --> 00:52:45,599

similar to the moon it's dry it's rocky

1391

00:52:49,750 --> 00:52:47,760

it has an iron core

1392

00:52:52,230 --> 00:52:49,760

and it's been around for four and a half

1393

00:52:54,870 --> 00:52:52,240

billion years recording the history of

1394

00:52:58,470 --> 00:52:54,880

the solar system its surface is telling

1395

00:53:01,030 --> 00:52:58,480

us about the intense dynamic bombardment

1396

00:53:03,190 --> 00:53:01,040

that it has experienced over time and

1397

00:53:05,510 --> 00:53:03,200

one of the really interesting things

1398

00:53:07,109 --> 00:53:05,520

about vesta is that many of the

1399

00:53:09,510 --> 00:53:07,119

meteorites that fall to the earth in

1400

00:53:11,270 --> 00:53:09,520

fact five percent come from vesta it's a

1401

00:53:13,829 --> 00:53:11,280

special class of meteorites called the

1402

00:53:15,430 --> 00:53:13,839

heds and in fact more we have more

1403

00:53:17,349 --> 00:53:15,440

meteorites from vesta than we have from

1404

00:53:19,430 --> 00:53:17,359

the moon and mars combined

1405

00:53:21,990 --> 00:53:19,440

so uh we already know a lot about vesta

1406

00:53:24,950 --> 00:53:22,000

and we want to know um where what this

1407

00:53:29,030 --> 00:53:24,960

body is is able to tell us in concert

1408

00:53:30,470 --> 00:53:29,040

with those rocks about um the intense

1409

00:53:32,870 --> 00:53:30,480

dynamic environment the physical

1410

00:53:34,870 --> 00:53:32,880

processes the chemical gradients that

1411

00:53:38,309 --> 00:53:34,880

were present at the beginning and that

1412

00:53:39,510 --> 00:53:38,319

influenced the planet building process

1413

00:53:41,190 --> 00:53:39,520

another

1414

00:53:43,270 --> 00:53:41,200

amazing thing about these two bodies is

1415

00:53:46,549 --> 00:53:43,280

that they're there at all

1416

00:53:48,549 --> 00:53:46,559

that they have survived this intense

1417

00:53:50,390 --> 00:53:48,559

dynamic environment for four and a half

1418

00:53:51,990 --> 00:53:50,400

billion years and they're there to tell

1419

00:53:53,829 --> 00:53:52,000

us the story

1420

00:53:55,349 --> 00:53:53,839

so uh ceres is quite different than

1421

00:53:57,829 --> 00:53:55,359

vesta

1422

00:54:01,510 --> 00:53:57,839

it is not dry it's very wet

1423

00:54:03,670 --> 00:54:01,520

it has a rocky core which is silicate it

1424

00:54:05,750 --> 00:54:03,680

has some silicate which has more water

1425

00:54:07,349 --> 00:54:05,760

in it on the outside and then at the at

1426
00:54:09,349 --> 00:54:07,359
the outer

1427
00:54:10,630 --> 00:54:09,359
edge it's got an ice shell

1428
00:54:13,990 --> 00:54:10,640
and underneath that eye shell there

1429
00:54:18,470 --> 00:54:15,910
so so ceres has

1430
00:54:20,790 --> 00:54:18,480
retained water and gases like

1431
00:54:22,390 --> 00:54:20,800
carbon dioxide and methane over solar

1432
00:54:24,549 --> 00:54:22,400
system history

1433
00:54:26,309 --> 00:54:24,559
its surface chemistry is expected to be

1434
00:54:27,349 --> 00:54:26,319
very interesting because it's got a warm

1435
00:54:30,230 --> 00:54:27,359
surface

1436
00:54:31,430 --> 00:54:30,240
um and in fact it shows some specific

1437
00:54:33,829 --> 00:54:31,440
minerals that are associated with

1438
00:54:35,109 --> 00:54:33,839

hydrothermal vents on the earth and that

1439

00:54:37,270 --> 00:54:35,119

have only been

1440

00:54:40,470 --> 00:54:37,280

uh recognized on the earth in mars and

1441

00:54:42,390 --> 00:54:40,480

ceres so when we get to series in 2015

1442

00:54:45,270 --> 00:54:42,400

we know we're going to find some really

1443

00:54:47,829 --> 00:54:45,280

interesting things

1444

00:54:50,150 --> 00:54:47,839

so next i'll show you a short tour of

1445

00:54:51,510 --> 00:54:50,160

vesta and then i'm going to give you a

1446

00:54:53,430 --> 00:54:51,520

little more

1447

00:54:55,589 --> 00:54:53,440

information on a couple of special

1448

00:54:57,829 --> 00:54:55,599

places

1449

00:55:00,470 --> 00:54:57,839

and the first thing we're going to see

1450

00:55:06,150 --> 00:55:03,510

if my movie will play

1451
00:55:08,150 --> 00:55:06,160
okay i don't think my movie is going to

1452
00:55:09,829 --> 00:55:08,160
play yes it is okay so the first thing

1453
00:55:12,390 --> 00:55:09,839
we're going to see is uh these the

1454
00:55:14,790 --> 00:55:12,400
vessels rotating on saxis we have some

1455
00:55:16,150 --> 00:55:14,800
deep troughs around the equator

1456
00:55:17,109 --> 00:55:16,160
then we're going to look at the south

1457
00:55:19,109 --> 00:55:17,119
pole

1458
00:55:20,710 --> 00:55:19,119
and we're going to see that the south

1459
00:55:23,030 --> 00:55:20,720
pole has some very

1460
00:55:24,150 --> 00:55:23,040
chaotic topography with a lot of ripples

1461
00:55:26,230 --> 00:55:24,160
in it

1462
00:55:27,829 --> 00:55:26,240
and this is the area of a very large

1463
00:55:30,150 --> 00:55:27,839

impact basin which you'll see in an

1464

00:55:31,990 --> 00:55:30,160

upcoming slide

1465

00:55:34,230 --> 00:55:32,000

the surface of vestas

1466

00:55:35,670 --> 00:55:34,240

is quite smooth and younger looking at

1467

00:55:36,710 --> 00:55:35,680

the south where this large impact

1468

00:55:39,109 --> 00:55:36,720

occurred

1469

00:55:40,870 --> 00:55:39,119

whereas the north shows many more

1470

00:55:44,069 --> 00:55:40,880

craters

1471

00:55:46,870 --> 00:55:44,079

an older surface and if we this this is

1472

00:55:49,589 --> 00:55:46,880

a flyover showing you

1473

00:55:50,309 --> 00:55:49,599

the topography in that south polar basin

1474

00:55:53,270 --> 00:55:50,319

um

1475

00:55:54,870 --> 00:55:53,280

coming up over a central mountain which

1476

00:55:55,910 --> 00:55:54,880

is one of the highest in the solar

1477

00:55:58,789 --> 00:55:55,920

system

1478

00:56:00,870 --> 00:55:58,799

um here we're looking down into a crater

1479

00:56:02,710 --> 00:56:00,880

we call marcia and you'll see that

1480

00:56:05,109 --> 00:56:02,720

coming up in a little bit

1481

00:56:07,190 --> 00:56:05,119

in the north of vesta

1482

00:56:09,910 --> 00:56:07,200

and then i'm going to cut from the movie

1483

00:56:15,589 --> 00:56:12,150

excuse me in the interest of time

1484

00:56:20,309 --> 00:56:17,430

a little more detail

1485

00:56:24,630 --> 00:56:20,319

so this is the uh the large impact basin

1486

00:56:27,670 --> 00:56:24,640

um it has a uh it's so large that it its

1487

00:56:30,230 --> 00:56:27,680

effects affected the entire asteroid and

1488

00:56:33,030 --> 00:56:30,240

those equatorial troughs that i showed

1489

00:56:35,270 --> 00:56:33,040

you earlier are actually associated with

1490

00:56:36,230 --> 00:56:35,280

that impact

1491

00:56:45,030 --> 00:56:36,240

the

1492

00:56:48,230 --> 00:56:45,040

it rivals olympus mons on mars it's a

1493

00:56:51,270 --> 00:56:48,240

very unusual uh feature and we generally

1494

00:56:53,190 --> 00:56:51,280

see extremely steep slopes on vesta

1495

00:56:55,349 --> 00:56:53,200

um in addition to the large ray sylvia

1496

00:56:58,549 --> 00:56:55,359

basin there's an underlying

1497

00:57:00,710 --> 00:56:58,559

second large basin so um it's it's clear

1498

00:57:03,430 --> 00:57:00,720

that these these um

1499

00:57:05,109 --> 00:57:03,440

these impacts have had a a very large

1500

00:57:08,309 --> 00:57:05,119

effect on the body

1501
00:57:10,870 --> 00:57:08,319
um and here is uh is vesta's party dress

1502
00:57:13,430 --> 00:57:10,880
this is showing you the spectral data

1503
00:57:15,030 --> 00:57:13,440
from our italian spectrometer

1504
00:57:17,030 --> 00:57:15,040
draped across the surface and these

1505
00:57:19,349 --> 00:57:17,040
color variations are identifying

1506
00:57:22,549 --> 00:57:19,359
minerals which allow us to identify

1507
00:57:26,069 --> 00:57:22,559
rocks and give us the ability to do this

1508
00:57:27,990 --> 00:57:26,079
this tie back into the meteorites so

1509
00:57:29,990 --> 00:57:28,000
we we can

1510
00:57:31,349 --> 00:57:30,000
associate different parts of the surface

1511
00:57:33,670 --> 00:57:31,359
with the different rock types and we've

1512
00:57:35,670 --> 00:57:33,680
confirmed that these these rocks have

1513
00:57:38,710 --> 00:57:35,680

been liberated from vesta by this giant

1514

00:57:40,950 --> 00:57:38,720

impact at the south pole so now we have

1515

00:57:43,109 --> 00:57:40,960

a better basis in which to make

1516

00:57:45,030 --> 00:57:43,119

a geologic history of vesta and

1517

00:57:47,109 --> 00:57:45,040

understand its relation

1518

00:57:49,430 --> 00:57:47,119

to the solar system formation so i'm

1519

00:57:51,349 --> 00:57:49,440

going to leave you with this picture of

1520

00:57:53,030 --> 00:57:51,359

marsha crater this beautiful crater in

1521

00:58:00,789 --> 00:57:53,040

the north and

1522

00:58:04,230 --> 00:58:02,390

you mentioned how inspired you were by

1523

00:58:06,630 --> 00:58:04,240

maria's work i'm sure we're all going to

1524

00:58:09,990 --> 00:58:06,640

make this point but was there a mentor

1525

00:58:11,990 --> 00:58:10,000

or someone who and brought you along or

1526

00:58:15,510 --> 00:58:12,000

on the other hand maybe someone who said

1527

00:58:16,549 --> 00:58:15,520

nah science that's not for you gurley um

1528

00:58:21,349 --> 00:58:16,559

no

1529

00:58:23,990 --> 00:58:21,359

were many mentors along the way starting

1530

00:58:25,349 --> 00:58:24,000

in junior high school um i

1531

00:58:27,910 --> 00:58:25,359

you know people ask that question all

1532

00:58:29,589 --> 00:58:27,920

the time and and i i thought very hard

1533

00:58:31,510 --> 00:58:29,599

about it and i can't come up with a

1534

00:58:34,390 --> 00:58:31,520

single instance of

1535

00:58:36,230 --> 00:58:34,400

um anybody not encouraging me other than

1536

00:58:38,309 --> 00:58:36,240

once you get out in the in the world i

1537

00:58:40,230 --> 00:58:38,319

did a lot of work on ships and i can

1538

00:58:41,589 --> 00:58:40,240

tell you that's a pretty chauvinistic

1539

00:58:43,670 --> 00:58:41,599

environment to work in and there were

1540

00:58:45,829 --> 00:58:43,680

many men who told me things like you

1541

00:58:48,390 --> 00:58:45,839

know i should i should just smile and

1542

00:58:50,390 --> 00:58:48,400

use my feminine charms to get the men to

1543

00:58:52,549 --> 00:58:50,400

do the work for me

1544

00:58:54,950 --> 00:58:52,559

but that's not what i was there for so

1545

00:58:55,670 --> 00:58:54,960

um so yeah you hear things you ignore

1546

00:58:59,030 --> 00:58:55,680

them

1547

00:59:01,270 --> 00:58:59,040

um you develop a thick skin and just

1548

00:59:02,950 --> 00:59:01,280

keep your eye on what what your goals

1549

00:59:04,549 --> 00:59:02,960

are is that the best advice just kind of

1550

00:59:06,470 --> 00:59:04,559

ignore this stuff let it roll off your

1551
00:59:07,750 --> 00:59:06,480
backs why not

1552
00:59:09,990 --> 00:59:07,760
yeah

1553
00:59:11,589 --> 00:59:10,000
all right let's hear from fiona harrison

1554
00:59:14,150 --> 00:59:11,599
she teaches physics and astronomy at

1555
00:59:15,589 --> 00:59:14,160
caltech she's the pi on nustar it's part

1556
00:59:17,990 --> 00:59:15,599
of the program to build the first

1557
00:59:19,910 --> 00:59:18,000
on-orbit telescope tasked with finding

1558
00:59:21,589 --> 00:59:19,920
black holes and supernovas and all those

1559
00:59:23,829 --> 00:59:21,599
extreme galaxy events that we like

1560
00:59:25,750 --> 00:59:23,839
sounds like a reality show and like a

1561
00:59:28,789 --> 00:59:25,760
reality show she has taken leadership

1562
00:59:31,190 --> 00:59:28,799
roles in these great unknowns

1563
00:59:33,030 --> 00:59:31,200

okay so this is a picture of my second

1564

00:59:36,630 --> 00:59:33,040

child

1565

00:59:39,750 --> 00:59:36,640

five-year-old girl

1566

00:59:41,510 --> 00:59:39,760

and talk about you know what maria said

1567

00:59:43,109 --> 00:59:41,520

worrying about sending your kids off to

1568

00:59:45,109 --> 00:59:43,119

college well

1569

00:59:47,990 --> 00:59:45,119

my second child is

1570

00:59:49,990 --> 00:59:48,000

right now at vanderberg air force base

1571

00:59:53,990 --> 00:59:50,000

in a fairing we're about to put it under

1572

00:59:56,150 --> 00:59:54,000

the an aircraft fly it from kwajale from

1573

00:59:57,990 --> 00:59:56,160

vanderberg to kwajalein which is an

1574

00:59:59,829 --> 00:59:58,000

atoll in the south pacific

1575

01:00:02,870 --> 00:59:59,839

have the plane take off have the rocket

1576

01:00:05,190 --> 01:00:02,880

drop and five seconds later go up into

1577

01:00:06,390 --> 01:00:05,200

space working flawlessly

1578

01:00:07,910 --> 01:00:06,400

so

1579

01:00:10,150 --> 01:00:07,920

fingers crossed this is all going to

1580

01:00:10,870 --> 01:00:10,160

happen in about two weeks

1581

01:00:14,230 --> 01:00:10,880

so

1582

01:00:16,230 --> 01:00:14,240

doing

1583

01:00:19,510 --> 01:00:16,240

and the problem is

1584

01:00:23,750 --> 01:00:21,910

if nasa's behind then in our case you

1585

01:00:26,630 --> 01:00:23,760

know we do have a few issues making sure

1586

01:00:29,349 --> 01:00:26,640

the rocket's ready uh sadly you just

1587

01:00:31,750 --> 01:00:29,359

have to wait my project manager told me

1588

01:00:33,670 --> 01:00:31,760

on the way back from

1589

01:00:35,270 --> 01:00:33,680

nasa headquarters last night on the

1590

01:00:36,789 --> 01:00:35,280

plane he said well

1591

01:00:39,109 --> 01:00:36,799

space science

1592

01:00:40,150 --> 01:00:39,119

isn't for the impatient

1593

01:00:43,030 --> 01:00:40,160

but

1594

01:00:44,549 --> 01:00:43,040

it's a combination of frustration and

1595

01:00:47,030 --> 01:00:44,559

exhilaration

1596

01:00:49,589 --> 01:00:47,040

kind of like raising children but focus

1597

01:00:51,910 --> 01:00:49,599

on the exhilaration because being being

1598

01:00:54,630 --> 01:00:51,920

able to lead a mission and work with a

1599

01:00:55,829 --> 01:00:54,640

as mary said a smart team of people and

1600

01:00:58,950 --> 01:00:55,839

achieve something that's never been

1601
01:01:01,349 --> 01:00:58,960
achieved before that is a sense of

1602
01:01:02,069 --> 01:01:01,359
you know accomplishment and exhilaration

1603
01:01:03,829 --> 01:01:02,079
and

1604
01:01:07,030 --> 01:01:03,839
three weeks from now i

1605
01:01:08,950 --> 01:01:07,040
uh hope to be uh telling you

1606
01:01:10,950 --> 01:01:08,960
uh how everything worked but let me

1607
01:01:14,150 --> 01:01:10,960
first i what i really want to focus on

1608
01:01:15,910 --> 01:01:14,160
first is the exhilaration why

1609
01:01:17,750 --> 01:01:15,920
is it so great to be able to do

1610
01:01:20,069 --> 01:01:17,760
something new well nustar is going to

1611
01:01:21,750 --> 01:01:20,079
open a whole new window on the universe

1612
01:01:22,630 --> 01:01:21,760
it's going to be the first telescope

1613
01:01:25,510 --> 01:01:22,640

ever

1614

01:01:27,589 --> 01:01:25,520

that can take high sensitivity

1615

01:01:30,069 --> 01:01:27,599

images of the universe in the high

1616

01:01:32,789 --> 01:01:30,079

energy x-ray band and we conceived of

1617

01:01:36,150 --> 01:01:32,799

this in 1995 we had to develop new

1618

01:01:38,870 --> 01:01:36,160

technologies new optics detectors

1619

01:01:41,190 --> 01:01:38,880

to make this happen but in the end on a

1620

01:01:43,430 --> 01:01:41,200

small mission so this is small nasa's

1621

01:01:45,030 --> 01:01:43,440

smallest astrophysics platform we're

1622

01:01:46,069 --> 01:01:45,040

going to achieve something a hundred

1623

01:01:47,030 --> 01:01:46,079

times

1624

01:01:48,390 --> 01:01:47,040

uh

1625

01:01:50,549 --> 01:01:48,400

that can look a hundred times more

1626
01:01:52,549 --> 01:01:50,559
sensitively with ten times sharper

1627
01:01:55,349 --> 01:01:52,559
images than anything that's that's ever

1628
01:01:58,950 --> 01:01:55,359
been flown so we go to the next

1629
01:02:01,670 --> 01:01:58,960
uh view graph so why do we want to open

1630
01:02:03,190 --> 01:02:01,680
uh the universe to high energy x-ray

1631
01:02:04,390 --> 01:02:03,200
exploration

1632
01:02:06,630 --> 01:02:04,400
well x-rays are part of the

1633
01:02:08,150 --> 01:02:06,640
electromagnetic spectrum just like the

1634
01:02:10,549 --> 01:02:08,160
infrared light that

1635
01:02:12,710 --> 01:02:10,559
any talked about

1636
01:02:14,470 --> 01:02:12,720
and radio waves and optical but the

1637
01:02:17,270 --> 01:02:14,480
thing about x-rays is they're emitted

1638
01:02:19,109 --> 01:02:17,280

from objects that are 10 000 times

1639

01:02:20,549 --> 01:02:19,119

hotter than our sun from regions where

1640

01:02:22,710 --> 01:02:20,559

particles are moving

1641

01:02:24,470 --> 01:02:22,720

close to the speed of light and the

1642

01:02:26,549 --> 01:02:24,480

other thing about the high energy x-ray

1643

01:02:29,109 --> 01:02:26,559

band nasa has built telescopes in the

1644

01:02:31,190 --> 01:02:29,119

low energy x-ray band by going to higher

1645

01:02:33,829 --> 01:02:31,200

energy x-rays these are the same

1646

01:02:36,630 --> 01:02:33,839

energy x-rays that are used in baggage

1647

01:02:38,309 --> 01:02:36,640

scanners and

1648

01:02:42,549 --> 01:02:38,319

in in medical x-rays because they're

1649

01:02:46,710 --> 01:02:44,470

rather than just being exotic things and

1650

01:02:48,789 --> 01:02:46,720

they are exotic and we want to study

1651

01:02:50,630 --> 01:02:48,799

them for that reason they're also

1652

01:02:54,150 --> 01:02:50,640

building blocks of the universe it turns

1653

01:02:56,069 --> 01:02:54,160

out and so nustar is going to shed

1654

01:02:59,109 --> 01:02:56,079

a whole new light

1655

01:03:02,470 --> 01:02:59,119

on the question of how galaxies and

1656

01:03:04,230 --> 01:03:02,480

black holes uh form together

1657

01:03:06,630 --> 01:03:04,240

so i want to turn for a minute to

1658

01:03:10,069 --> 01:03:06,640

talking about the hardware

1659

01:03:11,589 --> 01:03:10,079

so this when i was a post-doc we

1660

01:03:13,750 --> 01:03:11,599

wanted to build a sensitive high energy

1661

01:03:16,950 --> 01:03:13,760

tech telescope but the technologies

1662

01:03:19,349 --> 01:03:16,960

didn't exist the optics the detectors

1663

01:03:21,510 --> 01:03:19,359

and i'm a person who has my own lab i go

1664

01:03:23,670 --> 01:03:21,520

down there i spend you know a lot of

1665

01:03:25,990 --> 01:03:23,680

time thinking about how to build things

1666

01:03:29,349 --> 01:03:26,000

and

1667

01:03:32,069 --> 01:03:29,359

it's been an amazing

1668

01:03:34,470 --> 01:03:32,079

effort to work with a lot of talented

1669

01:03:35,670 --> 01:03:34,480

people to figure out how to build these

1670

01:03:37,670 --> 01:03:35,680

new

1671

01:03:39,029 --> 01:03:37,680

optics and detectors and i'll tell you

1672

01:03:40,710 --> 01:03:39,039

when i was

1673

01:03:42,470 --> 01:03:40,720

a graduate student

1674

01:03:44,950 --> 01:03:42,480

i almost gave up

1675

01:03:47,670 --> 01:03:44,960

because i started to work on a balloon

1676
01:03:48,950 --> 01:03:47,680
experiment not this technology but but

1677
01:03:50,710 --> 01:03:48,960
related

1678
01:03:52,870 --> 01:03:50,720
and i was told my

1679
01:03:54,470 --> 01:03:52,880
by my advisor

1680
01:03:56,789 --> 01:03:54,480
he said well

1681
01:03:58,470 --> 01:03:56,799
there's a bunch of engineers over here

1682
01:03:59,510 --> 01:03:58,480
this group i want you to

1683
01:04:01,510 --> 01:03:59,520
go

1684
01:04:03,109 --> 01:04:01,520
you know tell them how to design the

1685
01:04:05,829 --> 01:04:03,119
system work with them

1686
01:04:08,549 --> 01:04:05,839
uh you know to get it to work and

1687
01:04:10,150 --> 01:04:08,559
i can tell you they didn't really like

1688
01:04:12,789 --> 01:04:10,160

a

1689

01:04:15,109 --> 01:04:12,799

uh

1690

01:04:16,309 --> 01:04:15,119

girl as they called me coming in and

1691

01:04:17,190 --> 01:04:16,319

telling them

1692

01:04:18,870 --> 01:04:17,200

uh

1693

01:04:22,309 --> 01:04:18,880

you know

1694

01:04:25,270 --> 01:04:22,319

we're gonna do things this way so

1695

01:04:27,029 --> 01:04:25,280

i figured very quickly the way to get

1696

01:04:29,510 --> 01:04:27,039

around this was

1697

01:04:31,750 --> 01:04:29,520

you know we're a team we work together

1698

01:04:32,470 --> 01:04:31,760

you know i listen to you you listen to

1699

01:04:34,470 --> 01:04:32,480

me

1700

01:04:35,430 --> 01:04:34,480

and just ignore the

1701

01:04:36,870 --> 01:04:35,440

the

1702

01:04:39,190 --> 01:04:36,880

you know

1703

01:04:40,789 --> 01:04:39,200

the comments and the and once you get

1704

01:04:42,870 --> 01:04:40,799

past that and you start working with

1705

01:04:44,870 --> 01:04:42,880

people on a personal level

1706

01:04:46,230 --> 01:04:44,880

right it really

1707

01:04:47,510 --> 01:04:46,240

uh

1708

01:04:49,510 --> 01:04:47,520

it really

1709

01:04:51,190 --> 01:04:49,520

doesn't make a difference anymore people

1710

01:04:53,510 --> 01:04:51,200

don't see you

1711

01:04:56,150 --> 01:04:53,520

as you know a young woman

1712

01:04:58,069 --> 01:04:56,160

they see you as a scientist and

1713

01:05:00,230 --> 01:04:58,079

eventually you know as a leader and

1714

01:05:01,829 --> 01:05:00,240

somebody they respect so

1715

01:05:04,549 --> 01:05:01,839

um

1716

01:05:06,150 --> 01:05:04,559

but it was don't give up because if you

1717

01:05:07,029 --> 01:05:06,160

can get past that

1718

01:05:09,190 --> 01:05:07,039

then

1719

01:05:11,589 --> 01:05:09,200

you know you have tremendous

1720

01:05:14,390 --> 01:05:11,599

opportunities ahead and here's the

1721

01:05:21,190 --> 01:05:17,750

that we realized on with my team which

1722

01:05:22,950 --> 01:05:21,200

is the spacecraft you can see two x-ray

1723

01:05:26,150 --> 01:05:22,960

telescopes that funny

1724

01:05:28,230 --> 01:05:26,160

uh cone-shaped thing is a star tracker

1725

01:05:29,589 --> 01:05:28,240

there's solar panels that have to unfold

1726

01:05:30,789 --> 01:05:29,599

after we launch

1727

01:05:32,230 --> 01:05:30,799

there it is

1728

01:05:34,470 --> 01:05:32,240

it's really beautiful just like your

1729

01:05:38,470 --> 01:05:34,480

kids they're always the cutest one in

1730

01:05:42,069 --> 01:05:39,750

so

1731

01:05:45,510 --> 01:05:42,079

the other thing that

1732

01:05:46,470 --> 01:05:45,520

my kid has to learn to do is extend

1733

01:05:51,829 --> 01:05:46,480

a

1734

01:05:54,069 --> 01:05:51,839

is

1735

01:05:56,630 --> 01:05:54,079

an animation because we're a small

1736

01:05:58,549 --> 01:05:56,640

mission and we x-ray telescopes require

1737

01:06:00,150 --> 01:05:58,559

a long distance between their optics and

1738

01:06:01,589 --> 01:06:00,160

their detectors

1739

01:06:04,150 --> 01:06:01,599

we

1740

01:06:05,589 --> 01:06:04,160

are the first mission to fly this novel

1741

01:06:07,750 --> 01:06:05,599

structure

1742

01:06:10,470 --> 01:06:07,760

on a telescope an astronomical telescope

1743

01:06:12,470 --> 01:06:10,480

which will unfold to be the size of a

1744

01:06:14,230 --> 01:06:12,480

school bus after we launch so this is

1745

01:06:15,029 --> 01:06:14,240

going to happen seven days after launch

1746

01:06:19,589 --> 01:06:15,039

so

1747

01:06:22,870 --> 01:06:19,599

i don't know

1748

01:06:24,470 --> 01:06:22,880

equivalent maybe to uh

1749

01:06:27,430 --> 01:06:24,480

you know sending your kid to walk to

1750

01:06:29,430 --> 01:06:27,440

school for the first time

1751

01:06:32,710 --> 01:06:29,440

so figures crossed

1752

01:06:34,470 --> 01:06:32,720

seven days after launch next so we'll

1753

01:06:36,390 --> 01:06:34,480

take three weeks from now we'll watch

1754

01:06:38,710 --> 01:06:36,400

that's right hopefully

1755

01:06:40,870 --> 01:06:38,720

hopefully

1756

01:06:42,549 --> 01:06:40,880

so after that point we'll take this

1757

01:06:44,309 --> 01:06:42,559

image of the

1758

01:06:47,190 --> 01:06:44,319

high energy universe

1759

01:06:48,870 --> 01:06:47,200

that's a glow of unresolved black holes

1760

01:06:51,510 --> 01:06:48,880

none of those are real point sources

1761

01:06:53,750 --> 01:06:51,520

it's just the glow of the sky and x-rays

1762

01:06:55,349 --> 01:06:53,760

made by the previous best high-energy

1763

01:06:57,029 --> 01:06:55,359

x-ray telescope and we're going to turn

1764

01:06:59,430 --> 01:06:57,039

it into

1765

01:07:04,549 --> 01:07:02,390

and that is the exhilaration that's a

1766

01:07:10,630 --> 01:07:04,559

better makeover than seventeen magazine

1767

01:07:10,640 --> 01:07:18,950

thank you so much fiona

1768

01:07:22,630 --> 01:07:20,789

we've got questions from the audience i

1769

01:07:24,950 --> 01:07:22,640

know but i also know that one of them is

1770

01:07:27,190 --> 01:07:24,960

going to be about advice for young women

1771

01:07:30,870 --> 01:07:27,200

going into the sciences good advice

1772

01:07:33,510 --> 01:07:30,880

and and advice about things not to do

1773

01:07:35,670 --> 01:07:33,520

we can learn from you

1774

01:07:37,430 --> 01:07:35,680

jump in

1775

01:07:40,950 --> 01:07:37,440

science and engineering are great

1776

01:07:43,190 --> 01:07:40,960

careers you should do them

1777

01:07:45,349 --> 01:07:43,200

it's a lot of fun it's hard work but

1778

01:07:47,190 --> 01:07:45,359

they're just so much fun i love i love

1779

01:07:49,190 --> 01:07:47,200

my job i couldn't imagine not being a

1780

01:07:51,349 --> 01:07:49,200

scientist

1781

01:07:52,230 --> 01:07:51,359

and and what what shouldn't you do what

1782

01:07:56,069 --> 01:07:52,240

are the

1783

01:07:57,430 --> 01:07:56,079

don't not do science know

1784

01:07:59,670 --> 01:07:57,440

mean don't be afraid it's it's a great

1785

01:08:01,349 --> 01:07:59,680

career it's absolutely fabulous

1786

01:08:02,950 --> 01:08:01,359

what what are some of the the dumb

1787

01:08:04,549 --> 01:08:02,960

questions and remarks you've heard on

1788

01:08:05,750 --> 01:08:04,559

the way to where you are now in your

1789

01:08:06,870 --> 01:08:05,760

career

1790

01:08:08,950 --> 01:08:06,880

you know there are a lot of little

1791

01:08:10,390 --> 01:08:08,960

things but i think a common theme is

1792

01:08:11,430 --> 01:08:10,400

keep your eyes on the prize

1793

01:08:13,430 --> 01:08:11,440

you know

1794

01:08:15,349 --> 01:08:13,440

just keep going if you get knocked down

1795

01:08:18,630 --> 01:08:15,359

get up if you get knocked down again get

1796

01:08:20,149 --> 01:08:18,640

up again you know and just keep going

1797

01:08:22,309 --> 01:08:20,159

the most important thing is is

1798

01:08:25,910 --> 01:08:22,319

determination really

1799

01:08:28,229 --> 01:08:25,920

i might say don't underestimate yourself

1800

01:08:30,709 --> 01:08:28,239

i think that that's something

1801
01:08:35,749 --> 01:08:33,349
is is easy to do when

1802
01:08:37,749 --> 01:08:35,759
people around you are more blustery than

1803
01:08:40,070 --> 01:08:37,759
you are

1804
01:08:44,470 --> 01:08:40,080
recognize that

1805
01:08:53,349 --> 01:08:45,669
be a

1806
01:08:56,550 --> 01:08:53,359
fine scientist and i think that that

1807
01:08:59,030 --> 01:08:56,560
personality trait is one that some women

1808
01:09:00,470 --> 01:08:59,040
have to overcome

