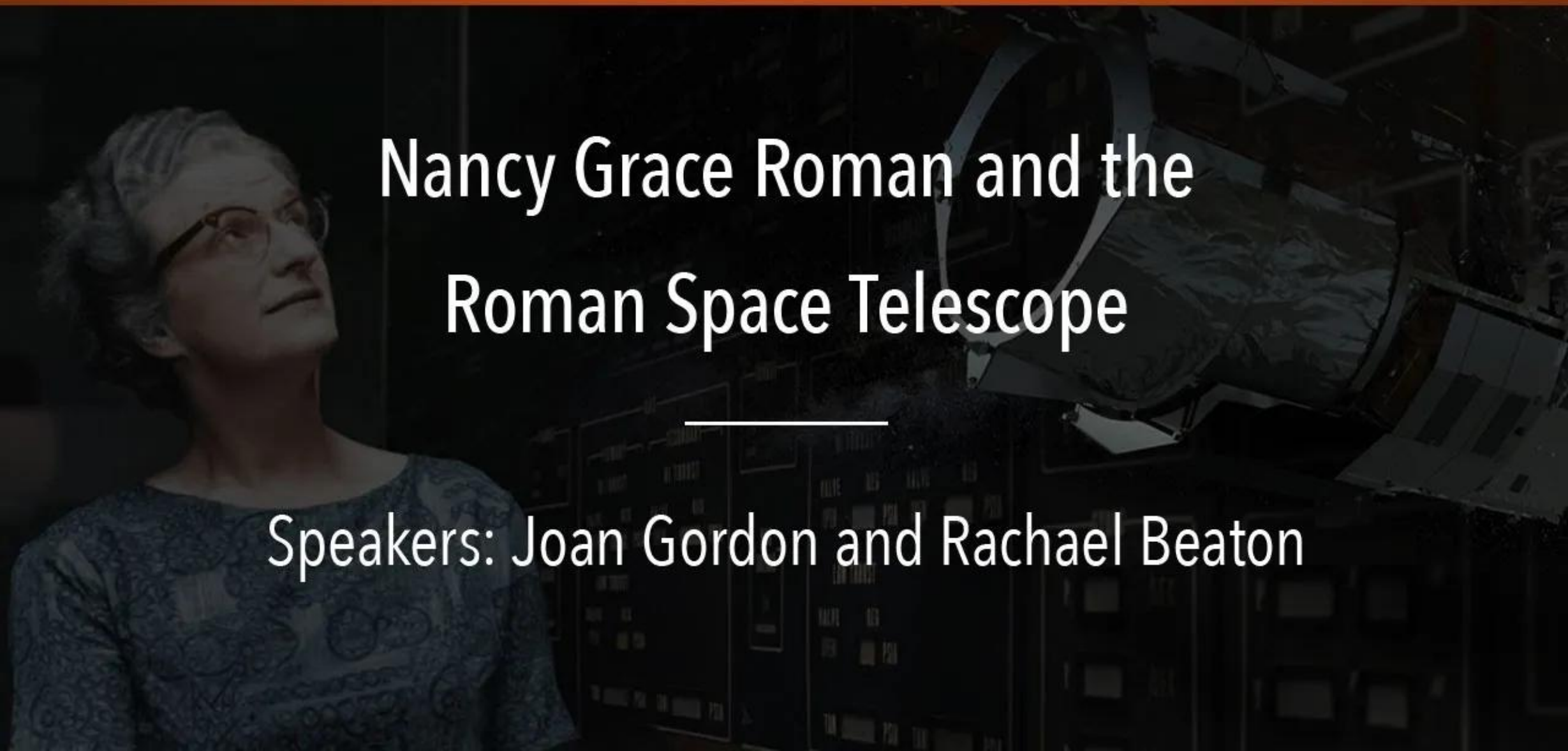
PUBLIC LECTURE SERIES



Nancy Grace Roman and the Roman Space Telescope

Speakers: Joan Gordon and Rachael Beaton

1
00:00:08,509 --> 00:00:06,650
all right welcome everybody Welcome

2
00:00:10,910 --> 00:00:08,519
everybody in the room everybody online

3
00:00:12,530 --> 00:00:10,920
listening to uh this month's Space

4
00:00:13,610 --> 00:00:12,540
Telescope Science Institute public

5
00:00:15,950 --> 00:00:13,620
lecture

6
00:00:18,470 --> 00:00:15,960
we really have a treat uh this month

7
00:00:20,870 --> 00:00:18,480
these public lectures are are usually on

8
00:00:22,849 --> 00:00:20,880
a Cadence that follow um around the

9
00:00:24,290 --> 00:00:22,859
early week of the month

10
00:00:25,970 --> 00:00:24,300
um but we have aligned this public

11
00:00:27,589 --> 00:00:25,980
lecture with a science meeting we are

12
00:00:30,109 --> 00:00:27,599
hosting here at the Space Telescope

13
00:00:32,330 --> 00:00:30,119

Science Institute and so because of that

14
00:00:33,770 --> 00:00:32,340
we have a lot of experts that happen to

15
00:00:35,690 --> 00:00:33,780
be in the room here that are going to

16
00:00:38,810 --> 00:00:35,700
ask wonderful questions from our for our

17
00:00:40,430 --> 00:00:38,820
presenters and we also have a wonderful

18
00:00:42,770 --> 00:00:40,440
guest who I'll introduce in a few

19
00:00:44,150 --> 00:00:42,780
minutes who will talk a bit about Nancy

20
00:00:45,830 --> 00:00:44,160
Grace Roman

21
00:00:50,209 --> 00:00:45,840
um the person not just the Space

22
00:00:52,490 --> 00:00:50,219
Telescope so uh again at csci public

23
00:00:54,889 --> 00:00:52,500
lecture I let me do a few

24
00:00:56,810 --> 00:00:54,899
um housekeeping so I am Brandon lot and

25
00:00:58,490 --> 00:00:56,820
I'm uh I'm a scientist in the office

26
00:01:00,470 --> 00:00:58,500
public Outreach here and I lead our

27
00:01:03,290 --> 00:01:00,480
efforts for Roman science Communications

28
00:01:04,969 --> 00:01:03,300
at Space Telescope and I want a special

29
00:01:06,950 --> 00:01:04,979
thanks to our amazing Tech Team Thomas

30
00:01:08,570 --> 00:01:06,960
marufu and Grant Justice who are in the

31
00:01:11,810 --> 00:01:08,580
back and making sure that this all runs

32
00:01:14,570 --> 00:01:11,820
smoothly so that people online can can

33
00:01:17,990 --> 00:01:15,950
okay

34
00:01:19,010 --> 00:01:18,000
um just a plug of upcoming public

35
00:01:22,190 --> 00:01:19,020
lectures

36
00:01:24,170 --> 00:01:22,200
our next one uh will be on July 11th the

37
00:01:26,810 --> 00:01:24,180
topic will be Stefan's quintet a

38
00:01:29,030 --> 00:01:26,820

multi-wavelength exploration our very

39
00:01:32,210 --> 00:01:29,040
own uh Frank Summers will give that

40
00:01:34,609 --> 00:01:32,220
presentation in August we have the topic

41
00:01:36,530 --> 00:01:34,619
for web Space Telescope the first year

42
00:01:37,670 --> 00:01:36,540
of science it's already been a year of

43
00:01:39,649 --> 00:01:37,680
science

44
00:01:41,569 --> 00:01:39,659
um so we're reaching the the first

45
00:01:42,830 --> 00:01:41,579
anniversary of the first images from

46
00:01:45,469 --> 00:01:42,840
Webb and so we'll have a wonderful

47
00:01:47,990 --> 00:01:45,479
presentation in August on on the first

48
00:01:50,030 --> 00:01:48,000
year of science from web and then on

49
00:01:51,590 --> 00:01:50,040
September 5th uh we have a topic

50
00:01:54,350 --> 00:01:51,600
interstellar medium with the speaker

51
00:01:55,730 --> 00:01:54,360
Alexandra hermanowitz from Space

52
00:01:58,910 --> 00:01:55,740
Telescope

53
00:02:00,649 --> 00:01:58,920
so please join us for those also you can

54
00:02:03,050 --> 00:02:00,659
connect with us you can sign up at the

55
00:02:04,550 --> 00:02:03,060
web on our website at Hubble site you

56
00:02:06,170 --> 00:02:04,560
can subscribe to the YouTube channel we

57
00:02:08,990 --> 00:02:06,180
have all of our previous public lectures

58
00:02:11,510 --> 00:02:09,000
there and you can also submit uh

59
00:02:14,270 --> 00:02:11,520
comments and questions

60
00:02:16,670 --> 00:02:14,280
and we have several social media

61
00:02:18,589 --> 00:02:16,680
channels to get involved depending on um

62
00:02:20,449 --> 00:02:18,599
your interests so of course we have

63
00:02:22,369 --> 00:02:20,459

social media channels aligned with

64
00:02:24,410 --> 00:02:22,379
Hubble's telescope web telescope NASA

65
00:02:28,010 --> 00:02:24,420
Roman and The Space Telescope Science

66
00:02:30,890 --> 00:02:28,020
Institute so you can find us in multiple

67
00:02:33,530 --> 00:02:30,900
places okay

68
00:02:35,630 --> 00:02:33,540
okay so I wanted to just do a couple

69
00:02:36,949 --> 00:02:35,640
slides just to set the stage and then

70
00:02:40,309 --> 00:02:36,959
our speakers are going to take it away

71
00:02:42,170 --> 00:02:40,319
okay so first we are here to talk about

72
00:02:45,229 --> 00:02:42,180
the Nancy Grace Roman Space Telescope

73
00:02:47,390 --> 00:02:45,239
and Nancy Grace Roman so who was Nancy

74
00:02:49,550 --> 00:02:47,400
Grace Roman uh she was NASA's first

75
00:02:55,070 --> 00:02:49,560
chief of astronomy

76
00:02:57,830 --> 00:02:55,080
um she uh joined NASA in the 1950s when

77
00:02:59,509 --> 00:02:57,840
NASA as an agency was only a few months

78
00:03:02,150 --> 00:02:59,519
old so she was in at the very early

79
00:03:05,089 --> 00:03:02,160
stages and she is credited with

80
00:03:07,009 --> 00:03:05,099
shepherding essentially the astrophysics

81
00:03:09,170 --> 00:03:07,019
program and what became of the flagship

82
00:03:12,649 --> 00:03:09,180
astrophysics missions and other

83
00:03:14,690 --> 00:03:12,659
astrophysics Missions at Nasa and so uh

84
00:03:16,190 --> 00:03:14,700
you'll hear more about Nancy Grace Roman

85
00:03:18,890 --> 00:03:16,200
in a few minutes

86
00:03:22,970 --> 00:03:18,900
um but that just sets the stage for for

87
00:03:25,250 --> 00:03:22,980
uh who she was and now the telescope

88
00:03:26,570 --> 00:03:25,260

um for those for those listening to the

89
00:03:29,270 --> 00:03:26,580
public lecture online

90
00:03:31,790 --> 00:03:29,280
um I want to set the stage for comparing

91
00:03:33,050 --> 00:03:31,800
this with uh Hubble and web in some ways

92
00:03:34,490 --> 00:03:33,060
so

93
00:03:36,050 --> 00:03:34,500
one of the important things to think

94
00:03:39,170 --> 00:03:36,060
about for the science of the Nancy Grace

95
00:03:41,750 --> 00:03:39,180
uh Nancy Grace Roman Space Telescope is

96
00:03:43,490 --> 00:03:41,760
is that it is going to be very

97
00:03:45,050 --> 00:03:43,500
complementary and special in its own way

98
00:03:47,390 --> 00:03:45,060
and complementary with web and Hubble

99
00:03:50,449 --> 00:03:47,400
and this is just one way in which we can

100
00:03:52,250 --> 00:03:50,459
show that we have Hubble and Roman you

101
00:03:53,990 --> 00:03:52,260
can see the mirrors the light buckets

102
00:03:55,369 --> 00:03:54,000
that collect the photons from the

103
00:03:57,589 --> 00:03:55,379
Universe

104
00:04:00,170 --> 00:03:57,599
um Hubble and Roman have same size

105
00:04:01,750 --> 00:04:00,180
mirrors Webb has a larger size mirror so

106
00:04:05,210 --> 00:04:01,760
it's very sensitive

107
00:04:06,830 --> 00:04:05,220
to collecting photons from faint objects

108
00:04:09,289 --> 00:04:06,840
in the universe in a particular infrared

109
00:04:12,649 --> 00:04:09,299
sources because it has a very thin layer

110
00:04:15,649 --> 00:04:12,659
of gold and so web is very great at

111
00:04:17,210 --> 00:04:15,659
collecting photons from faint objects in

112
00:04:18,770 --> 00:04:17,220
the in the distant universe or faint

113
00:04:21,469 --> 00:04:18,780

objects in the universe

114
00:04:24,409 --> 00:04:21,479
but then you can see on down here under

115
00:04:26,210 --> 00:04:24,419
wavelength uh they are very these

116
00:04:28,909 --> 00:04:26,220
missions are very complementary Hubble

117
00:04:30,650 --> 00:04:28,919
is not going away anytime soon

118
00:04:33,350 --> 00:04:30,660
um and we certainly hope it keeps going

119
00:04:36,469 --> 00:04:33,360
for many many many many more years and

120
00:04:38,810 --> 00:04:36,479
in a particular Hubble Is Our eye to the

121
00:04:40,610 --> 00:04:38,820
ultraviolet Universe we do not have

122
00:04:42,469 --> 00:04:40,620
another Space Telescope planned in the

123
00:04:44,530 --> 00:04:42,479
in the near term that we'll be able to

124
00:04:46,969 --> 00:04:44,540
do what Hubble can do

125
00:04:48,590 --> 00:04:46,979
Hubble of course also observes through

126
00:04:51,290 --> 00:04:48,600
the visible spectrum and into the

127
00:04:53,390 --> 00:04:51,300
near-infrared Roman is sort of in this

128
00:04:56,090 --> 00:04:53,400
little sweet spot here and between

129
00:04:57,710 --> 00:04:56,100
visible and near ir and then web goes

130
00:05:00,050 --> 00:04:57,720
way out into the infrared into the mid

131
00:05:01,749 --> 00:05:00,060
infrared okay and so Webb has

132
00:05:04,370 --> 00:05:01,759
capabilities again

133
00:05:06,710 --> 00:05:04,380
that is provided by going into those

134
00:05:09,350 --> 00:05:06,720
larger wavelength regime

135
00:05:10,370 --> 00:05:09,360
all right so what Roman really brings to

136
00:05:13,550 --> 00:05:10,380
the table

137
00:05:14,990 --> 00:05:13,560
is that it's a survey telespace

138
00:05:17,330 --> 00:05:15,000

telescope

139
00:05:19,430 --> 00:05:17,340
Roman will have hubble-like resolution

140
00:05:21,890 --> 00:05:19,440
hubble-like equality data in the near

141
00:05:24,350 --> 00:05:21,900
infrared but it will have about 200

142
00:05:26,510 --> 00:05:24,360
times Hubble's infrared view of the

143
00:05:28,129 --> 00:05:26,520
universe and so that's what we call its

144
00:05:30,529 --> 00:05:28,139
field of view and so that's what you see

145
00:05:33,050 --> 00:05:30,539
in the upper right is you see that funny

146
00:05:35,210 --> 00:05:33,060
shape there that's the collect that's

147
00:05:37,850 --> 00:05:35,220
the that's the collected field of view

148
00:05:40,070 --> 00:05:37,860
of the 18 detectors on Romans wide field

149
00:05:42,469 --> 00:05:40,080
instrument camera and that's what it can

150
00:05:44,029 --> 00:05:42,479
see in one pointing and here for a

151
00:05:46,189 --> 00:05:44,039
comparison you can see what Hubble and

152
00:05:48,830 --> 00:05:46,199
Webb can see in one pointing so really

153
00:05:52,670 --> 00:05:48,840
Roman is going to be instrumental pun

154
00:05:55,790 --> 00:05:52,680
intended for building up maps of the

155
00:05:58,969 --> 00:05:55,800
universe at high resolution it's going

156
00:06:01,189 --> 00:05:58,979
to be a much faster Space Telescope than

157
00:06:03,290 --> 00:06:01,199
Hubble and Webb it will be able to take

158
00:06:05,810 --> 00:06:03,300
an image move very quickly take an image

159
00:06:08,990 --> 00:06:05,820
very quickly and build up these really

160
00:06:11,510 --> 00:06:09,000
high resolution Maps and so these three

161
00:06:13,189 --> 00:06:11,520
observatories working together are

162
00:06:15,710 --> 00:06:13,199
really going to feed a lot of our

163
00:06:18,590 --> 00:06:15,720

understanding of astrophysics throughout

164
00:06:20,870 --> 00:06:18,600
the 2020s and into the 2030s

165
00:06:21,469 --> 00:06:20,880
and so with that context

166
00:06:24,650 --> 00:06:21,479
um

167
00:06:26,990 --> 00:06:24,660
I just want to introduce our first

168
00:06:29,749 --> 00:06:27,000
speaker

169
00:06:34,129 --> 00:06:29,759
so I would I want to introduce Dr Joan

170
00:06:36,590 --> 00:06:34,139
Gordon so Joan got her PhD in 1982 from

171
00:06:39,350 --> 00:06:36,600
the Ohio State University in Psychology

172
00:06:41,870 --> 00:06:39,360
and she met Nancy Grace Roman through

173
00:06:43,790 --> 00:06:41,880
her aunt who was a member in the

174
00:06:45,770 --> 00:06:43,800
American Association of University women

175
00:06:47,570 --> 00:06:45,780
with Nancy

176
00:06:49,490 --> 00:06:47,580
and Joan became a close friend of

177