1809
01:09:02,309 --> 01:09:00,480
the fact that you're all up here means

1810
01:09:04,709 --> 01:09:02,319
they're probably a lot more mentors than

1811
01:09:06,950 --> 01:09:04,719
there were 10 and 20 years ago

1812
01:09:08,870 --> 01:09:06,960
were mentors important to you and do you

1813
01:09:10,470 --> 01:09:08,880

find young women coming to you now or

1814

01:09:12,630 --> 01:09:10,480

even young men and saying

1815

01:09:14,709 --> 01:09:12,640

help me out

1816

01:09:17,110 --> 01:09:14,719

i think one of the um the things that a

1817

01:09:19,669 --> 01:09:17,120

lot of women worry about is the balance

1818

01:09:20,950 --> 01:09:19,679

between work and family i hear that over

1819

01:09:22,229 --> 01:09:20,960

and over again

1820

01:09:23,590 --> 01:09:22,239

and

1821

01:09:25,349 --> 01:09:23,600

interestingly

1822

01:09:27,749 --> 01:09:25,359

there's a trend that i've seen in some

1823

01:09:29,269 --> 01:09:27,759

of my colleagues whereby

1824

01:09:32,149 --> 01:09:29,279

couples will

1825

01:09:33,749 --> 01:09:32,159

take one position and split it

1826

01:09:35,749 --> 01:09:33,759

you know tenure track professorship for

1827

01:09:37,910 --> 01:09:35,759

instance and split it so they can raise

1828

01:09:40,870 --> 01:09:37,920

a family um

1829

01:09:42,950 --> 01:09:40,880

with with equality in the relationship

1830

01:09:44,870 --> 01:09:42,960

until such time as they're ready to um

1831

01:09:46,390 --> 01:09:44,880

you know to take on more so that's

1832

01:09:48,390 --> 01:09:46,400

that's one innovative way to deal with

1833

01:09:49,510 --> 01:09:48,400

it but i think the important message is

1834

01:09:54,149 --> 01:09:49,520

that

1835

01:09:56,630 --> 01:09:54,159

women can succeed to

1836

01:09:58,950 --> 01:09:56,640

positions of leadership while still

1837

01:10:01,270 --> 01:09:58,960

doing all the other things that

1838

01:10:04,229 --> 01:10:01,280

everybody wants to do and

1839

01:10:06,470 --> 01:10:04,239

it's it is possible so

1840

01:10:07,510 --> 01:10:06,480

that that i think is one thing that that

1841

01:10:08,550 --> 01:10:07,520

deters

1842

01:10:10,390 --> 01:10:08,560

women and

1843

01:10:12,709 --> 01:10:10,400

one thing that my sister

1844

01:10:13,750 --> 01:10:12,719

told me is very prevalent in the medical

1845

01:10:15,590 --> 01:10:13,760

field

1846

01:10:17,189 --> 01:10:15,600

more than half the women entering

1847

01:10:19,189 --> 01:10:17,199

medical more than half of the people

1848

01:10:22,149 --> 01:10:19,199

entering medical school are women

1849

01:10:24,630 --> 01:10:22,159

but only about a quarter

1850

01:10:26,790 --> 01:10:24,640

of the the doctors

1851

01:10:29,030 --> 01:10:26,800

are are women because they just they

1852

01:10:30,790 --> 01:10:29,040

drop out very quickly

1853

01:10:33,510 --> 01:10:30,800

because probably because of workload

1854

01:10:34,390 --> 01:10:33,520

issues and family issues and so forth so

1855

01:10:36,950 --> 01:10:34,400

um

1856

01:10:39,669 --> 01:10:36,960

there there is a way to to achieve this

1857

01:10:41,110 --> 01:10:39,679

balance um it's not impossible and in

1858

01:10:44,550 --> 01:10:41,120

fact um

1859

01:10:47,030 --> 01:10:44,560

i i think your your kids really get it

1860

01:10:49,110 --> 01:10:47,040

get something out of it um just to see

1861

01:10:50,310 --> 01:10:49,120

their you know their parents achieving

1862

01:10:53,110 --> 01:10:50,320

such things that's what i was going to

1863

01:10:56,229 --> 01:10:53,120

ask maria yeah so um so i have uh i have

1864

01:10:59,110 --> 01:10:56,239

uh two boys and um and

1865

01:11:01,510 --> 01:10:59,120

you know when they were when they were

1866

01:11:03,350 --> 01:11:01,520

growing up i sat down and i asked them

1867

01:11:04,630 --> 01:11:03,360

at one point and i said

1868

01:11:07,430 --> 01:11:04,640

would you

1869

01:11:08,470 --> 01:11:07,440

prefer that i stayed at home

1870

01:11:10,229 --> 01:11:08,480

um

1871

01:11:12,070 --> 01:11:10,239

rather than you know having this job

1872

01:11:14,229 --> 01:11:12,080

that i have where i'm always running

1873

01:11:16,950 --> 01:11:14,239

around like a crazy person

1874

01:11:18,229 --> 01:11:16,960

and and my uh you know one of the kids

1875

01:11:19,430 --> 01:11:18,239

looked at me and went

1876

01:11:21,669 --> 01:11:19,440

mom

1877

01:11:23,750 --> 01:11:21,679

you're the only woman you're the only

1878

01:11:27,990 --> 01:11:23,760

mother in the class who shoots lasers in

1879

01:11:32,550 --> 01:11:29,270

and um

1880

01:11:34,630 --> 01:11:32,560

so uh so it it wasn't an issue and and

1881

01:11:35,910 --> 01:11:34,640

in fact it was you know i mean for your

1882

01:11:36,790 --> 01:11:35,920

children

1883

01:11:38,550 --> 01:11:36,800

uh

1884

01:11:42,310 --> 01:11:38,560

you know you as a parent it's it's all

1885

01:11:46,550 --> 01:11:42,320

they know so so for my children um

1886

01:11:49,830 --> 01:11:46,560

it you know i was normal to them and um

1887

01:11:50,790 --> 01:11:49,840

and uh and but what i would say is that

1888

01:11:54,310 --> 01:11:50,800

um

1889

01:11:56,149 --> 01:11:54,320

that that as a as a scientist uh you

1890

01:11:58,149 --> 01:11:56,159

know you have some flexibility in your

1891

01:12:00,630 --> 01:11:58,159

schedule so um

1892

01:12:03,270 --> 01:12:00,640

so i actually um

1893

01:12:06,550 --> 01:12:03,280

you know i remember my my uh

1894

01:12:09,669 --> 01:12:06,560

my one of my sons was a very very uh is

1895

01:12:12,790 --> 01:12:09,679

a is still is a very gifted athlete and

1896

01:12:15,110 --> 01:12:12,800

when he was a a senior he was a you know

1897

01:12:17,270 --> 01:12:15,120

three sport athlete and i remember

1898

01:12:19,669 --> 01:12:17,280

during his uh soccer season they went to

1899

01:12:23,590 --> 01:12:19,679

the semi-finals of the states

1900

01:12:25,750 --> 01:12:23,600

and uh and i missed two games

1901

01:12:28,149 --> 01:12:25,760

over the entire course of the season

1902

01:12:30,310 --> 01:12:28,159

because i was able to um work my

1903

01:12:33,110 --> 01:12:30,320

schedule around and and i i come out

1904

01:12:34,630 --> 01:12:33,120

here every two weeks so um so i don't

1905

01:12:37,750 --> 01:12:34,640

even want to think about how many red

1906

01:12:40,070 --> 01:12:37,760

eyes i took home in those days but i

1907

01:12:41,910 --> 01:12:40,080

um you know there's a flexibility in

1908

01:12:43,270 --> 01:12:41,920

your schedule

1909

01:12:45,189 --> 01:12:43,280

sometimes when you're a science and

1910

01:12:46,229 --> 01:12:45,199

engineer when you say how do you balance

1911

01:12:47,750 --> 01:12:46,239

all this

1912

01:12:50,390 --> 01:12:47,760

stuff

1913

01:12:51,189 --> 01:12:50,400

well you know it can be done

1914

01:12:53,350 --> 01:12:51,199

um

1915

01:12:55,830 --> 01:12:53,360

in some cases a lot easier than you

1916

01:12:58,310 --> 01:12:55,840

would think and a lot easier in careers

1917

01:12:59,990 --> 01:12:58,320

that uh uh you know other careers where

1918

01:13:01,510 --> 01:13:00,000

you just have to be sitting at your desk

1919

01:13:03,510 --> 01:13:01,520

for eight hours you know and then the

1920

01:13:05,110 --> 01:13:03,520

nice thing about science and engineering

1921

01:13:07,430 --> 01:13:05,120

is uh

1922

01:13:09,430 --> 01:13:07,440

you know it's if you get your job done

1923

01:13:11,510 --> 01:13:09,440

and um and so sometimes there's some

1924

01:13:12,630 --> 01:13:11,520

play in that as well as long as you're

1925

01:13:14,070 --> 01:13:12,640

nobody's looking to see if you're

1926

01:13:16,390 --> 01:13:14,080

sitting at your desk people are looking

1927

01:13:19,430 --> 01:13:16,400

to see if your job is done plus you get

1928

01:13:21,590 --> 01:13:19,440

to shoot lasers into space

1929

01:13:23,110 --> 01:13:21,600

you know you have to be smart to get to

1930

01:13:24,950 --> 01:13:23,120

the position you're all occupied and the

1931

01:13:26,630 --> 01:13:24,960

saying is that women have to be thought

1932

01:13:28,310 --> 01:13:26,640

to be twice as smart to be thought half

1933

01:13:29,990 --> 01:13:28,320

as good but what are some of the other

1934

01:13:34,470 --> 01:13:30,000

qualities i've heard persistence what

1935

01:13:38,149 --> 01:13:36,070

margaret well i was going to make a

1936

01:13:39,510 --> 01:13:38,159

comment that's not quite an answer to

1937

01:13:40,470 --> 01:13:39,520

your

1938

01:13:41,590 --> 01:13:40,480

question

1939

01:13:42,709 --> 01:13:41,600

but

1940

01:13:58,070 --> 01:13:42,719

i

1941

01:14:01,430 --> 01:13:58,080

onto the program

1942

01:14:04,870 --> 01:14:01,440

it's going to make it very very hard to

1943

01:14:07,350 --> 01:14:04,880

achieve a successful career so make sure

1944

01:14:09,430 --> 01:14:07,360

that any partner you hook up with

1945

01:14:10,709 --> 01:14:09,440

believes in you the way you believe in

1946

01:14:11,669 --> 01:14:10,719

yourself

1947

01:14:13,669 --> 01:14:11,679

yeah

1948

01:14:14,630 --> 01:14:13,679

one of the things that uh you know one

1949

01:14:17,430 --> 01:14:14,640

of the

1950

01:14:19,510 --> 01:14:17,440

issues about

1951

01:14:20,390 --> 01:14:19,520

girls going into science and technology

1952

01:14:21,990 --> 01:14:20,400

is they

1953

01:14:23,510 --> 01:14:22,000

you know when they're when they're in

1954

01:14:25,669 --> 01:14:23,520

school when they're in the middle school

1955

01:14:27,189 --> 01:14:25,679

to high school ages and even college

1956

01:14:29,590 --> 01:14:27,199

they don't want to look smarter than the

1957

01:14:30,310 --> 01:14:29,600

guys okay because the guys won't date

1958

01:14:33,110 --> 01:14:30,320

them

1959

01:14:35,110 --> 01:14:33,120

and you know my advice is

1960

01:14:43,910 --> 01:14:35,120

you don't want to be hanging out with

1961

01:14:51,270 --> 01:14:47,830

find yourself a great guy who who is

1962

01:14:53,750 --> 01:14:51,280

smart and challenged uh you know pursue

1963

01:14:55,430 --> 01:14:53,760

your dreams and you don't want to go

1964

01:14:57,510 --> 01:14:55,440

through life

1965

01:14:59,430 --> 01:14:57,520

you know hanging out with somebody who

1966

01:15:01,990 --> 01:14:59,440

who doesn't have you know mutual respect

1967

01:15:03,430 --> 01:15:02,000

is like the most important thing

1968

01:15:04,790 --> 01:15:03,440

so um

1969

01:15:07,189 --> 01:15:04,800

so uh

1970

01:15:09,669 --> 01:15:07,199

i guess that's my advice

1971

01:15:11,669 --> 01:15:09,679

wow anybody else i have a 14 year old

1972

01:15:14,070 --> 01:15:11,679

daughter and that's exactly what i told

1973

01:15:17,350 --> 01:15:15,510

well i tell you when when they're young

1974

01:15:19,750 --> 01:15:17,360

it's a little harder because you have to

1975

01:15:20,870 --> 01:15:19,760

explain why mommy's going to washington

1976

01:15:23,510 --> 01:15:20,880

again

1977

01:15:25,510 --> 01:15:23,520

and you know why are you picking me up

1978

01:15:27,030 --> 01:15:25,520

but when i told her she could have a dog

1979

01:15:30,550 --> 01:15:27,040

after my project

1980

01:15:32,149 --> 01:15:30,560

the satellite launches she was happy

1981

01:15:33,750 --> 01:15:32,159

and i said and then i'll walk it with

1982

01:15:36,310 --> 01:15:33,760

you every day

1983

01:15:39,110 --> 01:15:36,320

a little together time too yeah but i

1984

01:15:41,590 --> 01:15:39,120

think persistence and for me i was

1985

01:15:43,830 --> 01:15:41,600

definitely underconfident

1986

01:15:45,590 --> 01:15:43,840

in high school and in college i

1987

01:15:46,470 --> 01:15:45,600

wasn't the kind of

1988

01:15:48,149 --> 01:15:46,480

you know

1989

01:15:49,590 --> 01:15:48,159

person who went into college saying i'm

1990

01:15:50,870 --> 01:15:49,600

going to be a physicist and the

1991

01:15:52,550 --> 01:15:50,880

scientist

1992

01:15:54,950 --> 01:15:52,560

you know i thought

1993

01:15:58,070 --> 01:15:54,960

about a lot of different possibilities

1994

01:15:59,990 --> 01:15:58,080

and i loved physics but i always you

1995

01:16:00,950 --> 01:16:00,000

know i always questioned

1996

01:16:02,950 --> 01:16:00,960

uh

1997

01:16:05,430 --> 01:16:02,960

did i do well on the test because i got

1998

01:16:07,110 --> 01:16:05,440

lucky they asked the questions you know

1999

01:16:08,470 --> 01:16:07,120

that i was looking for

2000

01:16:10,390 --> 01:16:08,480

i think both

2001

01:16:11,669 --> 01:16:10,400

men and women

2002

01:16:13,990 --> 01:16:11,679

but

2003

01:16:18,870 --> 01:16:14,000

probably more women tend to be

2004

01:16:23,510 --> 01:16:21,669

sure of themselves and

2005

01:16:25,830 --> 01:16:23,520

you know that was something for me that

2006

01:16:28,550 --> 01:16:25,840

i had to get over so i think developing

2007

01:16:30,070 --> 01:16:28,560

a sense of confidence developing

2008

01:16:32,950 --> 01:16:30,080

you know

2009

01:16:35,590 --> 01:16:32,960

still i teach physics one and most of

2010

01:16:36,470 --> 01:16:35,600

the questions from my class come from

2011

01:16:39,669 --> 01:16:36,480

the

2012

01:16:41,430 --> 01:16:39,679

though

2013

01:16:44,390 --> 01:16:41,440

you know they have

2014

01:16:47,189 --> 01:16:44,400

perfectly uh you know

2015

01:16:49,030 --> 01:16:47,199

good questions to ask will

2016

01:16:50,229 --> 01:16:49,040

hold back and think

2017

01:16:52,550 --> 01:16:50,239

i don't want to look

2018

01:16:53,590 --> 01:16:52,560

silly i don't want to you know expose

2019

01:16:55,510 --> 01:16:53,600

myself

2020

01:16:57,030 --> 01:16:55,520

whereas men you know they

2021

01:16:59,030 --> 01:16:57,040

really don't mind

2022

01:17:00,390 --> 01:16:59,040

so what have you seen

2023

01:17:01,910 --> 01:17:00,400

and what have you heard from students

2024

01:17:03,350 --> 01:17:01,920

that's going on in the classroom to

2025

01:17:05,830 --> 01:17:03,360

change

2026

01:17:06,870 --> 01:17:05,840

that yeah it's hard you know you want to

2027

01:17:09,030 --> 01:17:06,880

try to

2028

01:17:10,950 --> 01:17:09,040

develop an open

2029

01:17:13,030 --> 01:17:10,960

style so that students feel comfortable

2030

01:17:14,870 --> 01:17:13,040

but i do spend a lot of time

2031

01:17:17,030 --> 01:17:14,880

talking to my

2032

01:17:18,950 --> 01:17:17,040

women undergraduates and and students

2033

01:17:21,910 --> 01:17:18,960

who work for me and telling them look

2034

01:17:25,110 --> 01:17:21,920

practice go to a talk a talk and just

2035

01:17:27,030 --> 01:17:25,120

ask a question you know

2036

01:17:28,630 --> 01:17:27,040

just get used to

2037

01:17:29,990 --> 01:17:28,640

put you know putting yourself out there

2038

01:17:32,870 --> 01:17:30,000

because that's what all science is all

2039

01:17:35,189 --> 01:17:32,880

about exchanging ideas not being afraid

2040

01:17:36,870 --> 01:17:35,199

to say you know something that that may

2041

01:17:38,470 --> 01:17:36,880

not be right and

2042

01:17:41,430 --> 01:17:38,480

you know i think that that's definitely

2043

01:17:43,430 --> 01:17:41,440

something that um you have to get over

2044

01:17:45,270 --> 01:17:43,440

and now i don't you know i have no

2045

01:17:46,630 --> 01:17:45,280

qualms without saying raising your hand

2046

01:17:49,030 --> 01:17:46,640

and crossing hey i dreamed about this

2047

01:17:50,950 --> 01:17:49,040

benzene ring thing last night it could

2048

01:17:52,550 --> 01:17:50,960

work for everybody on that point about

2049

01:17:54,950 --> 01:17:52,560

questions go ahead i'm sorry so i want

2050

01:17:57,110 --> 01:17:54,960

to i wanted to follow up on that and

2051
01:17:58,870 --> 01:17:57,120
reiterate what maria started with about

2052
01:18:01,350 --> 01:17:58,880
how uh you know working with these

2053
01:18:03,910 --> 01:18:01,360
incredibly talented creative people

2054
01:18:05,590 --> 01:18:03,920
on these missions is is really what it's

2055
01:18:07,189 --> 01:18:05,600
all about and it's it's different than

2056
01:18:09,030 --> 01:18:07,199
what we think of when we're in high

2057
01:18:11,189 --> 01:18:09,040
school and we take physics and you know

2058
01:18:13,189 --> 01:18:11,199
we're doing problems and you think of a

2059
01:18:15,910 --> 01:18:13,199
physicist sitting in their office you

2060
01:18:17,030 --> 01:18:15,920
know with books and writing out formulas

2061
01:18:18,550 --> 01:18:17,040
and it couldn't be farther from the

2062
01:18:20,790 --> 01:18:18,560
truth what it's really like is being on

2063
01:18:22,310 --> 01:18:20,800

an elites sports team you know you're

2064

01:18:24,550 --> 01:18:22,320

out there you're competing you're

2065

01:18:27,350 --> 01:18:24,560

competing for money you're competing for

2066

01:18:29,990 --> 01:18:27,360

being the best you're working in a team

2067

01:18:31,669 --> 01:18:30,000

everybody's supporting each other and

2068

01:18:33,750 --> 01:18:31,679

and you're going after big things you

2069

01:18:36,950 --> 01:18:33,760

know and so it's it's it's so

2070

01:18:39,270 --> 01:18:36,960

interesting and it's so fulfilling and

2071

01:18:41,430 --> 01:18:39,280

it's so active that i think i think

2072

01:18:43,430 --> 01:18:41,440

that's what a lot of people don't really

2073

01:18:44,390 --> 01:18:43,440

recognize when they think about science

2074

01:18:46,790 --> 01:18:44,400

they kind of

2075

01:18:47,910 --> 01:18:46,800

have this view of it being a very static

2076

01:18:50,390 --> 01:18:47,920

and kind of

2077

01:18:51,270 --> 01:18:50,400

almost boring career but it's anything

2078

01:18:53,350 --> 01:18:51,280

but

2079

01:18:55,110 --> 01:18:53,360

so on the encouragement to ask questions

2080

01:18:56,950 --> 01:18:55,120

and speak up and not be afraid here we

2081

01:18:58,390 --> 01:18:56,960

are at jpl and i'm asking you to do

2082

01:19:00,470 --> 01:18:58,400

exactly that we have a couple people

2083

01:19:02,310 --> 01:19:00,480

with microphones raise your hand if

2084

01:19:04,229 --> 01:19:02,320

you've got a question we'd also like to

2085

01:19:06,950 --> 01:19:04,239

find out who you are and where you are

2086

01:19:10,070 --> 01:19:06,960

from so who've we got

2087

01:19:12,550 --> 01:19:10,080

come on you just heard this here

2088

01:19:13,750 --> 01:19:12,560

all right we have someone here yes

2089

01:19:16,470 --> 01:19:13,760

can you stand up and speak into the

2090

01:19:18,070 --> 01:19:16,480

microphone tell us who you are hi i'm

2091

01:19:19,990 --> 01:19:18,080

claire dickey i'm a sophomore

2092

01:19:21,110 --> 01:19:20,000

astrophysics major at pomona college in

2093

01:19:23,990 --> 01:19:21,120

claremont

2094

01:19:25,750 --> 01:19:24,000

and you all men talked about how you

2095

01:19:29,030 --> 01:19:25,760

often just ignored the fact that you

2096

01:19:30,470 --> 01:19:29,040

were the only woman in your class or

2097

01:19:32,550 --> 01:19:30,480

that these men didn't necessarily

2098

01:19:36,229 --> 01:19:32,560

respect you did you ever just turn

2099

01:19:38,229 --> 01:19:36,239

around and say no don't call me girl you

2100

01:19:39,189 --> 01:19:38,239

can't say these things or you guys need

2101
01:19:40,229 --> 01:19:39,199
to

2102
01:19:42,709 --> 01:19:40,239
bring more

2103
01:19:44,550 --> 01:19:42,719
women physics phds you need to have more

2104
01:19:46,229 --> 01:19:44,560
women speakers did you ever just turn

2105
01:19:47,430 --> 01:19:46,239
around and try and talk

2106
01:19:48,790 --> 01:19:47,440
to the administration or the people

2107
01:19:54,229 --> 01:19:48,800
around you and

2108
01:19:57,669 --> 01:19:55,590
margaret

2109
01:20:01,430 --> 01:19:57,679
i've been on more committees than i

2110
01:20:04,870 --> 01:20:01,440
would like to remember

2111
01:20:07,510 --> 01:20:04,880
and many of them were a committee on the

2112
01:20:09,350 --> 01:20:07,520
study of women in science committee on

2113
01:20:12,790 --> 01:20:09,360

the advancement of women that kind of

2114

01:20:16,790 --> 01:20:12,800

thing and i'd love to tell you the the

2115

01:20:20,310 --> 01:20:16,800

worst story that i encountered that got

2116

01:20:22,390 --> 01:20:20,320

changed as soon as we discovered it when

2117

01:20:24,950 --> 01:20:22,400

i was on the first committee on the

2118

01:20:26,709 --> 01:20:24,960

status of women at ucla

2119

01:20:28,149 --> 01:20:26,719

we discovered

2120

01:20:29,830 --> 01:20:28,159

the following

2121

01:20:31,270 --> 01:20:29,840

regulation

2122

01:20:33,110 --> 01:20:31,280

if a woman

2123

01:20:36,070 --> 01:20:33,120

was a resident of the state of

2124

01:20:39,590 --> 01:20:36,080

california and married a man from out of

2125

01:20:42,390 --> 01:20:39,600

state she lost her in-state status and

2126
01:20:45,350 --> 01:20:42,400
had to pay out-of-state tuition

2127
01:20:46,550 --> 01:20:45,360
if a man was a resident of the state of

2128
01:20:48,709 --> 01:20:46,560
california

2129
01:20:50,149 --> 01:20:48,719
and married a woman from out of the

2130
01:20:57,110 --> 01:20:50,159
state

2131
01:20:59,669 --> 01:20:57,120
that that regulation got changed before

2132
01:21:02,070 --> 01:20:59,679
we ever got the report

2133
01:21:04,870 --> 01:21:02,080
out onto the

2134
01:21:06,470 --> 01:21:04,880
you know distributed so yes i've been

2135
01:21:09,270 --> 01:21:06,480
involved

2136
01:21:11,910 --> 01:21:09,280
it's been a steady it's an important

2137
01:21:14,870 --> 01:21:11,920
thing to keep going

2138
01:21:18,310 --> 01:21:14,880

changes are always

2139

01:21:21,270 --> 01:21:18,320

needed but then things go back again and

2140

01:21:23,590 --> 01:21:21,280

you have to keep alert and it's really

2141

01:21:25,270 --> 01:21:23,600

important to think about the people who

2142

01:21:28,070 --> 01:21:25,280

are coming up

2143

01:21:29,350 --> 01:21:28,080

behind you and help them to it's a shame

2144

01:21:31,590 --> 01:21:29,360

you have to keep fighting rearguard

2145

01:21:34,709 --> 01:21:31,600

actions but there it is maria yeah well

2146

01:21:37,030 --> 01:21:34,719

at mit actually we've the the women

2147

01:21:39,350 --> 01:21:37,040

faculty there have been extremely uh

2148

01:21:42,229 --> 01:21:39,360

proactive and and i would just agree

2149

01:21:45,590 --> 01:21:42,239

with uh with what maggie said here about

2150

01:21:48,870 --> 01:21:45,600

constant vigilance okay so when i became

2151
01:21:52,629 --> 01:21:48,880
a department head i was uh i was head of

2152
01:21:55,430 --> 01:21:52,639
my department i made uh nine hires

2153
01:21:56,390 --> 01:21:55,440
uh seven of whom were women okay

2154
01:22:02,229 --> 01:21:56,400
and

2155
01:22:05,590 --> 01:22:02,239
that you just had to be very proactive

2156
01:22:08,950 --> 01:22:05,600
about getting women invited to give a

2157
01:22:11,590 --> 01:22:08,960
talk so once once somebody comes in

2158
01:22:13,830 --> 01:22:11,600
uh everyone will look at it and and you

2159
01:22:16,550 --> 01:22:13,840
will get evaluated by the quality of

2160
01:22:19,510 --> 01:22:16,560
your work but it's it's it was getting

2161
01:22:22,470 --> 01:22:19,520
over the hump of the invitation list

2162
01:22:24,470 --> 01:22:22,480
uh and um and so just being

2163
01:22:27,910 --> 01:22:24,480

you just have to be extremely proactive

2164

01:22:29,910 --> 01:22:27,920

about this because everybody wants

2165

01:22:31,030 --> 01:22:29,920

great scientists great engineers you

2166

01:22:33,990 --> 01:22:31,040

know you want to be you want to be

2167

01:22:34,790 --> 01:22:34,000

surrounded by outstanding colleagues but

2168

01:22:36,830 --> 01:22:34,800

um

2169

01:22:39,830 --> 01:22:36,840

but there's a tendency for people to

2170

01:22:43,350 --> 01:22:39,840

recommend their former student you know

2171

01:22:44,790 --> 01:22:43,360

their i mean and women tend not to be

2172

01:22:46,950 --> 01:22:44,800

out there

2173

01:22:49,110 --> 01:22:46,960

you know promoting being self-promoters

2174

01:22:50,149 --> 01:22:49,120

of themselves so so you really need to

2175

01:22:53,110 --> 01:22:50,159

go in and

2176
01:22:56,149 --> 01:22:53,120
read the papers and you know uh look at

2177
01:22:57,750 --> 01:22:56,159
things in more detail uh but but it

2178
01:22:59,750 --> 01:22:57,760
really is is proactive and you have to

2179
01:23:00,870 --> 01:22:59,760
be part of the solution i mean you can't

2180
01:23:02,950 --> 01:23:00,880
sit back

2181
01:23:04,790 --> 01:23:02,960
and assume that this is all going to get

2182
01:23:06,229 --> 01:23:04,800
taken care of or assume that your

2183
01:23:08,070 --> 01:23:06,239
qualities alone are going to advance

2184
01:23:09,910 --> 01:23:08,080
exactly in every profession you have an

2185
01:23:11,990 --> 01:23:09,920
editor who would advance a young man

2186
01:23:14,149 --> 01:23:12,000
saying he reminds me of me at that age

2187
01:23:16,310 --> 01:23:14,159
i'm never going to remind him of him at

2188
01:23:17,910 --> 01:23:16,320

that age so that's the lookout for all

2189

01:23:19,430 --> 01:23:17,920

of you i'm sure

2190

01:23:21,270 --> 01:23:19,440

okay we have another question over here

2191

01:23:22,950 --> 01:23:21,280

who are you where do you go to school

2192

01:23:24,310 --> 01:23:22,960

hi my name is andrea lawler thank you

2193

01:23:26,229 --> 01:23:24,320

all so much for coming by the way um i

2194

01:23:28,390 --> 01:23:26,239

go to usc i'm a screenwriting electrical

2195

01:23:29,990 --> 01:23:28,400

engineering double major and my curio i

2196

01:23:32,149 --> 01:23:30,000

have two questions for you so my first

2197

01:23:33,669 --> 01:23:32,159

question is just that um a lot of times

2198

01:23:35,750 --> 01:23:33,679

i at least have heard in college a few

2199

01:23:37,750 --> 01:23:35,760

times when whenever an opportunity comes

2200

01:23:39,669 --> 01:23:37,760

my way maybe or comes by the way of

2201

01:23:40,709 --> 01:23:39,679

another female engineer a lot of times

2202

01:23:42,149 --> 01:23:40,719

they would hear oh you only got that

2203

01:23:43,590 --> 01:23:42,159

because you're a woman i don't know if

2204

01:23:45,350 --> 01:23:43,600

you guys ever had that kind of thing

2205

01:23:47,030 --> 01:23:45,360

happen to you guys have nodded um and

2206

01:23:48,870 --> 01:23:47,040

maybe how you overcome that bias and the

2207

01:23:50,870 --> 01:23:48,880

second question is just that a lot of

2208

01:23:52,149 --> 01:23:50,880

people may think that

2209

01:23:54,070 --> 01:23:52,159

the tendency to think that engineering

2210

01:23:55,750 --> 01:23:54,080

doesn't involve a lot of creativity when

2211

01:23:57,110 --> 01:23:55,760

that's usually not the case at all and i

2212

01:23:58,629 --> 01:23:57,120

was curious to know because a lot of

2213

01:24:00,629 --> 01:23:58,639

people attribute women to being more

2214

01:24:02,229 --> 01:24:00,639

creative than men just a fun fact and

2215

01:24:03,830 --> 01:24:02,239

how maybe you've incorporated creativity

2216

01:24:05,510 --> 01:24:03,840

into your own career

2217

01:24:07,189 --> 01:24:05,520

so two questions creativity in your

2218

01:24:09,990 --> 01:24:07,199

careers and do people ever say oh you

2219

01:24:11,830 --> 01:24:10,000

only got that job because you're a woman

2220

01:24:14,390 --> 01:24:11,840