00:06:50,270 --> 00:06:49,500
Nancy's uh later in life in her later

178
00:06:52,969 --> 00:06:50,280
years

179
00:06:54,590 --> 00:06:52,979
and after Nancy's death Joan authored

180
00:06:56,809 --> 00:06:54,600
the press release for the Associated

181
00:06:59,469 --> 00:06:56,819
Press and co-produced the segment aired

182
00:07:02,870 --> 00:06:59,479
on Sunday today with Willie Geist

183
00:07:04,430 --> 00:07:02,880
Joan will be sharing a personal side of

184
00:07:11,809 --> 00:07:04,440
Nancy with you all

185
00:07:16,850 --> 00:07:14,689
thank you thank you I just want to make

186
00:07:21,830 --> 00:07:16,860
sure everybody can hear

187
00:07:26,210 --> 00:07:23,390
so we're just getting so I just only

188
00:07:29,689 --> 00:07:26,220

have a few slides to share the kind of

189
00:07:34,249 --> 00:07:29,699
like keep me on point so I don't drift

190
00:07:38,029 --> 00:07:34,259
into outer space no pun intended

191
00:07:40,370 --> 00:07:38,039
all right thank you and here um I know

192
00:07:43,370 --> 00:07:40,380
her and please forgive me if I call her

193
00:07:46,790 --> 00:07:43,380
Nancy Grace I'll try to say Dr Roman as

194
00:07:49,670 --> 00:07:46,800
as much as possible but I know her as a

195
00:07:53,450 --> 00:07:49,680
family and as as friend we're not blood

196
00:07:56,510 --> 00:07:53,460
related but we were so close she was

197
00:08:02,809 --> 00:07:56,520
like a second mom for me

198
00:08:02,819 --> 00:08:06,110
let's see

199
00:08:13,309 --> 00:08:10,430
or if it's this way there we go try it

200
00:08:14,689 --> 00:08:13,319
one more time okay to the left or to the

201
00:08:20,390 --> 00:08:14,699
right

202
00:08:22,670 --> 00:08:20,400
so I'm going to play a video

203
00:08:24,650 --> 00:08:22,680
um that Nassau produced it's less than

204
00:08:27,830 --> 00:08:24,660
seven minutes but it talks about her

205
00:08:29,930 --> 00:08:27,840
entire life and some of her aspirations

206
00:08:33,829 --> 00:08:29,940
and all and then from that I'm going to

207
00:08:41,889 --> 00:08:33,839
share stories about Nancy Grace Dr Roman

208
00:08:41,899 --> 00:08:54,050
let's go

209
00:08:54,060 --> 00:09:09,670
sorry it's okay

210
00:09:16,490 --> 00:09:13,550
we may need an it911 so while they're

211
00:09:19,730 --> 00:09:16,500
doing that let me just give you my

212
00:09:21,829 --> 00:09:19,740
background so I did my work at the Ohio

213
00:09:23,750 --> 00:09:21,839

State University I got my doctorate and

214
00:09:26,630 --> 00:09:23,760
my Master's there in instructional

215
00:09:29,930 --> 00:09:26,640
television and in Psychology and

216
00:09:31,130 --> 00:09:29,940
cultural anthropology for fast forward I

217
00:09:33,110 --> 00:09:31,140
mean it's been a number of years in

218
00:09:35,090 --> 00:09:33,120
Corporate America working for IBM

219
00:09:37,070 --> 00:09:35,100
working for what was in Lucent

220
00:09:39,470 --> 00:09:37,080
Technologies and then for the past 13

221
00:09:42,530 --> 00:09:39,480
years I've been in the military health

222
00:09:44,269 --> 00:09:42,540
system most of the time working at

223
00:09:46,910 --> 00:09:44,279
Walter Reed National military Medical

224
00:09:49,910 --> 00:09:46,920
Center so when they did the big merger

225
00:09:52,250 --> 00:09:49,920
between the Army Walter Reed and with

226
00:09:54,470 --> 00:09:52,260
the national Naval Medical Center I had

227
00:09:56,690 --> 00:09:54,480
overall responsibility of training

228
00:09:58,670 --> 00:09:56,700
thousands of people who would either

229
00:10:01,130 --> 00:09:58,680
work at Walter Reed National military

230
00:10:04,009 --> 00:10:01,140
Medical Center or go down to Fort

231
00:10:14,690 --> 00:10:04,019
Belvoir Community Hospital the lady

232
00:10:20,650 --> 00:10:16,610
we want to see the video you need to

233
00:10:26,520 --> 00:10:24,170
what lady would take mathematics instead

234
00:10:34,430 --> 00:10:26,530
of Latin

235
00:10:37,430 --> 00:10:36,710
the idea of Hubble was something that

236
00:10:40,009 --> 00:10:37,440
was

237
00:10:42,590 --> 00:10:40,019
among the astronomical Community for

238
00:10:45,949 --> 00:10:42,600

Generations it was not something that

239
00:10:48,769 --> 00:10:45,959
was new astronomers badly wanted a large

240
00:10:51,590 --> 00:10:48,779
telescope above the atmosphere well I

241
00:10:53,990 --> 00:10:51,600
decided that if the aerospace companies

242
00:10:56,449 --> 00:10:54,000
were going to put a lot of money into

243
00:10:59,449 --> 00:10:56,459
designing a telescope they might as well

244
00:11:01,910 --> 00:10:59,459
design one that made sense so what I did

245
00:11:03,710 --> 00:11:01,920
was to bring together a collection of

246
00:11:06,530 --> 00:11:03,720
astronomers from all over the country

247
00:11:09,290 --> 00:11:06,540
trying to represent a variety of things

248
00:11:12,230 --> 00:11:09,300
that we might do with the telescope and

249
00:11:15,410 --> 00:11:12,240
to bring and some NASA engineers and get

250
00:11:16,910 --> 00:11:15,420
them to sit down together and come up

251
00:11:18,829 --> 00:11:16,920
with something that the engineers

252
00:11:20,760 --> 00:11:18,839
thought would work and that the

253
00:11:24,170 --> 00:11:20,770
astronomers thought would do their job

254
00:11:29,410 --> 00:11:25,100
foreign

255
00:11:34,970 --> 00:11:32,569
I just wanted to satisfy my curiosity

256
00:11:37,430 --> 00:11:34,980
and astronomy in particular was the

257
00:11:39,769 --> 00:11:37,440
subject I wanted to learn more about I

258
00:11:41,090 --> 00:11:39,779
blamed my mother because she used to

259
00:11:43,370 --> 00:11:41,100
take me out and show me the

260
00:11:45,769 --> 00:11:43,380
constellations and show me the Northern

261
00:11:48,889 --> 00:11:45,779
Lights things like that I just was

262
00:11:51,889 --> 00:11:48,899
fascinated went between fifth and sixth

263
00:11:53,810 --> 00:11:51,899

grade I organized my friends into an

264
00:11:56,990 --> 00:11:53,820
astronomy club to study the

265
00:11:59,750 --> 00:11:57,000
constellations and by seventh grade I

266
00:12:01,670 --> 00:11:59,760
decided I wanted to be an astronomer and

267
00:12:03,650 --> 00:12:01,680
I was going to try for it I knew it was

268
00:12:06,710 --> 00:12:03,660
going to take me another 12 years of

269
00:12:08,569 --> 00:12:06,720
schooling but I figured I'd try and if I

270
00:12:11,389 --> 00:12:08,579
didn't make it I could probably could

271
00:12:13,190 --> 00:12:11,399
teach physics or math in high school I

272
00:12:15,710 --> 00:12:13,200
certainly did not receive any

273
00:12:18,530 --> 00:12:15,720
encouragement I was told from the

274
00:12:21,310 --> 00:12:18,540
beginning that women could not be

275
00:12:24,050 --> 00:12:21,320
scientists in high school one of the

276
00:12:26,090 --> 00:12:24,060
experiences I remember is I asked my

277
00:12:29,090 --> 00:12:26,100
guidance counselor for permission to

278
00:12:31,790 --> 00:12:29,100
take a second year of algebra instead of

279
00:12:34,490 --> 00:12:31,800
a fifth year of Latin and she looked

280
00:12:37,069 --> 00:12:34,500
down her nose at me and sneered what

281
00:12:42,110 --> 00:12:37,079
lady would take mathematics instead of

282
00:12:45,290 --> 00:12:42,120
Latin the first encouragement I got was

283
00:12:47,150 --> 00:12:45,300
in my junior year at College when the

284
00:12:50,870 --> 00:12:47,160
head of the physics department came up

285
00:12:52,970 --> 00:12:50,880
to me in lab one day and said you know I

286
00:12:57,410 --> 00:12:52,980
usually try to talk women out of going

287
00:12:58,910 --> 00:12:57,420
into physics but I think maybe you might

288
00:13:02,090 --> 00:12:58,920

make it

289
00:13:04,250 --> 00:13:02,100
by a big astronomical research area when

290
00:13:07,610 --> 00:13:04,260
I started out was what they call

291
00:13:10,069 --> 00:13:07,620
Spectral classification looking at stars

292
00:13:12,410 --> 00:13:10,079
spreading the light out into a rainbow

293
00:13:15,170 --> 00:13:12,420
so that you can see the different colors

294
00:13:17,150 --> 00:13:15,180
separately what I started out doing was

295
00:13:20,509 --> 00:13:17,160
looking at these Spectra looking at

296
00:13:22,490 --> 00:13:20,519
these rainbows and deciding the

297
00:13:25,009 --> 00:13:22,500
temperature and the brightness of the

298
00:13:27,110 --> 00:13:25,019
stars and then I was trying to find out

299
00:13:28,310 --> 00:13:27,120
how far away they were and how they

300
00:13:32,030 --> 00:13:28,320
moved

301
00:13:34,250 --> 00:13:32,040
my thesis Professor was one I often

302
00:13:36,650 --> 00:13:34,260
didn't get the support that I'd expected

303
00:13:38,690 --> 00:13:36,660
there was a period in which he went for

304
00:13:40,970 --> 00:13:38,700
six months without speaking to me even

305
00:13:42,470 --> 00:13:40,980
when I said hello to him in the hall he

306
00:13:47,870 --> 00:13:42,480
didn't want to have anything to do with

307
00:13:53,269 --> 00:13:50,870
I didn't think I could get tenure as a

308
00:13:55,730 --> 00:13:53,279
research astronomer I didn't think I

309
00:13:58,610 --> 00:13:55,740
could stay as I say in the academic

310
00:14:00,769 --> 00:13:58,620
Community because I looked around in the

311
00:14:02,810 --> 00:14:00,779
I think there was one other woman in

312
00:14:06,949 --> 00:14:02,820
astronomy who had tenure in this country

313
00:14:08,269 --> 00:14:06,959

but I saw a very uh senior women who

314
00:14:10,970 --> 00:14:08,279
didn't have it

315
00:14:13,850 --> 00:14:10,980
when NASA came along and offered me a

316
00:14:18,949 --> 00:14:13,860
job I decided to take it I started in

317
00:14:21,470 --> 00:14:18,959
NASA in 1959 it was six months old when

318
00:14:24,470 --> 00:14:21,480
I joined the government I was hired as a

319
00:14:26,389 --> 00:14:24,480
fresh PhD in spite of the fact that I

320
00:14:30,009 --> 00:14:26,399
had not only six years of experience

321
00:14:33,170 --> 00:14:30,019
with an international reputation and

322
00:14:36,230 --> 00:14:33,180
afterwards they understood the reason my

323
00:14:39,050 --> 00:14:36,240
salary at the University was so low that

324
00:14:41,689 --> 00:14:39,060
Civil Service did not recognize it as a

325
00:14:44,509 --> 00:14:41,699
professional experience being the first

326
00:14:45,970 --> 00:14:44,519
executive woman at Nasa turned out not

327
00:14:51,410 --> 00:14:45,980
to be terribly

328
00:14:54,230 --> 00:14:51,420
eventful I was accepted very readily as

329
00:14:56,569 --> 00:14:54,240
a scientist and as in my job the men

330
00:14:58,490 --> 00:14:56,579
were very Cooperative then I felt that

331
00:15:01,189 --> 00:14:58,500
the men treated me as one of the team

332
00:15:05,329 --> 00:15:01,199
without a problem Civil Service had

333
00:15:09,170 --> 00:15:05,339
rewards for outstanding work

334
00:15:11,030 --> 00:15:09,180
but it was they were limited to men to

335
00:15:14,689 --> 00:15:11,040
someone who decided that there should be

336
00:15:17,449 --> 00:15:14,699
something for women in 1962. I received

337
00:15:19,670 --> 00:15:17,459
a federal women's award we all met with

338
00:15:24,650 --> 00:15:19,680

Kennedy in the course of receiving the

339
00:15:30,710 --> 00:15:27,590
I'm happy about the fact that women can

340
00:15:35,290 --> 00:15:30,720
get senior jobs now and they're not

341
00:15:38,210 --> 00:15:35,300
being quite as as discouraged as I was

342
00:15:40,790 --> 00:15:38,220
but I think the two things that I would

343
00:15:43,790 --> 00:15:40,800
like to see change one is sell risk

344
00:15:46,189 --> 00:15:43,800
salaries are still not equal

345
00:15:50,930 --> 00:15:46,199
and the other thing is I'd like to see

346
00:15:53,810 --> 00:15:50,940
more uniform women across the ranks

347
00:15:55,250 --> 00:15:53,820
women can get into senior positions in

348
00:15:57,470 --> 00:15:55,260
astronomy now

349
00:15:59,910 --> 00:15:57,480
but they're percentage-wise there's

350
00:16:02,389 --> 00:15:59,920
still few at the high levels

351
00:16:05,990 --> 00:16:02,399
[Music]

352
00:16:08,810 --> 00:16:06,000
it's hard to to decide how history will

353
00:16:11,569 --> 00:16:08,820
view my accomplishments people generally

354
00:16:13,189 --> 00:16:11,579
aren't terribly interested in what gets

355
00:16:15,170 --> 00:16:13,199
saved started

356
00:16:17,150 --> 00:16:15,180
and so I'm not sure they're going to

357
00:16:32,389 --> 00:16:17,160
have much of an idea of my rule

358
00:16:32,399 --> 00:16:46,610
foreign

359
00:16:46,620 --> 00:16:49,550
it's okay

360
00:16:54,290 --> 00:16:51,410
great thank you

361
00:16:57,350 --> 00:16:54,300
so I thought that would do a much better

362
00:17:00,110 --> 00:16:57,360
job about Nancy Grace Roman and her

363
00:17:02,170 --> 00:17:00,120

career versus me going through what she

364
00:17:05,449 --> 00:17:02,180
had shared with me I'll share some

365
00:17:08,510 --> 00:17:05,459
stories in relation to her career and

366
00:17:10,970 --> 00:17:08,520
personal things as well so here I have

367
00:17:13,610 --> 00:17:10,980
it as she was family and friend

368
00:17:14,829 --> 00:17:13,620
especially in the later lives in her

369
00:17:17,689 --> 00:17:14,839
later life

370
00:17:20,689 --> 00:17:17,699
I spent a lot of time with her because

371
00:17:23,510 --> 00:17:20,699
she and my aunt stayed in an independent

372
00:17:26,329 --> 00:17:23,520
living she had her apartment my aunt had

373
00:17:29,210 --> 00:17:26,339
hers and so whatever I would visit I had

374
00:17:31,370 --> 00:17:29,220
to visit both whenever we had dinner we

375
00:17:33,350 --> 00:17:31,380
would have dinner together we had dinner

376
00:17:36,230 --> 00:17:33,360
together for Thanksgiving and Christmas

377
00:17:39,529 --> 00:17:36,240
year after year after year where when

378
00:17:42,370 --> 00:17:39,539
they dwelled in the same place

379
00:17:46,010 --> 00:17:42,380
so I really got to know Nancy Grace then

380
00:17:49,130 --> 00:17:46,020
I met her back in 2006 I had heard of

381
00:17:51,529 --> 00:17:49,140
her but I met her then and I would take

382
00:17:54,110 --> 00:17:51,539
her to some recognition programs or

383
00:17:55,909 --> 00:17:54,120
places where she was judging

384
00:17:58,190 --> 00:17:55,919
competitions

385
00:18:00,650 --> 00:17:58,200
Etc in The Sciences

386
00:18:03,409 --> 00:18:00,660
and then I got to get to know her even

387
00:18:05,570 --> 00:18:03,419
much later

388
00:18:08,570 --> 00:18:05,580

so I knew her through my art and this is

389
00:18:10,730 --> 00:18:08,580
my aunt over here and they met at the

390
00:18:13,789 --> 00:18:10,740
American Association of University women

391
00:18:16,850 --> 00:18:13,799
back in the 70s and they served on

392
00:18:20,810 --> 00:18:16,860
committees together they created a

393
00:18:23,510 --> 00:18:20,820
memoir group and so Dr Roman let me keep

394
00:18:26,750 --> 00:18:23,520
saying Dr Roman had some Memoirs that I

395
00:18:28,970 --> 00:18:26,760
don't know where they are right now but

396
00:18:30,890 --> 00:18:28,980
she wrote a lot of things about her life

397
00:18:33,289 --> 00:18:30,900
I know that she was working with

398
00:18:34,370 --> 00:18:33,299
somebody who was going to do a biography

399
00:18:37,549 --> 00:18:34,380
of her

400
00:18:39,470 --> 00:18:37,559
has anyone heard anything about that

401
00:18:41,690 --> 00:18:39,480
I didn't I didn't get her name I

402
00:18:44,390 --> 00:18:41,700
remember her telling me that

403
00:18:46,190 --> 00:18:44,400
so they they met there and I used to go

404
00:18:48,770 --> 00:18:46,200
to the meetings with them or take them

405
00:18:51,049 --> 00:18:48,780
to the meetings more of that and so I

406
00:18:53,090 --> 00:18:51,059
got a chance to know her even better and

407
00:18:56,390 --> 00:18:53,100
another thing was Explorer vision and

408
00:18:57,770 --> 00:18:56,400
that was a competition for kids like

409
00:19:01,010 --> 00:18:57,780
Middle School through High School

410
00:19:03,830 --> 00:19:01,020
between Toshiba and the National Science

411
00:19:06,590 --> 00:19:03,840
teaching Association she was one of the

412
00:19:09,350 --> 00:19:06,600
judges and these kids would come up with

413
00:19:12,110 --> 00:19:09,360

solution scientific solutions to

414
00:19:14,330 --> 00:19:12,120
problems and what was really neat and

415
00:19:18,409 --> 00:19:14,340
going here is that because that started

416
00:19:20,510 --> 00:19:18,419
in 92 you would hear from graduates who

417
00:19:23,510 --> 00:19:20,520
have gone on to medicine or anything

418
00:19:25,490 --> 00:19:23,520
else and how it started there and then

419
00:19:26,570 --> 00:19:25,500
they did a lot of

420
00:19:29,330 --> 00:19:26,580
uh

421
00:19:32,029 --> 00:19:29,340
sayings in terms of what Nancy Grace had

422
00:19:33,710 --> 00:19:32,039
inspired them so usually after these

423
00:19:36,289 --> 00:19:33,720
sessions she was always surrounded by

424
00:19:40,310 --> 00:19:36,299
kids and they were under autograph or

425
00:19:45,409 --> 00:19:42,289
this was one of the things she was

426
00:19:48,590 --> 00:19:45,419
really proud of with the the Legos

427
00:19:51,470 --> 00:19:48,600
and so I told her I said well I know

428
00:19:53,690 --> 00:19:51,480
that she's very interested in setting up

429
00:19:57,169 --> 00:19:53,700
funding for women who wanted to pursue

430
00:19:58,970 --> 00:19:57,179
the sciences and so I I recommended I

431
00:20:01,250 --> 00:19:58,980
said well listen from the sale of this

432
00:20:04,850 --> 00:20:01,260
maybe a proceed of that can go toward it

433
00:20:07,250 --> 00:20:04,860
I don't know if that really happened but

434
00:20:12,650 --> 00:20:07,260
she was really really excited and

435
00:20:18,650 --> 00:20:14,870
now I'm just going to talk about her as

436
00:20:20,289 --> 00:20:18,660
the person tenacious resilient and a

437
00:20:23,750 --> 00:20:20,299
trailblazer

438
00:20:25,630 --> 00:20:23,760

tenacious I remember her telling me how

439
00:20:28,310 --> 00:20:25,640
she knew she wasn't going to get tenure

440
00:20:31,789 --> 00:20:28,320
and so it was like okay so what am I

441
00:20:33,470 --> 00:20:31,799
going to do and then she met someone who

442
00:20:35,810 --> 00:20:33,480
said that he was looking for somebody to

443
00:20:39,289 --> 00:20:35,820
work at Nasa within the next six months

444
00:20:41,930 --> 00:20:39,299
and then she was hired tenacious from a

445
00:20:45,470 --> 00:20:41,940
personal side it was very cold to see

446
00:20:47,450 --> 00:20:45,480
maybe it was back in 2016 and we were

447
00:20:49,250 --> 00:20:47,460
concerned that she needed a new winter

448
00:20:57,350 --> 00:20:49,260
coat

449
00:21:02,630 --> 00:21:00,230
I wanted to get one so that it gathered

450
00:21:05,570 --> 00:21:02,640
and the cold wouldn't go you know in and

451
00:21:07,669 --> 00:21:05,580
I tried on all these coats all excited

452
00:21:09,350 --> 00:21:07,679
about I called her down to my aunt's

453
00:21:13,490 --> 00:21:09,360
apartment and I said I have something

454
00:21:16,850 --> 00:21:13,500
for you and so I bought a hat scarf and

455
00:21:18,950 --> 00:21:16,860
matching gloves with it and I said well

456
00:21:21,529 --> 00:21:18,960
listen I think this this can really help

457
00:21:24,049 --> 00:21:21,539
you you should you should take this oh

458
00:21:26,450 --> 00:21:24,059
no I can't take this oh no no I already

459
00:21:28,610 --> 00:21:26,460
have a winter coat I don't need this I

460
00:21:31,190 --> 00:21:28,620
said if you would just please try it on

461
00:21:34,250 --> 00:21:31,200
for me I'd spent a long time trying to

462
00:21:37,010 --> 00:21:34,260
get this coat and then she put it on and

463
00:21:39,770 --> 00:21:37,020

she said you know no one's ever done

464
00:21:42,890 --> 00:21:39,780
anything like this for me

465
00:21:44,930 --> 00:21:42,900
but she wouldn't take it and I think the

466
00:21:47,990 --> 00:21:44,940
reason why oh yeah I was really really

467
00:21:50,149 --> 00:21:48,000
upset but I couldn't show it that much

468
00:21:51,590 --> 00:21:50,159
but anyway because we both were like you

469
00:21:53,090 --> 00:21:51,600
know you're gonna take this coat no I'm

470
00:21:53,810 --> 00:21:53,100
not you're gonna take it you know I'm

471
00:21:56,810 --> 00:21:53,820
not

472
00:21:58,909 --> 00:21:56,820
and so I think she really didn't want to

473
00:22:02,330 --> 00:21:58,919
take advantage of my quote-unquote

474
00:22:04,669 --> 00:22:02,340
kindness and I said but we're family and

475
00:22:05,870 --> 00:22:04,679
I'm doing this for you don't worry I

476
00:22:08,090 --> 00:22:05,880
said I don't you know I don't want you

477
00:22:10,190 --> 00:22:08,100
to pay for it or anything I just want to

478
00:22:11,690 --> 00:22:10,200
make sure that you're warm because she

479
00:22:15,470 --> 00:22:11,700
used to take that shuttle and go

480
00:22:18,230 --> 00:22:15,480
everywhere shopping to the Kennedy

481
00:22:20,090 --> 00:22:18,240
Center and I just wanted her warm

482
00:22:22,310 --> 00:22:20,100
she won that one

483
00:22:25,029 --> 00:22:22,320
so that was so I said okay yeah she's

484
00:22:28,490 --> 00:22:25,039
tenacious there was another incident

485
00:22:31,130 --> 00:22:28,500
where her lamp wasn't working

486
00:22:34,789 --> 00:22:33,289
okay either we can go on Amazon but I

487
00:22:38,149 --> 00:22:34,799
think I'm just going to go and get you a

488
00:22:40,970 --> 00:22:38,159

new lamp and she said you will not you

489
00:22:43,130 --> 00:22:40,980
will not get me a lamp we are going to

490
00:22:46,070 --> 00:22:43,140
fix this lamp we're going to repair this

491
00:22:49,070 --> 00:22:46,080
lamp and you're going to help me and

492
00:22:51,470 --> 00:22:49,080
then she said my father raised me to be

493
00:22:54,169 --> 00:22:51,480
independent and my father taught me who

494
00:22:56,870 --> 00:22:54,179
in her father was a scientist he taught

495
00:23:00,049 --> 00:22:56,880
me how to fix a lamp and I'm going to

496
00:23:01,490 --> 00:23:00,059
teach you so she wrote everything out

497
00:23:04,250 --> 00:23:01,500
that had to go to the local hardware

498
00:23:07,190 --> 00:23:04,260
store not Home Depot or any new I had to

499
00:23:10,610 --> 00:23:07,200
go to the local hardware store and I got

500
00:23:13,610 --> 00:23:10,620
whatever she needed and we was we sat at

501
00:23:16,070 --> 00:23:13,620
her dining room table with this lamp and

502
00:23:18,770 --> 00:23:16,080
we replaced the wiring to it and she

503
00:23:23,270 --> 00:23:18,780
taught me how to do that she was

504
00:23:25,430 --> 00:23:23,280
extremely proud but in a humble way but

505
00:23:27,230 --> 00:23:25,440
very resourceful

506
00:23:29,630 --> 00:23:27,240
so that was one of the things so I said

507
00:23:32,870 --> 00:23:29,640
okay I'm glad that I learned how to do

508
00:23:35,210 --> 00:23:32,880
that when I would visit now we have

509
00:23:37,430 --> 00:23:35,220
grocery stores right

510
00:23:40,250 --> 00:23:37,440
she thought her refrigerator was a

511
00:23:43,010 --> 00:23:40,260
grocery store for me and so she would go

512
00:23:46,430 --> 00:23:43,020
to her refrigerator she'd call me Joni

513
00:23:48,470 --> 00:23:46,440

not Joan but Joni here take this here I

514
00:23:49,909 --> 00:23:48,480
got extra this and blah blah blah blah

515
00:23:52,850 --> 00:23:49,919
blah you know I think you should have

516
00:23:54,470 --> 00:23:52,860
this uh take this home with you and I'm

517
00:23:57,230 --> 00:23:54,480
want to say do I look like I'm not

518
00:23:59,690 --> 00:23:57,240
eating or you know what's the problem

519
00:24:00,950 --> 00:23:59,700
so what I did with her I said okay

520
00:24:02,990 --> 00:24:00,960
because I used to do some of the

521
00:24:05,330 --> 00:24:03,000
shopping if she wasn't able to do it I

522
00:24:08,510 --> 00:24:05,340
realized let me just shop just enough

523
00:24:10,669 --> 00:24:08,520
for her not get a whole lot that she

524
00:24:14,090 --> 00:24:10,679
would want to share with me

525
00:24:15,950 --> 00:24:14,100
so I said that that fixed that problem

526
00:24:18,529 --> 00:24:15,960
I was the one that helped her with her

527
00:24:20,930 --> 00:24:18,539
computer if she had problems with the

528
00:24:23,450 --> 00:24:20,940
printer and she wouldn't have maybe I

529
00:24:25,370 --> 00:24:23,460
shouldn't say this but sometimes she

530
00:24:28,430 --> 00:24:25,380
would share some of the Nassau things

531
00:24:32,270 --> 00:24:28,440
with me and I was totally amazed that

532
00:24:35,149 --> 00:24:32,280
wasn't confidential okay it wasn't

533
00:24:37,250 --> 00:24:35,159
I don't I don't want to get arrested or

534
00:24:40,430 --> 00:24:37,260
anything like that

535
00:24:43,370 --> 00:24:40,440
I was totally she's telling me certain

536
00:24:44,990 --> 00:24:43,380
things and even on the tour today it

537
00:24:48,649 --> 00:24:45,000
reminded me of the things she shared

538
00:24:50,990 --> 00:24:48,659

with me and I I was just like I kind of

539
00:24:53,390 --> 00:24:51,000
like tuned her out because I was so

540
00:24:55,730 --> 00:24:53,400
amazed with what I was seeing I said I

541
00:24:57,710 --> 00:24:55,740
said oh my goodness this is amazing and

542
00:25:00,830 --> 00:24:57,720
she's like yeah yeah yeah okay we're

543
00:25:03,049 --> 00:25:00,840
used to it and so I used to go up and

544
00:25:05,090 --> 00:25:03,059
spend hours which would make my aunt a

545
00:25:07,130 --> 00:25:05,100
little bit jealous because I was

546
00:25:09,770 --> 00:25:07,140
spending so much time up there I was

547
00:25:10,549 --> 00:25:09,780
learning I was like a sponge with this

548
00:25:14,390 --> 00:25:10,559
stuff

549
00:25:17,390 --> 00:25:14,400
uh she had a special cabinet with all of

550
00:25:20,330 --> 00:25:17,400
her slides I mean thousands of slides so

551
00:25:23,510 --> 00:25:20,340
I'm hoping that NASA has some of them

552
00:25:25,190 --> 00:25:23,520
because I know she would want NASA to

553
00:25:27,830 --> 00:25:25,200
have them

554
00:25:30,289 --> 00:25:27,840
whenever she got ill

555
00:25:32,570 --> 00:25:30,299
call me or there they would call me up

556
00:25:36,110 --> 00:25:32,580
and I would go to the hospital

557
00:25:38,990 --> 00:25:36,120
and so uh like if she's in the ER or the

558
00:25:42,470 --> 00:25:39,000
ICU usually those places are limited to

559
00:25:44,810 --> 00:25:42,480
family so I would show up and they would

560
00:25:47,090 --> 00:25:44,820
say oh your mom is in cubicle such and

561
00:25:48,970 --> 00:25:47,100
so and so and I said well you know I

562
00:25:51,250 --> 00:25:48,980
didn't think I looked like Nancy Grace

563
00:25:54,529 --> 00:25:51,260

but that's okay

564
00:25:58,190 --> 00:25:54,539
she would not she would not correct them

565
00:26:00,169 --> 00:25:58,200
okay and so I remember going into the ER

566
00:26:02,090 --> 00:26:00,179
she for whatever reason they were trying

567
00:26:05,149 --> 00:26:02,100
to get her ready for an MRI she wouldn't

568
00:26:07,370 --> 00:26:05,159
drink the water so I walk in there and

569
00:26:10,130 --> 00:26:07,380
it's close to midnight and the woman

570
00:26:12,890 --> 00:26:10,140
said oh I'm so glad you're here maybe

571
00:26:15,169 --> 00:26:12,900
you can get her to drink some water

572
00:26:17,630 --> 00:26:15,179
and so I grabbed the water and I said

573
00:26:19,190 --> 00:26:17,640
that you know you need this water you

574
00:26:20,690 --> 00:26:19,200
know you need this so that we can go

575
00:26:22,669 --> 00:26:20,700
through you know the next phase of

576
00:26:24,169 --> 00:26:22,679
whatever we're trying to do and she

577
00:26:26,390 --> 00:26:24,179
would drink it I said even if it's just

578
00:26:28,909 --> 00:26:26,400
a little bit at a time so she would

579
00:26:31,070 --> 00:26:28,919
drink it for me so people got to the

580
00:26:33,769 --> 00:26:31,080
point like if you need Nancy Grace to do

581
00:26:36,049 --> 00:26:33,779
something get her daughter she'll

582
00:26:39,649 --> 00:26:36,059
comment and make sure she'll do it

583
00:26:43,850 --> 00:26:39,659
she'll make her do it there was one

584
00:26:46,430 --> 00:26:43,860
thing when we moved her from the ER to

585
00:26:50,690 --> 00:26:46,440
to a bed they found one this was over at

586
00:26:53,390 --> 00:26:50,700
Holy Cross hospital and so I told some

587
00:26:55,310 --> 00:26:53,400
of the nurses about her background and

588
00:26:57,769 --> 00:26:55,320

they said oh really oh and you know I

589
00:27:00,950 --> 00:26:57,779
said well she was a Trailblazer really

590
00:27:03,529 --> 00:27:00,960
for women in The Sciences these nurses

591
00:27:05,750 --> 00:27:03,539
about six to eight of them came into her

592
00:27:08,570 --> 00:27:05,760
room at one in the morning yes I was

593
00:27:11,210 --> 00:27:08,580
still there of course talking and they

594
00:27:13,669 --> 00:27:11,220
surrounded her bed and each one said

595
00:27:16,850 --> 00:27:13,679
Thank you to her for the contributions

596
00:27:19,669 --> 00:27:16,860
she's made and they clapped for her and

597
00:27:21,710 --> 00:27:19,679
you know it was just it was absolutely

598
00:27:24,529 --> 00:27:21,720
wonderful and she just sat there and she

599
00:27:26,029 --> 00:27:24,539
smiled and somebody said something about

600
00:27:29,210 --> 00:27:26,039
well your mother this that and the other

601
00:27:30,890 --> 00:27:29,220
she never corrected them she just sat

602
00:27:33,470 --> 00:27:30,900
there and said like yeah yeah that's my

603
00:27:37,730 --> 00:27:33,480
daughter over there

604
00:27:41,510 --> 00:27:37,740
so I've had I mean just a wonderful time

605
00:27:44,090 --> 00:27:41,520
with her um I I didn't know her from the

606
00:27:47,630 --> 00:27:44,100
science part until we would look at the

607
00:27:48,310 --> 00:27:47,640
stuff on NASA I know if she were my

608
00:27:51,409 --> 00:27:48,320
mother

609
00:27:55,010 --> 00:27:51,419
that I probably would have gone into

610
00:27:57,110 --> 00:27:55,020
astronomy because I was so gosh I mean

611
00:27:59,210 --> 00:27:57,120
enamored with everything that was going

612
00:28:03,769 --> 00:27:59,220
on when I was six years old I actually

613
00:28:05,930 --> 00:28:03,779

built a model of the universe so at that

614
00:28:08,149 --> 00:28:05,940
time by memory I had done that so even

615
00:28:09,789 --> 00:28:08,159
back then I guess maybe God knew okay

616
00:28:13,810 --> 00:28:09,799
later on you're going to meet somebody

617
00:28:16,570 --> 00:28:13,820
who can help you with that but she was a

618
00:28:20,870 --> 00:28:16,580
resilient she would always bounce back

619
00:28:24,950 --> 00:28:20,880
health-wise and then again a trailblazer

620
00:28:28,549 --> 00:28:24,960
so for me not to say too much or

621
00:28:31,190 --> 00:28:28,559
I could just like I said oh

622
00:28:32,510 --> 00:28:31,200
this is one and I really love this quote

623
00:28:34,730 --> 00:28:32,520
from her

624
00:28:38,390 --> 00:28:34,740
and it says I was told by many people

625
00:28:40,970 --> 00:28:38,400
that a woman could not be an astronomer

626
00:28:43,909 --> 00:28:40,980
I'm glad I ignored them and that was out

627
00:28:47,029 --> 00:28:43,919
of recognition back in 2016 and I was

628
00:28:50,390 --> 00:28:47,039
there so I'm glad that she ignored them

629
00:28:52,909 --> 00:28:50,400
I feel very blessed that she was part of

630
00:28:54,529 --> 00:28:52,919
my life and I was part of her life and

631
00:28:56,990 --> 00:28:54,539
there are many other stories but I'm not

632
00:29:00,710 --> 00:28:57,000
going to bore you with them but she was

633
00:29:03,649 --> 00:29:00,720
a true Delight sense of humor and so I

634
00:29:06,169 --> 00:29:03,659
knew her from a different perspective

635
00:29:08,450 --> 00:29:06,179
so that's my talk I don't know if people

636
00:29:11,200 --> 00:29:08,460
have questions or just I know our time

637
00:29:19,970 --> 00:29:11,210
is limited

638
00:29:21,710 --> 00:29:19,980

[Applause]