yeah actually um

2221

01:24:17,510 --> 01:24:14,400

that is one that i you know you still

2222

01:24:18,950 --> 01:24:17,520

sometimes just have to swallow

2223

01:24:23,510 --> 01:24:18,960

i was told when i got the faculty

2224

01:24:26,470 --> 01:24:23,520

position at caltech that i was chosen

2225

01:24:27,510 --> 01:24:26,480

because i was a woman and

2226

01:24:31,590 --> 01:24:27,520

by

2227

01:24:33,350 --> 01:24:31,600

a number of people but you know

2228

01:24:35,590 --> 01:24:33,360

ultimately it just comes down to

2229

01:24:37,510 --> 01:24:35,600

building your confidence

2230

01:24:39,750 --> 01:24:37,520

and building enough confidence that you

2231

01:24:41,510 --> 01:24:39,760

just ignore it and you know you know

2232

01:24:43,590 --> 01:24:41,520

it's not true i

2233

01:24:45,590 --> 01:24:43,600

so i you know

2234

01:24:47,990 --> 01:24:45,600

my strategy there was to confront the

2235

01:24:49,430 --> 01:24:48,000

people who said that and just say

2236

01:24:51,590 --> 01:24:49,440

uh no i was

2237

01:24:52,790 --> 01:24:51,600

i was chosen because you know they

2238

01:24:54,310 --> 01:24:52,800

believe that i'm going to do great

2239

01:24:55,910 --> 01:24:54,320

things and

2240

01:24:59,510 --> 01:24:55,920

you know

2241

01:25:01,669 --> 01:24:59,520

it i think is good

2242

01:25:02,470 --> 01:25:01,679

and just telling people

2243

01:25:04,470 --> 01:25:02,480

uh

2244

01:25:06,470 --> 01:25:04,480

that's not an appropriate

2245

01:25:08,629 --> 01:25:06,480

uh

2246

01:25:11,270 --> 01:25:08,639

response but you will get it

2247

01:25:13,910 --> 01:25:11,280

if you're successful you will hear it

2248

01:25:15,270 --> 01:25:13,920

and you know are these people who wanted

2249

01:25:18,950 --> 01:25:15,280

your job

2250

01:25:21,510 --> 01:25:20,629

i think there's many examples of where

2251
01:25:26,709 --> 01:25:21,520
women

2252
01:25:27,669 --> 01:25:26,719
that's also true um and so

2253
01:25:29,110 --> 01:25:27,679
you know

2254
01:25:30,629 --> 01:25:29,120
there's a tendency

2255
01:25:33,110 --> 01:25:30,639
for some men to

2256
01:25:34,870 --> 01:25:33,120
think of the flip side but um i think

2257
01:25:36,390 --> 01:25:34,880
it's more often the case that women

2258
01:25:39,510 --> 01:25:36,400
don't get the job because they're women

2259
01:25:41,030 --> 01:25:39,520
because they don't have the connections

2260
01:25:43,510 --> 01:25:41,040
they don't remind the

2261
01:25:45,270 --> 01:25:43,520
the hiring committee of themselves and

2262
01:25:46,950 --> 01:25:45,280
you know there's a saying that says you

2263
01:25:49,350 --> 01:25:46,960

can't be what you can't see

2264

01:25:50,870 --> 01:25:49,360

so you have to know that there are other

2265

01:25:52,870 --> 01:25:50,880

people like you out there you have to

2266

01:25:55,030 --> 01:25:52,880

find them you have to network you have

2267

01:25:56,870 --> 01:25:55,040

to um you know

2268

01:26:00,310 --> 01:25:56,880

become

2269

01:26:04,390 --> 01:26:00,320

part of a community whereby um you're

2270

01:26:08,149 --> 01:26:04,400

not seen as the um the outsider who is

2271

01:26:10,470 --> 01:26:08,159

somehow special and and got this this um

2272

01:26:11,510 --> 01:26:10,480

position because of that reason because

2273

01:26:18,550 --> 01:26:11,520

it's

2274

01:26:23,990 --> 01:26:21,830

science is incredibly creative i mean

2275

01:26:26,070 --> 01:26:24,000

so i like to think of it as doing art

2276

01:26:28,149 --> 01:26:26,080

but with a different medium

2277

01:26:29,910 --> 01:26:28,159

you know it's basically metal and

2278

01:26:32,709 --> 01:26:29,920

electronics and

2279

01:26:35,189 --> 01:26:32,719

weird cryogenics and things like that and

2280

01:26:36,629 --> 01:26:35,199

you know and computers uh so it's it's

2281

01:26:38,870 --> 01:26:36,639

extremely creative i mean to be able to

2282

01:26:41,270 --> 01:26:38,880

come up with missions that uh that are

2283

01:26:43,430 --> 01:26:41,280

able to survive the rigors of space is

2284

01:26:45,110 --> 01:26:43,440

really hard space is a very strange and

2285

01:26:46,390 --> 01:26:45,120

alien environment it's very difficult to

2286

01:26:47,669 --> 01:26:46,400

work in so to be able to figure

2287

01:26:49,510 --> 01:26:47,679

something out that's not going to go

2288

01:26:50,709 --> 01:26:49,520

horribly wrong that it takes a lot of

2289

01:26:53,110 --> 01:26:50,719

creativity

2290

01:26:55,110 --> 01:26:53,120

and and teamwork too i mean it's like

2291

01:26:56,470 --> 01:26:55,120

everybody said one of the really fun

2292

01:26:58,870 --> 01:26:56,480

things about science is you're not

2293

01:27:00,470 --> 01:26:58,880

working alone usually you're usually

2294

01:27:02,390 --> 01:27:00,480

working in big teams it's kind of like

2295

01:27:04,870 --> 01:27:02,400

uh being a crew on a sailing ship you

2296

01:27:06,229 --> 01:27:04,880

know i mean everybody's pulling ropes

2297

01:27:07,990 --> 01:27:06,239

and pulling oars and all trying to row

2298

01:27:09,430 --> 01:27:08,000

in the same direction and and it's

2299

01:27:11,430 --> 01:27:09,440

really fun that's i think one of the

2300

01:27:13,189 --> 01:27:11,440

best things it is like a great sports

2301

01:27:14,470 --> 01:27:13,199

team we have another question over here

2302

01:27:16,470 --> 01:27:14,480

can you tell us who you are where do you

2303

01:27:17,830 --> 01:27:16,480

go to school hi my name is emilia stone

2304

01:27:19,430 --> 01:27:17,840

i'm a grad student in the math

2305

01:27:22,870 --> 01:27:19,440

department at usc

2306

01:27:25,110 --> 01:27:22,880

and um you said that when people

2307

01:27:26,870 --> 01:27:25,120

criticize you or like assume that you

2308

01:27:28,790 --> 01:27:26,880

got the position because you're a woman

2309

01:27:30,790 --> 01:27:28,800

you go and you

2310

01:27:33,030 --> 01:27:30,800

confront them i want to know at what

2311

01:27:35,189 --> 01:27:33,040

point do you confront because i know a

2312

01:27:36,790 --> 01:27:35,199

lot of females have issues with people

2313

01:27:38,550 --> 01:27:36,800

saying oh it's because you're a female

2314

01:27:39,510 --> 01:27:38,560

you're emotional so

2315

01:27:41,510 --> 01:27:39,520

like

2316

01:27:42,870 --> 01:27:41,520

at what point do you confront someone

2317

01:27:44,830 --> 01:27:42,880

should you just ignore it should you

2318

01:27:47,189 --> 01:27:44,840

like turn the other

2319

01:27:49,030 --> 01:27:47,199

cheek well

2320

01:27:51,910 --> 01:27:49,040

you know in my case the way that i dealt

2321

01:27:53,189 --> 01:27:51,920

with it was was to confront to talk to

2322

01:27:54,790 --> 01:27:53,199

people you know when i heard about it

2323

01:27:56,470 --> 01:27:54,800

when somebody said that or said it

2324

01:27:59,430 --> 01:27:56,480

behind my back

2325

01:28:00,870 --> 01:27:59,440

uh because i thought it was important

2326

01:28:03,350 --> 01:28:00,880

uh

2327

01:28:04,790 --> 01:28:03,360

you know that it's just not a

2328

01:28:06,550 --> 01:28:04,800

an acceptable

2329

01:28:08,790 --> 01:28:06,560

attitude i mean i've been on the other

2330

01:28:09,590 --> 01:28:08,800

side of hiring committees now i've hired

2331

01:28:11,110 --> 01:28:09,600

uh

2332

01:28:12,709 --> 01:28:11,120

like many

2333

01:28:16,229 --> 01:28:12,719

faculty members and i'll tell you what

2334

01:28:19,910 --> 01:28:16,239

you care about is talent you care about

2335

01:28:22,870 --> 01:28:19,920

who's going to make an impact it is true

2336

01:28:25,990 --> 01:28:22,880

in some cases you know

2337

01:28:27,270 --> 01:28:26,000

if the person isn't isn't flashy or have

2338

01:28:29,270 --> 01:28:27,280

the connections you have to read the

2339

01:28:31,430 --> 01:28:29,280

papers you have to do

2340

01:28:33,750 --> 01:28:31,440

more diligence but i'll tell you we hire

2341

01:28:35,669 --> 01:28:33,760

people people succeed because they are

2342

01:28:37,990 --> 01:28:35,679

good and

2343

01:28:41,110 --> 01:28:38,000

i think it's important to just iterate

2344

01:28:45,350 --> 01:28:43,590

but it is you know it's uncomfortable

2345

01:28:47,110 --> 01:28:45,360

i'd be more inclined to throw it back

2346

01:28:50,149 --> 01:28:47,120

you know with a bumper sticker like my

2347

01:28:53,510 --> 01:28:50,159

brain is bigger than your you know what

2348

01:28:55,110 --> 01:28:53,520

i don't know how that would work for you

2349

01:28:57,990 --> 01:28:55,120

well there's a there's a phenomenon

2350

01:29:00,070 --> 01:28:58,000

called imposter syndrome that i've heard

2351

01:29:01,910 --> 01:29:00,080

uh discussed and psychologists use this

2352

01:29:04,070 --> 01:29:01,920

term to to talk about

2353

01:29:06,070 --> 01:29:04,080

uh basically the notion that oh you

2354

01:29:07,669 --> 01:29:06,080

think to yourself well i'm only i'm only

2355

01:29:09,590 --> 01:29:07,679

able to do this because you know i'm a

2356

01:29:12,070 --> 01:29:09,600

woman or you know i shouldn't be here i

2357

01:29:13,510 --> 01:29:12,080

don't deserve this i'm a fake and every

2358

01:29:15,590 --> 01:29:13,520

question yourself yeah and everybody

2359

01:29:17,270 --> 01:29:15,600

will find out and and that's impostor

2360

01:29:19,430 --> 01:29:17,280

syndrome it's

2361

01:29:21,430 --> 01:29:19,440

you gotta get past it and you know

2362

01:29:22,870 --> 01:29:21,440

that's something to to when you find

2363

01:29:25,189 --> 01:29:22,880

yourself falling into those behaviors

2364

01:29:27,510 --> 01:29:25,199

you have to recognize it and say oh okay

2365

01:29:29,510 --> 01:29:27,520

i'm doing this behavior and i want to

2366

01:29:30,950 --> 01:29:29,520

try to change my behavior because that's

2367

01:29:31,990 --> 01:29:30,960

the only thing i can change i can change

2368

01:29:33,510 --> 01:29:32,000

myself

2369

01:29:35,110 --> 01:29:33,520

and i'm not going to listen to that

2370

01:29:36,950 --> 01:29:35,120

voice telling me that i don't belong

2371

01:29:38,629 --> 01:29:36,960

here and to tell yourself i have this

2372

01:29:40,229 --> 01:29:38,639

job because i deserve this yeah and you

2373

01:29:41,830 --> 01:29:40,239

deserve it yeah

2374

01:29:43,669 --> 01:29:41,840

i would also say that

2375

01:29:46,310 --> 01:29:43,679

you know whether you confront somebody

2376

01:29:48,550 --> 01:29:46,320

or not i mean the best way to deal with

2377

01:29:49,510 --> 01:29:48,560

comments like that is to do really good

2378

01:29:52,870 --> 01:29:49,520

work

2379

01:29:54,550 --> 01:29:52,880

okay and and ultimately things will take

2380

01:29:56,229 --> 01:29:54,560

care of themselves

2381

01:29:58,870 --> 01:29:56,239

over here we have a question who are you

2382

01:30:01,350 --> 01:29:58,880

where do you go to school

2383

01:30:02,790 --> 01:30:01,360

thank you my name is dina anderson i'm

2384

01:30:05,189 --> 01:30:02,800

an undergraduate at california state

2385

01:30:06,790 --> 01:30:05,199

university of san bernardino and my

2386

01:30:08,470 --> 01:30:06,800

question to you is because of the

2387

01:30:10,070 --> 01:30:08,480

increased education and the proactive

2388

01:30:12,070 --> 01:30:10,080

stance you're taking toward hiring more

2389

01:30:13,669 --> 01:30:12,080

women do you find that there are more

2390

01:30:15,110 --> 01:30:13,679

opportunities for women or have the

2391

01:30:16,709 --> 01:30:15,120

opportunity levels stayed the same and

2392

01:30:18,950 --> 01:30:16,719

we're just increasing the education

2393

01:30:20,629 --> 01:30:18,960

level for these women and

2394

01:30:27,030 --> 01:30:20,639

making them aware that the opportunities

2395

01:30:29,590 --> 01:30:28,390

margaret maybe you could

2396

01:30:31,350 --> 01:30:29,600

i don't know if you've seen the the

2397

01:30:34,550 --> 01:30:31,360

changes over years of the numbers the

2398

01:30:38,470 --> 01:30:34,560

availabilities and that that particular

2399

01:30:40,390 --> 01:30:38,480

what calculation you'd like okay uh

2400

01:30:42,629 --> 01:30:40,400

i i'm not sure that i

2401
01:30:43,910 --> 01:30:42,639
am answering exactly the question you're

2402
01:30:45,510 --> 01:30:43,920
asking but

2403
01:30:47,189 --> 01:30:45,520
there

2404
01:30:54,390 --> 01:30:47,199
the

2405
01:30:55,110 --> 01:30:54,400
sciences is not uniformly spread through

2406
01:31:04,950 --> 01:30:55,120
the

2407
01:31:08,149 --> 01:31:04,960
in all universities who are really eager

2408
01:31:11,270 --> 01:31:08,159
to recruit women and to identify

2409
01:31:12,629 --> 01:31:11,280
outstanding women there are others who

2410
01:31:15,270 --> 01:31:12,639
would

2411
01:31:17,590 --> 01:31:15,280
who have very little interest in this

2412
01:31:18,470 --> 01:31:17,600
and uh so

2413
01:31:25,750 --> 01:31:18,480

it

2414

01:31:26,790 --> 01:31:25,760

is uh is dominant there was a burst of

2415

01:31:28,950 --> 01:31:26,800

interest

2416

01:31:31,910 --> 01:31:28,960

in hiring women

2417

01:31:34,790 --> 01:31:31,920

at the during the johnson administration

2418

01:31:36,229 --> 01:31:34,800

when title seven of the title

2419

01:31:38,310 --> 01:31:36,239

seven of the

2420

01:31:40,870 --> 01:31:38,320

civil rights act was passed the one that

2421

01:31:44,070 --> 01:31:40,880

said you can't discriminate on the basis

2422

01:31:47,110 --> 01:31:44,080

of gender and there was a really serious

2423

01:31:50,070 --> 01:31:47,120

effort to hire women and there were even

2424

01:31:52,629 --> 01:31:50,080

special positions set aside if you could

2425

01:31:54,070 --> 01:31:52,639

find an extremely gifted woman a

2426

01:31:55,830 --> 01:31:54,080

department could get an extra

2427

01:31:57,510 --> 01:31:55,840

appointment

2428

01:31:59,590 --> 01:31:57,520

and then

2429

01:32:02,629 --> 01:31:59,600

people began to get smug

2430

01:32:05,430 --> 01:32:02,639

and there was much less uh direct

2431

01:32:08,470 --> 01:32:05,440

attempt higher women and then we in

2432

01:32:10,550 --> 01:32:08,480

california we passed the proposition

2433

01:32:14,390 --> 01:32:10,560

that said that you couldn't

2434

01:32:17,030 --> 01:32:14,400

take direct action to for affirmative

2435

01:32:19,270 --> 01:32:17,040

action in hiring so it's gone up and

2436

01:32:21,430 --> 01:32:19,280

down i think right now

2437

01:32:23,189 --> 01:32:21,440

it's kind of

2438

01:32:24,870 --> 01:32:23,199

somewhere in the middle is there a

2439

01:32:27,430 --> 01:32:24,880

critical mass that we have yet to

2440

01:32:29,510 --> 01:32:27,440

achieve with the number of women in the

2441

01:32:32,149 --> 01:32:29,520

universities and in academic positions i

2442

01:32:34,629 --> 01:32:32,159

think in academia in the sciences we

2443

01:32:35,750 --> 01:32:34,639

haven't reached the critical the the

2444

01:32:38,070 --> 01:32:35,760

there are

2445

01:32:41,350 --> 01:32:38,080

there have been studies that suggest

2446

01:32:43,830 --> 01:32:41,360

that you need at least a third women for

2447

01:32:46,470 --> 01:32:43,840

people to stop thinking about a person

2448

01:32:49,350 --> 01:32:46,480

as being a woman faculty member and

2449

01:32:52,310 --> 01:32:49,360

think of her as being a physics faculty

2450

01:32:53,590 --> 01:32:52,320

member uh so that that that we haven't

2451
01:32:55,750 --> 01:32:53,600
reached in

2452
01:32:57,270 --> 01:32:55,760
the physical science carol

2453
01:32:59,030 --> 01:32:57,280
i would say that i think at the jet

2454
01:33:01,110 --> 01:32:59,040
propulsion lab um

2455
01:33:03,350 --> 01:33:01,120
that critical mass has been reached um

2456
01:33:05,430 --> 01:33:03,360
as charles was saying charles is also

2457
01:33:07,350 --> 01:33:05,440
one of these people who's very proactive

2458
01:33:08,950 --> 01:33:07,360
we have two members of the ec you're

2459
01:33:11,110 --> 01:33:08,960
seeing women in the top positions you're

2460
01:33:12,950 --> 01:33:11,120
seeing women leading

2461
01:33:15,990 --> 01:33:12,960
technology developments which is one

2462
01:33:18,870 --> 01:33:16,000
area that was was often dominated by men

2463
01:33:21,510 --> 01:33:18,880

leading projects and when i came here

2464

01:33:23,510 --> 01:33:21,520

the management of projects was all male

2465

01:33:26,229 --> 01:33:23,520

you know all of the highly technical

2466

01:33:28,950 --> 01:33:26,239

fields were led by males and women were

2467

01:33:31,590 --> 01:33:28,960

generally in human resources or some you

2468

01:33:33,750 --> 01:33:31,600

know some more soft positions and that's

2469

01:33:35,430 --> 01:33:33,760

changed entirely so

2470

01:33:37,510 --> 01:33:35,440

i see that that we've reached this

2471

01:33:40,229 --> 01:33:37,520

critical mass and no longer

2472

01:33:42,310 --> 01:33:40,239

is a really a gender issue here at jpl

2473

01:33:44,470 --> 01:33:42,320

we have another question up here

2474

01:33:46,070 --> 01:33:44,480

hi yes i'm lauren edgar i'm a geology

2475

01:33:47,669 --> 01:33:46,080

student at caltech and i was wondering

2476

01:33:49,910 --> 01:33:47,679

if there was anything in particular that

2477

01:33:52,470 --> 01:33:49,920

you did to prepare yourselves not just

2478

01:33:54,390 --> 01:33:52,480

for careers in science and engineering

2479

01:33:56,149 --> 01:33:54,400

but to take on leadership roles in some

2480

01:33:57,430 --> 01:33:56,159

of these missions was it something that

2481

01:33:59,189 --> 01:33:57,440

you always thought that you wanted to do

2482

01:34:01,510 --> 01:33:59,199

or did you seize the opportunity when it

2483

01:34:02,310 --> 01:34:01,520

came about

2484

01:34:03,270 --> 01:34:02,320

yeah

2485

01:34:04,950 --> 01:34:03,280

so i

2486

01:34:06,390 --> 01:34:04,960

this is not related to the the mission

2487

01:34:08,229 --> 01:34:06,400

although i think they're related but

2488

01:34:09,990 --> 01:34:08,239

when i was um

2489

01:34:11,590 --> 01:34:10,000

when i was uh

2490

01:34:14,709 --> 01:34:11,600

negotiating to become head of my

2491

01:34:15,990 --> 01:34:14,719

department um and met with the dean

2492

01:34:19,750 --> 01:34:16,000

uh

2493

01:34:20,870 --> 01:34:19,760

he he said you'll be fine you've raised

2494

01:34:24,070 --> 01:34:20,880

children

2495

01:34:29,830 --> 01:34:27,350

and uh but i um

2496

01:34:33,110 --> 01:34:29,840

and actually i i think that he was

2497

01:34:34,790 --> 01:34:33,120

correct and actually i think that that

2498

01:34:36,950 --> 01:34:34,800

did uh

2499

01:34:38,310 --> 01:34:36,960

actually apply on the the mission side

2500

01:34:41,590 --> 01:34:38,320

too because

2501

01:34:42,870 --> 01:34:41,600

um because in in a mission

2502

01:34:45,189 --> 01:34:42,880

you want to give everybody an

2503

01:34:47,430 --> 01:34:45,199

opportunity and and you want everybody

2504

01:34:49,669 --> 01:34:47,440

to do their best because that's the only

2505

01:34:51,990 --> 01:34:49,679

way that you and it's it's basically the

2506

01:34:53,750 --> 01:34:52,000

same qualities that you have uh as a

2507

01:34:56,790 --> 01:34:53,760

parent okay

2508

01:34:58,870 --> 01:34:56,800

and um and so so for me that's you know

2509

01:35:00,550 --> 01:34:58,880

something that uh that i've looked at in

2510

01:35:02,310 --> 01:35:00,560

that way but um

2511

01:35:04,310 --> 01:35:02,320

but there's you know there's there's two

2512

01:35:06,470 --> 01:35:04,320

issues there's leadership and then

2513

01:35:08,229 --> 01:35:06,480

there's management and the the

2514

01:35:10,709 --> 01:35:08,239

management i don't know you know there

2515

01:35:12,629 --> 01:35:10,719

are there are ways to pick that up that

2516

01:35:14,629 --> 01:35:12,639

that could be more on the the coursework

2517

01:35:16,390 --> 01:35:14,639

side but i think on the the leaner the

2518

01:35:17,990 --> 01:35:16,400

leadership side

2519

01:35:20,390 --> 01:35:18,000

uh it's uh

2520

01:35:22,790 --> 01:35:20,400

it's going out and just trying to do

2521

01:35:24,709 --> 01:35:22,800

what you think is the the best thing and

2522

01:35:28,149 --> 01:35:24,719

to to really be

2523

01:35:30,550 --> 01:35:28,159

receptive to to input from others okay

2524

01:35:33,430 --> 01:35:30,560

um if you're if you're not receptive to

2525

01:35:35,510 --> 01:35:33,440

the the input of others who have good

2526

01:35:37,189 --> 01:35:35,520

ideas then then i think that you can't

2527

01:35:42,870 --> 01:35:37,199

go nearly as far yeah then you're the

2528

01:35:47,430 --> 01:35:45,590

hi my name is kapana ramsey and i'm a

2529

01:35:50,149 --> 01:35:47,440

student at scripps college which happens

2530

01:35:51,669 --> 01:35:50,159

to be a women's college um

2531

01:35:53,669 --> 01:35:51,679

i just wondered have you ever found

2532

01:35:55,350 --> 01:35:53,679

yourselves being discouraged by the

2533

01:35:57,270 --> 01:35:55,360

women in your life

2534

01:35:59,750 --> 01:35:57,280

for doing the sciences because

2535

01:36:01,510 --> 01:35:59,760

guaranteed like i always have a physics

2536

01:36:03,830 --> 01:36:01,520

problem that i find particularly hard

2537

01:36:05,669 --> 01:36:03,840

and i tend to vent to my friends

2538

01:36:07,510 --> 01:36:05,679

and once i was

2539

01:36:09,990 --> 01:36:07,520

once a friend of mine said well no one's

2540

01:36:11,430 --> 01:36:10,000

telling you to do the sciences

2541

01:36:13,189 --> 01:36:11,440

i wonder if you guys have ever had

2542

01:36:14,629 --> 01:36:13,199

anything like that and how you dealt

2543

01:36:16,390 --> 01:36:14,639

with it

2544

01:36:18,229 --> 01:36:16,400

we tend to think of women as practicing

2545

01:36:20,790 --> 01:36:18,239

solidarity but sometimes it's not always

2546

01:36:26,790 --> 01:36:24,709

well i guess i guess i would say that um

2547

01:36:29,350 --> 01:36:26,800

women tend to be the hardest critics on

2548

01:36:31,189 --> 01:36:29,360

other women okay because because you

2549

01:36:33,189 --> 01:36:31,199

want to avoid

2550

01:36:35,510 --> 01:36:33,199

um the

2551

01:36:37,270 --> 01:36:35,520

any issue that any woman got anything

2552

01:36:40,709 --> 01:36:37,280

because she was a woman

2553

01:36:42,870 --> 01:36:40,719

so um so i i don't know maggie maybe you

2554

01:36:44,550 --> 01:36:42,880

can comment on that but i i think women

2555

01:36:46,950 --> 01:36:44,560

look at women and say you know look you

2556

01:36:49,510 --> 01:36:46,960

got to be better than that and i think

2557

01:36:51,590 --> 01:36:49,520

you've got a point

2558

01:36:54,629 --> 01:36:51,600

yeah i think that's actually true

2559

01:37:00,550 --> 01:36:57,669

hi my name is yao hackett i haven't been

2560

01:37:03,510 --> 01:37:00,560

living america only nine years

2561

01:37:05,189 --> 01:37:03,520

obviously i'm 44 years old it's a very

2562

01:37:06,390 --> 01:37:05,199

old age

2563

01:37:08,070 --> 01:37:06,400

i'm from

2564

01:37:09,830 --> 01:37:08,080

csu long beach

2565

01:37:12,790 --> 01:37:09,840

at a lancaster

2566

01:37:15,189 --> 01:37:12,800

which is a very small small group

2567

01:37:18,470 --> 01:37:15,199

engineering program

2568

01:37:21,510 --> 01:37:18,480

my situation is since that is a very

2569

01:37:22,950 --> 01:37:21,520

small group i only have nine students in

2570

01:37:25,830 --> 01:37:22,960

double e

2571

01:37:28,390 --> 01:37:25,840

so and most of the teacher is a

2572

01:37:31,510 --> 01:37:28,400

part-time so they don't obviously don't

2573

01:37:32,550 --> 01:37:31,520

have office hours and

2574

01:37:34,950 --> 01:37:32,560

so it's

2575

01:37:36,790 --> 01:37:34,960

it's very difficult to handle with them

2576

01:37:38,950 --> 01:37:36,800

so only can you see the professor is

2577

01:37:41,189 --> 01:37:38,960

only just a class time

2578

01:37:44,070 --> 01:37:41,199

so i have a really a little bit of a

2579

01:37:46,870 --> 01:37:44,080

hard time to to continue to take a class

2580

01:37:50,070 --> 01:37:46,880

so i told my friend so they all suggest

2581

01:37:53,669 --> 01:37:50,080

me moving to another university so which

2582

01:37:56,229 --> 01:37:53,679

is i was in the csu san jose

2583

01:37:57,669 --> 01:37:56,239

so beyond your experience so what do you

2584

01:37:59,030 --> 01:37:57,679

think

2585

01:38:01,910 --> 01:37:59,040

thank you and thank you here's a

2586

01:38:03,910 --> 01:38:01,920

situation where the professors part-time

2587

01:38:05,910 --> 01:38:03,920

no office hours no access to the kind of

2588

01:38:07,109 --> 01:38:05,920

advice that you were talking about

2589

01:38:09,189 --> 01:38:07,119

should people look for different

2590

01:38:11,750 --> 01:38:09,199

universities if they can in these cases

2591

01:38:15,830 --> 01:38:11,760

that may be more able to

2592

01:38:20,790 --> 01:38:17,270

that that's certainly

2593

01:38:24,470 --> 01:38:20,800

a good option um another is that

2594

01:38:25,270 --> 01:38:24,480

there are associations national state of

2595

01:38:28,470 --> 01:38:25,280

of

2596

01:38:30,390 --> 01:38:28,480

students and you can always find

2597

01:38:33,030 --> 01:38:30,400

people that can mentor you and help you

2598

01:38:35,109 --> 01:38:33,040

um through those organizations uh so i

2599

01:38:37,910 --> 01:38:35,119

would i would look for for what other

2600

01:38:40,790 --> 01:38:37,920

what kind of organizations um there's a

2601

01:38:43,750 --> 01:38:40,800

it's a national association of

2602

01:38:44,870 --> 01:38:43,760

geo science

2603

01:38:46,629 --> 01:38:44,880

there's an association of women

2604

01:38:47,910 --> 01:38:46,639

geoscientists um that's kind of a

2605

01:38:50,709 --> 01:38:47,920

professional level there are other

2606

01:38:52,550 --> 01:38:50,719

graduate student associations um that

2607

01:38:56,229 --> 01:38:52,560

are usually active

2608

01:38:58,229 --> 01:38:56,239

on most campuses so i i don't know in

2609

01:39:00,550 --> 01:38:58,239

some specific examples but certainly you

2610

01:39:03,669 --> 01:39:00,560

know they the association of women in in

2611

01:39:05,350 --> 01:39:03,679

geosciences um would be a place to to go

2612

01:39:07,590 --> 01:39:05,360

to um

2613

01:39:08,870 --> 01:39:07,600

if you're in geosciences but you know

2614

01:39:10,629 --> 01:39:08,880

you get the point but professional

2615

01:39:12,390 --> 01:39:10,639

groups are beyond the the immediate

2616

01:39:14,310 --> 01:39:12,400

physical presence of a faculty member or

2617

01:39:17,270 --> 01:39:14,320

the absence of a faculty member good

2618

01:39:21,590 --> 01:39:19,430

hi my name is savannah vanessa and i'm a

2619

01:39:24,390 --> 01:39:21,600

graduating senior in california state

2620

01:39:26,149 --> 01:39:24,400

university northridge i'm studying

2621

01:39:28,550 --> 01:39:26,159

mechanical engineering and minoring in

2622

01:39:30,470 --> 01:39:28,560

writing and rhetoric

2623

01:39:32,229 --> 01:39:30,480

i wanted to ask a few years ago i was

2624

01:39:33,590 --> 01:39:32,239

doing some research on the number of

2625

01:39:35,669 --> 01:39:33,600

women

2626
01:39:37,750 --> 01:39:35,679
that were studying in

2627
01:39:40,790 --> 01:39:37,760
science and engineering and i did notice

2628
01:39:43,350 --> 01:39:40,800
that the flood of women during the 60s

2629