639
00:29:23,210 --> 00:29:21,720
go ahead and keep that on let's take a

640
00:29:24,830 --> 00:29:23,220
let's take some questions we have time

641
00:29:27,350 --> 00:29:24,840
for questions

642
00:29:29,570 --> 00:29:27,360
um and do we have a um is there a mic

643
00:29:32,210 --> 00:29:29,580
that we can pass around

644
00:29:35,090 --> 00:29:32,220
I'll just repeat it is it here you want

645
00:29:44,470 --> 00:29:35,100
to repeat it okay okay I'll just re yeah

646
00:29:50,389 --> 00:29:47,510
no so the question sorry the question

647
00:29:51,889 --> 00:29:50,399
was um did did Nancy Grace Roman ever

648
00:29:53,870 --> 00:29:51,899
have an inkling that a telescope would

649
00:29:55,789 --> 00:29:53,880
be named after her someday to my

650
00:29:57,830 --> 00:29:55,799
knowledge no she never she we only

651
00:29:59,269 --> 00:29:57,840
talked about the Hubble

652
00:30:01,130 --> 00:29:59,279
um and she really didn't like being

653
00:30:04,430 --> 00:30:01,140
called the mother of a Hubble but it got

654
00:30:07,730 --> 00:30:04,440
she got used to it but yeah but yeah

655
00:30:10,010 --> 00:30:07,740
that that was it she would just be golly

656
00:30:11,570 --> 00:30:10,020
I don't know so elated if she knew

657
00:30:13,789 --> 00:30:11,580
something like that maybe she does in

658
00:30:24,610 --> 00:30:13,799
the heavens she knows about it but no

659
00:30:30,649 --> 00:30:27,590
thank you

660
00:30:35,149 --> 00:30:32,870
um so part of you know looking into her

661
00:30:36,889 --> 00:30:35,159
life this this may not be relevant but

662
00:30:38,870 --> 00:30:36,899
I'd see all these pictures of her

663
00:30:42,409 --> 00:30:38,880

wearing pearl necklaces

664
00:30:45,049 --> 00:30:42,419
and so you know in one hand I totally

665
00:30:46,789 --> 00:30:45,059
get I mean she was a force of nature

666
00:30:48,169 --> 00:30:46,799
what she accomplished but I get the

667
00:30:50,570 --> 00:30:48,179
impression she kind of had a kind and

668
00:30:52,510 --> 00:30:50,580
gentle side too I was wondering if you

669
00:30:55,610 --> 00:30:52,520
had more you could say about that

670
00:30:56,450 --> 00:30:55,620
very very much so

671
00:31:00,590 --> 00:30:56,460
um

672
00:31:02,990 --> 00:31:00,600
she again she wanted to establish some

673
00:31:05,149 --> 00:31:03,000
type of fellowship or scholarship for

674
00:31:08,570 --> 00:31:05,159
women in particular not to ignore the

675
00:31:10,070 --> 00:31:08,580
men but for women in particular and then

676
00:31:12,289 --> 00:31:10,080
when we would go to these recognition

677
00:31:14,149 --> 00:31:12,299
programs and the young people were there

678
00:31:16,370 --> 00:31:14,159
in their surrounding her she always took

679
00:31:18,289 --> 00:31:16,380
the time to speak with them we were

680
00:31:21,289 --> 00:31:18,299
literally like the last people to leave

681
00:31:23,350 --> 00:31:21,299
unless she was tired she spoke to

682
00:31:27,830 --> 00:31:23,360
everybody

683
00:31:31,010 --> 00:31:27,840
she poured herself into her work but she

684
00:31:34,370 --> 00:31:31,020
also poured herself into people and I

685
00:31:37,850 --> 00:31:34,380
think I became a recipient later in life

686
00:31:41,029 --> 00:31:37,860
so I went through a period where with my

687
00:31:42,950 --> 00:31:41,039
job and with certain challenges and you

688
00:31:44,870 --> 00:31:42,960

deal with people who may be envious of

689
00:31:47,450 --> 00:31:44,880
your abilities and things things like

690
00:31:49,850 --> 00:31:47,460
that and I'm sure she did as well so she

691
00:31:52,010 --> 00:31:49,860
would share her Pearls of Wisdom with me

692
00:31:54,409 --> 00:31:52,020
well this is what you need to do and we

693
00:31:57,169 --> 00:31:54,419
would speak for hours about that and she

694
00:32:00,070 --> 00:31:57,179
didn't have to do that but she would do

695
00:32:03,470 --> 00:32:00,080
things along those lines so

696
00:32:05,690 --> 00:32:03,480
very giving nature I have her mother's

697
00:32:08,389 --> 00:32:05,700
her mother was a classical pianist and a

698
00:32:10,370 --> 00:32:08,399
piano teacher so she gave me her her

699
00:32:13,010 --> 00:32:10,380
mother's piano books that are like 100

700
00:32:15,350 --> 00:32:13,020
years old she wanted to give me her

701
00:32:18,669 --> 00:32:15,360
mother's baby grand it was a Steinway

702
00:32:23,510 --> 00:32:18,679
but it wouldn't fit into my uh place

703
00:32:25,310 --> 00:32:23,520
which really made her upset but

704
00:32:26,810 --> 00:32:25,320
um you know that's how much my aunt

705
00:32:29,450 --> 00:32:26,820
would say that's how much she thought of

706
00:32:31,070 --> 00:32:29,460
me her mother was also an artist and so

707
00:32:33,049 --> 00:32:31,080
I noticed in

708
00:32:34,850 --> 00:32:33,059
her other place where she used to live

709
00:32:39,649 --> 00:32:34,860
all

710
00:32:39,659 --> 00:32:42,529
mother when her mother

711
00:32:48,470 --> 00:32:44,350
back in the 90s

712
00:32:51,130 --> 00:32:48,480
so she just that kind of person that the

713
00:32:55,070 --> 00:32:51,140

person who was the aide for her mother

714
00:32:57,409 --> 00:32:55,080
they were friends for years and so she

715
00:32:59,210 --> 00:32:57,419
you know she included that person as

716
00:33:01,909 --> 00:32:59,220
family and that person had children so

717
00:33:04,430 --> 00:33:01,919
she looked at those kids as grandkids

718
00:33:06,950 --> 00:33:04,440
so anything that they needed and she

719
00:33:09,950 --> 00:33:06,960
could help she did it so it wasn't

720
00:33:12,230 --> 00:33:09,960
anything when she had to announce it she

721
00:33:14,509 --> 00:33:12,240
just did it and you can find out or if

722
00:33:17,210 --> 00:33:14,519
you didn't it was okay for her she

723
00:33:20,330 --> 00:33:17,220
wasn't a showy person

724
00:33:22,370 --> 00:33:20,340
so that just wasn't her thing and in

725
00:33:24,409 --> 00:33:22,380
terms of constantly being in the

726
00:33:26,450 --> 00:33:24,419
spotlight she did a lot of traveling

727
00:33:28,190 --> 00:33:26,460
globally and so that's why I was looking

728
00:33:29,149 --> 00:33:28,200
at all these slides I said oh my

729
00:33:31,310 --> 00:33:29,159
goodness

730
00:33:33,769 --> 00:33:31,320
she did talk about the getting the

731
00:33:36,350 --> 00:33:33,779
financing for the Hubble and how she had

732
00:33:39,950 --> 00:33:36,360
to prepare briefing after briefing after

733
00:33:42,289 --> 00:33:39,960
briefing to get enough money for it and

734
00:33:44,990 --> 00:33:42,299
she finally was successful in doing it

735
00:33:48,230 --> 00:33:45,000
and she realized it was a team effort as

736
00:33:49,789 --> 00:33:48,240
well it wasn't just Dr Roman so she

737
00:33:51,649 --> 00:33:49,799
always would give credit where credit

738
00:33:57,049 --> 00:33:51,659

was due

739
00:34:01,789 --> 00:33:59,509
thank you I really enjoy getting to hear

740
00:34:03,350 --> 00:34:01,799
about all these stories from Nancy Grace

741
00:34:05,810 --> 00:34:03,360
Roman and I wonder if you might be able

742
00:34:07,190 --> 00:34:05,820
to help me with another story okay of

743
00:34:09,770 --> 00:34:07,200
course she's accomplished so much during

744
00:34:11,389 --> 00:34:09,780
her long career ranging from being like

745
00:34:13,430 --> 00:34:11,399
the first scientist to go beyond the

746
00:34:14,810 --> 00:34:13,440
Iron Curtain all the way to founding the

747
00:34:17,089 --> 00:34:14,820
building that we're sitting in right now

748
00:34:19,070 --> 00:34:17,099
but based on her Recollections what did

749
00:34:20,930 --> 00:34:19,080
she focus on what was what was it that

750
00:34:23,210 --> 00:34:20,940
she really felt she had was most proud

751
00:34:24,490 --> 00:34:23,220
of in life

752
00:34:29,149 --> 00:34:24,500
um

753
00:34:31,970 --> 00:34:29,159
she was very proud of of her parents and

754
00:34:35,389 --> 00:34:31,980
especially her both of them so she spoke

755
00:34:38,329 --> 00:34:35,399
very highly of them also she was an avid

756
00:34:41,510 --> 00:34:38,339
swimmer did you know that she loved to

757
00:34:44,149 --> 00:34:41,520
swim and so at the last place where she

758
00:34:45,409 --> 00:34:44,159
stayed she did a lot of a lot of that we

759
00:34:48,849 --> 00:34:45,419
were concerned to make sure she didn't

760
00:34:52,970 --> 00:34:48,859
get catch cold but she was fine

761
00:34:55,970 --> 00:34:52,980
I think for her is not just the work not

762
00:34:57,890 --> 00:34:55,980
just the telescope but being able to

763
00:35:01,250 --> 00:34:57,900

pave the way for women

764
00:35:03,170 --> 00:35:01,260
uh that was huge for her because she

765
00:35:05,510 --> 00:35:03,180
knew when she was at the University of

766
00:35:08,390 --> 00:35:05,520
Chicago that she wasn't going to get

767
00:35:09,950 --> 00:35:08,400
tenure and in fact maybe I shouldn't say

768
00:35:13,010 --> 00:35:09,960
this but in fact she said they

769
00:35:16,550 --> 00:35:13,020
insinuated that she really needed to go

770
00:35:20,750 --> 00:35:16,560
somewhere settle down and have a family

771
00:35:23,089 --> 00:35:20,760
and so that was how she was treated and

772
00:35:26,510 --> 00:35:23,099
she was wrestling with okay so what do I

773
00:35:28,970 --> 00:35:26,520
do next okay so after she went through

774
00:35:31,790 --> 00:35:28,980
that she really wanted to make sure that

775
00:35:34,490 --> 00:35:31,800
other women behind her would not have

776
00:35:37,130 --> 00:35:34,500
the same experiences so I think that's

777
00:35:39,650 --> 00:35:37,140
part of her Legacy that was her passion

778
00:35:40,550 --> 00:35:39,660
and in her memoirs and all that she's

779
00:35:44,030 --> 00:35:40,560
written

780
00:35:46,370 --> 00:35:44,040
that's Central to it but she's open to

781
00:35:48,410 --> 00:35:46,380
help anybody so it's not just well it

782
00:35:50,150 --> 00:35:48,420
has to only be women or young girls or

783
00:35:53,270 --> 00:35:50,160
whatever

784
00:35:55,190 --> 00:35:53,280
thank you I hope I answered it

785
00:35:56,569 --> 00:35:55,200
are there any other questions I don't

786
00:35:58,730 --> 00:35:56,579
want to take up your time because I know

787
00:36:01,730 --> 00:35:58,740
we have another presenter

788
00:36:04,550 --> 00:36:01,740

you have been fabulous this has been

789
00:36:07,069 --> 00:36:04,560
such an honor for me yes sir oh did you

790
00:36:08,710 --> 00:36:07,079
Arthur oh

791
00:36:11,690 --> 00:36:08,720
did you have a question

792
00:36:14,390 --> 00:36:11,700
I wanted to ask if do we have any

793
00:36:17,930 --> 00:36:14,400
questions from our online oh

794
00:36:22,609 --> 00:36:19,670
I don't know what the hand signals mean

795
00:36:23,930 --> 00:36:22,619
oh we'll do that at the end okay okay so

796
00:36:25,730 --> 00:36:23,940
we can take a few questions at the end

797
00:36:34,970 --> 00:36:25,740
from the online community any other

798
00:36:40,370 --> 00:36:36,910
you can tell me if this is a true story

799
00:36:42,349 --> 00:36:40,380
I heard that um in her later years Dr

800
00:36:44,030 --> 00:36:42,359
Roman used to sit in meetings and knit

801
00:36:46,069 --> 00:36:44,040
and she would seem like she wasn't

802
00:36:46,970 --> 00:36:46,079
paying attention and then she put down

803
00:36:49,849 --> 00:36:46,980
her knitting and say something

804
00:36:51,890 --> 00:36:49,859
absolutely astonishing are are you

805
00:36:54,290 --> 00:36:51,900
familiar with that story I'm not

806
00:36:56,210 --> 00:36:54,300
familiar with that story I think with

807
00:36:58,849 --> 00:36:56,220
her hands it was hard for her to do

808
00:37:01,130 --> 00:36:58,859
knitting but she was really perceptive I

809
00:37:02,810 --> 00:37:01,140
mean you can say something and you

810
00:37:04,550 --> 00:37:02,820
really thought she wasn't paying any

811
00:37:07,130 --> 00:37:04,560
attention oh she paid attention and

812
00:37:09,890 --> 00:37:07,140
could repeat it so we've had that

813
00:37:12,770 --> 00:37:09,900

experience she also liked to sew so I'd

814
00:37:14,750 --> 00:37:12,780
have to go to her place and thread the

815
00:37:17,450 --> 00:37:14,760
needle for her because of her eyesight

816
00:37:19,790 --> 00:37:17,460
it was hard for her to see it but yet

817
00:37:23,390 --> 00:37:19,800
once you know got everything set up she

818
00:37:26,510 --> 00:37:23,400
can do that but I had heard that today

819
00:37:29,150 --> 00:37:26,520
and I wasn't sure but but I'm sure she

820
00:37:31,730 --> 00:37:29,160
did that in a way well she always had to

821
00:37:34,310 --> 00:37:31,740
be doing something she was always busy

822
00:37:36,829 --> 00:37:34,320
and sometimes when you do things like

823
00:37:39,050 --> 00:37:36,839
that you people think oh she's not

824
00:37:40,490 --> 00:37:39,060
paying any attention we're just going to

825
00:37:42,410 --> 00:37:40,500
say this and we're going to do this and

826
00:37:44,870 --> 00:37:42,420
we're going to do that and then they get

827
00:37:46,609 --> 00:37:44,880
caught because then she can repeat what

828
00:37:48,589 --> 00:37:46,619
you know you know you thought I was very

829
00:37:50,810 --> 00:37:48,599
busy with this I am but I'm hearing

830
00:37:53,270 --> 00:37:50,820
everything

831
00:37:56,089 --> 00:37:53,280
so that probably was true

832
00:37:58,310 --> 00:37:56,099
yeah definitely true knowing her she

833
00:37:59,810 --> 00:37:58,320
just you know it was just like she had

834
00:38:01,430 --> 00:37:59,820
to be on the go

835
00:38:03,890 --> 00:38:01,440
that's why I wanted to give her that

836
00:38:08,569 --> 00:38:03,900
winter coat because I knew she was going

837
00:38:13,310 --> 00:38:11,990
hi so I have a question about the Hubble

838
00:38:14,810 --> 00:38:13,320

Space Telescope so I know there's

839
00:38:17,510 --> 00:38:14,820
obviously a lot of people in this room

840
00:38:19,190 --> 00:38:17,520
that Hubble shape their careers in terms

841
00:38:20,930 --> 00:38:19,200
of astronomy so I was wondering if you

842
00:38:22,970 --> 00:38:20,940
could say anything about whether she

843
00:38:25,010 --> 00:38:22,980
mentioned what was kind of the key to

844
00:38:27,770 --> 00:38:25,020
getting Hubble off the ground for her

845
00:38:30,770 --> 00:38:27,780
personally for her for her the key thing

846
00:38:32,810 --> 00:38:30,780
was funding making sure first of all

847
00:38:35,210 --> 00:38:32,820
making sure she had the right team to

848
00:38:37,010 --> 00:38:35,220
manage and as she said when she joined

849
00:38:39,589 --> 00:38:37,020
NASA you know people thought oh it's

850
00:38:41,030 --> 00:38:39,599
going to be real exciting but it was but

851
00:38:44,270 --> 00:38:41,040
it wasn't like oh you're the first

852
00:38:46,550 --> 00:38:44,280
female and all she got over that but for

853
00:38:48,829 --> 00:38:46,560
her she wanted to be surrounded by

854
00:38:52,190 --> 00:38:48,839
people who were smarter than her

855
00:38:55,550 --> 00:38:52,200
and then who can get the job done in

856
00:39:00,170 --> 00:38:55,560
time in within schedule and within

857
00:39:03,290 --> 00:39:00,180
budget preferably less under budget that

858
00:39:05,210 --> 00:39:03,300
was her thing so for her it was like

859
00:39:06,829 --> 00:39:05,220
again going before and she told me how

860
00:39:09,290 --> 00:39:06,839
often she had to go before Congress or

861
00:39:11,270 --> 00:39:09,300
somebody else had to in order to make

862
00:39:14,089 --> 00:39:11,280
sure they had the appropriate funding

863
00:39:15,589 --> 00:39:14,099

for it but yeah she just said and she

864
00:39:17,089 --> 00:39:15,599
said tell me you want to make sure you

865
00:39:19,069 --> 00:39:17,099
know you're managing people which I have

866
00:39:21,770 --> 00:39:19,079
to get folks who are smarter than you

867
00:39:24,349 --> 00:39:21,780
and they'll make you look good and

868
00:39:26,690 --> 00:39:24,359
recognize people even just saying Amir

869
00:39:30,230 --> 00:39:26,700
thank you to somebody is wonderful

870
00:39:33,290 --> 00:39:30,240
versus just you know the other stuff but

871
00:39:40,370 --> 00:39:33,300
but she was very very uh good at doing

872
00:39:45,890 --> 00:39:43,310
any other question

873
00:39:47,810 --> 00:39:45,900
I'm going to be around if that's okay so

874
00:39:50,870 --> 00:39:47,820
if somebody says hey I really wanted to

875
00:39:54,050 --> 00:39:50,880
ask this but not in public okay you had

876
00:39:57,050 --> 00:39:54,060
you had your hands up yet

877
00:40:00,050 --> 00:39:57,060
I said this during the um

878
00:40:02,210 --> 00:40:00,060
the other talks we were having and I

879
00:40:05,810 --> 00:40:02,220
when I first started working here in

880
00:40:08,150 --> 00:40:05,820
July 1985 I there were a few times I sat

881
00:40:11,510 --> 00:40:08,160
next to her in meetings

882
00:40:13,370 --> 00:40:11,520
here not knowing what her role was or

883
00:40:14,450 --> 00:40:13,380
who she was I was just new didn't know

884
00:40:17,150 --> 00:40:14,460
anything

885
00:40:18,530 --> 00:40:17,160
she talked to me very graciously and I

886
00:40:21,290 --> 00:40:18,540
was telling her what I was working on

887
00:40:23,569 --> 00:40:21,300
what part of things and you know she was

888
00:40:27,050 --> 00:40:23,579

asking me other things and she just

889
00:40:29,270 --> 00:40:27,060
struck me as a very gracious nice person

890
00:40:31,670 --> 00:40:29,280
but in the course of

891
00:40:33,290 --> 00:40:31,680
sitting there and listening to other

892
00:40:35,810 --> 00:40:33,300
people and the questions she would ask

893
00:40:38,150 --> 00:40:35,820
people then and things like that it

894
00:40:41,510 --> 00:40:38,160
dawned on me oh this is a really

895
00:40:47,270 --> 00:40:44,150
next to

896
00:40:49,010 --> 00:40:47,280
it so just kind of a you know wander in

897
00:40:50,630 --> 00:40:49,020
sit next to somebody in here in the

898
00:40:53,270 --> 00:40:50,640
auditorium you don't know you're new

899
00:40:58,569 --> 00:40:56,150
well well we did I had to take her my

900
00:41:00,890 --> 00:40:58,579
aunt and other friends

901
00:41:02,270 --> 00:41:00,900
from the Independent Living environment

902
00:41:04,430 --> 00:41:02,280
to awake

903
00:41:07,370 --> 00:41:04,440
and so there were some young men at the

904
00:41:10,910 --> 00:41:07,380
wake and as we were leaving I told them

905
00:41:14,150 --> 00:41:10,920
I said oh well you know this is Dr Roman

906
00:41:17,329 --> 00:41:14,160
she created you know the the Hubble

907
00:41:21,050 --> 00:41:17,339
telescope and Nancy Grace was walking

908
00:41:22,550 --> 00:41:21,060
away they were running after her running

909
00:41:26,390 --> 00:41:22,560
and these were guys probably in their

910
00:41:28,910 --> 00:41:26,400
20s they said oh wow oh cool really and

911
00:41:30,710 --> 00:41:28,920
I said oh yeah she she did that

912
00:41:34,250 --> 00:41:30,720
um and I don't know I just shared that

913
00:41:36,050 --> 00:41:34,260

in passing and they ran after her they

914
00:41:38,569 --> 00:41:36,060
of course held us up so we couldn't

915
00:41:41,750 --> 00:41:38,579
leave right away because they had

916
00:41:44,810 --> 00:41:41,760
questions of her but that's just you

917
00:41:47,089 --> 00:41:44,820
know who she was so it wasn't like okay

918
00:41:49,310 --> 00:41:47,099
well Joanie we gotta go now you know no

919
00:41:50,030 --> 00:41:49,320
she just she took the time to talk with

920
00:41:53,150 --> 00:41:50,040
them

921
00:41:57,170 --> 00:41:53,160
so there are so many other stories about

922
00:42:00,290 --> 00:41:57,180
her but again I was I was blessed to

923
00:42:02,870 --> 00:42:00,300
have known her she touched my life in

924
00:42:06,109 --> 00:42:02,880
different ways and hopefully I touched

925
00:42:08,510 --> 00:42:06,119
her life in different ways as well even

926
00:42:11,810 --> 00:42:08,520
though she didn't take that coat yes I

927
00:42:15,349 --> 00:42:11,820
haven't gotten I have not gotten over

928
00:42:18,609 --> 00:42:15,359
that in fact I gave the coat to my aunt

929
00:42:21,050 --> 00:42:18,619
and I went and got the same coat myself

930
00:42:22,609 --> 00:42:21,060
because then I figured I said well maybe

931
00:42:28,190 --> 00:42:22,619
she'll look at and say you know that's a

932
00:42:30,770 --> 00:42:28,200
nice coat yes it's yours take it so

933
00:42:33,829 --> 00:42:30,780
um but anyway I do I I was with her two

934
00:42:35,870 --> 00:42:33,839
days before she passed away and I told

935
00:42:38,870 --> 00:42:35,880
the nursing staff I said she loves the

936
00:42:42,050 --> 00:42:38,880
classics so please play the classic

937
00:42:44,470 --> 00:42:42,060
music on the television on one of those

938
00:42:47,089 --> 00:42:44,480

channels for her and they did

939
00:42:48,770 --> 00:42:47,099
she said that oh I have a taste for

940
00:42:51,829 --> 00:42:48,780
strawberry ice cream I said we'll get it

941
00:42:55,190 --> 00:42:51,839
so please give her some strawberry ice

942
00:42:56,870 --> 00:42:55,200
cream and they said well you know you

943
00:42:58,609 --> 00:42:56,880
can spend the night here we'll we'll get

944
00:43:01,130 --> 00:42:58,619
a food time for you and you can spend

945
00:43:03,050 --> 00:43:01,140
the night here I said no I'll come back

946
00:43:05,510 --> 00:43:03,060
and I'll see I'll spend Christmas day

947
00:43:07,490 --> 00:43:05,520
with her well unfortunately that didn't

948
00:43:11,089 --> 00:43:07,500
happen I got the call around two in the

949
00:43:12,950 --> 00:43:11,099
morning that she had gone away so but at

950
00:43:15,410 --> 00:43:12,960
least I was able to spend some time with

951
00:43:19,309 --> 00:43:15,420
her and then she knew that she was loved

952
00:43:22,550 --> 00:43:19,319
by Family local as well as she has two

953
00:43:25,130 --> 00:43:22,560
cousins that she spoke very highly of

954
00:43:27,950 --> 00:43:25,140
and then another cousin who was in Texas

955
00:43:30,170 --> 00:43:27,960
so she she really said a lot about them

956
00:43:34,730 --> 00:43:30,180
but as far as local she didn't have

957
00:43:35,990 --> 00:43:34,740
immediate blood family but she had us

958
00:43:38,510 --> 00:43:36,000
anyway

959
00:43:40,490 --> 00:43:38,520
I'm gonna hang around after if that's

960
00:43:42,589 --> 00:43:40,500
okay absolutely I mean if you're if

961
00:43:45,650 --> 00:43:42,599
you're doing something confidential I I

962
00:43:48,770 --> 00:43:45,660
oh I'm out of here

963
00:43:51,290 --> 00:43:48,780

but I don't mind staying so if somebody

964
00:43:52,390 --> 00:43:51,300
wants to ask me something afterwards off

965
00:43:56,329 --> 00:43:52,400
record

966
00:43:59,780 --> 00:43:56,339
yes let's thank Dr Gordon again

967
00:43:59,790 --> 00:44:06,589
[Applause]