01:39:44,390 --> 01:39:43,360
and the 70s but what caught my attention

2630
01:39:46,870 --> 01:39:44,400
was

2631
01:39:48,629 --> 01:39:46,880
during the 70s

2632
01:39:51,189 --> 01:39:48,639
during the flood of the women

2633
01:39:53,189 --> 01:39:51,199
there was a sudden decrease in men

2634
01:39:55,910 --> 01:39:53,199
actually going into

2635
01:39:58,790 --> 01:39:55,920
engineering and the sciences and some of

2636
01:40:02,950 --> 01:39:58,800
the papers had suggested that it was

2637
01:40:05,510 --> 01:40:02,960
just a negative reaction by the men for

2638
01:40:06,550 --> 01:40:05,520

the sudden uh increase in number of

2639

01:40:09,830 --> 01:40:06,560

women

2640

01:40:12,470 --> 01:40:09,840

i wanted to ask uh your opinions uh do

2641

01:40:13,669 --> 01:40:12,480

you think there is any truth in these

2642

01:40:15,990 --> 01:40:13,679

uh

2643

01:40:17,750 --> 01:40:16,000

suggestions or have you ever encountered

2644

01:40:19,270 --> 01:40:17,760

any such negative reactions thank you

2645

01:40:20,709 --> 01:40:19,280

and and there was a phenomenon that you

2646

01:40:22,790 --> 01:40:20,719

saw on the soviet union which would brag

2647

01:40:24,629 --> 01:40:22,800

oh we have 70 percent of our doctors are

2648

01:40:27,109 --> 01:40:24,639

women but at the same time that

2649

01:40:28,709 --> 01:40:27,119

profession became devalued because more

2650

01:40:30,390 --> 01:40:28,719

women went into it and i think that's a

2651

01:40:33,669 --> 01:40:30,400

good question

2652

01:40:38,390 --> 01:40:35,750

i i've never

2653

01:40:40,629 --> 01:40:38,400

encountered any attitudes like that

2654

01:40:43,189 --> 01:40:40,639

um and i i tend to think that

2655

01:40:45,669 --> 01:40:43,199

engineering is still a male

2656

01:40:47,030 --> 01:40:45,679

associated with being male dominated and

2657

01:40:49,030 --> 01:40:47,040

so therefore

2658

01:40:50,790 --> 01:40:49,040

you know men wouldn't have that that

2659

01:40:52,070 --> 01:40:50,800

kind of backlash um

2660

01:40:54,470 --> 01:40:52,080

mentality

2661

01:40:57,990 --> 01:40:54,480

um but but i'll say that what i saw in

2662

01:40:59,270 --> 01:40:58,000

the 80s is that um very smart people

2663

01:41:01,270 --> 01:40:59,280

including some of the people i went to

2664

01:41:03,189 --> 01:41:01,280

graduate school with went to wall street

2665

01:41:05,750 --> 01:41:03,199

because that's where the money was

2666

01:41:07,830 --> 01:41:05,760

so there's you know people shipped

2667

01:41:10,709 --> 01:41:07,840

around for different reasons

2668

01:41:12,790 --> 01:41:10,719

but no i haven't experienced that

2669

01:41:23,910 --> 01:41:12,800

thank you all for coming terrific panel

2670

01:41:29,109 --> 01:41:26,950

thank you pat thank you to the panelists

2671

01:41:44,390 --> 01:41:29,119

here for a really enlightening

2672

01:41:50,149 --> 01:41:47,189

welcome back we have assembled an

2673

01:41:52,550 --> 01:41:50,159

outstanding panel of jpl women

2674

01:41:56,310 --> 01:41:52,560

leaders in all aspects of what we do

2675

01:41:58,550 --> 01:41:56,320

here from flight project to science to

2676

01:42:01,510 --> 01:41:58,560

technology engineering

2677

01:42:04,790 --> 01:42:01,520

line in executive management

2678

01:42:07,669 --> 01:42:04,800

here to engage them in a conversation

2679

01:42:10,950 --> 01:42:07,679

and take your questions is our director

2680

01:42:18,629 --> 01:42:10,960

of human resources cozette heart because

2681

01:42:24,310 --> 01:42:21,830

i know we left off at a very engaging q

2682

01:42:26,629 --> 01:42:24,320

a and i hope we can carry that into this

2683

01:42:29,030 --> 01:42:26,639

next session i'm just going to be sort

2684

01:42:30,470 --> 01:42:29,040

of kicking off some questions for this

2685

01:42:33,350 --> 01:42:30,480

group of panelists these are all very

2686

01:42:35,750 --> 01:42:33,360

successful women here at jpl

2687

01:42:37,350 --> 01:42:35,760

and um i think they're anxious to ask

2688

01:42:39,669 --> 01:42:37,360

answer some of the same questions that

2689

01:42:42,149 --> 01:42:39,679

the earlier panel got so

2690

01:42:43,910 --> 01:42:42,159

i think if you've got the questions you

2691

01:42:45,430 --> 01:42:43,920

know write them down we'll make sure

2692

01:42:47,189 --> 01:42:45,440

there's plenty of time at the end for

2693

01:42:49,109 --> 01:42:47,199

that i'm going to just quickly go

2694

01:42:52,070 --> 01:42:49,119

through a little bit about each person

2695

01:42:53,590 --> 01:42:52,080

so that you know who we have here very

2696

01:42:56,950 --> 01:42:53,600

briefly it certainly doesn't do their

2697

01:42:58,790 --> 01:42:56,960

careers justice and hopefully as we talk

2698

01:43:01,590 --> 01:42:58,800

some of what their highlights of their

2699

01:43:03,910 --> 01:43:01,600

career will come out as part of that so

2700

01:43:06,070 --> 01:43:03,920

thank you very much first to my to my

2701
01:43:08,390 --> 01:43:06,080
left immediate left is dr meg powell

2702
01:43:11,270 --> 01:43:08,400
meeks she's the associate

2703
01:43:13,109 --> 01:43:11,280
chief information officer here at jpl

2704
01:43:15,030 --> 01:43:13,119
she's earned a bachelor's degree in

2705
01:43:16,950 --> 01:43:15,040
physics and then went on and earned

2706
01:43:19,109 --> 01:43:16,960
advanced degrees in engineering

2707
01:43:20,870 --> 01:43:19,119
management computer science and

2708
01:43:24,950 --> 01:43:20,880
information systems

2709
01:43:27,030 --> 01:43:24,960
next to mag is elizabeth km she is our

2710
01:43:29,189 --> 01:43:27,040
manager for instrument software and

2711
01:43:31,510 --> 01:43:29,199
science data systems

2712
01:43:34,229 --> 01:43:31,520
liz holds a bachelor's degree in math

2713
01:43:36,310 --> 01:43:34,239

two degrees in math computer science and

2714

01:43:40,070 --> 01:43:36,320

business administration

2715

01:43:41,990 --> 01:43:40,080

next to elizabeth is dr diane evans she

2716

01:43:44,390 --> 01:43:42,000

is an executive for earth science and

2717

01:43:46,950 --> 01:43:44,400

technology she's been a project

2718

01:43:49,510 --> 01:43:46,960

scientist a chief scientist and held

2719

01:43:51,510 --> 01:43:49,520

increasingly higher levels of management

2720

01:43:55,350 --> 01:43:51,520

responsibilities throughout her career

2721

01:43:57,430 --> 01:43:55,360

with jpl she holds a bachelor's master's

2722

01:43:59,830 --> 01:43:57,440

and doctoral degree in geological

2723

01:44:03,030 --> 01:43:59,840

sciences

2724

01:44:05,590 --> 01:44:03,040

next is dr claudia alexander she is a

2725

01:44:07,910 --> 01:44:05,600

project scientist for rosetta which is

2726
01:44:10,310 --> 01:44:07,920
one of our international missions

2727
01:44:11,590 --> 01:44:10,320
in our solar system exploration

2728
01:44:13,430 --> 01:44:11,600
directorate

2729
01:44:15,669 --> 01:44:13,440
she holds a degree in engineering and

2730
01:44:17,990 --> 01:44:15,679
received her doctorate in atmosphere and

2731
01:44:20,070 --> 01:44:18,000
space science

2732
01:44:22,790 --> 01:44:20,080
next we have jan chotis she's an

2733
01:44:25,430 --> 01:44:22,800
executive for our safety and mission

2734
01:44:27,990 --> 01:44:25,440
success organization she most recently

2735
01:44:29,430 --> 01:44:28,000
was our project manager for juno which

2736
01:44:30,470 --> 01:44:29,440
is a mission that we have going to

2737
01:44:32,390 --> 01:44:30,480
jupiter

2738
01:44:35,590 --> 01:44:32,400

she holds undergraduate and graduate

2739

01:44:38,470 --> 01:44:35,600

degrees in aerospace engineering

2740

01:44:40,629 --> 01:44:38,480

next is kendra short she's a senior

2741

01:44:43,030 --> 01:44:40,639

manager here in our mechanical systems

2742

01:44:45,030 --> 01:44:43,040

division she holds a bachelor's degree

2743

01:44:46,950 --> 01:44:45,040

in mechanical and aerospace engineering

2744

01:44:49,510 --> 01:44:46,960

and a master's in aero and astro

2745

01:44:52,070 --> 01:44:49,520

engineering and finally last but not

2746

01:44:54,629 --> 01:44:52,080

least is dr rosalie lopez

2747

01:44:57,669 --> 01:44:54,639

she's a planetary science scientist in

2748

01:44:59,590 --> 01:44:57,679

our solar system exploration directorate

2749

01:45:01,510 --> 01:44:59,600

she holds a degree in a star astronomy

2750

01:45:03,990 --> 01:45:01,520

and received a doctorate in planetary

2751
01:45:06,790 --> 01:45:04,000
science and she's our leading volcano

2752
01:45:08,550 --> 01:45:06,800
specialist here at jpl

2753
01:45:10,550 --> 01:45:08,560
so first of all i'd just like to kick

2754
01:45:13,109 --> 01:45:10,560
this off and i'm going to direct the

2755
01:45:16,629 --> 01:45:13,119
first question to mag i've just gone

2756
01:45:19,030 --> 01:45:16,639
through a lot of advanced degrees here

2757
01:45:20,950 --> 01:45:19,040
how important do you think it is to have

2758
01:45:23,669 --> 01:45:20,960
an advanced degree and continue on with

2759
01:45:26,070 --> 01:45:23,679
your education be successful sure well

2760
01:45:28,470 --> 01:45:26,080
for me i found having an advanced degree

2761
01:45:30,950 --> 01:45:28,480
very helpful in my career development

2762
01:45:32,550 --> 01:45:30,960
for example when i came to jpl i had a

2763
01:45:34,550 --> 01:45:32,560

degree in physics and some training in

2764

01:45:36,950 --> 01:45:34,560

engineering management so my first job

2765

01:45:38,390 --> 01:45:36,960

was a junior instrumentations engineer

2766

01:45:40,870 --> 01:45:38,400

and although i enjoyed working with

2767

01:45:42,550 --> 01:45:40,880

hardware i really became excited when i

2768

01:45:43,830 --> 01:45:42,560

had a chance to work on a data

2769

01:45:46,629 --> 01:45:43,840

acquisition system that involved

2770

01:45:49,270 --> 01:45:46,639

computers and software that acquired and

2771

01:45:52,070 --> 01:45:49,280

analyzed data and that inspired me to go

2772

01:45:54,629 --> 01:45:52,080

back to school and study computers and

2773

01:45:57,510 --> 01:45:54,639

computer science information systems and

2774

01:45:59,669 --> 01:45:57,520

the the natural integration of those

2775

01:46:02,149 --> 01:45:59,679

technical areas i think opened a lot of

2776

01:46:04,790 --> 01:46:02,159

doors for me to pursue other jobs across

2777

01:46:06,950 --> 01:46:04,800

the laboratory and it turned out that

2778

01:46:09,510 --> 01:46:06,960

i moved into the it organization a

2779

01:46:11,830 --> 01:46:09,520

little bit and right at the time jpl was

2780

01:46:13,350 --> 01:46:11,840

looking at outsourcing and i did my

2781

01:46:14,709 --> 01:46:13,360

dissertation in that area and it turns

2782

01:46:16,229 --> 01:46:14,719

out that i was able to contribute i

2783

01:46:18,149 --> 01:46:16,239

think to

2784

01:46:20,149 --> 01:46:18,159

learning how to start up an organization

2785

01:46:21,270 --> 01:46:20,159

how to transition people

2786

01:46:25,510 --> 01:46:21,280

and

2787

01:46:26,870 --> 01:46:25,520

business how to do business management

2788

01:46:28,709 --> 01:46:26,880

and

2789

01:46:30,470 --> 01:46:28,719

got the opportunity to come back to jpl

2790

01:46:32,950 --> 01:46:30,480

and work in both engineering and nit so

2791

01:46:34,790 --> 01:46:32,960

that's a perfect blend i think of having

2792

01:46:36,709 --> 01:46:34,800

when you continue school how many doors

2793

01:46:38,629 --> 01:46:36,719

can open and the different paths your

2794

01:46:39,669 --> 01:46:38,639

career can take so for me it's been a

2795

01:46:41,669 --> 01:46:39,679

wonderful thing i think you should

2796

01:46:44,229 --> 01:46:41,679

continue

2797

01:46:46,229 --> 01:46:44,239

any others here who decided

2798

01:46:48,070 --> 01:46:46,239

that they needed that for their career

2799

01:46:50,149 --> 01:46:48,080

as well yeah i think especially in the

2800

01:46:51,910 --> 01:46:50,159

science area here we most of the

2801
01:46:53,510 --> 01:46:51,920
scientists here have advanced degrees i

2802
01:46:55,270 --> 01:46:53,520
do think that that's a very important

2803
01:46:57,910 --> 01:46:55,280
for jpl

2804
01:46:59,350 --> 01:46:57,920
yes when you do an advanced degree

2805
01:47:02,229 --> 01:46:59,360
that's when you really learn to do

2806
01:47:05,030 --> 01:47:02,239
research so if you want to do research

2807
01:47:07,350 --> 01:47:05,040
it's very important to have that and you

2808
01:47:09,430 --> 01:47:07,360
might also find

2809
01:47:11,910 --> 01:47:09,440
different slightly different areas of

2810
01:47:13,669 --> 01:47:11,920
research that you enjoy

2811
01:47:16,149 --> 01:47:13,679
i actually started out with an

2812
01:47:18,470 --> 01:47:16,159
undergraduate in astronomy

2813
01:47:20,870 --> 01:47:18,480

but in my final year i took a class in

2814

01:47:23,430 --> 01:47:20,880

planter geology and my professor was a

2815

01:47:26,629 --> 01:47:23,440

volcanologist and that's where i decided

2816

01:47:28,310 --> 01:47:26,639

to go into geology and volcanology

2817

01:47:29,990 --> 01:47:28,320

how about those of you who have been in

2818

01:47:32,070 --> 01:47:30,000

line management positions and you're

2819

01:47:33,590 --> 01:47:32,080

looking at students and

2820

01:47:35,750 --> 01:47:33,600

graduates

2821

01:47:37,669 --> 01:47:35,760

how do you look at

2822

01:47:39,990 --> 01:47:37,679

undergraduate degree versus advanced

2823

01:47:42,070 --> 01:47:40,000

degree versus phds

2824

01:47:43,669 --> 01:47:42,080

because that i can comment from my own

2825

01:47:45,189 --> 01:47:43,679

personal experience i did an

2826

01:47:46,550 --> 01:47:45,199

undergraduate degree in aerospace

2827

01:47:49,350 --> 01:47:46,560

engineering

2828

01:47:51,270 --> 01:47:49,360

but that curriculum was

2829

01:47:53,910 --> 01:47:51,280

broad engineering and then broad

2830

01:47:56,070 --> 01:47:53,920

aerospace engineering it wasn't until my

2831

01:47:58,310 --> 01:47:56,080

master's degree that i was able to focus

2832

01:48:00,470 --> 01:47:58,320

in on dynamics and control of spacecraft

2833

01:48:03,830 --> 01:48:00,480

and so having that opportunity to do a

2834

01:48:05,990 --> 01:48:03,840

masters in a particular area was made it

2835

01:48:08,229 --> 01:48:06,000

much easier for me to look at jpl and

2836

01:48:10,149 --> 01:48:08,239

decide what part of jpl i was most

2837

01:48:11,270 --> 01:48:10,159

interested in applying to when i was

2838

01:48:13,750 --> 01:48:11,280

graduating

2839

01:48:14,790 --> 01:48:13,760

from my master's program so i would

2840

01:48:17,270 --> 01:48:14,800

encourage

2841

01:48:19,430 --> 01:48:17,280

folks to think of the masters and phd

2842

01:48:20,709 --> 01:48:19,440

opportunities as ones where you can

2843

01:48:22,709 --> 01:48:20,719

actually

2844

01:48:25,430 --> 01:48:22,719

specialize dive deeper into your

2845

01:48:26,470 --> 01:48:25,440

technical interests maybe try something

2846

01:48:29,109 --> 01:48:26,480

different

2847

01:48:32,870 --> 01:48:29,119

as illustrated by meg's career but it

2848

01:48:35,830 --> 01:48:32,880

really does pay off in many perspectives

2849

01:48:37,030 --> 01:48:35,840

i think oh go ahead i'd like to add that

2850

01:48:39,030 --> 01:48:37,040

i think

2851

01:48:41,430 --> 01:48:39,040

getting the an advanced degree helps to

2852

01:48:44,790 --> 01:48:41,440

open up your mind to what you don't know

2853

01:48:46,629 --> 01:48:44,800

that when i uh see people who stop at a

2854

01:48:48,149 --> 01:48:46,639

master's degree and then want to solve

2855

01:48:49,750 --> 01:48:48,159

the universe

2856

01:48:51,350 --> 01:48:49,760

that it was that extra step of getting a

2857

01:48:53,109 --> 01:48:51,360

phd that helped me to understand that

2858

01:48:55,590 --> 01:48:53,119

there's so much more and to be

2859

01:48:56,709 --> 01:48:55,600

respectful of the areas that i that i

2860

01:48:58,310 --> 01:48:56,719

don't know

2861

01:48:59,910 --> 01:48:58,320

and make sure i have someone on my team

2862

01:49:02,149 --> 01:48:59,920

who can cover that and not think that i

2863

01:49:03,990 --> 01:49:02,159

can do all those things myself

2864

01:49:06,310 --> 01:49:04,000

i'd like to offer from my perspective as

2865

01:49:08,229 --> 01:49:06,320

a hiring manager and for my own personal

2866

01:49:10,629 --> 01:49:08,239

experience there's different ways you

2867

01:49:11,910 --> 01:49:10,639

can go about getting advanced degrees

2868

01:49:13,990 --> 01:49:11,920

you don't have to stay in school

2869

01:49:16,870 --> 01:49:14,000

continuously as a bachelor's and go

2870

01:49:18,870 --> 01:49:16,880

right into a master's or phd program

2871

01:49:20,550 --> 01:49:18,880

i know i i came to jpl after my

2872

01:49:22,629 --> 01:49:20,560

bachelor's degree

2873

01:49:24,550 --> 01:49:22,639

and had a chance to sort of see how my

2874

01:49:26,790 --> 01:49:24,560

education was applied in a working

2875

01:49:29,189 --> 01:49:26,800

environment and and how the things that

2876

01:49:30,709 --> 01:49:29,199

i learned what what parts of those were

2877

01:49:33,030 --> 01:49:30,719

important in the in the work world and

2878

01:49:34,790 --> 01:49:33,040

the application to spacecraft design

2879

01:49:36,310 --> 01:49:34,800

then i chose to go back to school after

2880

01:49:38,149 --> 01:49:36,320

a couple of years of working and i was

2881

01:49:40,870 --> 01:49:38,159

able to focus in on what i really wanted

2882

01:49:42,950 --> 01:49:40,880

to do and it made me a better student in

2883

01:49:45,510 --> 01:49:42,960

a graduate program having had some work

2884

01:49:49,510 --> 01:49:45,520

experience so

2885

01:49:50,950 --> 01:49:49,520

jpl hires a lot of bachelor students but

2886

01:49:52,629 --> 01:49:50,960

we have

2887

01:49:54,550 --> 01:49:52,639

you know good programs and and the

2888

01:49:56,790 --> 01:49:54,560

encouragement to continue to go back and

2889

01:49:58,550 --> 01:49:56,800

learn either through an academic program

2890

01:50:00,709 --> 01:49:58,560

or through professional development in

2891

01:50:04,229 --> 01:50:00,719

whatever company you might

2892

01:50:05,510 --> 01:50:04,239

hire into is absolutely important and

2893

01:50:07,270 --> 01:50:05,520

there's different ways to do it you

2894

01:50:09,350 --> 01:50:07,280

don't have to stay in school

2895

01:50:10,550 --> 01:50:09,360

until you get the final degree

2896

01:50:12,950 --> 01:50:10,560

getting a little work experience

2897

01:50:15,109 --> 01:50:12,960

sprinkled in there is is also a good

2898

01:50:17,830 --> 01:50:15,119

piece of advice yeah i want to add you

2899

01:50:19,910 --> 01:50:17,840

know to to kendra's statement

2900

01:50:22,390 --> 01:50:19,920

as the line managers i found out you

2901

01:50:25,109 --> 01:50:22,400

know a lot of students they even before

2902

01:50:27,109 --> 01:50:25,119

they complete the bachelor degree jpo do

2903

01:50:29,990 --> 01:50:27,119

offer different type of programs such as

2904

01:50:32,229 --> 01:50:30,000

a summer intern or we call academic

2905

01:50:34,390 --> 01:50:32,239

part-time in a program especially for

2906

01:50:36,470 --> 01:50:34,400

local universities it really gives them

2907

01:50:38,550 --> 01:50:36,480

an opportunity to just come in and have

2908

01:50:40,550 --> 01:50:38,560

a hands-on experience and at the same

2909

01:50:42,149 --> 01:50:40,560

time you can just decide if it's really

2910

01:50:45,109 --> 01:50:42,159

this is really the career path you want

2911

01:50:46,950 --> 01:50:45,119

to take okay and then they probably you

2912

01:50:48,950 --> 01:50:46,960

know can get a job as a bachelor degree

2913

01:50:50,229 --> 01:50:48,960

coming in and decide two years later i

2914

01:50:52,070 --> 01:50:50,239

want to go back and for a master's

2915

01:50:53,990 --> 01:50:52,080

degree so there are different ways

2916

01:50:55,830 --> 01:50:54,000

approaching it and a lot of opportunity

2917

01:50:57,430 --> 01:50:55,840

for the students

2918

01:51:00,149 --> 01:50:57,440

so the next question i have i want to

2919

01:51:01,990 --> 01:51:00,159

direct to the scientists here diane i

2920

01:51:05,510 --> 01:51:02,000

mentioned that you were

2921

01:51:07,990 --> 01:51:05,520

a chief scientist you were a pi

2922

01:51:10,149 --> 01:51:08,000

and you're a pi

2923

01:51:12,390 --> 01:51:10,159

sorry claudia and rosalia you're a

2924

01:51:15,189 --> 01:51:12,400

planetary scientist what does doing

2925

01:51:17,430 --> 01:51:15,199

research at jpl entail and what is that

2926

01:51:19,830 --> 01:51:17,440

like as a career sort of the highs and

2927

01:51:22,310 --> 01:51:19,840

lows that you might have experienced and

2928

01:51:24,229 --> 01:51:22,320

hallmarks that you have from that

2929

01:51:25,109 --> 01:51:24,239

let's start with you like if i can start

2930

01:51:27,669 --> 01:51:25,119

um

2931

01:51:28,950 --> 01:51:27,679

you know the the role is that well

2932

01:51:31,350 --> 01:51:28,960

there are lots of different roles that

2933

01:51:34,229 --> 01:51:31,360

the scientists play here um from my own

2934

01:51:35,910 --> 01:51:34,239

personal uh perspective i have always

2935

01:51:37,830 --> 01:51:35,920

done my own research

2936

01:51:40,229 --> 01:51:37,840

and then but but actually one of the

2937

01:51:42,149 --> 01:51:40,239

things that i found early on

2938

01:51:44,310 --> 01:51:42,159

maybe even more satisfying

2939

01:51:46,870 --> 01:51:44,320

was to be a bridge to the outside

2940

01:51:48,470 --> 01:51:46,880

community because after you're at jpl

2941

01:51:50,790 --> 01:51:48,480

for a while you

2942

01:51:52,950 --> 01:51:50,800

really get to learn

2943

01:51:54,149 --> 01:51:52,960

how important engineering is and to make

2944

01:51:55,589 --> 01:51:54,159

things happen

2945

01:51:57,589 --> 01:51:55,599

and so

2946

01:52:00,149 --> 01:51:57,599

we're very lucky here that we have such

2947

01:52:01,830 --> 01:52:00,159

an incredible engineering staff and so

2948

01:52:04,629 --> 01:52:01,840

so i really thought one of the exciting

2949

01:52:06,629 --> 01:52:04,639

things was to introduce the external

2950

01:52:08,790 --> 01:52:06,639

science community to some extent to the

2951
01:52:11,430 --> 01:52:08,800
incredible technology and engineering

2952
01:52:13,270 --> 01:52:11,440
capabilities jpl had and that's uh you

2953
01:52:14,870 --> 01:52:13,280
know i was able to do that

2954
01:52:17,189 --> 01:52:14,880
through being a project scientist and

2955
01:52:19,669 --> 01:52:17,199
then and then certainly in my role now

2956
01:52:21,430 --> 01:52:19,679
that's one of the the most fun i have is

2957
01:52:23,750 --> 01:52:21,440
is people getting so excited about the

2958
01:52:26,629 --> 01:52:23,760
capabilities we have here at jpl to to

2959
01:52:28,950 --> 01:52:26,639
make their science possible

2960
01:52:31,189 --> 01:52:28,960
so when i moved into my new neighborhood

2961
01:52:33,109 --> 01:52:31,199
i i met my neighbors and two of them

2962
01:52:35,750 --> 01:52:33,119
told me they were scientists and i first

2963
01:52:36,709 --> 01:52:35,760

i laughed i was like who does that

2964

01:52:44,149 --> 01:52:36,719

and

2965

01:52:46,229 --> 01:52:44,159

then i i asked one of what they they

2966

01:52:48,149 --> 01:52:46,239

told me that they studied the rings of

2967

01:52:50,070 --> 01:52:48,159

saturn and then i really laughed it's

2968

01:52:51,750 --> 01:52:50,080

like you you actually get paid to do

2969

01:52:54,070 --> 01:52:51,760

this

2970

01:52:56,709 --> 01:52:54,080

rosalie to tell us about planetary

2971

01:52:58,390 --> 01:52:56,719

amazing thing we get paid to do work

2972

01:53:00,870 --> 01:52:58,400

that we really love

2973

01:53:03,990 --> 01:53:00,880

i came to jpl because i really wanted to

2974

01:53:06,229 --> 01:53:04,000

become involved in missions i really

2975

01:53:08,629 --> 01:53:06,239

like this feeling of exploration of

2976

01:53:10,709 --> 01:53:08,639

sending a spacecraft somewhere that we

2977

01:53:14,229 --> 01:53:10,719

haven't been before and finding out

2978

01:53:17,030 --> 01:53:14,239

things that we didn't know about and i

2979

01:53:19,510 --> 01:53:17,040

was i came to jp i was a postdoc i was

2980

01:53:21,430 --> 01:53:19,520

living in england at the time and i had

2981

01:53:23,910 --> 01:53:21,440

the chance to come here for two years

2982

01:53:25,510 --> 01:53:23,920

and now 22 years later

2983

01:53:27,109 --> 01:53:25,520

i'm still here

2984

01:53:29,350 --> 01:53:27,119

and then

2985

01:53:32,149 --> 01:53:29,360

during my post-doc i got to know people

2986

01:53:35,030 --> 01:53:32,159

who were working on the galileo project

2987

01:53:36,470 --> 01:53:35,040

with uh the infrared instrument

2988

01:53:38,229 --> 01:53:36,480

and

2989

01:53:40,470 --> 01:53:38,239

you know i became interested in what

2990

01:53:42,310 --> 01:53:40,480

they were doing and they liked me and

2991

01:53:44,470 --> 01:53:42,320

they offered me a job

2992

01:53:46,790 --> 01:53:44,480

and in fact i had never worked with an

2993

01:53:47,669 --> 01:53:46,800

infrared instrument before

2994

01:53:50,070 --> 01:53:47,679

but

2995

01:53:51,990 --> 01:53:50,080

luckily the principal investigators said

2996

01:53:55,189 --> 01:53:52,000

oh don't worry you learn very quickly

2997

01:53:58,470 --> 01:53:55,199

and in fact i jumped in and i did learn

2998

01:54:00,629 --> 01:53:58,480

and after that project came to an end in

2999

01:54:03,750 --> 01:54:00,639

fact um you know marge and i were

3000

01:54:06,790 --> 01:54:03,760

working on the same project on galileo

3001
01:54:09,270 --> 01:54:06,800
and after that came to an end i actually

3002
01:54:11,350 --> 01:54:09,280
joined the cassini mission which is now

3003
01:54:13,669 --> 01:54:11,360
around saturn and has the scientists who

3004
01:54:15,990 --> 01:54:13,679
are studying the rings of saturn but now

3005
01:54:19,510 --> 01:54:16,000
i'm working on a radar instrument that's

3006
01:54:20,390 --> 01:54:19,520
diane's specialty and again at first i

3007
01:54:22,790 --> 01:54:20,400
thought

3008
01:54:25,430 --> 01:54:22,800
i really don't know anything about radar

3009
01:54:27,589 --> 01:54:25,440
but again the answer was you know you

3010
01:54:30,070 --> 01:54:27,599
learned so i think that

3011
01:54:32,709 --> 01:54:30,080
there is this uh it's a challenge in a

3012
01:54:33,830 --> 01:54:32,719
way but you jump in and do the best you

3013
01:54:35,830 --> 01:54:33,840

can and

3014

01:54:37,990 --> 01:54:35,840

and i think it makes you a better

3015

01:54:41,350 --> 01:54:38,000

scientist when you're broader

3016

01:54:42,870 --> 01:54:41,360

yeah let me throw in uh that um one of

3017

01:54:45,350 --> 01:54:42,880

the differences with an academic

3018

01:54:47,270 --> 01:54:45,360

scientist is that and they tell you

3019

01:54:49,109 --> 01:54:47,280

know oh it's just like being a professor

3020

01:54:51,030 --> 01:54:49,119

except that you have missions instead of

3021

01:54:52,470 --> 01:54:51,040

committees and all that other stuff that

3022

01:54:54,950 --> 01:54:52,480

professors do

3023

01:54:56,470 --> 01:54:54,960

um and at first when you rosley and i

3024

01:54:58,149 --> 01:54:56,480

kind of started together and it's

3025

01:55:00,229 --> 01:54:58,159