968
00:44:13,250 --> 00:44:08,630
I hope I didn't ramble too much no it

969
00:44:18,710 --> 00:44:16,370
okay so I have the pleasure of course of

970
00:44:21,890 --> 00:44:18,720
introducing our second speaker who's

971
00:44:23,870 --> 00:44:21,900
standing here next to me so uh Dr Rachel

972
00:44:25,250 --> 00:44:23,880
Beaton joined the Roman telescope Branch

973
00:44:27,890 --> 00:44:25,260
here at the Space Telescope Science

974
00:44:29,750 --> 00:44:27,900
Institute in 2022

975
00:44:31,430 --> 00:44:29,760
prior to this she was a Carnegie

976
00:44:33,770 --> 00:44:31,440
Princeton fellow and a Hubble fellow at

977
00:44:35,690 --> 00:44:33,780
Princeton University and a postdoctoral

978
00:44:37,970 --> 00:44:35,700
research associate at the observatories

979
00:44:42,470 --> 00:44:37,980
of the Carnegie Institution for Science

980
00:44:43,849 --> 00:44:42,480
after receiving her PhD in 2014 from the

981
00:44:46,010 --> 00:44:43,859
University of Virginia

982
00:44:47,870 --> 00:44:46,020
so Rachel will discuss the Roman Space

983
00:45:00,650 --> 00:44:47,880
Telescope Mission and how it will

984
00:45:04,910 --> 00:45:03,170
okay cool

985
00:45:07,250 --> 00:45:04,920
all right I have to swap the slides

986
00:45:08,870 --> 00:45:07,260
really quick

987
00:45:11,809 --> 00:45:08,880
um this is actually one of my big jobs

988
00:45:25,730 --> 00:45:11,819

this week at the conference

989
00:45:29,809 --> 00:45:26,829
awesome

990
00:45:32,329 --> 00:45:29,819
and okay

991
00:45:34,910 --> 00:45:32,339
so I'm going to talk about Nancy Grace

992
00:45:38,990 --> 00:45:34,920
Roman uh and

993
00:45:41,270 --> 00:45:39,000
um I'm going to use things that she said

994
00:45:43,250 --> 00:45:41,280
um and then use that to introduce the

995
00:45:45,290 --> 00:45:43,260
Nancy Grace Roman Space Telescope

996
00:45:47,150 --> 00:45:45,300
because I think this mission is

997
00:45:50,690 --> 00:45:47,160
particularly emblematic of the person we

998
00:45:52,309 --> 00:45:50,700
just had so vividly painted for us for

999
00:45:54,950 --> 00:45:52,319
some really specific reasons not just

1000
00:45:57,050 --> 00:45:54,960
the science but how the mission is going

1001
00:46:01,190 --> 00:45:57,060
to work and who the mission will reach

1002
00:46:05,690 --> 00:46:03,589
um and I'm glad Joan mentioned what she

1003
00:46:07,670 --> 00:46:05,700
did uh because the best books that I

1004
00:46:10,130 --> 00:46:07,680
found about Nancy were these two kids

1005
00:46:12,770 --> 00:46:10,140
books there's a beautiful Trailblazer

1006
00:46:14,390 --> 00:46:12,780
bio about Nancy and then there's also

1007
00:46:16,370 --> 00:46:14,400
this really beautifully illustrated book

1008
00:46:20,150 --> 00:46:16,380
about Nancy there's not a biography

1009
00:46:22,970 --> 00:46:20,160
about her uh so I read uh oral histories

1010
00:46:25,190 --> 00:46:22,980
and I read conference documents and

1011
00:46:26,569 --> 00:46:25,200
decisions to actually find out what she

1012
00:46:28,430 --> 00:46:26,579
thought and the kinds of things she went

1013
00:46:29,690 --> 00:46:28,440

through so if anyone's listening that

1014
00:46:33,530 --> 00:46:29,700
wants to write

1015
00:46:37,910 --> 00:46:33,540
something more adults but not quite a

1016
00:46:40,550 --> 00:46:37,920
committee report about Nancy let's chat

1017
00:46:41,630 --> 00:46:40,560
because I have about 800 tabs open right

1018
00:46:43,670 --> 00:46:41,640
now

1019
00:46:45,410 --> 00:46:43,680
um and I'd like to to put them to good

1020
00:46:46,370 --> 00:46:45,420
use

1021
00:46:49,309 --> 00:46:46,380
um

1022
00:46:51,470 --> 00:46:49,319
so one thing that Nancy said uh is she

1023
00:46:53,270 --> 00:46:51,480
said when NASA was formed one of the men

1024
00:46:54,770 --> 00:46:53,280
there asked me if I knew anyone who

1025
00:46:57,770 --> 00:46:54,780
would like to set up a program in space

1026
00:46:59,150 --> 00:46:57,780
astronomy he didn't ask her he asked her

1027
00:47:01,790 --> 00:46:59,160
if she knew anyone

1028
00:47:03,589 --> 00:47:01,800
uh and so she applied so she says and I

1029
00:47:05,990 --> 00:47:03,599
decided that the idea of influencing

1030
00:47:07,910 --> 00:47:06,000
astronomy for 50 years was just more

1031
00:47:08,930 --> 00:47:07,920
than I could resist and so I took the

1032
00:47:11,210 --> 00:47:08,940
job

1033
00:47:13,250 --> 00:47:11,220
so at this time Nancy was working at the

1034
00:47:15,230 --> 00:47:13,260
Naval Research Labs she only worked

1035
00:47:17,870 --> 00:47:15,240
there for a few years she had moved

1036
00:47:19,430 --> 00:47:17,880
there from yerky's Observatory at the

1037
00:47:21,710 --> 00:47:19,440
University of Chicago where she had been

1038
00:47:24,589 --> 00:47:21,720

teaching after getting her doctorate

1039
00:47:26,150 --> 00:47:24,599
and after teaching for several years uh

1040
00:47:27,230 --> 00:47:26,160
you know in the video we heard she

1041
00:47:30,309 --> 00:47:27,240
didn't feel like she was going to get

1042
00:47:33,290 --> 00:47:30,319
tenure it wasn't exactly a feeling

1043
00:47:37,490 --> 00:47:33,300
she actually went to uh Chandra sakar

1044
00:47:39,109 --> 00:47:37,500
who is a very famous astronomer and she

1045
00:47:40,910 --> 00:47:39,119
complained about her salary like they

1046
00:47:43,010 --> 00:47:40,920
mentioned the civil servants didn't

1047
00:47:45,950 --> 00:47:43,020
consider her salary high enough to count

1048
00:47:48,109 --> 00:47:45,960
as technical work to get her into a

1049
00:47:50,630 --> 00:47:48,119
higher level and she complained about it

1050
00:47:55,069 --> 00:47:50,640
and he said well because you're a woman

1051
00:47:57,170 --> 00:47:55,079
I can pay you less you're cheaper okay

1052
00:47:59,450 --> 00:47:57,180
um and so she said fine I don't have to

1053
00:48:01,490 --> 00:47:59,460
work here anymore and she moved to the

1054
00:48:02,930 --> 00:48:01,500
naval research lab and so when she said

1055
00:48:04,970 --> 00:48:02,940
she was she felt like she wasn't going

1056
00:48:07,190 --> 00:48:04,980
to get tenure it was made very clear she

1057
00:48:08,870 --> 00:48:07,200
wasn't going to get tenure but she went

1058
00:48:10,970 --> 00:48:08,880
on I think to do some of the most

1059
00:48:13,550 --> 00:48:10,980
transformational things that probably

1060
00:48:15,650 --> 00:48:13,560
could have happened to astronomy as a

1061
00:48:18,050 --> 00:48:15,660
field

1062
00:48:20,329 --> 00:48:18,060
um there's a great quote at the end of

1063
00:48:22,670 --> 00:48:20,339

an article about her it's actually from

1064
00:48:24,950 --> 00:48:22,680
Twitter uh Twitter's supposed to be

1065
00:48:26,750 --> 00:48:24,960
backed up some way uh but I don't know

1066
00:48:29,030 --> 00:48:26,760
Twitter's had a bit of a tumultuous year

1067
00:48:31,849 --> 00:48:29,040
so I couldn't find some of these old

1068
00:48:33,710 --> 00:48:31,859
tweets but I really love this

1069
00:48:36,530 --> 00:48:33,720
um this was in a celebration uh during

1070
00:48:38,510 --> 00:48:36,540
the renaming uh of this Mission he said

1071
00:48:40,430 --> 00:48:38,520
Nancy Roman took Chief astronomer job at

1072
00:48:43,370 --> 00:48:40,440
Nasa because women couldn't get 10 women

1073
00:48:45,530 --> 00:48:43,380
couldn't get tenure opted to reshape the

1074
00:48:47,510 --> 00:48:45,540
history of astronomy and said hashtag

1075
00:48:51,230 --> 00:48:47,520
Plan B

1076
00:48:53,930 --> 00:48:51,240
um so you know from that kind of defeat

1077
00:48:56,030 --> 00:48:53,940
uh can come uh some really true

1078
00:48:59,270 --> 00:48:56,040
greatness

1079
00:49:01,069 --> 00:48:59,280
so uh one thing that Nancy says

1080
00:49:03,290 --> 00:49:01,079
um is the real way to learn about the

1081
00:49:04,970 --> 00:49:03,300
night sky is to look at it so I recently

1082
00:49:08,630 --> 00:49:04,980
gave a talk about the Roman Mission and

1083
00:49:10,609 --> 00:49:08,640
about Nancy uh in front of

1084
00:49:13,010 --> 00:49:10,619
um a bunch of kids so I thought this was

1085
00:49:14,329 --> 00:49:13,020
a really great way to vote to get them

1086
00:49:16,069 --> 00:49:14,339
thinking about the night sky we're also

1087
00:49:18,050 --> 00:49:16,079
outside in a national park so we really

1088
00:49:20,569 --> 00:49:18,060

wanted to think of think up

1089
00:49:22,849 --> 00:49:20,579
uh but why I wanted to use this quote to

1090
00:49:25,130 --> 00:49:22,859
talk about Roman has to do with its

1091
00:49:28,069 --> 00:49:25,140
field of view and how that's unique

1092
00:49:30,230 --> 00:49:28,079
so this is a um a kind of real picture

1093
00:49:32,030 --> 00:49:30,240
so this is a real picture of the Horizon

1094
00:49:33,470 --> 00:49:32,040
so if you went outside The Horizon's

1095
00:49:35,809 --> 00:49:33,480
here you can see some light pollution

1096
00:49:37,790 --> 00:49:35,819
off in the distance and this is a real

1097
00:49:39,290 --> 00:49:37,800
picture of the Moon that's how big the

1098
00:49:41,990 --> 00:49:39,300
Moon is on the sky

1099
00:49:44,809 --> 00:49:42,000
and this is actually a UV image of the

1100
00:49:46,670 --> 00:49:44,819
Andromeda galaxy but it's not what you

1101
00:49:50,329 --> 00:49:46,680
would see with your eyes if you could

1102
00:49:52,609 --> 00:49:50,339
see this uh thing with your eyes on the

1103
00:49:55,790 --> 00:49:52,619
sky that's how big the Andromeda galaxy

1104
00:49:59,210 --> 00:49:55,800
is on the sky proper

1105
00:50:03,050 --> 00:49:59,220
ah which is cool I actually used to

1106
00:50:05,569 --> 00:50:03,060
study it's Halo which goes way out which

1107
00:50:08,710 --> 00:50:05,579
is always a fun thing to show

1108
00:50:11,569 --> 00:50:08,720
so I want to put this picture in context

1109
00:50:13,609 --> 00:50:11,579
with the Roman field of view

1110
00:50:16,010 --> 00:50:13,619
so this is the same galaxy it's just

1111
00:50:17,569 --> 00:50:16,020
rotated differently I had a different

1112
00:50:19,309 --> 00:50:17,579
view where I actually rotated it but

1113
00:50:21,410 --> 00:50:19,319

this one has words and I thought that

1114
00:50:25,609 --> 00:50:21,420
might be confusing but there's the Moon

1115
00:50:28,150 --> 00:50:25,619
to scale and so the Roman footprint

1116
00:50:31,069 --> 00:50:28,160
is an appreciable part of the night sky

1117
00:50:33,710 --> 00:50:31,079
so one thing that's really hard to talk

1118
00:50:36,349 --> 00:50:33,720
about Hubble with the public is that

1119
00:50:39,050 --> 00:50:36,359
those images are so tiny

1120
00:50:42,410 --> 00:50:39,060
so the Hubble images are about the width

1121
00:50:44,950 --> 00:50:42,420
of my ring at arm's length on the sky

1122
00:50:47,990 --> 00:50:44,960
patch of the sky

1123
00:50:50,210 --> 00:50:48,000
your Roman field of view is about the

1124
00:50:52,130 --> 00:50:50,220
width of your thumb on the night sky

1125
00:50:53,870 --> 00:50:52,140
held at arm's length

1126
00:50:55,970 --> 00:50:53,880
so if we were outside it'd be a lot

1127
00:50:58,010 --> 00:50:55,980
better demonstration but just keep that

1128
00:50:59,809 --> 00:50:58,020
in mind like a Roman pointing is

1129
00:51:01,670 --> 00:50:59,819
something that you can go outside with

1130
00:51:04,130 --> 00:51:01,680
your eyes with the instrument that

1131
00:51:06,290 --> 00:51:04,140
astronomers used are sorry that humans

1132
00:51:08,510 --> 00:51:06,300
have used for what 20 000 years to

1133
00:51:11,809 --> 00:51:08,520
observe the night sky and and Roman will

1134
00:51:14,870 --> 00:51:11,819
be looking at something like that

1135
00:51:18,290 --> 00:51:14,880
uh which is pretty pretty cool

1136
00:51:19,190 --> 00:51:18,300
but uh in getting this huge field of

1137
00:51:21,470 --> 00:51:19,200
view

1138
00:51:24,890 --> 00:51:21,480

uh we're actually not sacrificing the

1139
00:51:27,589 --> 00:51:24,900
detail okay Hubble is amazing it has

1140
00:51:29,630 --> 00:51:27,599
inspired people for 30 years because of

1141
00:51:32,530 --> 00:51:29,640
the detail and the beauty

1142
00:51:34,670 --> 00:51:32,540
so if I swap to actually looking at

1143
00:51:37,910 --> 00:51:34,680
these in the background are real

1144
00:51:40,430 --> 00:51:37,920
observations taken from Hubble

1145
00:51:42,470 --> 00:51:40,440
um but mapped onto the Roman field of

1146
00:51:44,329 --> 00:51:42,480
view to give you a sense we have this

1147
00:51:45,530 --> 00:51:44,339
huge field of view this thumb print at

1148
00:51:47,690 --> 00:51:45,540
arm's length

1149
00:51:49,970 --> 00:51:47,700
but I can zoom in

1150
00:51:52,730 --> 00:51:49,980
and see with Incredible detail with

1151
00:51:57,349 --> 00:51:52,740
Hubble level detail

1152
00:52:02,630 --> 00:51:59,630
um and in there is embedded all the

1153
00:52:05,089 --> 00:52:02,640
beautiful astrophysics that gets us from

1154
00:52:07,910 --> 00:52:05,099
the primordial soup at the beginning of

1155
00:52:09,890 --> 00:52:07,920
the universe all the way uh to the life

1156
00:52:12,890 --> 00:52:09,900
here on Earth so we have young Stellar

1157
00:52:15,530 --> 00:52:12,900
associations dust clouds and uh

1158
00:52:17,329 --> 00:52:15,540
associations of stars so we're not just

1159
00:52:21,470 --> 00:52:17,339
getting this huge field of view we're

1160
00:52:23,390 --> 00:52:21,480
getting all the detail at the same time

1161
00:52:25,970 --> 00:52:23,400
now

1162
00:52:29,510 --> 00:52:25,980
this huge field of view taking one

1163
00:52:32,750 --> 00:52:29,520

picture gives us an ability to actually

1164
00:52:35,990 --> 00:52:32,760
map huge areas of the sky

1165
00:52:37,670 --> 00:52:36,000
so if we take everything that Hubble has

1166
00:52:39,470 --> 00:52:37,680
ever observed on the sky and we put it

1167
00:52:40,910 --> 00:52:39,480
all together and tried to observe it

1168
00:52:42,230 --> 00:52:40,920
with Roman which you can't do because

1169
00:52:43,069 --> 00:52:42,240
it's all over the sky so we put it all

1170
00:52:47,930 --> 00:52:43,079
together

1171
00:52:52,370 --> 00:52:50,030
you know but we don't want to brag and

1172
00:52:54,950 --> 00:52:52,380
make Hubble feel bad because Hubble has

1173
00:52:56,630 --> 00:52:54,960
done some really amazing work so the way

1174
00:52:58,970 --> 00:52:56,640
to think about this and why I wanted to

1175
00:53:01,190 --> 00:52:58,980
start with this the quote to look up is

1176
00:53:03,230 --> 00:53:01,200
that this uh blue hopefully you can see

1177
00:53:05,210 --> 00:53:03,240
it it's this double-lined box is

1178
00:53:09,170 --> 00:53:05,220
actually a footprint that was considered

1179
00:53:11,569 --> 00:53:09,180
for what is called the high latitude

1180
00:53:14,150 --> 00:53:11,579
oh gosh am I going to blank on the name

1181
00:53:16,190 --> 00:53:14,160
of the survey wide area survey thank you

1182
00:53:20,210 --> 00:53:16,200
see teamwork

1183
00:53:22,849 --> 00:53:20,220
um and I've placed it to scale on a plot

1184
00:53:25,370 --> 00:53:22,859
showing you the constellations uh over

1185
00:53:27,470 --> 00:53:25,380
the full sky

1186
00:53:29,510 --> 00:53:27,480
and I've picked out a few in particular

1187
00:53:31,089 --> 00:53:29,520
that are quite important there's the

1188
00:53:34,250 --> 00:53:31,099

summer triangle which is a quite famous

1189
00:53:36,170 --> 00:53:34,260
so were it not raining

1190
00:53:38,650 --> 00:53:36,180
on your way home you could look up and

1191
00:53:42,349 --> 00:53:38,660
see these bright stars on the sky

1192
00:53:44,450 --> 00:53:42,359
Romans survey will cover that whole area

1193
00:53:46,069 --> 00:53:44,460
around it

1194
00:53:49,069 --> 00:53:46,079
so

1195
00:53:51,290 --> 00:53:49,079
wow and we're going to zoom in

1196
00:53:52,490 --> 00:53:51,300
just like a Hubble image

1197
00:53:55,370 --> 00:53:52,500
okay

1198
00:53:58,190 --> 00:53:55,380
another pretty famous thing is actually

1199
00:53:59,510 --> 00:53:58,200
the winter hexagon so those teachers in

1200
00:54:02,210 --> 00:53:59,520
the room you can actually use this

1201
00:54:04,010 --> 00:54:02,220
graphic summer or winter we will map

1202
00:54:06,710 --> 00:54:04,020
almost the entirety of the winter

1203
00:54:08,390 --> 00:54:06,720
hexagon so we're probably not going to

1204
00:54:10,790 --> 00:54:08,400
do this patch of Sky that's being

1205
00:54:13,609 --> 00:54:10,800
debated right now what patches guy will

1206
00:54:14,750 --> 00:54:13,619
do but that's just a tremendous amount

1207
00:54:17,990 --> 00:54:14,760
of sky

1208
00:54:20,329 --> 00:54:18,000
and my famous my favorite one is we'll

1209
00:54:22,730 --> 00:54:20,339
actually map larger than the area of

1210
00:54:24,230 --> 00:54:22,740
Ursa Major which contains the Big Dipper

1211
00:54:26,630 --> 00:54:24,240
so that's also something you can go look

1212
00:54:27,230 --> 00:54:26,640
at it's actually my earrings

1213
00:54:29,450 --> 00:54:27,240

um

1214
00:54:32,150 --> 00:54:29,460
that's how big

1215
00:54:33,589 --> 00:54:32,160
the wide area survey is so it's about 2

1216
00:54:35,690 --> 00:54:33,599
000 Square degrees

1217
00:54:38,329 --> 00:54:35,700
and for the astronomers in the room who

1218
00:54:40,490 --> 00:54:38,339
like data this is from Wikipedia the

1219
00:54:42,589 --> 00:54:40,500
actual area of all the constellations

1220
00:54:45,109 --> 00:54:42,599
sorted by area and the largest

1221
00:54:48,950 --> 00:54:45,119
constellation on the sky is about uh

1222
00:54:51,890 --> 00:54:48,960
1300 Square degrees so our wide area

1223
00:54:54,470 --> 00:54:51,900
survey will be larger than any one

1224
00:54:56,510 --> 00:54:54,480
constellation

1225
00:54:58,490 --> 00:54:56,520
cool fact to take home to Mom and Dad

1226
00:55:01,069 --> 00:54:58,500
that's a fun one

1227
00:55:03,950 --> 00:55:01,079
uh it's not only that we have this area

1228
00:55:07,370 --> 00:55:03,960
it's that Roman can actually do things

1229
00:55:10,130 --> 00:55:07,380
very quickly so I did some back of the

1230
00:55:13,970 --> 00:55:10,140
envelope math and to cover this one time

1231
00:55:16,190 --> 00:55:13,980
is about 7 200 pointings

1232
00:55:18,290 --> 00:55:16,200
uh the equivalent with HST would be

1233
00:55:21,170 --> 00:55:18,300
about 660

1234
00:55:22,970 --> 00:55:21,180
000 HST pointings and this is a hundred

1235
00:55:25,790 --> 00:55:22,980
times more area than Hubble has observed

1236
00:55:27,829 --> 00:55:25,800
over 30 years

1237
00:55:29,870 --> 00:55:27,839
um so

1238
00:55:33,109 --> 00:55:29,880

in a couple of years

1239
00:55:35,569 --> 00:55:33,119
you can actually go outside and look up

1240
00:55:37,670 --> 00:55:35,579
and then you can pull out your phone and

1241
00:55:42,049 --> 00:55:37,680
you can zoom in to Hubble level

1242
00:55:47,450 --> 00:55:45,230
um and uh let me give you a real

1243
00:55:50,089 --> 00:55:47,460
simulated data this is a simulation that

1244
00:55:52,370 --> 00:55:50,099
was done by my colleague Sebastian uh

1245
00:55:55,309 --> 00:55:52,380
here at the science operations center so

1246
00:55:57,770 --> 00:55:55,319
this is real data uh that's then

1247
00:55:59,750 --> 00:55:57,780
stimulated through a something that

1248
00:56:01,970 --> 00:55:59,760
simulates what Roman's going to do of

1249
00:56:03,349 --> 00:56:01,980
the Hercules star cluster this is a

1250
00:56:06,770 --> 00:56:03,359
cluster you could go out and observe

1251
00:56:08,690 --> 00:56:06,780
with binoculars or a small telescope

1252
00:56:12,589 --> 00:56:08,700
um and that is the Hubble image up there

1253
00:56:15,290 --> 00:56:12,599
which is just of this tiny little region

1254
00:56:16,309 --> 00:56:15,300
um and so we get all of this area at one

1255
00:56:18,109 --> 00:56:16,319
go

1256
00:56:20,450 --> 00:56:18,119
but to just really drive the point home

1257
00:56:23,569 --> 00:56:20,460
I'm going to zoom in on that one chip

1258
00:56:25,430 --> 00:56:23,579
and we get all of this beautiful detail

1259
00:56:26,510 --> 00:56:25,440
as well

1260
00:56:29,569 --> 00:56:26,520
so

1261
00:56:31,730 --> 00:56:29,579
fun times ahead

1262
00:56:34,010 --> 00:56:31,740
the other thing to keep in mind is that

1263
00:56:36,470 --> 00:56:34,020

I'm talking a lot about things in the

1264
00:56:39,589 --> 00:56:36,480
nearby Universe constellations star

1265
00:56:41,990 --> 00:56:39,599
clusters and this huge area

1266
00:56:43,970 --> 00:56:42,000
but actually as we look further and

1267
00:56:46,549 --> 00:56:43,980
further away we're looking back in time

1268
00:56:48,650 --> 00:56:46,559
and this large area to Us nearby

1269
00:56:50,210 --> 00:56:48,660
actually gets bigger and bigger and

1270
00:56:50,930 --> 00:56:50,220
bigger as we look further and further

1271
00:56:53,030 --> 00:56:50,940
back

1272
00:56:56,150 --> 00:56:53,040
so not only do we observe what's nearby

1273
00:56:58,670 --> 00:56:56,160
could we observe the Big Dipper we

1274
00:57:00,049 --> 00:56:58,680
actually look all the way back and in

1275
00:57:04,250 --> 00:57:00,059
our deep surveys

1276
00:57:06,530 --> 00:57:04,260
and get these huge areas of the sky in

1277
00:57:08,990 --> 00:57:06,540
older times and that is going to be

1278
00:57:10,849 --> 00:57:09,000
tremendous for doing cosmology for

1279
00:57:12,829 --> 00:57:10,859
studying the evolution of the universe

1280
00:57:15,290 --> 00:57:12,839
at these large scales

1281
00:57:18,470 --> 00:57:15,300
so on the largest scales the universe is

1282
00:57:21,470 --> 00:57:18,480
very homogeneous it's boring

1283
00:57:23,349 --> 00:57:21,480
um but you can get unlucky and study a

1284
00:57:26,329 --> 00:57:23,359
patch that is more or less interesting

1285
00:57:29,150 --> 00:57:26,339
so this survey is going to give us these

1286
00:57:31,190 --> 00:57:29,160
huge areas where we can average over and

1287
00:57:32,630 --> 00:57:31,200
get a really good understanding of

1288
00:57:35,390 --> 00:57:32,640

what's going on

1289
00:57:37,870 --> 00:57:35,400
uh in our writer's Workshop that we had

1290
00:57:40,130 --> 00:57:37,880
as part of this conference someone

1291
00:57:41,450 --> 00:57:40,140
compared it to taking little tiny

1292
00:57:44,150 --> 00:57:41,460
snapshots

1293
00:57:46,010 --> 00:57:44,160
of of a scene and looking at them

1294
00:57:47,510 --> 00:57:46,020
individually versus seeing the whole

1295
00:57:49,130 --> 00:57:47,520
scene at one time we're going to start

1296
00:57:51,410 --> 00:57:49,140
getting the whole scene

1297
00:57:53,990 --> 00:57:51,420
we have a different survey that's not

1298
00:57:56,809 --> 00:57:54,000
going to cover a huge area it's going to

1299
00:57:58,790 --> 00:57:56,819
go to the same area and view it many

1300
00:58:01,370 --> 00:57:58,800
many times over the course of the

1301
00:58:04,190 --> 00:58:01,380
mission to see what changes

1302
00:58:07,790 --> 00:58:04,200
and some of those things that change are

1303
00:58:10,490 --> 00:58:07,800
called supernovae uh and supernovae uh

1304
00:58:12,049 --> 00:58:10,500
are cool because they're so bright

1305
00:58:13,309 --> 00:58:12,059
they're brighter than an individual

1306
00:58:15,950 --> 00:58:13,319
Galaxy

1307
00:58:18,170 --> 00:58:15,960
that we can observe them so individuals

1308
00:58:20,089 --> 00:58:18,180
their individual stars or maybe binaries

1309
00:58:22,309 --> 00:58:20,099
depends on who you talk to that are

1310
00:58:24,290 --> 00:58:22,319
exploding but we can see them all the

1311
00:58:25,849 --> 00:58:24,300
way back to half the age of the universe

1312
00:58:27,650 --> 00:58:25,859
already

1313
00:58:30,230 --> 00:58:27,660

and we might be able to see them further

1314
00:58:31,970 --> 00:58:30,240
people are working on it

1315
00:58:33,950 --> 00:58:31,980
um and that's incredible because these

1316
00:58:35,750 --> 00:58:33,960
things are standard candles which means

1317
00:58:37,670 --> 00:58:35,760
we know how bright they should be their

1318
00:58:38,930 --> 00:58:37,680
standards so we actually can measure

1319
00:58:41,150 --> 00:58:38,940
distances

1320
00:58:42,289 --> 00:58:41,160
all the way out to half the age of the

1321
00:58:44,630 --> 00:58:42,299
universe

1322
00:58:47,030 --> 00:58:44,640
and measure How the Universe changes

1323
00:58:48,349 --> 00:58:47,040
in a very simple form there's people

1324
00:58:51,289 --> 00:58:48,359
here at this conference that could tell

1325
00:58:53,210 --> 00:58:51,299
you all the details but that is for

1326
00:58:55,849 --> 00:58:53,220
another day

1327
00:59:01,789 --> 00:58:58,250
um another thing I wanted to talk about

1328
00:59:05,270 --> 00:59:01,799
with Nancy is she has this quote that

1329
00:59:08,270 --> 00:59:05,280
was used to try and convince people to

1330
00:59:10,069 --> 00:59:08,280
do a Space Telescope and she says

1331
00:59:13,130 --> 00:59:10,079
looking at stars through the atmosphere

1332
00:59:15,289 --> 00:59:13,140
is not too different from looking at

1333
00:59:16,670 --> 00:59:15,299
street lights through a plane of old

1334
00:59:19,250 --> 00:59:16,680
stained glass

1335
00:59:22,309 --> 00:59:19,260
so just imagine that in your head

1336
00:59:24,589 --> 00:59:22,319
so the atmosphere

1337
00:59:26,870 --> 00:59:24,599
is like a thousand little lenses bending

1338
00:59:29,210 --> 00:59:26,880

and moving around and it causes the

1339
00:59:32,569 --> 00:59:29,220
image that's made on the telescope plane

1340
00:59:35,630 --> 00:59:32,579
to bounce around and get blurred

1341
00:59:37,609 --> 00:59:35,640
and this is why we do space astronomy

1342
00:59:41,089 --> 00:59:37,619
because we're going to put our telescope

1343
00:59:44,150 --> 00:59:41,099
above the atmosphere and just skip that

1344
00:59:48,710 --> 00:59:46,309
um so when she started talking about the

1345
00:59:52,430 --> 00:59:48,720
idea of a Space Telescope believe it or

1346
00:59:55,730 --> 00:59:52,440
not most astronomers were like no

1347
00:59:57,770 --> 00:59:55,740
no not for me not what I wanted so a

1348
01:00:00,589 --> 00:59:57,780
tremendous amount of her work was

1349
01:00:02,270 --> 01:00:00,599
convincing the community that they did

1350
01:00:05,390 --> 01:00:02,280
want this

1351
01:00:07,849 --> 01:00:05,400
the engineers got so excited and this

1352
01:00:10,430 --> 01:00:07,859
flashed through uh in that talk and it

1353
01:00:13,010 --> 01:00:10,440
took me forever to find an actual copy

1354
01:00:15,049 --> 01:00:13,020
of it Splash through in the video the

1355
01:00:16,789 --> 01:00:15,059
engineers thought this was rad they're

1356
01:00:19,130 --> 01:00:16,799
like this is cool so we're gonna build

1357
01:00:21,710 --> 01:00:19,140
this telescope and then we're gonna have

1358
01:00:23,809 --> 01:00:21,720
this camera back here and this astronaut

1359
01:00:26,990 --> 01:00:23,819
will go up and they'll so that thing in

1360
01:00:29,089 --> 01:00:27,000
his hand is a canister of film that

1361
01:00:31,250 --> 01:00:29,099
he'll change and then he'll take it back

1362
01:00:33,950 --> 01:00:31,260
down to earth and we'll have all these

1363
01:00:36,650 --> 01:00:33,960

pictures of space and it'll be great and

1364
01:00:38,870 --> 01:00:36,660
Nancy much to her credit was just kind

1365
01:00:42,890 --> 01:00:38,880
of like

1366
01:00:46,800 --> 01:00:44,930
that's a concept

1367
01:00:49,730 --> 01:00:46,810
um I see you made drawings

1368
01:00:51,410 --> 01:00:49,740
[Laughter]