actually quite difficult to go back and

3026
01:55:01,990 --> 01:55:00,239
forth between the mission work and the

3027
01:55:03,350 --> 01:55:02,000
kind of publication work that you do the

3028
01:55:04,629 --> 01:55:03,360
publisher parish

3029
01:55:07,189 --> 01:55:04,639
environment

3030
01:55:09,350 --> 01:55:07,199
and so that's a a little bit hard to

3031
01:55:11,510 --> 01:55:09,360
deal with but then after you kind of

3032
01:55:13,350 --> 01:55:11,520
make the adjustment you are

3033
01:55:15,589 --> 01:55:13,360
part of you know the nation's

3034
01:55:17,669 --> 01:55:15,599
exploration program and you're doing

3035
01:55:19,990 --> 01:55:17,679
what diane talked about the beautiful

3036
01:55:23,270 --> 01:55:20,000
marriage of science and engineering that

3037
01:55:25,910 --> 01:55:23,280
is unique to jpl and it becomes uh an

3038
01:55:27,430 --> 01:55:25,920

incredible uh and incredible uh career

3039

01:55:29,430 --> 01:55:27,440

path

3040

01:55:31,589 --> 01:55:29,440

so our lab director he while he didn't

3041

01:55:34,470 --> 01:55:31,599

say it today he usually does

3042

01:55:37,750 --> 01:55:34,480

to to our workforce and others that we

3043

01:55:40,310 --> 01:55:37,760

do hear what is impossible what the rest

3044

01:55:42,629 --> 01:55:40,320

of the world cannot do

3045

01:55:44,310 --> 01:55:42,639

the problems don't come to us unless

3046

01:55:46,390 --> 01:55:44,320

they're unsolvable

3047

01:55:48,709 --> 01:55:46,400

and so i'll direct my first question

3048

01:55:50,629 --> 01:55:48,719

question on this to kendra you know how

3049

01:55:52,390 --> 01:55:50,639

do we inspire the people here to

3050

01:55:54,950 --> 01:55:52,400

actually solve the unsolvable as a

3051

01:56:00,229 --> 01:55:56,550

i would have to say the the first thing

3052

01:56:01,750 --> 01:56:00,239

we do is we hire very very smart people

3053

01:56:04,629 --> 01:56:01,760

i don't know how you could put that in a

3054

01:56:05,510 --> 01:56:04,639

job application or a job description but

3055

01:56:07,510 --> 01:56:05,520

um

3056

01:56:10,470 --> 01:56:07,520

but we try and hire the the best and the

3057

01:56:12,310 --> 01:56:10,480

brightest that we can across the nation

3058

01:56:14,149 --> 01:56:12,320

and usually what comes along with that

3059

01:56:15,030 --> 01:56:14,159

is a lot of passion for what they want

3060

01:56:17,030 --> 01:56:15,040

to do

3061

01:56:18,629 --> 01:56:17,040

whether it's the mechanical engineering

3062

01:56:21,430 --> 01:56:18,639

or the science or the electrical

3063

01:56:24,950 --> 01:56:21,440

engineering and that passion is really

3064

01:56:26,709 --> 01:56:24,960

the internal motivation uh for them to

3065

01:56:29,189 --> 01:56:26,719

do the impossible

3066

01:56:31,109 --> 01:56:29,199

we uh we have a lot of people that are

3067

01:56:32,709 --> 01:56:31,119

personally dedicated that will come on

3068

01:56:34,149 --> 01:56:32,719

in on the weekends because they know

3069

01:56:35,830 --> 01:56:34,159

there's a tough problem that needs to be

3070

01:56:39,990 --> 01:56:35,840

solved and they just can't stop thinking

3071

01:56:41,510 --> 01:56:40,000

about it um so to start with we have a

3072

01:56:43,910 --> 01:56:41,520

we have a workforce that doesn't need a

3073

01:56:45,669 --> 01:56:43,920

lot of inspiration uh they come with

3074

01:56:47,669 --> 01:56:45,679

that built in

3075

01:56:51,189 --> 01:56:47,679

but once they get into

3076

01:56:53,510 --> 01:56:51,199

uh project work at jpl uh the demands of

3077

01:56:56,390 --> 01:56:53,520

a mission and a flight project are are

3078

01:56:58,149 --> 01:56:56,400

pretty high um there's a launch window

3079

01:57:00,629 --> 01:56:58,159

that has to be met there's not a lot of

3080

01:57:02,149 --> 01:57:00,639

extra time to sort of noodle around on

3081

01:57:03,830 --> 01:57:02,159

on tough problems and you've got to get

3082

01:57:05,589 --> 01:57:03,840

a solution that's the whole point of

3083

01:57:08,229 --> 01:57:05,599

engineering is is building something

3084

01:57:10,070 --> 01:57:08,239

that that does what you want it to do

3085

01:57:12,550 --> 01:57:10,080

and so the inspiration or the leadership

3086

01:57:13,990 --> 01:57:12,560

that that people can can apply

3087

01:57:16,470 --> 01:57:14,000

throughout a mission is to make sure

3088

01:57:17,910 --> 01:57:16,480

people are uh enjoying what they're

3089

01:57:20,950 --> 01:57:17,920

doing they're well matched to their

3090

01:57:22,629 --> 01:57:20,960

talents and that you continue to

3091

01:57:24,550 --> 01:57:22,639

let them know the importance of the work

3092

01:57:26,709 --> 01:57:24,560

that they're doing and

3093

01:57:28,550 --> 01:57:26,719

that the contributions they're making on

3094

01:57:30,470 --> 01:57:28,560

an individual one by one basis are

3095

01:57:32,629 --> 01:57:30,480

incredibly valuable to the overall

3096

01:57:35,830 --> 01:57:32,639

result and the overall goal the the

3097

01:57:37,589 --> 01:57:35,840

first panel this morning talked about uh

3098

01:57:39,430 --> 01:57:37,599

we all have a role to play on a team

3099

01:57:41,510 --> 01:57:39,440

it's you know we're we're achieving

3100

01:57:44,470 --> 01:57:41,520

something as a as a group that's bigger

3101
01:57:46,390 --> 01:57:44,480
than anything we can do by ourselves and

3102
01:57:49,350 --> 01:57:46,400
knowing that you played one particular

3103
01:57:51,669 --> 01:57:49,360
role on that team uh can be very

3104
01:57:53,109 --> 01:57:51,679
inspiring to people and so that's that's

3105
01:57:55,910 --> 01:57:53,119
sort of the environment that you need to

3106
01:57:57,510 --> 01:57:55,920
create when you want people to to give

3107
01:57:59,430 --> 01:57:57,520
their heart and soul to the job that

3108
01:58:01,109 --> 01:57:59,440
they're that they're doing so that's

3109
01:58:03,669 --> 01:58:01,119
what we have here

3110
01:58:05,430 --> 01:58:03,679
so do you see that do do women bring

3111
01:58:08,149 --> 01:58:05,440
different characteristics to those teams

3112
01:58:09,430 --> 01:58:08,159
and success than men or or is it neutral

3113
01:58:11,669 --> 01:58:09,440

in the workplace

3114

01:58:14,149 --> 01:58:11,679

what do you find in terms of the the

3115

01:58:17,270 --> 01:58:14,159

characteristics that people bring

3116

01:58:19,589 --> 01:58:17,280

i'll go ahead and follow up um it takes

3117

01:58:20,790 --> 01:58:19,599

all kinds of people to succeed on a

3118

01:58:22,709 --> 01:58:20,800

mission

3119

01:58:26,870 --> 01:58:22,719

it takes the very deep intellectual

3120

01:58:28,950 --> 01:58:26,880

thinkers it takes the very creative and

3121

01:58:31,430 --> 01:58:28,960

blue sky thinkers

3122

01:58:32,870 --> 01:58:31,440

it takes the people that are

3123

01:58:35,669 --> 01:58:32,880

very good with

3124

01:58:38,229 --> 01:58:35,679

with hand assembly of of the hardware

3125

01:58:40,229 --> 01:58:38,239

that we build it also takes people that

3126

01:58:42,070 --> 01:58:40,239

that can think uh think through a

3127

01:58:46,470 --> 01:58:42,080

problem that's uh that nobody's ever

3128

01:58:48,390 --> 01:58:46,480

solved before it also takes all kinds of

3129

01:58:51,109 --> 01:58:48,400

demographics and one of those

3130

01:58:52,950 --> 01:58:51,119

demographics is gender and you have to

3131

01:58:55,189 --> 01:58:52,960

recognize that people bring different

3132

01:58:57,589 --> 01:58:55,199

perspectives to a team there are shy

3133

01:58:59,589 --> 01:58:57,599

introverted people there are outgoing

3134

01:59:01,830 --> 01:58:59,599

people there are men there are women

3135

01:59:03,830 --> 01:59:01,840

there are senior highly experienced

3136

01:59:05,750 --> 01:59:03,840

people there are young people of of you

3137

01:59:07,589 --> 01:59:05,760

know the new generation

3138

01:59:10,070 --> 01:59:07,599

and it's that mix of different

3139

01:59:11,430 --> 01:59:10,080

perspectives on the problem

3140

01:59:13,270 --> 01:59:11,440

that

3141

01:59:15,510 --> 01:59:13,280

go towards success

3142

01:59:17,510 --> 01:59:15,520

and one of those differences is gender

3143

01:59:19,350 --> 01:59:17,520

and you have to recognize that women do

3144

01:59:20,790 --> 01:59:19,360

approach a problem a little differently

3145

01:59:22,550 --> 01:59:20,800

they have different

3146

01:59:24,870 --> 01:59:22,560

social interaction

3147

01:59:27,350 --> 01:59:24,880

approaches and that's just one of the

3148

01:59:29,030 --> 01:59:27,360

things that contributes to success but

3149

01:59:31,109 --> 01:59:29,040

it's not the only thing

3150

01:59:33,750 --> 01:59:31,119

let me throw in something because when i

3151
01:59:35,510 --> 01:59:33,760
first became a manager at jpl i actually

3152
01:59:38,310 --> 01:59:35,520
had some women take me aside and say

3153
01:59:40,149 --> 01:59:38,320
don't worry if your management style is

3154
01:59:42,950 --> 01:59:40,159
decidedly different from the guys who

3155
01:59:44,310 --> 01:59:42,960
you work with and i was going into a

3156
01:59:46,390 --> 01:59:44,320
division here at jpl where they were

3157
01:59:48,149 --> 01:59:46,400
mostly male managers

3158
01:59:49,189 --> 01:59:48,159
and i was a little bit nervous about

3159
01:59:51,589 --> 01:59:49,199
that

3160
01:59:54,310 --> 01:59:51,599
i tend to be a team builder and i really

3161
01:59:55,830 --> 01:59:54,320
am work on consensus building

3162
01:59:58,390 --> 01:59:55,840
and there's another management style

3163
01:59:59,910 --> 01:59:58,400

called top down and a lot of our

3164

02:00:01,589 --> 01:59:59,920

guys are more

3165

02:00:04,310 --> 02:00:01,599

uh comfortable with that style of

3166

02:00:06,950 --> 02:00:04,320

management um but i have learned really

3167

02:00:09,589 --> 02:00:06,960

that it's more personality oriented that

3168

02:00:11,270 --> 02:00:09,599

is not necessarily a gender issue

3169

02:00:12,390 --> 02:00:11,280

so it took me a while to learn that

3170

02:00:14,550 --> 02:00:12,400

though

3171

02:00:16,709 --> 02:00:14,560

yeah i totally agree and i agree with

3172

02:00:18,629 --> 02:00:16,719

what kendra said it takes all kinds of

3173

02:00:19,990 --> 02:00:18,639

people and that's what makes a team

3174

02:00:22,229 --> 02:00:20,000

successful

3175

02:00:24,149 --> 02:00:22,239

and what you said earlier about doing

3176

02:00:26,310 --> 02:00:24,159

things that are impossible

3177

02:00:29,669 --> 02:00:26,320

i started out on the galileo mission

3178

02:00:32,470 --> 02:00:29,679

that margin claudia were on and that

3179

02:00:34,229 --> 02:00:32,480

mission had a lot of problems in fact at

3180

02:00:36,870 --> 02:00:34,239

times it looked like

3181

02:00:39,910 --> 02:00:36,880

it was impossible and what was so

3182

02:00:42,550 --> 02:00:39,920

inspiring about being a jpl was that you

3183

02:00:44,550 --> 02:00:42,560

know nothing was impossible we just got

3184

02:00:47,589 --> 02:00:44,560

people together and teams together the

3185

02:00:49,910 --> 02:00:47,599

engineering the teams the science teams

3186

02:00:52,229 --> 02:00:49,920

and we just solved all the problems and

3187

02:00:54,310 --> 02:00:52,239

we did the mission perhaps a little bit

3188

02:00:57,189 --> 02:00:54,320

differently than the for example our

3189

02:00:59,669 --> 02:00:57,199

main communications antenna

3190

02:01:02,390 --> 02:00:59,679

didn't open so instead of taking a

3191

02:01:04,790 --> 02:01:02,400

zillion images for example you had to

3192

02:01:07,510 --> 02:01:04,800

think very carefully about which ones to

3193

02:01:11,750 --> 02:01:07,520

take that would answer your science

3194

02:01:13,589 --> 02:01:11,760

questions so i likened it before to um a

3195

02:01:16,550 --> 02:01:13,599

lot of missions are like a tourist with

3196

02:01:18,629 --> 02:01:16,560

a point-and-shoot camera and galileo was

3197

02:01:20,870 --> 02:01:18,639

like and so adam's you know really

3198

02:01:23,830 --> 02:01:20,880

planning everything

3199

02:01:26,950 --> 02:01:23,840

but so it took a lot of creativity but

3200

02:01:29,990 --> 02:01:26,960

what at one time looked impossible

3201

02:01:32,550 --> 02:01:30,000

because of some engineering problems in

3202

02:01:35,030 --> 02:01:32,560

the end i think made the mission more

3203

02:01:37,589 --> 02:01:35,040

successful

3204

02:01:39,669 --> 02:01:37,599

i've always wanted to do uh interview of

3205

02:01:41,750 --> 02:01:39,679

the people that work here and sort of

3206

02:01:43,510 --> 02:01:41,760

what you know why did you come here when

3207

02:01:45,109 --> 02:01:43,520

at what point in your career in your

3208

02:01:47,189 --> 02:01:45,119

life did you know this is what you

3209

02:01:48,629 --> 02:01:47,199

wanted to do and i'm sure there's an

3210

02:01:52,070 --> 02:01:48,639

audience here of people that aren't

3211

02:01:55,990 --> 02:01:53,750

how did you decide and i'll start with

3212

02:01:57,669 --> 02:01:56,000

you liz at what point did you decide

3213

02:01:59,910 --> 02:01:57,679

this is what you wanted to do and what

3214

02:02:01,350 --> 02:01:59,920

factors play into that and how does it

3215

02:02:02,950 --> 02:02:01,360

happen

3216

02:02:04,629 --> 02:02:02,960

let me tell you i think my story might

3217

02:02:08,709 --> 02:02:04,639

be very different

3218

02:02:11,030 --> 02:02:08,719

than my fellow panelists over here

3219

02:02:13,189 --> 02:02:11,040

actually for me it's by luck

3220

02:02:15,750 --> 02:02:13,199

i didn't know i didn't know that i'm

3221

02:02:17,990 --> 02:02:15,760

going to be working at jpl

3222

02:02:20,629 --> 02:02:18,000

at the very beginning because i started

3223

02:02:22,629 --> 02:02:20,639

with a business administration degree

3224

02:02:24,790 --> 02:02:22,639

my first year for college and just

3225

02:02:27,350 --> 02:02:24,800

happened that i did well in the

3226

02:02:30,629 --> 02:02:27,360

mathematic and programming class

3227

02:02:32,390 --> 02:02:30,639

so my professor that time said hey why

3228

02:02:34,550 --> 02:02:32,400

not double major

3229

02:02:36,870 --> 02:02:34,560

i say wow private school four years i

3230

02:02:39,350 --> 02:02:36,880

had to finish

3231

02:02:40,149 --> 02:02:39,360

but i did it i did it um

3232

02:02:44,229 --> 02:02:40,159

so

3233

02:02:46,709 --> 02:02:44,239

i kind of had to decide if i want to you

3234

02:02:47,990 --> 02:02:46,719

know go to in a technical field or do i

3235

02:02:51,030 --> 02:02:48,000

want to be

3236

02:02:53,109 --> 02:02:51,040

a buyer for macy's

3237

02:02:55,510 --> 02:02:53,119

and that is a true story

3238

02:02:57,669 --> 02:02:55,520

and and it just happened that at that

3239

02:03:00,950 --> 02:02:57,679

time before i graduated i was hired as

3240

02:03:03,109 --> 02:03:00,960

an intern and i started a project and i

3241

02:03:05,589 --> 02:03:03,119

really really have fun and inspired by a

3242

02:03:07,270 --> 02:03:05,599

lot of people over here at jpl and it's

3243

02:03:09,830 --> 02:03:07,280

really the opportunity that they have

3244

02:03:11,669 --> 02:03:09,840

given me and helped me decide what my

3245

02:03:13,270 --> 02:03:11,679

career path is going to be

3246

02:03:16,070 --> 02:03:13,280

so a lot of times you know you start

3247

02:03:17,830 --> 02:03:16,080

with something very different and along

3248

02:03:20,070 --> 02:03:17,840

the way you have people helping you and

3249

02:03:22,709 --> 02:03:20,080

mentoring you and at that moment you

3250

02:03:24,229 --> 02:03:22,719

start deciding um so

3251

02:03:25,830 --> 02:03:24,239

you think that you know my business

3252

02:03:27,270 --> 02:03:25,840

degree probably is totally you can just

3253

02:03:29,589 --> 02:03:27,280

you know toss it and it's not going to

3254

02:03:32,310 --> 02:03:29,599

be useful in this environment

3255

02:03:34,550 --> 02:03:32,320

for this environment particularly even

3256

02:03:36,470 --> 02:03:34,560

though it's very scientifically focused

3257

02:03:38,550 --> 02:03:36,480

um leadership skill

3258

02:03:40,950 --> 02:03:38,560

and business administration you know

3259

02:03:42,629 --> 02:03:40,960

knowledge it become critical especially

3260

02:03:44,629 --> 02:03:42,639

you're managing a large in the

3261

02:03:47,109 --> 02:03:44,639

organization um

3262

02:03:48,870 --> 02:03:47,119

retaining you know right people and get

3263

02:03:51,510 --> 02:03:48,880

the people together create the right

3264

02:03:53,189 --> 02:03:51,520

capabilities and moving forward having

3265

02:03:55,830 --> 02:03:53,199

having that vision

3266

02:03:58,229 --> 02:03:55,840

so all those things uh you know not just

3267

02:04:00,709 --> 02:03:58,239

you know what you learn at that moment

3268

02:04:01,910 --> 02:04:00,719

and it's really how you infuse it and

3269

02:04:04,149 --> 02:04:01,920

apply it

3270

02:04:06,149 --> 02:04:04,159

um so that's just my little story very

3271

02:04:08,229 --> 02:04:06,159

different but i bet you know it's funny

3272

02:04:09,350 --> 02:04:08,239

how you find out that um you actually

3273

02:04:10,390 --> 02:04:09,360

have a lot more in common than you

3274

02:04:12,950 --> 02:04:10,400

thought

3275

02:04:14,870 --> 02:04:12,960

your story is almost identical to my own

3276

02:04:17,750 --> 02:04:14,880

i i always say that i was i'm here at

3277

02:04:19,910 --> 02:04:17,760

jpl by accident i i came from

3278

02:04:21,510 --> 02:04:19,920

what i would call a probably not a very

3279

02:04:23,669 --> 02:04:21,520

popular school a school that jp would

3280

02:04:25,669 --> 02:04:23,679

normally recruit from and i didn't know

3281

02:04:27,510 --> 02:04:25,679

a lot about jpl but i there was an

3282

02:04:29,350 --> 02:04:27,520

opportunity at my campus that invited us

3283

02:04:31,830 --> 02:04:29,360

to come and apply for a job here they

3284

02:04:34,550 --> 02:04:31,840

had two positions open and for co-op

3285

02:04:36,629 --> 02:04:34,560

students and as soon as i

3286

02:04:38,310 --> 02:04:36,639

saw the announcement i grabbed my

3287

02:04:40,149 --> 02:04:38,320

roommate and i said let's go and took

3288

02:04:42,950 --> 02:04:40,159

the oh the invitation down to make sure

3289

02:04:44,790 --> 02:04:42,960

nobody could go to california

3290

02:04:46,390 --> 02:04:44,800

our focus was getting to california and

3291

02:04:48,149 --> 02:04:46,400

it wasn't about jp all the time but i

3292

02:04:49,350 --> 02:04:48,159

can tell you when i got here as a co-op

3293

02:04:52,470 --> 02:04:49,360

student

3294

02:04:54,470 --> 02:04:52,480

it's it's a place like no other i um we

3295

02:04:56,149 --> 02:04:54,480

had people who helped us with our

3296

02:04:57,350 --> 02:04:56,159

homework i mean if you i remember

3297

02:04:58,870 --> 02:04:57,360

staying in school with tuition

3298

02:05:00,870 --> 02:04:58,880

reimbursement and going to school in the

3299

02:05:02,550 --> 02:05:00,880

evenings and taking on

3300

02:05:04,229 --> 02:05:02,560

my advanced studies as i mentioned

3301
02:05:05,990 --> 02:05:04,239
before and

3302
02:05:08,229 --> 02:05:06,000
how passionate the scientists were the

3303
02:05:10,629 --> 02:05:08,239
engineers were and helping

3304
02:05:12,390 --> 02:05:10,639
new people come along and uh

3305
02:05:13,430 --> 02:05:12,400
get business done and get on the right

3306
02:05:14,950 --> 02:05:13,440
path so

3307
02:05:16,390 --> 02:05:14,960
actually we're not that far not that

3308
02:05:17,589 --> 02:05:16,400
different but the environment is what

3309
02:05:18,629 --> 02:05:17,599
makes the difference and i'm so glad

3310
02:05:19,910 --> 02:05:18,639
that i did

3311
02:05:24,790 --> 02:05:19,920
take that sheet of paper down and

3312
02:05:30,629 --> 02:05:27,189
very good anybody who decided at five

3313
02:05:35,270 --> 02:05:33,990

i wanted to be an astronaut i still do

3314

02:05:37,430 --> 02:05:35,280

i applied

3315

02:05:40,470 --> 02:05:37,440

i didn't really make it so i'm still

3316

02:05:44,229 --> 02:05:42,070

i think i'm a little too old now to join

3317

02:05:46,390 --> 02:05:44,239

the astronaut corps but um

3318

02:05:48,310 --> 02:05:46,400

but you know my thought was i wanted to

3319

02:05:50,390 --> 02:05:48,320

be an astronaut

3320

02:05:51,830 --> 02:05:50,400

my dad was an engineer so i and i was

3321

02:05:53,830 --> 02:05:51,840

good with math and science all through

3322

02:05:55,430 --> 02:05:53,840

grade school so i i kind of knew what

3323

02:05:58,550 --> 02:05:55,440

path i was going to be on from the very

3324

02:05:59,990 --> 02:05:58,560

beginning and i i love outer space i'm

3325

02:06:02,870 --> 02:06:00,000

one of those engineers that looks at

3326

02:06:05,350 --> 02:06:02,880

what the scientists do with all and uh

3327

02:06:06,229 --> 02:06:05,360

and i'm glad i can help achieve their

3328

02:06:07,669 --> 02:06:06,239

vision

3329

02:06:09,270 --> 02:06:07,679

um

3330

02:06:10,870 --> 02:06:09,280

but uh you know

3331

02:06:13,350 --> 02:06:10,880

having a goal of being an astronaut

3332

02:06:15,910 --> 02:06:13,360

that's that's kind of a narrow top of

3333

02:06:17,910 --> 02:06:15,920

the pyramid and um and so you have to

3334

02:06:20,790 --> 02:06:17,920

sort of enjoy the journey on the way and

3335

02:06:23,109 --> 02:06:20,800

so jpl was the best place to to pursue

3336

02:06:24,709 --> 02:06:23,119

the passion of space and you know apply

3337

02:06:26,790 --> 02:06:24,719

it to the astronaut program on the site

3338

02:06:28,870 --> 02:06:26,800

but uh like i said i think i'm a little

3339

02:06:31,189 --> 02:06:28,880

too old for that now

3340

02:06:33,270 --> 02:06:31,199

well we have something in common i uh i

3341

02:06:35,830 --> 02:06:33,280

grew up with the apollo program and

3342

02:06:38,310 --> 02:06:35,840

again i wanted to become an astronaut

3343

02:06:40,870 --> 02:06:38,320

but i realized even from a very early

3344

02:06:43,270 --> 02:06:40,880

age that i had several problems one

3345

02:06:46,069 --> 02:06:43,280

being female at that time only one

3346

02:06:49,270 --> 02:06:46,079

russian woman had gone into space

3347

02:06:51,109 --> 02:06:49,280

the second i i'm brazilian i grew up in

3348

02:06:52,310 --> 02:06:51,119

brazil and there weren't any brazilian

3349

02:06:55,109 --> 02:06:52,320

astronauts

3350

02:06:58,629 --> 02:06:55,119

and and the third problem is that i have

3351

02:07:02,069 --> 02:06:58,639

terrible eyesight i wear contact lenses

3352

02:07:03,990 --> 02:07:02,079

so i decided in fact uh you know now the

3353

02:07:05,750 --> 02:07:04,000

first two problems don't matter but the

3354

02:07:08,310 --> 02:07:05,760

eyesight still matters

3355

02:07:10,550 --> 02:07:08,320

but so i decided from quite an early age

3356

02:07:12,550 --> 02:07:10,560

that i was going to do the next best

3357

02:07:15,830 --> 02:07:12,560

thing i was going to become a scientist

3358

02:07:19,510 --> 02:07:18,149

so um i think somebody this morning we

3359

02:07:22,310 --> 02:07:19,520

were talking about

3360

02:07:25,510 --> 02:07:22,320

in the earlier panel about mentors and

3361

02:07:27,669 --> 02:07:25,520

how they play a part and i know again

3362

02:07:28,950 --> 02:07:27,679

this audience may be interested in

3363

02:07:31,109 --> 02:07:28,960

really

3364

02:07:33,189 --> 02:07:31,119

what is a mentor relationship and how

3365

02:07:36,149 --> 02:07:33,199

does it help and what do you want out of

3366

02:07:38,830 --> 02:07:36,159

that relationship how does it help you

3367

02:07:41,669 --> 02:07:38,840

and i'll start that one over with you

3368

02:07:43,830 --> 02:07:41,679

meg i was very fortunate to have several

3369

02:07:45,990 --> 02:07:43,840

mentors in my career

3370

02:07:47,589 --> 02:07:46,000

the very first mentor i had i would say

3371

02:07:49,189 --> 02:07:47,599

i was in the 10th grade when my teacher

3372

02:07:52,069 --> 02:07:49,199

noticed that i was very good and very

3373

02:07:54,310 --> 02:07:52,079

strong in math and science when a lot of

3374

02:07:56,310 --> 02:07:54,320

people in our class would tend to go to

3375

02:07:57,910 --> 02:07:56,320

non-technical degrees in pursuits if

3376

02:07:59,589 --> 02:07:57,920

they went to college she strongly

3377

02:08:01,750 --> 02:07:59,599

encouraged me to to pursue math and

3378

02:08:03,430 --> 02:08:01,760

science and technology which i did and

3379

02:08:04,870 --> 02:08:03,440

so i would count her as my very first

3380

02:08:06,870 --> 02:08:04,880

mentor and that was putting me on the

3381

02:08:09,109 --> 02:08:06,880

path i think that brought me here but

3382

02:08:11,430 --> 02:08:09,119

when i got to jpl i actually

3383

02:08:13,750 --> 02:08:11,440

found two great mentors and they both

3384

02:08:15,189 --> 02:08:13,760

gave me two different um perspectives on

3385

02:08:16,790 --> 02:08:15,199

what my career could be and what my

3386

02:08:18,950 --> 02:08:16,800

career opportunities could be if i

3387

02:08:20,870 --> 02:08:18,960

created them myself actually the first

3388

02:08:22,629 --> 02:08:20,880

person that i remember his name was ek

3389

02:08:25,669 --> 02:08:22,639

davis he was a division manager here at

3390

02:08:27,430 --> 02:08:25,679

jpl and i remember when he told me he

3391

02:08:29,109 --> 02:08:27,440

said i think i noticed something in you

3392

02:08:30,550 --> 02:08:29,119

you're really good with um you have a

3393

02:08:33,109 --> 02:08:30,560

passion for people you have a passion

3394

02:08:35,189 --> 02:08:33,119

for working with teams and working on

3395

02:08:37,510 --> 02:08:35,199

teams i can see you in line management i

3396

02:08:38,950 --> 02:08:37,520

said oh yeah i can't wait one day i want

3397

02:08:40,310 --> 02:08:38,960

to be a group manager i can't wait he

3398

02:08:41,990 --> 02:08:40,320

says oh you got a dream bigger i want

3399

02:08:43,589 --> 02:08:42,000

your dream way bigger than that and

3400

02:08:45,270 --> 02:08:43,599

today i'm in a job that's bigger than a

3401

02:08:47,350 --> 02:08:45,280

job that he had which is amazing and i

3402

02:08:48,870 --> 02:08:47,360

did have the job that he had at the time

3403

02:08:51,109 --> 02:08:48,880

i wasn't thinking along that line but he

3404

02:08:52,390 --> 02:08:51,119

gave me some tips about line management

3405

02:08:54,550 --> 02:08:52,400

and how to pursue

3406

02:08:56,950 --> 02:08:54,560

opportunities there now a different

3407

02:08:59,350 --> 02:08:56,960

mentor that i also found at jpl was one

3408

02:09:00,790 --> 02:08:59,360

who was on the project side of the house

3409

02:09:03,350 --> 02:09:00,800

and that person talked about how

3410

02:09:05,430 --> 02:09:03,360

workflowed at jpl i was only at that

3411

02:09:07,430 --> 02:09:05,440

time i was very young engineer and

3412

02:09:09,669 --> 02:09:07,440

didn't know a lot about all of jpl i

3413

02:09:11,990 --> 02:09:09,679

knew about my organization i knew about

3414

02:09:13,910 --> 02:09:12,000

my group i knew about my my team but i

3415

02:09:16,310 --> 02:09:13,920

didn't know a lot about how workflow

3416

02:09:17,910 --> 02:09:16,320

through the through jpl as a business

3417

02:09:20,470 --> 02:09:17,920

and what he did is he sat down and he

3418

02:09:22,470 --> 02:09:20,480

showed me how work came into jpl he

3419

02:09:24,550 --> 02:09:22,480

showed me every directorate and every

3420

02:09:26,470 --> 02:09:24,560

directorate's purpose and getting the

3421

02:09:27,990 --> 02:09:26,480

bigger picture helped me see how i could

3422

02:09:29,189 --> 02:09:28,000

move around and navigate and when i

3423

02:09:31,030 --> 02:09:29,199

talked to you earlier about the fact

3424

02:09:33,669 --> 02:09:31,040

that i moved around i was able to do

3425

02:09:34,870 --> 02:09:33,679

that because this person said um here's

3426

02:09:36,709 --> 02:09:34,880

the kind of things you want to do you

3427

02:09:38,870 --> 02:09:36,719

want to get those experiences to prepare

3428

02:09:41,189 --> 02:09:38,880

you to become a line manager so i think

3429

02:09:43,589 --> 02:09:41,199

you look for different things based on

3430

02:09:45,109 --> 02:09:43,599

um where you are in your career and i

3431

02:09:48,229 --> 02:09:45,119

and i think that they can offer you know

3432

02:09:50,390 --> 02:09:48,239

coaching they can offer inspiration they

3433

02:09:53,109 --> 02:09:50,400

can also guide you technically into what

3434

02:09:55,430 --> 02:09:53,119

programs to take or which ones to avoid

3435

02:09:56,709 --> 02:09:55,440

and so i think that having mentors

3436

02:09:57,910 --> 02:09:56,719

though makes a huge difference and i

3437

02:09:59,669 --> 02:09:57,920

think that's one of the first things you

3438

02:10:01,189 --> 02:09:59,679

should think about doing when you join

3439

02:10:03,430 --> 02:10:01,199

any company any career i think you

3440

02:10:05,910 --> 02:10:03,440

should do that

3441

02:10:08,229 --> 02:10:05,920

other thoughts here other experiences i

3442

02:10:09,750 --> 02:10:08,239

i think mentors uh

3443

02:10:11,189 --> 02:10:09,760

i know no one's ever walked in my door

3444

02:10:13,350 --> 02:10:11,199

and said well you please mentor me i

3445

02:10:15,669 --> 02:10:13,360

think people choose each other

3446

02:10:17,830 --> 02:10:15,679

based on similarities of temperament and

3447

02:10:19,750 --> 02:10:17,840

personality you recognize someone who's

3448

02:10:20,709 --> 02:10:19,760

like you and you know how to advise that

3449

02:10:23,430 --> 02:10:20,719

person

3450

02:10:25,910 --> 02:10:23,440

so i had actually a project manager i

3451
02:10:28,550 --> 02:10:25,920
was yelling at someone on the phone

3452
02:10:30,310 --> 02:10:28,560
and this guy walked in my house and said

3453
02:10:31,830 --> 02:10:30,320
no you don't i don't ever want to hear

3454
02:10:34,390 --> 02:10:31,840
that tone of voice out of you again and

3455
02:10:35,750 --> 02:10:34,400
i have to admit i have this kind of 180

3456
02:10:37,910 --> 02:10:35,760
degrees the opposite of the

3457
02:10:39,669 --> 02:10:37,920
mild-mannered person

3458
02:10:42,149 --> 02:10:39,679
we don't ever really don't ever want to

3459
02:10:44,950 --> 02:10:42,159
see that person come out of its box

3460
02:10:47,270 --> 02:10:44,960
and he he actually then really then

3461
02:10:48,550 --> 02:10:47,280
started coaching me in a very profound

3462
02:10:50,550 --> 02:10:48,560
way so that was

3463
02:10:52,629 --> 02:10:50,560

that's how mentoring happens really but

3464

02:10:54,550 --> 02:10:52,639

it's important to recognize when that's

3465

02:10:56,470 --> 02:10:54,560

when that's happening and it's important

3466

02:10:58,790 --> 02:10:56,480

to seize on those opportunities i think

3467

02:11:00,390 --> 02:10:58,800

almost everyone at jpl agrees it's

3468

02:11:02,709 --> 02:11:00,400

impossible to have a successful career

3469

02:11:04,790 --> 02:11:02,719

without good mentoring

3470

02:11:07,990 --> 02:11:04,800

so someone who sees your potential

3471

02:11:10,470 --> 02:11:08,000

somebody who shows you how things work

3472

02:11:12,950 --> 02:11:10,480

how the work gets done and how it really

3473

02:11:14,709 --> 02:11:12,960

works aside from what the book says how

3474

02:11:16,790 --> 02:11:14,719

things really get done

3475

02:11:19,430 --> 02:11:16,800

and someone who puts you in check when

3476

02:11:21,510 --> 02:11:19,440

you need to be in check and and tells

3477

02:11:23,669 --> 02:11:21,520

you someone how to behave if you need to

3478

02:11:25,910 --> 02:11:23,679

need that who levels with you and i

3479

02:11:28,069 --> 02:11:25,920

could add to those um that list of

3480

02:11:30,550 --> 02:11:28,079

characteristics uh cozette by saying

3481

02:11:32,870 --> 02:11:30,560

also someone who delegates

3482

02:11:35,030 --> 02:11:32,880

responsibility to you and watches to see

3483

02:11:38,390 --> 02:11:35,040

you rise to the occasion i had that

3484

02:11:39,430 --> 02:11:38,400

opportunity in a similar way to mag in

3485

02:11:41,910 --> 02:11:39,440

terms of

3486

02:11:43,830 --> 02:11:41,920

group supervisor

3487

02:11:46,550 --> 02:11:43,840

helping me through the lifecycle life

3488

02:11:48,229 --> 02:11:46,560

cycle of a project i was a member of the

3489

02:11:50,390 --> 02:11:48,239

group he was the group supervisor and

3490

02:11:52,790 --> 02:11:50,400

had years more experience than i did at

3491

02:11:54,069 --> 02:11:52,800

that time and so he kind of coached me

3492

02:11:55,910 --> 02:11:54,079

along the way you know this is what we

3493

02:11:59,109 --> 02:11:55,920

do here this is what why this is going

3494

02:12:00,310 --> 02:11:59,119

on but then he made me a group leader in

3495

02:12:02,550 --> 02:12:00,320

charge of part of the group and

3496

02:12:03,990 --> 02:12:02,560

delegated a lot of his group supervisor

3497

02:12:05,430 --> 02:12:04,000

responsibilities

3498

02:12:07,669 --> 02:12:05,440

to me so that i would have the

3499

02:12:08,470 --> 02:12:07,679

opportunity under his guidance

3500

02:12:11,270 --> 02:12:08,480

to

3501

02:12:12,790 --> 02:12:11,280

make my own decisions in conference you

3502

02:12:15,350 --> 02:12:12,800

know i could always have him there as a

3503

02:12:17,669 --> 02:12:15,360

resource but that delegation of

3504

02:12:18,470 --> 02:12:17,679

responsibility and empowerment i find

3505

02:12:21,350 --> 02:12:18,480

that

3506

02:12:23,270 --> 02:12:21,360

99 of the folks at jpl if you delegate

3507

02:12:25,510 --> 02:12:23,280

and empower them they will rise to the

3508

02:12:27,109 --> 02:12:25,520

occasion and surpass your expectations

3509

02:12:30,629 --> 02:12:27,119

right that's true

3510

02:12:33,510 --> 02:12:30,639

so in terms of your guys's careers um i

3511

02:12:36,470 --> 02:12:33,520

was with charles talking to the group of

3512

02:12:38,390 --> 02:12:36,480

early career hires that we have here

3513

02:12:40,390 --> 02:12:38,400

i think it was last year and one of the

3514

02:12:42,950 --> 02:12:40,400

employees stood up and said i need to

3515

02:12:44,629 --> 02:12:42,960

know where i'm going to be in five years

3516

02:12:47,910 --> 02:12:44,639

i want to know what position i'm going

3517

02:12:50,310 --> 02:12:47,920

to have and and so for that person

3518

02:12:52,870 --> 02:12:50,320

structure was important

3519

02:12:55,669 --> 02:12:52,880

how have you found careers to develop

3520

02:12:58,229 --> 02:12:55,679

here was it a a linear path that made

3521

02:12:59,990 --> 02:12:58,239

sense according to the discipline that

3522

02:13:03,910 --> 02:13:00,000

you chose at the time

3523

02:13:05,270 --> 02:13:03,920

um or was it a windy path

3524

02:13:07,350 --> 02:13:05,280

or um

3525

02:13:08,709 --> 02:13:07,360

just opportunities that happened to open

3526

02:13:10,870 --> 02:13:08,719

up at the time

3527

02:13:11,750 --> 02:13:10,880

i'll start with you jan

3528

02:13:13,189 --> 02:13:11,760

um

3529

02:13:16,229 --> 02:13:13,199

interesting question

3530

02:13:17,189 --> 02:13:16,239

i would say that um careers happen both

3531

02:13:20,069 --> 02:13:17,199

ways

3532

02:13:22,149 --> 02:13:20,079

my personal experience was more

3533

02:13:23,589 --> 02:13:22,159

i did not have a five-year plan or a

3534

02:13:27,109 --> 02:13:23,599

10-year plan or

3535

02:13:29,270 --> 02:13:27,119

or a vision to be a division manager

3536

02:13:32,229 --> 02:13:29,280

i took advantage of opportunities as

3537

02:13:35,990 --> 02:13:32,239

they came by when i started at jpl in

3538

02:13:37,750 --> 02:13:36,000

1980 i joined the galileo project as a

3539

02:13:39,350 --> 02:13:37,760

dynamics and control analyst because i

3540

02:13:41,109 --> 02:13:39,360

just graduated with my master's in

3541

02:13:43,109 --> 02:13:41,119

dynamics and control of spacecraft so i

3542

02:13:45,030 --> 02:13:43,119

had the technical background and so i

3543

02:13:47,910 --> 02:13:45,040

joined a group and i started designing

3544

02:13:50,390 --> 02:13:47,920

control laws and and testing them in the

3545

02:13:52,229 --> 02:13:50,400

flight software and in our test lab

3546

02:13:54,470 --> 02:13:52,239

and i found by that experience that i

3547

02:13:57,189 --> 02:13:54,480

was more interested in more the systems

3548

02:13:59,109 --> 02:13:57,199

aspect of the job so i moved slightly in

3549

02:14:01,350 --> 02:13:59,119

the in the tactical arena to kind of

3550

02:14:03,669 --> 02:14:01,360

broaden my focus

3551
02:14:05,669 --> 02:14:03,679
more at a technical systems engineering

3552
02:14:08,069 --> 02:14:05,679
subsystem looking across the whole

3553
02:14:10,550 --> 02:14:08,079
dimension of the attitude control system

3554
02:14:12,550 --> 02:14:10,560
so i i took advantage of the way the

3555
02:14:15,030 --> 02:14:12,560
project life cycle was progressing to

3556
02:14:17,109 --> 02:14:15,040
move into a broader technical role and

3557
02:14:19,990 --> 02:14:17,119
then i'd always been a really well

3558
02:14:22,390 --> 02:14:20,000
organized person and so

3559
02:14:24,149 --> 02:14:22,400
planning scheduling anticipating

3560
02:14:26,870 --> 02:14:24,159
problems trying to

3561
02:14:29,510 --> 02:14:26,880
fend them off early um was was really

3562
02:14:32,470 --> 02:14:29,520
unnatural for me so i started becoming a

3563
02:14:34,310 --> 02:14:32,480

technical manager of a small team and

3564

02:14:36,709 --> 02:14:34,320

and there was an opportunity to do that

3565

02:14:39,109 --> 02:14:36,719

again in the context of the galileo

3566

02:14:41,830 --> 02:14:39,119

project and so i was able to move into

3567

02:14:43,990 --> 02:14:41,840

that arena and find that i really

3568

02:14:45,030 --> 02:14:44,000

blossomed in the technical management

3569

02:14:47,990 --> 02:14:45,040

arena

3570

02:14:49,830 --> 02:14:48,000

probably more so than the deep technical

3571

02:14:52,629 --> 02:14:49,840

folks that kendra referred to earlier

3572

02:14:54,390 --> 02:14:52,639

jpl is full of brilliant very deep

3573

02:14:56,550 --> 02:14:54,400

highly technical folks and that just

3574

02:14:59,910 --> 02:14:56,560

wasn't my strength as much as the

3575

02:15:02,470 --> 02:14:59,920

management aspect of the job and so i

3576

02:15:04,550 --> 02:15:02,480

had opportunities to

3577

02:15:06,629 --> 02:15:04,560

become the technical manager of the

3578

02:15:08,390 --> 02:15:06,639

galileo attitude control subsystem so

3579

02:15:10,390 --> 02:15:08,400

again staying technical but from a

3580

02:15:12,390 --> 02:15:10,400

management perspective then i moved on

3581

02:15:14,870 --> 02:15:12,400

to the cassini project i did the same

3582

02:15:17,109 --> 02:15:14,880

type of technical management and then

3583

02:15:19,350 --> 02:15:17,119

jpl prizes

3584

02:15:22,149 --> 02:15:19,360

folks who have done both technical

3585

02:15:25,030 --> 02:15:22,159

management and line management and so

3586

02:15:27,589 --> 02:15:25,040

they encourage us to get flavors of both

3587

02:15:30,069 --> 02:15:27,599

sides of our matrix organization so i

3588

02:15:32,629 --> 02:15:30,079

had opportunities again that weren't

3589

02:15:34,390 --> 02:15:32,639

planned in head or i wasn't looking on a

3590

02:15:35,910 --> 02:15:34,400

five or ten year horizon to do that but

3591

02:15:37,830 --> 02:15:35,920

i was able to move into some line

3592

02:15:40,229 --> 02:15:37,840

management positions bounce back to

3593

02:15:42,790 --> 02:15:40,239

project line

3594

02:15:44,790 --> 02:15:42,800

to where i am today

3595

02:15:47,030 --> 02:15:44,800

what what about you diane you came with

3596

02:15:49,510 --> 02:15:47,040

a geology degree and who knew you'd be

3597

02:15:52,069 --> 02:15:49,520

heading up the largest division of jpl

3598

02:15:54,390 --> 02:15:52,079

right now in terms of uh

3599

02:15:56,629 --> 02:15:54,400

work work for the future well i think

3600

02:15:58,709 --> 02:15:56,639

again i you know when it became clear

3601

02:16:01,109 --> 02:15:58,719

that i really enjoyed bringing together

3602

02:16:02,950 --> 02:16:01,119

science technology and engineering and

3603

02:16:05,189 --> 02:16:02,960

creating something of creating missions

3604

02:16:06,950 --> 02:16:05,199

out of that you know or working with a a

3605

02:16:09,830 --> 02:16:06,960

team of people to do that

3606

02:16:13,270 --> 02:16:09,840

and i've always had a you know i did my

3607

02:16:14,629 --> 02:16:13,280

phd on on mars geology but i i really

3608

02:16:15,830 --> 02:16:14,639

you know have a passion for earth

3609

02:16:16,950 --> 02:16:15,840

science and

3610

02:16:21,189 --> 02:16:16,960

and

3611

02:16:22,950 --> 02:16:21,199

earth science directorate when he became

3612

02:16:25,109 --> 02:16:22,960

director of jpl

3613

02:16:27,430 --> 02:16:25,119

and he asked me to lead that um that was

3614

02:16:29,750 --> 02:16:27,440

a huge step for me but

3615

02:16:31,350 --> 02:16:29,760

by having really great people in the

3616

02:16:33,910 --> 02:16:31,360

directorate

3617

02:16:35,910 --> 02:16:33,920

we've been able to accomplish a lot and

3618

02:16:38,070 --> 02:16:35,920

and start a lot of new missions launch a

3619

02:16:39,830 --> 02:16:38,080

lot of new missions get this the science

3620

02:16:41,990 --> 02:16:39,840

data down so it's been

3621

02:16:43,589 --> 02:16:42,000

um you know really that's been really

3622

02:16:48,629 --> 02:16:43,599

one of the main things

3623

02:16:53,110 --> 02:16:51,830

my perspective on career advancement is

3624

02:16:55,110 --> 02:16:53,120

you know a lot of people think it's a

3625

02:16:58,549 --> 02:16:55,120

straight line upward and you know your

3626

02:17:00,870 --> 02:16:58,559

next step has to be to the next level up

3627

02:17:02,150 --> 02:17:00,880

and you hear a lot of comments like i

3628

02:17:04,230 --> 02:17:02,160

need to know where i'm going to be in

3629

02:17:06,790 --> 02:17:04,240

five years i need to know how to get to

3630

02:17:08,309 --> 02:17:06,800

the next uh promotion or or what have

3631

02:17:10,070 --> 02:17:08,319

you

3632

02:17:11,589 --> 02:17:10,080

but i try to encourage the folks that

3633

02:17:12,870 --> 02:17:11,599

i've advised and the folks that i've

3634

02:17:15,429 --> 02:17:12,880

hired you know when i was a group

3635

02:17:19,030 --> 02:17:15,439

supervisor and and trying to mentor

3636

02:17:21,349 --> 02:17:19,040

folks um a career is is is a pyramid

3637

02:17:24,070 --> 02:17:21,359

structure and and your career should go

3638

02:17:26,950 --> 02:17:24,080

back and forth along one level

3639

02:17:29,349 --> 02:17:26,960

for a while before you take the step to

3640

02:17:31,669 --> 02:17:29,359

the next rung of the ladder or the next

3641

02:17:33,190 --> 02:17:31,679

level of the pyramid you want to explore

3642

02:17:35,990 --> 02:17:33,200

the breadth of what you're doing in a

3643

02:17:37,429 --> 02:17:36,000

particular area as much as you possibly

3644

02:17:39,990 --> 02:17:37,439

can because that will make you a

3645

02:17:42,230 --> 02:17:40,000

stronger person at the next level up and

3646

02:17:43,750 --> 02:17:42,240

whether it's you know getting the

3647

02:17:45,910 --> 02:17:43,760

breadth of all of the engineering

3648

02:17:47,669 --> 02:17:45,920

disciplines that we have at jpl before

3649

02:17:49,589 --> 02:17:47,679

you become a flight system manager

3650

02:17:51,669 --> 02:17:49,599

because then you have to be seeing the

3651
02:17:53,190 --> 02:17:51,679
and managing and trading off the risks

3652
02:17:54,790 --> 02:17:53,200
of all of those disciplines the better

3653
02:17:57,349 --> 02:17:54,800
you understand that the better you'll do

3654
02:17:59,429 --> 02:17:57,359
that job and so i try to encourage

3655
02:18:01,669 --> 02:17:59,439
people that their that their moves in

3656
02:18:02,709 --> 02:18:01,679
their career should be sideways a lot of

3657
02:18:04,629 --> 02:18:02,719
the time

3658
02:18:06,309 --> 02:18:04,639
and and exploring the breadth of the

3659
02:18:08,150 --> 02:18:06,319
challenges that you can have before

3660
02:18:10,389 --> 02:18:08,160
you're ready to move into a

3661
02:18:12,950 --> 02:18:10,399
an increased level of responsibility

3662
02:18:15,429 --> 02:18:12,960
and and kind of view that as a as a

3663
02:18:17,750 --> 02:18:15,439

pyramid and really explore those levels

3664

02:18:19,589 --> 02:18:17,760

and those layers as much as you can and

3665

02:18:22,230 --> 02:18:19,599

don't be so worried about when you get

3666

02:18:23,990 --> 02:18:22,240

to the next level up so i think i need

3667

02:18:25,509 --> 02:18:24,000

to throw in a word about a science

3668

02:18:27,509 --> 02:18:25,519

career where

3669

02:18:30,629 --> 02:18:27,519

in general scientists are encouraged to

3670

02:18:32,790 --> 02:18:30,639

have great depth on a very narrow area

3671

02:18:36,469 --> 02:18:32,800

to become the world's leading expert on

3672

02:18:40,389 --> 02:18:38,709

when i was in the science division my

3673

02:18:41,910 --> 02:18:40,399

manager that was my performance

3674

02:18:43,509 --> 02:18:41,920

evaluation for a couple of years

3675

02:18:45,990 --> 02:18:43,519

straight it was

3676

02:18:48,389 --> 02:18:46,000

um you have to become very highly

3677

02:18:50,709 --> 02:18:48,399

focused and narrowly focused and also at

3678

02:18:52,790 --> 02:18:50,719

jpl become the world's leading expert on

3679

02:18:54,870 --> 02:18:52,800

something he told me that the first my

3680

02:18:57,589 --> 02:18:54,880

very first year and i pushed the paper

3681

02:18:59,030 --> 02:18:57,599

back to him and said that is so arrogant

3682

02:19:00,709 --> 02:18:59,040

to think that you are going to be the

3683

02:19:03,030 --> 02:19:00,719

world's leading expert on something and

3684

02:19:06,790 --> 02:19:03,040

he pushed the paper back to me and he

3685

02:19:09,349 --> 02:19:06,800

said you better figure out what it is

3686

02:19:11,270 --> 02:19:09,359

so e so in science you know it's

3687

02:19:13,830 --> 02:19:11,280

important to be the world's leading

3688

02:19:16,549 --> 02:19:13,840

expert but even in science

3689

02:19:18,629 --> 02:19:16,559

scientists end up making leaps uh one of

3690

02:19:21,429 --> 02:19:18,639

my uh colleagues made this leap from

3691

02:19:23,669 --> 02:19:21,439

being the world's leading expert on io

3692

02:19:25,830 --> 02:19:23,679

and fiery volcanism

3693

02:19:28,309 --> 02:19:25,840

to being the world's leading expert on

3694

02:19:30,870 --> 02:19:28,319

icy moons and he did that in about three

3695

02:19:33,110 --> 02:19:30,880

months and he said wink wink you know

3696

02:19:34,790 --> 02:19:33,120

suddenly i went from you know fiery

3697

02:19:37,270 --> 02:19:34,800

moons to icy moons and i'm the world's

3698

02:19:39,110 --> 02:19:37,280

leading expert but um even in science

3699

02:19:43,349 --> 02:19:39,120

you have to learn when to

3700

02:19:46,469 --> 02:19:43,359

go to the next uh horizontal um uh

3701
02:19:48,230 --> 02:19:46,479
area uh in order to continue your career

3702
02:19:50,389 --> 02:19:48,240
so yeah you resonated that with me

3703
02:19:53,030 --> 02:19:50,399
talking about before that i mean my

3704
02:19:55,110 --> 02:19:53,040
expertise is in plantar geology but i

3705
02:19:58,150 --> 02:19:55,120
have applied it to

3706
02:20:01,429 --> 02:19:58,160
io to icy moons to mars i started out

3707
02:20:04,070 --> 02:20:01,439
like diane on geology of mars and so you

3708
02:20:06,550 --> 02:20:04,080
have your core expertise but you can

3709
02:20:09,510 --> 02:20:06,560
then apply to different budgets using

3710
02:20:11,270 --> 02:20:09,520
different techniques uh imaging infrared

3711
02:20:13,670 --> 02:20:11,280
radar you know i don't know where i'm

3712
02:20:16,230 --> 02:20:13,680
going to go next but um it's wherever

3713
02:20:18,150 --> 02:20:16,240

the next opportunity years i i have said

3714

02:20:23,110 --> 02:20:18,160

that i'll change wave wavelength for

3715

02:20:28,710 --> 02:20:26,710

and i i think there is an advantage also

3716

02:20:30,790 --> 02:20:28,720

in being broad

3717

02:20:33,910 --> 02:20:30,800

because you can make connections

3718

02:20:36,950 --> 02:20:33,920

uh rather than being you know just

3719

02:20:38,870 --> 02:20:36,960

an expert on that narrow drop right and

3720

02:20:41,590 --> 02:20:38,880

it also makes you a better manager i'm

3721

02:20:44,790 --> 02:20:41,600

now also a line manager manager i have

3722

02:20:47,750 --> 02:20:44,800

worked on research on flight projects

3723

02:20:50,870 --> 02:20:47,760

line management so again i gone kind of

3724

02:20:52,950 --> 02:20:50,880

sideways and up

3725

02:20:55,830 --> 02:20:52,960

so many in this room i'm sure want to

3726

02:20:58,630 --> 02:20:55,840

have a life of travel and seeing lots of

3727

02:21:00,790 --> 02:20:58,640

the world it's all ahead of them i know

3728

02:21:03,030 --> 02:21:00,800

a couple of you here have had a lot of

3729

02:21:04,469 --> 02:21:03,040

international travel and

3730

02:21:05,510 --> 02:21:04,479

why don't you talk a little bit about

3731

02:21:07,510 --> 02:21:05,520

how

3732

02:21:10,150 --> 02:21:07,520

directing this diane and rosalia diane

3733

02:21:12,710 --> 02:21:10,160

first how did that how did that happen

3734

02:21:15,030 --> 02:21:12,720

and what were the hallmarks of that yeah

3735

02:21:18,469 --> 02:21:15,040

well a couple things one is uh certainly

3736

02:21:20,389 --> 02:21:18,479

to do uh geology uh we a lot of the work

3737

02:21:22,630 --> 02:21:20,399

that we did was in the early days of

3738

02:21:24,870 --> 02:21:22,640

developing remote sensing technology and

3739

02:21:27,590 --> 02:21:24,880

so we would um you know do a lot of

3740

02:21:29,990 --> 02:21:27,600

field work um but then more recently of

3741

02:21:32,150 --> 02:21:30,000

course most of our missions um be have

3742

02:21:34,389 --> 02:21:32,160

international partners so this is you

3743

02:21:36,070 --> 02:21:34,399

know just to make stronger um stronger

3744

02:21:37,590 --> 02:21:36,080

case for the mission and also you know

3745

02:21:40,630 --> 02:21:37,600

it is just one planet that we're all

3746

02:21:41,990 --> 02:21:40,640

living on we're all sharing and so um

3747

02:21:44,070 --> 02:21:42,000

quite a bit of the travel i've been

3748

02:21:45,670 --> 02:21:44,080

doing more recently has been in

3749

02:21:47,670 --> 02:21:45,680

association with

3750

02:21:50,070 --> 02:21:47,680

the missions that we've been working on

3751

02:21:53,030 --> 02:21:50,080

the most recent one aquarius which

3752

02:21:56,630 --> 02:21:53,040

launched last last june um turned out to

3753

02:21:58,790 --> 02:21:56,640

be joint with argentina and brazil and

3754

02:22:01,270 --> 02:21:58,800

so and we're hoping to do future

3755

02:22:03,270 --> 02:22:01,280

missions with brazil so that's really

3756

02:22:04,309 --> 02:22:03,280

afforded quite a bit of international

3757

02:22:07,429 --> 02:22:04,319

travel

3758

02:22:09,910 --> 02:22:07,439

yes when i was an astronomy student and

3759

02:22:11,670 --> 02:22:09,920

taking a class in planetary geology i

3760

02:22:13,670 --> 02:22:11,680

didn't know then that that's what i was

3761

02:22:15,429 --> 02:22:13,680

going to fall in love with but

3762

02:22:17,349 --> 02:22:15,439

one of the things that attracted my

3763

02:22:19,590 --> 02:22:17,359

attention was that one day the professor

3764

02:22:22,070 --> 02:22:19,600

didn't come to class and he sent a

3765

02:22:24,230 --> 02:22:22,080

substitute and the substitute said well

3766

02:22:26,870 --> 02:22:24,240

monday erupted and the professor had to

3767

02:22:29,030 --> 02:22:26,880

go and i thought that sounds like so

3768

02:22:31,990 --> 02:22:29,040

much fun

3769

02:22:32,790 --> 02:22:32,000

and so when i was doing my phd i was in

3770

02:22:37,190 --> 02:22:32,800

the

3771

02:22:39,349 --> 02:22:37,200

eruption surveillance team and

3772

02:22:41,270 --> 02:22:39,359

i got to go to erupting volcanoes and

3773

02:22:44,309 --> 02:22:41,280

really fell in love with them

3774

02:22:46,790 --> 02:22:44,319

and you know i have done field work but

3775

02:22:47,990 --> 02:22:46,800

you know these days i do less field work

3776

02:22:50,469 --> 02:22:48,000

but more

3777

02:22:52,630 --> 02:22:50,479

international travel because for example

3778

02:22:55,110 --> 02:22:52,640

the cassini mission is joined with the

3779

02:22:57,270 --> 02:22:55,120

european space agency and the italian

3780

02:22:59,270 --> 02:22:57,280

space agency so we have more

3781

02:23:01,270 --> 02:22:59,280

collaborations

3782

02:23:03,590 --> 02:23:01,280

so for some on this

3783

02:23:05,990 --> 02:23:03,600

setting that would not present uh

3784

02:23:08,870 --> 02:23:06,000

excitement for them i've got work life

3785

02:23:11,670 --> 02:23:08,880

balance issues and making maybe making

3786

02:23:13,590 --> 02:23:11,680

career choices to not have to travel

3787

02:23:16,070 --> 02:23:13,600

do we have some examples i think jan you

3788

02:23:17,190 --> 02:23:16,080

may be one that can talk about that

3789

02:23:20,309 --> 02:23:17,200

certainly

3790

02:23:21,910 --> 02:23:20,319

um i had enjoyed about 10 years of my

3791

02:23:23,590 --> 02:23:21,920

career at jpl

3792

02:23:25,349 --> 02:23:23,600

when my husband and i decided it was

3793

02:23:28,070 --> 02:23:25,359

time to start a family

3794

02:23:29,910 --> 02:23:28,080

when i had my first child i chose to

3795

02:23:31,990 --> 02:23:29,920

take six months off

3796

02:23:34,070 --> 02:23:32,000

and stay at home with the baby and then

3797

02:23:37,030 --> 02:23:34,080

when i came back to jpl i worked

3798

02:23:39,510 --> 02:23:37,040

part-time for six years i wanted to make

3799

02:23:41,750 --> 02:23:39,520

sure i had both the opportunities to

3800

02:23:43,030 --> 02:23:41,760

raise my child as well as keep my hand

3801
02:23:45,030 --> 02:23:43,040
in at work

3802
02:23:47,190 --> 02:23:45,040
three years after three years into that

3803
02:23:48,950 --> 02:23:47,200
i had our second child and i took nine

3804
02:23:50,469 --> 02:23:48,960
months off that time i had two of them

3805
02:23:51,510 --> 02:23:50,479
to deal with it took me longer to

3806
02:23:53,030 --> 02:23:51,520
recover

3807
02:23:55,190 --> 02:23:53,040
and

3808
02:23:57,270 --> 02:23:55,200
but but again when i came back i was

3809
02:23:59,030 --> 02:23:57,280
still working part-time and and for my

3810
02:24:00,870 --> 02:23:59,040
husband and i and our two children it

3811
02:24:02,550 --> 02:24:00,880
was a really good choice for our family

3812
02:24:03,750 --> 02:24:02,560
to have that work-life balance to be

3813
02:24:05,910 --> 02:24:03,760

able to

3814

02:24:08,309 --> 02:24:05,920

feel that when i went into work i would

3815

02:24:10,070 --> 02:24:08,319

be really work focused i would be

3816

02:24:11,670 --> 02:24:10,080

working as efficiently as possible i

3817

02:24:13,590 --> 02:24:11,680

mean the kids never crossed my mind we

3818

02:24:14,870 --> 02:24:13,600

have an excellent child educational

3819

02:24:17,990 --> 02:24:14,880

center here

3820

02:24:19,030 --> 02:24:18,000

daycare center for babies through age

3821

02:24:20,790 --> 02:24:19,040

five

3822

02:24:22,790 --> 02:24:20,800

so i knew the the children were very

3823

02:24:24,870 --> 02:24:22,800

well taken care of

3824

02:24:26,230 --> 02:24:24,880

and i really enjoyed keeping my hand in

3825

02:24:27,830 --> 02:24:26,240

it at work

3826

02:24:29,670 --> 02:24:27,840

but then on the other hand i had not

3827

02:24:32,070 --> 02:24:29,680

just the two days on the weekend and the

3828

02:24:34,230 --> 02:24:32,080

evenings to rush around and take care of

3829

02:24:35,830 --> 02:24:34,240

the family but also those other two days

3830

02:24:37,750 --> 02:24:35,840

during the week so that really made a

3831

02:24:39,990 --> 02:24:37,760

great difference to me and when i did

3832

02:24:42,630 --> 02:24:40,000

come back after my six years of

3833

02:24:45,110 --> 02:24:42,640

part-time work my career had plateaued

3834

02:24:47,110 --> 02:24:45,120

during that time but i had not lost

3835

02:24:49,190 --> 02:24:47,120

ground and i was able to pick up and

3836

02:24:51,510 --> 02:24:49,200

move forward from that point

3837

02:24:53,750 --> 02:24:51,520

now make a comment because i did it

3838

02:24:55,830 --> 02:24:53,760

totally differently um

3839

02:24:58,950 --> 02:24:55,840

i i have one son and i took two and a

3840

02:25:00,950 --> 02:24:58,960

half weeks off when he was born

3841

02:25:03,990 --> 02:25:00,960

in fact after two and a half weeks i was

3842

02:25:05,349 --> 02:25:04,000

on a plane going to a meeting

3843

02:25:06,309 --> 02:25:05,359

but

3844

02:25:09,910 --> 02:25:06,319

you know

3845

02:25:12,070 --> 02:25:09,920

my son grew up perfectly fine i never

3846

02:25:14,550 --> 02:25:12,080

stopped working or worked part-time i

3847

02:25:16,950 --> 02:25:14,560

never gave up traveling and in fact it's

3848

02:25:18,630 --> 02:25:16,960

a coincidence that jean's youngest son

3849

02:25:20,150 --> 02:25:18,640

and my son went through high school

3850

02:25:23,190 --> 02:25:20,160

together and they are now in college

3851
02:25:25,910 --> 02:25:23,200
together and right turned out great

3852
02:25:27,990 --> 02:25:25,920
that's right so i think it's very much

3853
02:25:29,750 --> 02:25:28,000
down to you know your choice your

3854
02:25:32,469 --> 02:25:29,760
personality

3855
02:25:34,870 --> 02:25:32,479
what you'd feel happiest doing because

3856
02:25:36,710 --> 02:25:34,880
if i had stayed home for six months i

3857
02:25:39,270 --> 02:25:36,720
would have gone crazy

3858
02:25:41,510 --> 02:25:39,280
i totally agree with you rosalie

3859
02:25:42,870 --> 02:25:41,520
i think that the overarching theme here

3860
02:25:45,429 --> 02:25:42,880
is that

3861
02:25:46,950 --> 02:25:45,439
when you come into that situation ask

3862
02:25:48,870 --> 02:25:46,960
your your boss

3863
02:25:51,270 --> 02:25:48,880

explore the opportunities you know what

3864

02:25:53,750 --> 02:25:51,280

is available to me what do i what do i

3865

02:25:55,510 --> 02:25:53,760

want to do with my family life ask your

3866

02:25:57,670 --> 02:25:55,520

boss think of some creative

3867

02:25:59,750 --> 02:25:57,680

opportunities if you don't ask you won't

3868

02:26:01,590 --> 02:25:59,760

have the opportunities um and for me it

3869

02:26:04,230 --> 02:26:01,600

worked out great and most all know

3870

02:26:07,510 --> 02:26:04,240

yourself you know know what's going to

3871

02:26:09,750 --> 02:26:07,520

make you more balanced and and happier

3872

02:26:11,270 --> 02:26:09,760

and sane and safe

3873

02:26:13,510 --> 02:26:11,280

that's very important

3874

02:26:14,790 --> 02:26:13,520

i have an interest in work-life balance

3875

02:26:16,469 --> 02:26:14,800

for a totally different reason i don't

3876

02:26:17,750 --> 02:26:16,479

have any children but i do have a

3877

02:26:20,630 --> 02:26:17,760

husband who

3878

02:26:22,790 --> 02:26:20,640

um unfortunately took really ill one

3879

02:26:24,469 --> 02:26:22,800

year and i had i was like many of us

3880

02:26:26,710 --> 02:26:24,479

probably are workaholics we just work

3881

02:26:28,550 --> 02:26:26,720

all the time and i remember especially

3882

02:26:30,150 --> 02:26:28,560

when i start a new job you tend to work

3883

02:26:31,670 --> 02:26:30,160

a lot of hours in this particular job i

3884

02:26:33,590 --> 02:26:31,680

had i would come in at 5 30 and stay

3885

02:26:35,030 --> 02:26:33,600

until i'm almost 10 at night because i

3886

02:26:37,030 --> 02:26:35,040

was a commuter and i would wait till the

3887

02:26:39,110 --> 02:26:37,040

traffic would die down before i leave

3888

02:26:41,349 --> 02:26:39,120

and on one occasion he took really ill

3889

02:26:42,790 --> 02:26:41,359

and i couldn't get to him and was very

3890

02:26:45,429 --> 02:26:42,800

difficult for me to

3891

02:26:47,510 --> 02:26:45,439

to to feel comfortable knowing that i

3892

02:26:49,270 --> 02:26:47,520

was not able to be

3893

02:26:52,150 --> 02:26:49,280

more balanced at home and so i made the

3894

02:26:54,070 --> 02:26:52,160

decision at that time to

3895

02:26:55,750 --> 02:26:54,080

commit to going home to dinner you know

3896

02:26:57,429 --> 02:26:55,760

so many days a week so one day a week i

3897

02:26:59,910 --> 02:26:57,439

make sure i'm home in time for dinner

3898

02:27:02,309 --> 02:26:59,920

and on weekends you know with us having

3899

02:27:03,990 --> 02:27:02,319

so much access to information especially

3900

02:27:05,429 --> 02:27:04,000

checking your email and working at home

3901
02:27:07,750 --> 02:27:05,439
all the time and working remotely that's

3902
02:27:08,710 --> 02:27:07,760
so easy for us it's easy to consume

3903
02:27:10,550 --> 02:27:08,720
yourself

3904
02:27:12,790 --> 02:27:10,560
especially when you have a type a

3905
02:27:14,389 --> 02:27:12,800
personality you tend to be a workaholic

3906
02:27:15,990 --> 02:27:14,399
to never take a break and it will

3907
02:27:18,230 --> 02:27:16,000
eventually take a whole toll on your own

3908
02:27:19,590 --> 02:27:18,240
body as well but what i tried to do is

3909
02:27:21,270 --> 02:27:19,600
not only commit to having a date night

3910
02:27:23,830 --> 02:27:21,280
or a day where i go home for dinner but

3911
02:27:25,670 --> 02:27:23,840
also on weekends i make sure now that i

3912
02:27:28,309 --> 02:27:25,680
check my messages periodically rather

3913
02:27:30,070 --> 02:27:28,319

than all day um all day you can sit

3914

02:27:31,670 --> 02:27:30,080

there and write messages and work on

3915

02:27:34,230 --> 02:27:31,680

things because there's always work to do

3916

02:27:36,469 --> 02:27:34,240

and you know work is challenging and it

3917

02:27:38,070 --> 02:27:36,479

but it can be fun but i do think

3918

02:27:40,710 --> 02:27:38,080

pursuing some kind of balance is really

3919

02:27:43,510 --> 02:27:40,720

important whatever your situation is

3920

02:27:46,710 --> 02:27:43,520

my story is a little bit different

3921

02:27:48,230 --> 02:27:46,720

before we i got married um i had chance

3922

02:27:50,950 --> 02:27:48,240

to go to moscow

3923

02:27:54,309 --> 02:27:50,960

for uh mars back then it's called mars

3924

02:27:57,910 --> 02:27:54,319

94 96 and later on become you know mars

3925

02:27:59,750 --> 02:27:57,920

express and small european mission

3926

02:28:02,389 --> 02:27:59,760

that was a great experience for me by

3927

02:28:04,550 --> 02:28:02,399

working you know with some

3928

02:28:06,710 --> 02:28:04,560

international partners to see how they

3929

02:28:09,349 --> 02:28:06,720

build this spacecraft is very different

3930

02:28:11,830 --> 02:28:09,359

than how u.s you know build a spacecraft

3931

02:28:14,950 --> 02:28:11,840

but that was probably my last

3932

02:28:16,630 --> 02:28:14,960

international travel um as soon as we

3933

02:28:18,630 --> 02:28:16,640

got married and

3934

02:28:19,750 --> 02:28:18,640

have kids with two kids

3935

02:28:21,349 --> 02:28:19,760

um

3936

02:28:23,429 --> 02:28:21,359

then there's some decision you know kind

3937

02:28:25,349 --> 02:28:23,439

of may not just based on by my you know

3938

02:28:26,710 --> 02:28:25,359

my decision you kind of have to work

3939

02:28:28,870 --> 02:28:26,720

with your partner

3940

02:28:30,469 --> 02:28:28,880

my husband also works at jpl and he's in

3941

02:28:32,710 --> 02:28:30,479

the programmatic side the programmatic

3942

02:28:35,270 --> 02:28:32,720

side means that he travels a lot

3943

02:28:37,429 --> 02:28:35,280

so um when he decided to take that job

3944

02:28:39,349 --> 02:28:37,439

then i had to decide to say okay i

3945

02:28:41,429 --> 02:28:39,359

cannot you know both both of us

3946

02:28:43,510 --> 02:28:41,439

traveling like crazy and our two kids

3947

02:28:44,870 --> 02:28:43,520

what we're gonna do um so we have

3948

02:28:47,110 --> 02:28:44,880

decided to say okay you do the

3949

02:28:48,309 --> 02:28:47,120

programmatic side and i'll do the line

3950

02:28:50,469 --> 02:28:48,319

sign and that means you know we do

3951

02:28:52,710 --> 02:28:50,479

development internally um so i don't

3952

02:28:54,469 --> 02:28:52,720

have to you know travel that much so

3953

02:28:57,110 --> 02:28:54,479

this is some decision you kind of to you

3954

02:28:59,110 --> 02:28:57,120

know make you know um not just by

3955

02:29:01,110 --> 02:28:59,120

yourself but you have to kind of do it

3956

02:29:03,590 --> 02:29:01,120

together with your your partner

3957

02:29:05,349 --> 02:29:03,600

and i agree with mag that um

3958

02:29:08,550 --> 02:29:05,359

a lot of time you really do have to

3959

02:29:10,710 --> 02:29:08,560

allocate time for yourself okay

3960

02:29:13,510 --> 02:29:10,720

i'm a human being when i go home i see

3961

02:29:18,710 --> 02:29:13,520

my kids piano not practiced and homework

3962

02:29:24,389 --> 02:29:21,110

and i'm just ten percent of tiger mom

3963

02:29:26,630 --> 02:29:25,270

um

3964

02:29:29,990 --> 02:29:26,640

you know you just

3965

02:29:32,070 --> 02:29:30,000

that one hour after the kids go to sleep

3966

02:29:34,469 --> 02:29:32,080

right and for yourself you don't have to

3967

02:29:36,070 --> 02:29:34,479

say oh okay let me just do more work

3968

02:29:39,270 --> 02:29:36,080

that one hour you just want to sit on

3969

02:29:41,270 --> 02:29:39,280

the sofa turn on the tv and enjoy and i

3970

02:29:43,990 --> 02:29:41,280

think that's very very important so it's

3971

02:29:46,550 --> 02:29:44,000

the balance that you have to create um

3972

02:29:48,830 --> 02:29:46,560

you have to love yourself in order to do

3973

02:29:52,070 --> 02:29:48,840

good things for others

3974

02:29:53,910 --> 02:29:52,080

so so i think we have an audience that

3975

02:29:56,070 --> 02:29:53,920

are all stem

3976

02:29:58,150 --> 02:29:56,080

students and hopefully we've inspired

3977

02:30:00,790 --> 02:29:58,160

you a little bit about different careers

3978

02:30:02,710 --> 02:30:00,800

here at jpl and in the space i'm going

3979

02:30:05,349 --> 02:30:02,720

to sort of save room for some questions

3980

02:30:08,469 --> 02:30:05,359

from you but end with asking diane you

3981

02:30:10,870 --> 02:30:08,479

know why space why should we

3982

02:30:13,270 --> 02:30:10,880

be interested in exploring space what

3983

02:30:15,910 --> 02:30:13,280

are the mysteries and curiosities and

3984

02:30:17,670 --> 02:30:15,920

big problems out there yet to solve oh

3985

02:30:18,950 --> 02:30:17,680

yeah well i look at this group and i

3986

02:30:20,710 --> 02:30:18,960

think of what you're going to be able to

3987

02:30:21,990 --> 02:30:20,720

accomplish in the you know the next few

3988

02:30:23,830 --> 02:30:22,000

years and it's going to be really

3989

02:30:25,349 --> 02:30:23,840

exciting i mean the things that we're

3990

02:30:27,990 --> 02:30:25,359

talking about doing we're going to get

3991

02:30:30,309 --> 02:30:28,000

samples back from mars we're going to be

3992

02:30:32,309 --> 02:30:30,319

getting data streaming from some of the

3993

02:30:35,910 --> 02:30:32,319

moons of the outer planets whether it's

3994

02:30:37,429 --> 02:30:35,920

in enceladus or titan or europa

3995

02:30:38,870 --> 02:30:37,439

and then i don't know i think one of the

3996

02:30:41,510 --> 02:30:38,880

coolest things is we're going to be

3997

02:30:44,630 --> 02:30:41,520

actually looking at atmospheres of

3998

02:30:46,710 --> 02:30:44,640

earth-like planets around other stars i

3999

02:30:48,550 --> 02:30:46,720

mean the kepler mission has just opened

4000

02:30:50,309 --> 02:30:48,560

up this whole new world to us how many

4001
02:30:52,550 --> 02:30:50,319
planets might be out there that are just

4002
02:30:54,389 --> 02:30:52,560
like our planet and then speaking of our

4003
02:30:55,990 --> 02:30:54,399
own planet you know as i said that's

4004
02:30:58,710 --> 02:30:56,000
kind of my passion but i think one of

4005
02:31:00,469 --> 02:30:58,720
the most important things is uh in in

4006
02:31:02,950 --> 02:31:00,479
the very near future if we stay on the

4007
02:31:05,349 --> 02:31:02,960
trajectory we're going right now

4008
02:31:07,429 --> 02:31:05,359
we're going to be making incredible

4009
02:31:09,510 --> 02:31:07,439
progress and understanding things like

4010
02:31:11,270 --> 02:31:09,520
earthquakes but also in the whole area

4011
02:31:13,030 --> 02:31:11,280
of climate change we're going to be able

4012
02:31:15,750 --> 02:31:13,040
to really

4013
02:31:18,790 --> 02:31:15,760

bring down our understanding of climate

4014

02:31:21,750 --> 02:31:18,800

change to to spatial and temporal scales

4015

02:31:24,870 --> 02:31:21,760

that matter in terms of predicting

4016

02:31:27,910 --> 02:31:24,880

natural hazards like floods and droughts

4017

02:31:30,309 --> 02:31:27,920

and then also deal with our resource

4018

02:31:32,469 --> 02:31:30,319

issues be able to manage our resources

4019

02:31:34,950 --> 02:31:32,479

better like water is one of the most

4020

02:31:37,429 --> 02:31:34,960

critical and so i mean there is just so

4021

02:31:38,630 --> 02:31:37,439

much opportunity so many exciting things

4022

02:31:40,469 --> 02:31:38,640

to do

4023

02:31:42,950 --> 02:31:40,479

and it takes as we've discussed here it

4024

02:31:45,270 --> 02:31:42,960

takes engineers it takes physicists it

4025

02:31:47,510 --> 02:31:45,280

takes scientists it takes

4026

02:31:48,870 --> 02:31:47,520

chemists all sorts of scientists so it's

4027

02:31:51,110 --> 02:31:48,880

a it's really

4028

02:31:52,150 --> 02:31:51,120

really a lot of opportunities that's

4029

02:31:53,429 --> 02:31:52,160

great

4030

02:31:55,510 --> 02:31:53,439

all right i think at this point we'll

4031

02:31:57,190 --> 02:31:55,520

open it up for q a if there's anybody

4032

02:31:58,950 --> 02:31:57,200

out there with questions i think we've

4033

02:32:04,950 --> 02:31:58,960

got some mic runners

4034

02:32:09,590 --> 02:32:07,750

hi i'm sneha i'm from university of

4035

02:32:12,070 --> 02:32:09,600

southern california and i'm computer

4036

02:32:14,950 --> 02:32:12,080

science graduate student

4037

02:32:16,469 --> 02:32:14,960

speaking about the opportunities

4038

02:32:18,790 --> 02:32:16,479

can you throw some light on

4039

02:32:20,710 --> 02:32:18,800

opportunities news for international

4040

02:32:22,950 --> 02:32:20,720

students or like are there equal

4041

02:32:24,950 --> 02:32:22,960

opportunities or

4042

02:32:27,510 --> 02:32:24,960

there are lots of questions either how

4043

02:32:32,630 --> 02:32:30,469

well i i wasn't you know international i

4044

02:32:34,389 --> 02:32:32,640

came here from abroad so maybe i can

4045

02:32:36,550 --> 02:32:34,399

talk about that

4046

02:32:40,710 --> 02:32:36,560

nasa has a program a post-doctoral

4047

02:32:42,790 --> 02:32:40,720

program that is open to foreign students

4048

02:32:45,110 --> 02:32:42,800

to foreign post docs and that's how i

4049

02:32:46,790 --> 02:32:45,120

got here and that's how many

4050

02:32:49,270 --> 02:32:46,800

uh of the

4051
02:32:52,790 --> 02:32:49,280
foreign scientists in particular who are

4052
02:32:55,190 --> 02:32:52,800
here actually have gotten here

4053
02:32:56,309 --> 02:32:55,200
so that's a really good opportunity it's

4054
02:32:58,870 --> 02:32:56,319
called the

4055
02:33:01,429 --> 02:32:58,880
nasa post-doctoral program

4056
02:33:04,630 --> 02:33:01,439
yeah we we couldn't exist without a

4057
02:33:06,550 --> 02:33:04,640
pretty large influx of international

4058
02:33:08,230 --> 02:33:06,560
you know employees so it's it it

4059
02:33:09,990 --> 02:33:08,240
involves paperwork there's no you know

4060
02:33:12,710 --> 02:33:10,000
there's no denying that there's always

4061
02:33:14,070 --> 02:33:12,720
paperwork but no it's uh it's definitely

4062
02:33:15,990 --> 02:33:14,080
we we talked about how important

4063
02:33:18,550 --> 02:33:16,000

diversity is and so that's an element of

4064

02:33:20,950 --> 02:33:18,560

diversity that we really we really you

4065

02:33:23,670 --> 02:33:20,960

know rely on and it's a great thing

4066

02:33:26,550 --> 02:33:23,680

about being at jpl it's like having a

4067

02:33:33,510 --> 02:33:26,560

united nations right here we have people

4068

02:33:36,389 --> 02:33:34,389

hi

4069

02:33:38,630 --> 02:33:36,399

my name's ann emerson and i'm here with

4070

02:33:41,510 --> 02:33:38,640

a group of colleagues who actually do

4071

02:33:44,150 --> 02:33:41,520

research in stem education and my

4072

02:33:46,870 --> 02:33:44,160

question is just what would you like to

4073

02:33:48,870 --> 02:33:46,880

know more of almost on a meta level of

4074

02:33:51,349 --> 02:33:48,880

how to best prepare students for some of

4075

02:33:52,389 --> 02:33:51,359

these careers that you've talked about

4076
02:33:54,710 --> 02:33:52,399
um

4077
02:33:56,870 --> 02:33:54,720
you know just like

4078
02:33:59,910 --> 02:33:56,880
what are some of your suggestions of

4079
02:34:03,429 --> 02:33:59,920
things that we need to know more of to

4080
02:34:05,590 --> 02:34:03,439
have acts more access to these great um

4081
02:34:07,349 --> 02:34:05,600
careers

4082
02:34:08,710 --> 02:34:07,359
what level of education are you talking

4083
02:34:10,550 --> 02:34:08,720
about are you talking about in in

4084
02:34:11,750 --> 02:34:10,560
elementary school all the way up the

4085
02:34:12,630 --> 02:34:11,760
whole spectrum

4086
02:34:15,349 --> 02:34:12,640
i mean

4087
02:34:22,070 --> 02:34:18,150
let me start with the uh

4088
02:34:26,630 --> 02:34:24,550

college students uh

4089

02:34:28,710 --> 02:34:26,640

the college curriculums tend to

4090

02:34:31,990 --> 02:34:28,720

tend to get a little too theoretical

4091

02:34:33,510 --> 02:34:32,000

these days they're much more

4092

02:34:35,750 --> 02:34:33,520

there's there's veering away from a

4093

02:34:37,750 --> 02:34:35,760

little bit more of

4094

02:34:39,670 --> 02:34:37,760

vocational may not be quite the the

4095

02:34:41,830 --> 02:34:39,680

right way to describe it but hands-on

4096

02:34:43,750 --> 02:34:41,840

experience uh with what you're doing

4097

02:34:45,670 --> 02:34:43,760

they they tend to teach the theory of

4098

02:34:47,750 --> 02:34:45,680

something but not how it actually shows

4099

02:34:49,910 --> 02:34:47,760

up in practice and and because i'm an

4100

02:34:51,910 --> 02:34:49,920

engineering manager engineering is a lot

4101
02:34:53,910 --> 02:34:51,920
of you know you know the theory but it

4102
02:34:55,590 --> 02:34:53,920
doesn't always work that way yeah and

4103
02:34:57,910 --> 02:34:55,600
you got to try it again and try it again

4104
02:35:00,070 --> 02:34:57,920
and fix the problems and figure it out

4105
02:35:02,710 --> 02:35:00,080
and so kids coming out of college don't

4106
02:35:04,550 --> 02:35:02,720
necessarily have all of that hands-on

4107
02:35:06,630 --> 02:35:04,560
practical experience and they don't have

4108
02:35:07,750 --> 02:35:06,640
that kind of relevant work experience

4109
02:35:09,110 --> 02:35:07,760
and so

4110
02:35:11,349 --> 02:35:09,120
you know trying to

4111
02:35:14,550 --> 02:35:11,359
encourage programs like the ap academic

4112
02:35:16,630 --> 02:35:14,560
part-time program or the co-op programs

4113
02:35:19,030 --> 02:35:16,640

is one of the best things that one of

4114

02:35:21,750 --> 02:35:19,040

the best experiences that

4115

02:35:23,590 --> 02:35:21,760

that kids can get in college moving more

4116

02:35:26,070 --> 02:35:23,600

into the high school age

4117

02:35:28,469 --> 02:35:26,080

again work experience is important but

4118

02:35:30,150 --> 02:35:28,479

understanding the practicality of what

4119

02:35:31,830 --> 02:35:30,160

they're learning that it's that physics

4120

02:35:34,309 --> 02:35:31,840

isn't just what you learn in a textbook

4121

02:35:36,790 --> 02:35:34,319

that it applies in the real world and

4122

02:35:38,950 --> 02:35:36,800

and trying to get them to ground that

4123

02:35:42,070 --> 02:35:38,960

knowledge and that experience into how

4124

02:35:44,389 --> 02:35:42,080

it can really help them on a day-to-day

4125

02:35:46,870 --> 02:35:44,399

uh basis makes it more interesting for

4126

02:35:49,670 --> 02:35:46,880

them and makes it more relevant as

4127

02:35:51,349 --> 02:35:49,680

opposed to that thing we study in school

4128

02:35:53,429 --> 02:35:51,359

so that's from my perspective i know

4129

02:35:55,270 --> 02:35:53,439

there's other other comments

4130

02:35:57,670 --> 02:35:55,280

i know some of the university they

4131

02:35:59,830 --> 02:35:57,680

establish you know department um for

4132

02:36:01,270 --> 02:35:59,840

advisory board they're trying to draw

4133

02:36:03,830 --> 02:36:01,280

different um

4134

02:36:06,230 --> 02:36:03,840

people from you know companies and help

4135

02:36:09,270 --> 02:36:06,240

them to build up the curriculums okay i

4136

02:36:10,630 --> 02:36:09,280

believe cal poly pomona in the computer

4137

02:36:12,950 --> 02:36:10,640

science department they have something

4138

02:36:15,590 --> 02:36:12,960

like that because i was the member um so

4139

02:36:17,349 --> 02:36:15,600

with that kind of exchange um

4140

02:36:20,469 --> 02:36:17,359

the school will know

4141

02:36:23,030 --> 02:36:20,479

what is the you know the demand um when

4142

02:36:24,469 --> 02:36:23,040

it's required and it can help you know

4143

02:36:27,349 --> 02:36:24,479

the school to develop a better

4144

02:36:29,429 --> 02:36:27,359

curriculum and just like what kendra has

4145

02:36:31,349 --> 02:36:29,439

said is really focuses more in the you

4146

02:36:33,670 --> 02:36:31,359

know hands-on experience and also

4147

02:36:34,870 --> 02:36:33,680

teaming too right because a lot of time

4148

02:36:37,190 --> 02:36:34,880

you know your project that you have

4149

02:36:38,710 --> 02:36:37,200

gotten is all individual

4150

02:36:40,150 --> 02:36:38,720

but a lot of time the challenge is

4151
02:36:42,070 --> 02:36:40,160
really you know working with the team

4152
02:36:44,550 --> 02:36:42,080
members and how to resolve the problem

4153
02:36:46,070 --> 02:36:44,560
together um so throughout that kind of

4154
02:36:48,150 --> 02:36:46,080
program and then set up i think it would

4155
02:36:50,389 --> 02:36:48,160
be very helpful for you guys

4156
02:36:53,510 --> 02:36:50,399
what about in the research area um yeah

4157
02:36:55,750 --> 02:36:53,520
i i find uh especially as a planetary

4158
02:36:57,670 --> 02:36:55,760
scientist i don't like any of the sort

4159
02:37:00,150 --> 02:36:57,680
of third grade as soon as kids start

4160
02:37:03,030 --> 02:37:00,160
having a vocabulary large enough

4161
02:37:06,230 --> 02:37:03,040
i don't like any of the books i see

4162
02:37:09,270 --> 02:37:06,240
uh and i i think kids are not afraid of

4163
02:37:11,349 --> 02:37:09,280

large vocabulary a kid who can memorize

4164

02:37:14,070 --> 02:37:11,359

all the dinosaurs and tell you all the

4165

02:37:15,830 --> 02:37:14,080

aspects of what every single reptile was

4166

02:37:17,429 --> 02:37:15,840

like they can also learn about the

4167

02:37:19,750 --> 02:37:17,439

earth's atmosphere and all the layers

4168

02:37:21,750 --> 02:37:19,760

the troposphere the stratosphere

4169

02:37:24,389 --> 02:37:21,760

magnetospheric physics i mean all of

4170

02:37:26,309 --> 02:37:24,399

these are things we shouldn't be afraid

4171

02:37:28,230 --> 02:37:26,319

to dive in and in a creative way

4172

02:37:30,790 --> 02:37:28,240

illustrate and i also would like to see

4173

02:37:33,110 --> 02:37:30,800

more multicultural material i'd like to

4174

02:37:35,429 --> 02:37:33,120

see you know african-american kids in

4175

02:37:40,469 --> 02:37:35,439

science shown that way in

4176
02:37:44,230 --> 02:37:42,550
hi my name is sharina and i'm from the

4177
02:37:46,469 --> 02:37:44,240
university of california riverside and

4178
02:37:47,910 --> 02:37:46,479
i'm a third year mechanical engineer um

4179
02:37:49,750 --> 02:37:47,920
i know earlier at the beginning of the

4180
02:37:51,190 --> 02:37:49,760
talk you guys mentioned

4181
02:37:53,670 --> 02:37:51,200
that you definitely recommend going into

4182
02:37:55,349 --> 02:37:53,680
higher education and my question was

4183
02:37:56,790 --> 02:37:55,359
i've been to a couple other panels and

4184
02:37:58,230 --> 02:37:56,800
they kind of said how going into higher

4185
02:38:00,150 --> 02:37:58,240
education in the sciences and

4186
02:38:01,190 --> 02:38:00,160
engineering kind of sometimes two

4187
02:38:03,590 --> 02:38:01,200
employers made them seem like

4188
02:38:05,270 --> 02:38:03,600

overqualified or too specified so i

4189

02:38:07,670 --> 02:38:05,280

guess what's your you're shaking your

4190

02:38:09,990 --> 02:38:07,680

head no okay

4191

02:38:11,429 --> 02:38:10,000

so i guess i just wanted to know um

4192

02:38:12,710 --> 02:38:11,439

what your take on that was if you know

4193

02:38:14,469 --> 02:38:12,720

to maybe go into engineering and

4194

02:38:15,990 --> 02:38:14,479

sciences or like go into maybe a

4195

02:38:17,590 --> 02:38:16,000

business administration degree of some

4196

02:38:19,110 --> 02:38:17,600

sort so i guess between the two

4197

02:38:21,590 --> 02:38:19,120

different fields what your

4198

02:38:24,389 --> 02:38:21,600

what your recommendation was and um also

4199

02:38:25,910 --> 02:38:24,399

part two um is it hard to go back into

4200

02:38:27,990 --> 02:38:25,920

school if you you know perhaps take a

4201
02:38:29,429 --> 02:38:28,000
break a couple of you said that you went

4202
02:38:30,870 --> 02:38:29,439
and you worked for a bit and then went

4203
02:38:32,150 --> 02:38:30,880
back to school so was it difficult

4204
02:38:35,429 --> 02:38:32,160
making that transition or was it just

4205
02:38:37,190 --> 02:38:35,439
kind of you just got right back into it

4206
02:38:40,230 --> 02:38:37,200
i guess because i was shaking my head i

4207
02:38:42,309 --> 02:38:40,240
guess i'll answer that question

4208
02:38:45,670 --> 02:38:42,319
when you come out of undergraduate with

4209
02:38:47,750 --> 02:38:45,680
an engineering degree there is

4210
02:38:50,790 --> 02:38:47,760
you've learned a lot you're very capable

4211
02:38:52,870 --> 02:38:50,800
but there is a huge amount of

4212
02:38:56,389 --> 02:38:52,880
information knowledge and experience

4213
02:38:59,270 --> 02:38:56,399

that you haven't even tapped into

4214

02:39:04,790 --> 02:39:02,230

i don't think a a masters or a phd makes

4215

02:39:06,790 --> 02:39:04,800

you overqualified for anything

4216

02:39:09,270 --> 02:39:06,800

i think it just makes you

4217

02:39:11,670 --> 02:39:09,280

maybe more focused

4218

02:39:13,429 --> 02:39:11,680

maybe uh

4219

02:39:15,830 --> 02:39:13,439

smarter at a different level of the

4220

02:39:19,750 --> 02:39:15,840

field that you that you're studying

4221

02:39:24,870 --> 02:39:22,870

a phd people tend to associate with with

4222

02:39:26,950 --> 02:39:24,880

science and research

4223

02:39:29,750 --> 02:39:26,960

some of our best engineers some of our

4224

02:39:31,670 --> 02:39:29,760

best managers some of our best leaders

4225

02:39:33,990 --> 02:39:31,680

in the engineering field are folks that

4226

02:39:35,990 --> 02:39:34,000

you would never know have a phd

4227

02:39:38,469 --> 02:39:36,000

they don't go by doctor all the time

4228

02:39:39,990 --> 02:39:38,479

they don't you know put it on their um

4229

02:39:42,309 --> 02:39:40,000

you know their business card or things

4230

02:39:43,910 --> 02:39:42,319

like that but they've learned a skill

4231

02:39:47,110 --> 02:39:43,920

through the graduate program that

4232

02:39:49,910 --> 02:39:47,120

they're in uh of analytical thinking

4233

02:39:51,750 --> 02:39:49,920

of verifying assumptions and things like

4234

02:39:54,150 --> 02:39:51,760

that and those are our general skills

4235

02:39:55,750 --> 02:39:54,160

that are applicable in a lot of places

4236

02:39:58,150 --> 02:39:55,760

whether you're actually

4237

02:40:00,550 --> 02:39:58,160

furthering along the path of what you

4238

02:40:02,790 --> 02:40:00,560

studied in your phd program or you're

4239

02:40:05,590 --> 02:40:02,800

doing something completely different and

4240

02:40:07,510 --> 02:40:05,600

so no masters and phds do not make you

4241

02:40:09,750 --> 02:40:07,520

overqualified

4242

02:40:12,550 --> 02:40:09,760

in the engineering field there's still a

4243

02:40:17,030 --> 02:40:14,790

is it hard to go back i

4244

02:40:21,190 --> 02:40:17,040

i went back after two years and yes you

4245

02:40:25,030 --> 02:40:21,200

do get accustomed to um

4246

02:40:28,950 --> 02:40:26,950

leaving and putting your pencil down at

4247

02:40:30,550 --> 02:40:28,960

five at the end of the day which when i

4248

02:40:32,309 --> 02:40:30,560

was an undergraduate student you know

4249

02:40:34,550 --> 02:40:32,319

you were pretty much working 20 out of

4250

02:40:36,389 --> 02:40:34,560

24 hours a day

4251
02:40:37,990 --> 02:40:36,399
you know studying over breakfast and

4252
02:40:39,510 --> 02:40:38,000
everything like that

4253
02:40:41,429 --> 02:40:39,520
you don't have to do that in the work

4254
02:40:43,910 --> 02:40:41,439
world you can if but but you don't have

4255
02:40:45,510 --> 02:40:43,920
to um so if you wait more than

4256
02:40:47,190 --> 02:40:45,520
somewhere between two to five years yeah

4257
02:40:50,469 --> 02:40:47,200
it's probably pretty difficult to go

4258
02:40:51,910 --> 02:40:50,479
back it was a transition but it's it's

4259
02:40:55,510 --> 02:40:51,920
doable

4260
02:40:58,230 --> 02:40:55,520
and i found a lot of students um who was

4261
02:41:00,309 --> 02:40:58,240
you know apt here and decided to go back

4262
02:41:02,469 --> 02:41:00,319
to for master degree after they've

4263
02:41:05,590 --> 02:41:02,479

completed bachelor they usually work you

4264

02:41:07,670 --> 02:41:05,600

know for a year or two then they go back

4265

02:41:09,910 --> 02:41:07,680

uh one thing i thought was really useful

4266

02:41:11,990 --> 02:41:09,920

for most of the the students was that

4267

02:41:13,429 --> 02:41:12,000

when they decide to do you know the the

4268

02:41:15,429 --> 02:41:13,439

final project

4269

02:41:17,750 --> 02:41:15,439

if they can pick something is related to

4270

02:41:20,150 --> 02:41:17,760

what they're currently working on

4271

02:41:23,510 --> 02:41:20,160

okay it tends to be you know more

4272

02:41:25,429 --> 02:41:23,520

interesting and seems more motivated um

4273

02:41:27,030 --> 02:41:25,439

so that's you know one thing i think you

4274

02:41:28,070 --> 02:41:27,040

know it's very helpful

4275

02:41:29,750 --> 02:41:28,080

you mentioned about business

4276

02:41:32,230 --> 02:41:29,760

administration degree and i think i'm

4277

02:41:33,910 --> 02:41:32,240

just going to give you a pointer here

4278

02:41:36,150 --> 02:41:33,920

it really depends on you know if you

4279

02:41:38,790 --> 02:41:36,160

feel there's a need

4280

02:41:41,110 --> 02:41:38,800

during your career

4281

02:41:43,349 --> 02:41:41,120

a degree whatever the level is providing

4282

02:41:44,950 --> 02:41:43,359

you a tool and it's really up to you how

4283

02:41:47,990 --> 02:41:44,960

you're going to apply it

4284

02:41:49,110 --> 02:41:48,000

you know at workplace so that's my my

4285

02:41:50,710 --> 02:41:49,120

point

4286

02:41:51,990 --> 02:41:50,720

i think we have time for one more

4287

02:41:53,990 --> 02:41:52,000

question and i think we've already

4288

02:41:55,990 --> 02:41:54,000

identified who gets it but we will be

4289

02:41:58,870 --> 02:41:56,000

around for a little bit afterwards and

4290

02:42:00,710 --> 02:41:58,880

uh we'll be uh having yet one more

4291

02:42:02,550 --> 02:42:00,720

little segment here before we do that um

4292

02:42:04,309 --> 02:42:02,560

hi my name is michelle sestado and i'm

4293

02:42:05,990 --> 02:42:04,319

from mount san antonio college and i'm a

4294

02:42:07,670 --> 02:42:06,000

chemical engineer

4295

02:42:09,990 --> 02:42:07,680

my question is what advice would you

4296

02:42:11,349 --> 02:42:10,000

give to a cure a very curious student

4297

02:42:13,270 --> 02:42:11,359

such as me

4298

02:42:15,510 --> 02:42:13,280

an example is that um

4299

02:42:17,750 --> 02:42:15,520

i'm working in a chemistry lab with

4300

02:42:20,230 --> 02:42:17,760

magnesium oxide aerogels but yet i'm

4301

02:42:22,389 --> 02:42:20,240

also the captain of a

4302

02:42:24,469 --> 02:42:22,399

one of the two robotics team at my

4303

02:42:26,870 --> 02:42:24,479

school and but yet i'm also very

4304

02:42:28,710 --> 02:42:26,880

interested in astrophysics so i'm kind

4305

02:42:30,230 --> 02:42:28,720

of all over the place

4306

02:42:31,990 --> 02:42:30,240

and what advice would you give to a

4307

02:42:34,550 --> 02:42:32,000

student like me who is just everything

4308

02:42:36,230 --> 02:42:34,560

is like appealing and i'm very much into

4309

02:42:39,510 --> 02:42:36,240

science and math so everything interests

4310

02:42:41,190 --> 02:42:39,520

me so yeah one answer who gets to who

4311

02:42:42,870 --> 02:42:41,200

wants to take it i'll take care of that

4312

02:42:46,230 --> 02:42:42,880

it's uh you know because i was

4313

02:42:48,150 --> 02:42:46,240

interested in a a lot of things during

4314

02:42:51,510 --> 02:42:48,160

most of my degree i was interested in

4315

02:42:53,590 --> 02:42:51,520

astrophysics in fact i was going to do

4316

02:42:55,270 --> 02:42:53,600

astrophysics and you know and then i

4317

02:42:57,750 --> 02:42:55,280

found something else i had a real

4318

02:43:00,870 --> 02:42:57,760

passion for that was you know planetary

4319

02:43:03,990 --> 02:43:00,880

geology um and i think the the best way

4320

02:43:07,990 --> 02:43:04,000

is uh uh do a do a masters

4321

02:43:10,389 --> 02:43:08,000

uh or a phd try to find that one area

4322

02:43:12,389 --> 02:43:10,399

that you know really you're passionate

4323

02:43:15,349 --> 02:43:12,399

about and it doesn't mean that at the

4324

02:43:18,150 --> 02:43:15,359

future time you cannot change

4325

02:43:19,510 --> 02:43:18,160

in fact people have made amazing career

4326
02:43:21,510 --> 02:43:19,520
changes

4327
02:43:22,389 --> 02:43:21,520
particularly from a first degree and one

4328
02:43:24,070 --> 02:43:22,399
of our

4329
02:43:26,790 --> 02:43:24,080
very best scientists here who

4330
02:43:30,070 --> 02:43:26,800
unfortunately has passed away he started

4331
02:43:31,190 --> 02:43:30,080
out of a degree in french and art

4332
02:43:39,030 --> 02:43:31,200
and

4333
02:43:40,950 --> 02:43:39,040
kind of led him uh into the science uh

4334
02:43:44,710 --> 02:43:40,960
later on and he did a masters and then a

4335
02:43:46,630 --> 02:43:44,720
phd uh so all i can say is that uh at

4336
02:43:48,870 --> 02:43:46,640
this stage a lot of things

4337
02:43:51,110 --> 02:43:48,880
uh will be appealing and it doesn't mean

4338
02:43:52,550 --> 02:43:51,120

that you know you're only ever going to

4339

02:43:54,389 --> 02:43:52,560

like one thing

4340

02:43:56,150 --> 02:43:54,399

but you know find

4341

02:43:56,950 --> 02:43:56,160

uh something that

4342

02:43:59,030 --> 02:43:56,960

you

4343

02:44:00,550 --> 02:43:59,040

can actually feel that calling or that

4344

02:44:04,070 --> 02:44:00,560

passion for

4345

02:44:06,469 --> 02:44:04,080

and and follow it

4346

02:44:07,990 --> 02:44:06,479

i'd like to thank the panelists and i'd

4347

02:44:18,710 --> 02:44:08,000

like to have you give them a big round

4348

02:44:23,030 --> 02:44:21,110

at this stage a lot of things

4349

02:44:25,269 --> 02:44:23,040

will be appealing and it doesn't mean

4350

02:44:26,710 --> 02:44:25,279

that you know you're only ever going to

4351
02:44:29,030 --> 02:44:26,720
like one thing

4352
02:44:30,309 --> 02:44:29,040
but you know find

4353
02:44:31,110 --> 02:44:30,319
something that

4354
02:44:33,190 --> 02:44:31,120
you

4355
02:44:34,710 --> 02:44:33,200
can actually feel that calling or that

4356
02:44:38,230 --> 02:44:34,720
passion for

4357
02:44:42,150 --> 02:44:40,630
i'd like to thank the panelists and i'd

4358
02:44:46,469 --> 02:44:42,160
like to have you give them a big round

4359
02:44:46,479 --> 02:44:49,830
i think some of them

4360
02:44:52,070 --> 02:44:51,190
some of them will be here for a little

4361
02:44:54,070 --> 02:44:52,080
while

4362
02:44:55,990 --> 02:44:54,080
we can't let this great pipeline of

4363
02:44:57,830 --> 02:44:56,000

talent leave without giving you a little

4364

02:45:00,230 --> 02:44:57,840

pitch about job opportunities and what

4365

02:45:02,150 --> 02:45:00,240

we do here in terms of careers so i'm

4366

02:45:03,750 --> 02:45:02,160

going to invite parven kasai to come up

4367

02:45:05,030 --> 02:45:03,760

she's going to do a little presentation

4368

02:45:07,110 --> 02:45:05,040

on our

4369

02:45:09,269 --> 02:45:07,120

education office and i'll sort of end

4370

02:45:11,670 --> 02:45:09,279

with the pitch for the employment

4371

02:45:14,870 --> 02:45:11,680

opportunities at jpl

4372

02:45:17,510 --> 02:45:14,880

thank you

4373

02:45:19,190 --> 02:45:17,520

good morning or good afternoon rather

4374

02:45:20,950 --> 02:45:19,200

the conversation we just had the

4375

02:45:24,150 --> 02:45:20,960

questions that you asked are a great

4376

02:45:27,349 --> 02:45:24,160

segue to this next next section uh we

4377

02:45:30,790 --> 02:45:27,359

just would like to take a few minutes to

4378

02:45:33,750 --> 02:45:30,800

extend an invitation to all of you to

4379

02:45:37,110 --> 02:45:33,760

the the students uh in our audience and

4380

02:45:39,190 --> 02:45:37,120

the young researchers um to join jpl and

4381

02:45:42,150 --> 02:45:39,200

nasa through some of our internship and

4382

02:45:44,230 --> 02:45:42,160

fellowship opportunities

4383

02:45:46,790 --> 02:45:44,240

you just heard many wonderful

4384

02:45:49,030 --> 02:45:46,800

inspirational stories of careers and all

4385

02:45:52,230 --> 02:45:49,040

the ups and downs and and challenges and

4386

02:45:54,950 --> 02:45:52,240

successes and you also heard that

4387

02:45:57,429 --> 02:45:54,960

you know it wasn't always easy to to get

4388

02:46:00,710 --> 02:45:57,439

where these accomplished scientists and

4389

02:46:03,110 --> 02:46:00,720

and engineers are um you heard dr olaji

4390

02:46:04,469 --> 02:46:03,120

talk about this morning talk about the

4391

02:46:06,550 --> 02:46:04,479

um

4392

02:46:08,150 --> 02:46:06,560

group of women who were here at jpl next

4393

02:46:12,950 --> 02:46:08,160

slide please

4394

02:46:15,670 --> 02:46:12,960

who were here um in 1940s and 50s

4395

02:46:17,510 --> 02:46:15,680

these were women with some college

4396

02:46:19,510 --> 02:46:17,520

education for that time they had at

4397

02:46:22,389 --> 02:46:19,520

least two years of mathematics behind

4398

02:46:25,910 --> 02:46:22,399

them and they were trained to work on

4399

02:46:28,389 --> 02:46:25,920

jpl's ibm machines they were doing um

4400

02:46:31,349 --> 02:46:28,399

theoretical calculations and they were

4401
02:46:33,590 --> 02:46:31,359
doing experimental data reductions and

4402
02:46:35,510 --> 02:46:33,600
uh for for that time and given that they

4403
02:46:37,590 --> 02:46:35,520
were women they were quite advanced but

4404
02:46:39,190 --> 02:46:37,600
as dr loggie said they were doing very

4405
02:46:41,349 --> 02:46:39,200
narrow technical

4406
02:46:43,110 --> 02:46:41,359
work here at jpl

4407
02:46:45,269 --> 02:46:43,120
so

4408
02:46:47,750 --> 02:46:45,279
this morning demonstrated that women

4409
02:46:49,910 --> 02:46:47,760
have come a long ways in what we call

4410
02:46:52,870 --> 02:46:49,920
stem fields science technology

4411
02:46:55,510 --> 02:46:52,880
engineering and mathematics

4412
02:46:58,230 --> 02:46:55,520
but if you look at the entire nation and

4413
02:47:01,429 --> 02:46:58,240

you'll see that the great

4414

02:47:03,830 --> 02:47:01,439

gains are not really still on par with

4415

02:47:05,510 --> 02:47:03,840

what needs to be achieved next slide

4416

02:47:07,910 --> 02:47:05,520

please

4417

02:47:10,230 --> 02:47:07,920

um this is data from

4418

02:47:12,710 --> 02:47:10,240

national science foundation and this was

4419

02:47:14,710 --> 02:47:12,720

referred to earlier again this morning

4420

02:47:16,950 --> 02:47:14,720

if you look at the number of women if

4421

02:47:19,030 --> 02:47:16,960

you add up all the little slivers there

4422

02:47:20,630 --> 02:47:19,040

and add up the number of women it adds

4423

02:47:23,750 --> 02:47:20,640

up to about 26

4424

02:47:27,510 --> 02:47:23,760

of of the stem workforce in this country

4425

02:47:29,349 --> 02:47:27,520

as opposed to 74 for um for our male

4426
02:47:31,830 --> 02:47:29,359
counterparts

4427
02:47:35,510 --> 02:47:31,840
and if you look at the ethnic breakdown

4428
02:47:37,750 --> 02:47:35,520
you'll see that it is even um

4429
02:47:42,070 --> 02:47:37,760
that the challenge there is even greater

4430
02:47:45,030 --> 02:47:42,080
to to overcome for some um ethnic groups

4431
02:47:48,469 --> 02:47:45,040
so um

4432
02:47:50,550 --> 02:47:48,479
there is a lot to be to be done uh and

4433
02:47:53,190 --> 02:47:50,560
you know we are happy to say that at jpl

4434
02:47:56,150 --> 02:47:53,200
we are taking steps to to remedy this

4435
02:48:01,590 --> 02:47:58,230
we have a number of internships and

4436
02:48:04,389 --> 02:48:01,600
fellowship programs at jpl along with hr

4437
02:48:07,429 --> 02:48:04,399
and with the office of chief scientist

4438
02:48:10,790 --> 02:48:07,439

the education office here at jpl we all

4439

02:48:13,269 --> 02:48:10,800

bring over about of hundreds of students

4440

02:48:14,790 --> 02:48:13,279

well over 500 students

4441

02:48:16,950 --> 02:48:14,800

every year

4442

02:48:19,030 --> 02:48:16,960

and if you other if you add other

4443

02:48:23,750 --> 02:48:19,040

participants in our internship and

4444

02:48:26,550 --> 02:48:23,760

fellowship programs um we have over 700

4445

02:48:28,309 --> 02:48:26,560

people every year that come to jpl for

4446

02:48:31,269 --> 02:48:28,319

opportunities to do research and

4447

02:48:32,710 --> 02:48:31,279

development work

4448

02:48:34,469 --> 02:48:32,720

at jpl

4449

02:48:37,269 --> 02:48:34,479

we have now

4450

02:48:39,429 --> 02:48:37,279

i'm happy to report that in in 2011 our

4451
02:48:41,349 --> 02:48:39,439
numbers show that we have 40 women

4452
02:48:43,830 --> 02:48:41,359
participating in our internship program

4453
02:48:45,830 --> 02:48:43,840
so we are well above the national

4454
02:48:48,309 --> 02:48:45,840
average but we're not there yet and

4455
02:48:51,110 --> 02:48:48,319
that's why this pitch to you

4456
02:48:53,750 --> 02:48:51,120
we would love to have you join us

4457
02:48:55,349 --> 02:48:53,760
um even if right now you're undecided

4458
02:48:57,990 --> 02:48:55,359
about your careers even if you're

4459
02:48:59,830 --> 02:48:58,000
undecided about your majors but you do

4460
02:49:01,990 --> 02:48:59,840
have the passion

4461
02:49:04,070 --> 02:49:02,000
and the vision and the at least some

4462
02:49:06,070 --> 02:49:04,080
sort of skills that you can be

4463
02:49:08,550 --> 02:49:06,080

comfortable with to start we would love

4464

02:49:13,830 --> 02:49:08,560

to give you the opportunity to explore

4465

02:49:16,230 --> 02:49:13,840

working for jpl and working for nasa

4466

02:49:17,910 --> 02:49:16,240

next slide

4467

02:49:19,910 --> 02:49:17,920

the same thing for our postdoctoral

4468

02:49:21,429 --> 02:49:19,920

programs if you are graduating if you

4469

02:49:24,070 --> 02:49:21,439

are thinking of doing a post doctoral

4470

02:49:26,150 --> 02:49:24,080

program jpl offers several postdoctoral

4471

02:49:29,110 --> 02:49:26,160

programs and our numbers there as you

4472

02:49:31,830 --> 02:49:29,120

see 25 a quarter at least good quarter

4473

02:49:32,710 --> 02:49:31,840

of our postdoctoral offerings are for

4474

02:49:35,750 --> 02:49:32,720

women

4475

02:49:37,429 --> 02:49:35,760

um and again this is if not uh if not

4476

02:49:38,950 --> 02:49:37,439

better than the national average it is

4477

02:49:41,030 --> 02:49:38,960

at least on par with the national

4478

02:49:43,670 --> 02:49:41,040

average for post-doctoral for

4479

02:49:46,230 --> 02:49:43,680

post-doctorals in stem fields

4480

02:49:48,870 --> 02:49:46,240

um so we encourage you to think about

4481

02:49:51,590 --> 02:49:48,880

the opportunity again as as you are

4482

02:49:55,349 --> 02:49:51,600

moving towards graduation and to help

4483

02:49:57,349 --> 02:49:55,359

you do that um the next slide please

4484

02:50:01,429 --> 02:49:57,359

we have we're inviting you see how cool

4485

02:50:08,550 --> 02:50:02,230

we

4486

02:50:12,150 --> 02:50:08,560

that gazette will will share with you

4487

02:50:14,150 --> 02:50:12,160

next um the first one on top is the jpl

4488

02:50:17,429 --> 02:50:14,160

education gateway and there there is an

4489

02:50:20,070 --> 02:50:17,439

icon um oh no wait a second no the first

4490

02:50:22,870 --> 02:50:20,080

one is the postdoc excuse me so so on

4491

02:50:23,670 --> 02:50:22,880

that website you will see

4492

02:50:25,349 --> 02:50:23,680

the

4493

02:50:27,590 --> 02:50:25,359

number of postdoctoral programs with

4494

02:50:30,230 --> 02:50:27,600

information and

4495

02:50:34,550 --> 02:50:30,240

requirements for participating in each

4496

02:50:35,750 --> 02:50:34,560

jpl truly values its postdoctoral

4497

02:50:38,070 --> 02:50:35,760

fellows

4498

02:50:41,349 --> 02:50:38,080

it's a very supportive environment and

4499

02:50:43,590 --> 02:50:41,359

um they are a great part of the research

4500

02:50:45,429 --> 02:50:43,600

community here at jpl

4501

02:50:46,870 --> 02:50:45,439

that's the that's the

4502

02:50:48,950 --> 02:50:46,880

website that will give you further

4503

02:50:51,269 --> 02:50:48,960

information and below that is the

4504

02:50:53,510 --> 02:50:51,279

education gateway

4505

02:50:55,750 --> 02:50:53,520

on that website if you click on

4506

02:50:59,030 --> 02:50:55,760

internships and fellowships a menu of

4507

02:51:01,750 --> 02:50:59,040

programs opens up and you will see that

4508

02:51:03,590 --> 02:51:01,760

we still have many opportunities open

4509

02:51:05,750 --> 02:51:03,600

for participation i talked to some of

4510

02:51:07,670 --> 02:51:05,760

you during the break i encourage you to

4511

02:51:09,510 --> 02:51:07,680

look i'd like to extend that offer to

4512

02:51:11,510 --> 02:51:09,520

the rest of you

4513

02:51:13,590 --> 02:51:11,520

there are many many opportunities open

4514

02:51:15,349 --> 02:51:13,600

still for summer and we also have

4515

02:51:17,750 --> 02:51:15,359

year-round programs for those of you who

4516

02:51:19,269 --> 02:51:17,760

may be going to school and doing you

4517

02:51:21,910 --> 02:51:19,279

know going to school part-time and

4518

02:51:23,830 --> 02:51:21,920

looking for opportunities to learn about

4519

02:51:26,550 --> 02:51:23,840

a professional environment and explore a

4520

02:51:27,910 --> 02:51:26,560

career if you are within 50 miles radius

4521

02:51:30,389 --> 02:51:27,920

of jpl

4522

02:51:31,269 --> 02:51:30,399

we have year-round programs that we

4523

02:51:32,469 --> 02:51:31,279

would

4524

02:51:35,510 --> 02:51:32,479

again you know like to see you

4525

02:51:40,790 --> 02:51:37,030

and then we also obviously have summer

4526
02:51:44,710 --> 02:51:40,800
programs these are all paid internships

4527
02:51:47,349 --> 02:51:44,720
so i see a few smiles

4528
02:51:50,150 --> 02:51:47,359
these are paid internships and again you

4529
02:51:52,309 --> 02:51:50,160
get to do real work here you get to do

4530
02:51:54,550 --> 02:51:52,319
real research it's not go for job you're

4531
02:51:56,630 --> 02:51:54,560
not running errands for or making coffee

4532
02:51:58,630 --> 02:51:56,640
you may be doing those things but you do

4533
02:52:03,670 --> 02:51:58,640
it in a way that a professional

4534
02:52:08,070 --> 02:52:06,230
we all do that yeah we all do that but

4535
02:52:09,590 --> 02:52:08,080
but when you're an intern that's you

4536
02:52:12,790 --> 02:52:09,600
know that's not a good sign you think

4537
02:52:15,190 --> 02:52:12,800
i'm being given a go for work but

4538
02:52:16,870 --> 02:52:15,200

my point here is that these are real

4539

02:52:18,790 --> 02:52:16,880

meaningful opportunities for

4540

02:52:20,469 --> 02:52:18,800

participation and jpl has a very

4541

02:52:22,710 --> 02:52:20,479

supportive environment for interns we

4542

02:52:24,870 --> 02:52:22,720

have a great infrastructure

4543

02:52:26,710 --> 02:52:24,880

that allows students no matter which

4544

02:52:28,550 --> 02:52:26,720

program they come through to work

4545

02:52:30,950 --> 02:52:28,560

together and to work with with the

4546

02:52:33,510 --> 02:52:30,960

entire community

4547

02:52:36,070 --> 02:52:33,520

um i'll be here after the program my

4548

02:52:37,429 --> 02:52:36,080

colleagues also will be here i think i

4549

02:52:39,110 --> 02:52:37,439

see some of them in the audience and

4550

02:52:41,190 --> 02:52:39,120

we'll be happy to answer any questions

4551
02:52:43,590 --> 02:52:41,200
that you have but please take those down

4552
02:52:44,950 --> 02:52:43,600
and visit us

4553
02:52:46,710 --> 02:52:44,960
and then the final slide if you'll put

4554
02:52:47,830 --> 02:52:46,720
that one up

4555
02:52:49,429 --> 02:52:47,840
um so

4556
02:52:51,910 --> 02:52:49,439
parven talked about every summer we have

4557
02:52:55,269 --> 02:52:51,920
about 500 students here at all different

4558
02:52:57,830 --> 02:52:55,279
levels we also recruit on a uh

4559
02:52:59,670 --> 02:52:57,840
at the colleges and universities for and

4560
02:53:01,590 --> 02:52:59,680
and much of the

4561
02:53:04,389 --> 02:53:01,600
funding for parvin's programs come out

4562
02:53:07,670 --> 02:53:04,399
of the nasa programs ours come out of

4563
02:53:09,910 --> 02:53:07,680

jpl as well and um through those

4564

02:53:11,670 --> 02:53:09,920

combined programs is where we bring in

4565

02:53:14,150 --> 02:53:11,680

you know all the students we hire

4566

02:53:15,830 --> 02:53:14,160

undergraduate graduate and post uh

4567

02:53:18,150 --> 02:53:15,840

doctoral students

4568

02:53:20,309 --> 02:53:18,160

our workforce at jpl we talk about being

4569

02:53:22,469 --> 02:53:20,319

a third or third a third a third phd is

4570

02:53:25,190 --> 02:53:22,479

a third masters and a third

4571

02:53:27,349 --> 02:53:25,200

undergrad so we kind of recruit the full

4572

02:53:30,150 --> 02:53:27,359

gamut you can see the kind of

4573

02:53:33,590 --> 02:53:30,160

opportunities uh that we look for

4574

02:53:37,030 --> 02:53:33,600

and um we've been historically very

4575

02:53:41,110 --> 02:53:37,040

committed um we will hire about a little

4576
02:53:42,790 --> 02:53:41,120
less than 150 between 125 and 140

4577
02:53:45,110 --> 02:53:42,800
students per year

4578
02:53:46,550 --> 02:53:45,120
graduating students a year

4579
02:53:49,110 --> 02:53:46,560
so we

4580
02:53:51,429 --> 02:53:49,120
have five generations of people working

4581
02:53:54,389 --> 02:53:51,439
in the workplace here at jpl and we're

4582
02:53:56,070 --> 02:53:54,399
quite proud of it we are very

4583
02:53:58,150 --> 02:53:56,080
respectful of the people who started the

4584
02:54:00,469 --> 02:53:58,160
space program and were very respectful

4585
02:54:02,630 --> 02:54:00,479
of the people who come out with fresh

4586
02:54:04,630 --> 02:54:02,640
ideas on how to do things so we'd

4587
02:54:06,150 --> 02:54:04,640
welcome you and again we're here and

4588
02:54:14,790 --> 02:54:06,160

thank you for coming it's great to see

4589

02:54:19,429 --> 02:54:17,349

so we have come to the end of our

4590

02:54:22,790 --> 02:54:19,439

journey this morning

4591

02:54:24,389 --> 02:54:22,800

let me take a moment now to acknowledge

4592

02:54:27,429 --> 02:54:24,399

all the schools

4593

02:54:30,070 --> 02:54:27,439

that have sent representatives here

4594

02:54:33,670 --> 02:54:30,080

we are really really grateful to you we

4595

02:54:36,070 --> 02:54:33,680

have seen your excitement we are just as

4596

02:54:39,830 --> 02:54:36,080

excited as you are

4597

02:54:42,469 --> 02:54:39,840

um to to see uh you know to see you

4598

02:54:45,349 --> 02:54:42,479

be part of our family today

4599

02:54:49,349 --> 02:54:45,359

and it was a great pleasure

4600

02:54:50,550 --> 02:54:49,359

i think a lot has been said about

4601

02:54:53,910 --> 02:54:50,560

careers

4602

02:54:56,710 --> 02:54:53,920

about our desire to see you join our

4603

02:54:59,190 --> 02:54:56,720

family i think i just want to quickly

4604

02:55:00,950 --> 02:54:59,200

conclude with a

4605

02:55:04,150 --> 02:55:00,960

movie line