1369
01:00:55,010 --> 01:00:51,420
um much to her credit she then

1370
01:00:57,829 --> 01:00:55,020
negotiated it was a yes but conversation

1371
01:01:00,109 --> 01:00:57,839
and uh there's a quote of hers where she

1372
01:01:03,010 --> 01:01:00,119
says I didn't know how to tell them

1373
01:01:05,450 --> 01:01:03,020
we hadn't been using film in that way

1374
01:01:07,609 --> 01:01:05,460
for decades

1375
01:01:09,470 --> 01:01:07,619
um but you have to remember it's 1969

1376
01:01:12,710 --> 01:01:09,480
and what's going on then it's it's

1377
01:01:15,530 --> 01:01:12,720
putting crude space missions putting

1378
01:01:17,030 --> 01:01:15,540
orbital science platforms into space so

1379
01:01:22,069 --> 01:01:17,040
they were they were running with the

1380
01:01:25,789 --> 01:01:22,079
theme and they ran a little too far uh

1381
01:01:28,069 --> 01:01:25,799
um but this actually gets a lot to the

1382
01:01:29,690 --> 01:01:28,079
technology that you needed to have a

1383
01:01:31,309 --> 01:01:29,700
space mission so I talked about the

1384
01:01:33,289 --> 01:01:31,319
atmosphere and how that adds all this

1385
01:01:35,150 --> 01:01:33,299
blurring and that means that we don't

1386
01:01:37,730 --> 01:01:35,160
actually get to the physical Optical

1387
01:01:39,470 --> 01:01:37,740
limit of what a telescope can do it's

1388
01:01:42,410 --> 01:01:39,480

not until you get above the atmosphere

1389
01:01:44,510 --> 01:01:42,420
so having a human there meant you could

1390
01:01:46,370 --> 01:01:44,520
only go so far up because you needed to

1391
01:01:49,370 --> 01:01:46,380
go back and forth to take the film to

1392
01:01:51,289 --> 01:01:49,380
CVS and get it processed

1393
01:01:56,089 --> 01:01:51,299
um

1394
01:01:58,490 --> 01:01:56,099
breathable atmosphere in the back and

1395
01:02:01,970 --> 01:01:58,500
all through and you had that heat that

1396
01:02:04,010 --> 01:02:01,980
extra heat of the humans and of the taxi

1397
01:02:05,450 --> 01:02:04,020
the Uber taking him back and forth I

1398
01:02:07,250 --> 01:02:05,460
don't know

1399
01:02:10,190 --> 01:02:07,260
um there's lots of reasons why this is

1400
01:02:12,950 --> 01:02:10,200
not actually a step forward for getting

1401
01:02:16,130 --> 01:02:12,960
to that physical resolution that

1402
01:02:19,910 --> 01:02:16,140
beautiful beautiful resolution

1403
01:02:22,190 --> 01:02:19,920
um there was also a long debate about

1404
01:02:24,170 --> 01:02:22,200
the camera that would go back there

1405
01:02:26,089 --> 01:02:24,180
because you want it to be not film

1406
01:02:27,470 --> 01:02:26,099
obviously but you want it to be a

1407
01:02:28,549 --> 01:02:27,480
digital camera

1408
01:02:31,309 --> 01:02:28,559
um and I'll talk about or something

1409
01:02:35,390 --> 01:02:31,319
digital and that technology wasn't in

1410
01:02:37,730 --> 01:02:35,400
place in 1969 either so there's a lot of

1411
01:02:38,930 --> 01:02:37,740
talk about how Nancy slowed this process

1412
01:02:40,430 --> 01:02:38,940
because she didn't feel like the

1413
01:02:43,730 --> 01:02:40,440

technology was ready

1414
01:02:45,230 --> 01:02:43,740
but the technology wasn't ready right I

1415
01:02:47,630 --> 01:02:45,240
mean this was the concept of the

1416
01:02:50,870 --> 01:02:47,640
technology at the time

1417
01:02:53,329 --> 01:02:50,880
so today with the Roman Mission uh we're

1418
01:02:56,450 --> 01:02:53,339
even getting beyond the Earth so this is

1419
01:02:59,030 --> 01:02:56,460
a map uh and this line here the sort of

1420
01:03:00,589 --> 01:02:59,040
dark kind of cyanide line is a

1421
01:03:03,230 --> 01:03:00,599
representation of the Earth's orbit

1422
01:03:04,549 --> 01:03:03,240
around the sun that's at the center and

1423
01:03:06,230 --> 01:03:04,559
what you're seeing here is a

1424
01:03:09,829 --> 01:03:06,240
representation of the gravitational

1425
01:03:11,390 --> 01:03:09,839
field that's much like a contour map so

1426
01:03:13,250 --> 01:03:11,400
where there's more lines together you're

1427
01:03:16,549 --> 01:03:13,260
stronger and where there's fewer lines

1428
01:03:18,650 --> 01:03:16,559
it's weaker in this visualization

1429
01:03:20,270 --> 01:03:18,660
so the Hubble Space Telescope actually

1430
01:03:22,069 --> 01:03:20,280
orbits the earth

1431
01:03:24,049 --> 01:03:22,079
and what happens if you orbit the earth

1432
01:03:27,049 --> 01:03:24,059
you spend half the time on the back side

1433
01:03:28,250 --> 01:03:27,059
and half the time on the front side and

1434
01:03:29,809 --> 01:03:28,260
what that means when you're on the back

1435
01:03:31,970 --> 01:03:29,819
side is you're shielded from the sun's

1436
01:03:33,109 --> 01:03:31,980
radiation and you can be quite cool but

1437
01:03:34,910 --> 01:03:33,119
when you're on the front side you're

1438
01:03:37,670 --> 01:03:34,920

getting heating up heated up by the sun

1439
01:03:39,109 --> 01:03:37,680
now if we don't want an astronomer

1440
01:03:40,670 --> 01:03:39,119
sitting in our telescope we probably

1441
01:03:43,130 --> 01:03:40,680
don't want the sun heating up our

1442
01:03:44,510 --> 01:03:43,140
telescope so and and part of my science

1443
01:03:47,030 --> 01:03:44,520
life I measure something called the

1444
01:03:49,789 --> 01:03:47,040
Hubble constant and in my data I can see

1445
01:03:52,309 --> 01:03:49,799
the effect of heating up that telescope

1446
01:03:54,289 --> 01:03:52,319
and warm things expand and stretch out

1447
01:03:56,510 --> 01:03:54,299
and cool things cool back down and I

1448
01:03:57,650 --> 01:03:56,520
have to take that effect out to do my

1449
01:04:00,170 --> 01:03:57,660
science

1450
01:04:02,390 --> 01:04:00,180
so where we're putting telescopes now

1451
01:04:05,630 --> 01:04:02,400
especially infrared sensitive telescopes

1452
01:04:07,130 --> 01:04:05,640
is out here at a point called L2 these

1453
01:04:08,930 --> 01:04:07,140
are called LaGrange points because you

1454
01:04:10,130 --> 01:04:08,940
solve the LaGrange equations and you get

1455
01:04:12,890 --> 01:04:10,140
these Five Points where you could

1456
01:04:15,230 --> 01:04:12,900
potentially send something to orbit uh

1457
01:04:17,150 --> 01:04:15,240
this is where James Webb is this is

1458
01:04:18,410 --> 01:04:17,160
where a satellite called Gaia is and

1459
01:04:19,970 --> 01:04:18,420
this is where we're going to put Roman

1460
01:04:21,950 --> 01:04:19,980
so we're getting far away from the earth

1461
01:04:24,589 --> 01:04:21,960
we're almost always going to in these

1462
01:04:27,410 --> 01:04:24,599
these uh points rotate oh sorry orbit

1463
01:04:28,730 --> 01:04:27,420

with the Earth uh so you'll always be in

1464
01:04:30,589 --> 01:04:28,740
the shadow and that gives us much more

1465
01:04:32,510 --> 01:04:30,599
time to use this telescope it makes it

1466
01:04:34,430 --> 01:04:32,520
much more efficient and it's going to be

1467
01:04:36,230 --> 01:04:34,440
temperature controlled and that gives us

1468
01:04:37,849 --> 01:04:36,240
pointing stability that gives us

1469
01:04:39,049 --> 01:04:37,859
stability of the images that we're

1470
01:04:41,930 --> 01:04:39,059
making

1471
01:04:44,390 --> 01:04:41,940
um and it's fantastic it also means

1472
01:04:46,370 --> 01:04:44,400
that on occasion

1473
01:04:48,530 --> 01:04:46,380
uh we'll get some pictures of James Webb

1474
01:04:50,870 --> 01:04:48,540
maybe

1475
01:04:53,210 --> 01:04:50,880
um there's a

1476
01:04:55,370 --> 01:04:53,220
there's a fun uh there's a fun game that

1477
01:04:57,230 --> 01:04:55,380
you have to play with with web data and

1478
01:04:59,390 --> 01:04:57,240
with some other projects where you're

1479
01:05:01,910 --> 01:04:59,400
like taking out people have rediscovered

1480
01:05:03,770 --> 01:05:01,920
these telescopes out at L2 many many

1481
01:05:06,530 --> 01:05:03,780
many

1482
01:05:09,170 --> 01:05:06,540
um so that will also be fun so we're

1483
01:05:10,849 --> 01:05:09,180
taking this concept a whole new level uh

1484
01:05:13,250 --> 01:05:10,859
getting as far away as possible making

1485
01:05:15,829 --> 01:05:13,260
this telescope as stable as possible to

1486
01:05:18,950 --> 01:05:15,839
do that tremendous science

1487
01:05:20,569 --> 01:05:18,960
uh this Mission actually ends up being

1488
01:05:23,329 --> 01:05:20,579

um less expensive than it could be

1489
01:05:25,549 --> 01:05:23,339
because we're actually using a leftover

1490
01:05:27,710 --> 01:05:25,559
telescope that came from the national

1491
01:05:29,930 --> 01:05:27,720
reconnaissance office

1492
01:05:31,750 --> 01:05:29,940
and I'll leave the context clues about

1493
01:05:35,390 --> 01:05:31,760
what the national reconnaissance office

1494
01:05:37,670 --> 01:05:35,400
does this telescope used to point down

1495
01:05:40,069 --> 01:05:37,680
instead of out

1496
01:05:42,410 --> 01:05:40,079
um so we got this Frame uh and we're

1497
01:05:43,609 --> 01:05:42,420
able to use it they actually took the

1498
01:05:46,670 --> 01:05:43,619
mirror that was in the telescope

1499
01:05:49,490 --> 01:05:46,680
refurbished it polished it uh fixed its

1500
01:05:52,130 --> 01:05:49,500
surface to an extreme degree and we're

1501
01:05:54,349 --> 01:05:52,140
adding Cutting Edge technology to this

1502
01:05:55,609 --> 01:05:54,359
telescope to make let it do this amazing

1503
01:05:57,430 --> 01:05:55,619
science

1504
01:06:00,349 --> 01:05:57,440
and one of the things that we're doing

1505
01:06:02,990 --> 01:06:00,359
is we're making

1506
01:06:05,990 --> 01:06:03,000
a camera that I just don't even know how

1507
01:06:08,089 --> 01:06:06,000
to explain how awesome this camera is we

1508
01:06:10,250 --> 01:06:08,099
all walk around with a detector right

1509
01:06:13,010 --> 01:06:10,260
now in our phone several of them

1510
01:06:15,829 --> 01:06:13,020
and that detector is there

1511
01:06:20,089 --> 01:06:15,839
it's like your cell phone camera

1512
01:06:22,309 --> 01:06:20,099
this is one of the 18 detectors going

1513
01:06:24,470 --> 01:06:22,319

into Roman it's about the size of a

1514
01:06:26,150 --> 01:06:24,480
Saltine cracker the folks in the

1515
01:06:29,569 --> 01:06:26,160
communications at Goddard told me that

1516
01:06:32,450 --> 01:06:29,579
was the official term it's a lowercase s

1517
01:06:33,230 --> 01:06:32,460
because we don't have the trademark

1518
01:06:35,569 --> 01:06:33,240
um

1519
01:06:38,690 --> 01:06:35,579
that is a Saltine cracker and this is

1520
01:06:41,270 --> 01:06:38,700
Greg one of the engineers uh astronomer

1521
01:06:43,670 --> 01:06:41,280
Engineers who works on it just to get a

1522
01:06:47,089 --> 01:06:43,680
sense for the scale this thing

1523
01:06:49,730 --> 01:06:47,099
and each one is about 12 megapixels and

1524
01:06:51,230 --> 01:06:49,740
I this is based on ground data but each

1525
01:06:53,450 --> 01:06:51,240
Raw

1526
01:06:54,589 --> 01:06:53,460
set of reads that we get which I'm not

1527
01:06:59,870 --> 01:06:54,599
going to explain exactly what I mean by

1528
01:07:06,289 --> 01:07:02,390
um when we put all 18 together

1529
01:07:08,329 --> 01:07:06,299
uh you get a detector array that you

1530
01:07:11,270 --> 01:07:08,339
know is like

1531
01:07:12,770 --> 01:07:11,280
something you can see and have heft so

1532
01:07:14,630 --> 01:07:12,780
that's a real person in their head and

1533
01:07:17,329 --> 01:07:14,640
their hand to get a sense for that scale

1534
01:07:22,970 --> 01:07:17,339
it's kind of unreal this detector it is

1535
01:07:26,089 --> 01:07:22,980
302 megapixels each uh image is about 40

1536
01:07:27,770 --> 01:07:26,099
gigabytes coming off raw we astronomers

1537
01:07:29,690 --> 01:07:27,780
called data processing reducing because

1538
01:07:31,910 --> 01:07:29,700

we actually reduce that total volume

1539
01:07:34,430 --> 01:07:31,920
down quite a bit as we process the raw

1540
01:07:36,470 --> 01:07:34,440
data but that's just a sense of the

1541
01:07:38,690 --> 01:07:36,480
technology that we have for this Mission

1542
01:07:44,329 --> 01:07:38,700
and what is giving us the power to map

1543
01:07:49,690 --> 01:07:46,970
um this is a quote from Nancy after she

1544
01:07:53,029 --> 01:07:49,700
retired from NASA she retired in about

1545
01:07:55,609 --> 01:07:53,039
1979. she hand-picked her successor who

1546
01:07:58,010 --> 01:07:55,619
called himself the first male head of

1547
01:08:01,190 --> 01:07:58,020
NASA astrophysics he's the one that

1548
01:08:04,309 --> 01:08:01,200
really coined that term mother of Hubble

1549
01:08:06,770 --> 01:08:04,319
she retired to take care of her mother

1550
01:08:09,589 --> 01:08:06,780
um and after a few years she decided she

1551
01:08:12,710 --> 01:08:09,599
wanted to work part-time so she went to

1552
01:08:14,630 --> 01:08:12,720
the Goddard astronomical Data Center

1553
01:08:17,090 --> 01:08:14,640
and she sat down and I hope the visual

1554
01:08:19,309 --> 01:08:17,100
the the whole story we just had about

1555
01:08:21,950 --> 01:08:19,319
Nancy you can just see this conversation

1556
01:08:25,550 --> 01:08:21,960
she said look

1557
01:08:28,130 --> 01:08:25,560
I know astronomical catalogs

1558
01:08:31,130 --> 01:08:28,140
if you'll teach me computers

1559
01:08:32,930 --> 01:08:31,140
I'd like to work for you so she did

1560
01:08:35,689 --> 01:08:32,940
astronomy on these measuring devices

1561
01:08:39,110 --> 01:08:35,699
with pen and paper calculated on a hand

1562
01:08:41,510 --> 01:08:39,120
calculator then was an administrator

1563
01:08:42,910 --> 01:08:41,520

so she had to learn how to use computers

1564
01:08:45,829 --> 01:08:42,920
how to use

1565
01:08:47,689 --> 01:08:45,839
that kind of data to work there she was

1566
01:08:49,309 --> 01:08:47,699
hired at Goddard at the astronomical

1567
01:08:50,689 --> 01:08:49,319
data center in a few years she was

1568
01:08:52,910 --> 01:08:50,699
actually the director

1569
01:08:55,729 --> 01:08:52,920
of that Center and she worked part-time

1570
01:08:57,410 --> 01:08:55,739
and telecommuted this was in the 80s she

1571
01:08:59,030 --> 01:08:57,420
telecommuted so she could take care of

1572
01:09:00,530 --> 01:08:59,040
her mother and there's a whole section

1573
01:09:02,329 --> 01:09:00,540
about how she's like I kind of invented

1574
01:09:04,370 --> 01:09:02,339
it I feel like she might have forced it

1575
01:09:06,650 --> 01:09:04,380
but anyway she like invented the concept

1576
01:09:08,450 --> 01:09:06,660
and over time more and more people

1577
01:09:10,669 --> 01:09:08,460
actually wanted to telecommute so coming

1578
01:09:13,430 --> 01:09:10,679
out of kovid and as we're all adapting

1579
01:09:16,430 --> 01:09:13,440
to working hybrid just like Nancy was

1580
01:09:19,010 --> 01:09:16,440
doing this in 1980 so

1581
01:09:20,630 --> 01:09:19,020
we can do it too

1582
01:09:23,090 --> 01:09:20,640
um so the thing

1583
01:09:24,530 --> 01:09:23,100
I I want to say is I've just talked to

1584
01:09:28,189 --> 01:09:24,540
you about all that data the 300

1585
01:09:30,130 --> 01:09:28,199
megapixels the 40 gigabyte files we have

1586
01:09:32,809 --> 01:09:30,140
to learn as a community

1587
01:09:34,789 --> 01:09:32,819
how to use this data and it's a

1588
01:09:36,650 --> 01:09:34,799

different context I can't download that

1589
01:09:39,229 --> 01:09:36,660
to my computer and do my analysis I have

1590
01:09:42,289 --> 01:09:39,239
to learn to do things in a new way

1591
01:09:44,090 --> 01:09:42,299
and let's put this into context this is

1592
01:09:45,470 --> 01:09:44,100
the data sent to Earth

1593
01:09:51,289 --> 01:09:45,480
per day

1594
01:09:53,870 --> 01:09:51,299
need quite the Hefty cellular data plan

1595
01:09:58,130 --> 01:09:53,880
but it's not out of context

1596
01:10:01,669 --> 01:09:58,140
right jwst 58 gigabytes per day it's

1597
01:10:04,689 --> 01:10:01,679
pretty heavy data data plan Romans is

1598
01:10:10,669 --> 01:10:04,699
going to send 1.4

1599
01:10:15,590 --> 01:10:12,709
um that's that's a lot

1600
01:10:17,689 --> 01:10:15,600
uh when I say sending the data back to

1601
01:10:19,790 --> 01:10:17,699
Earth what I mean is on the spacecraft

1602
01:10:23,030 --> 01:10:19,800
the data are prepared

1603
01:10:25,070 --> 01:10:23,040
um in in staged and then they're sent to

1604
01:10:29,030 --> 01:10:25,080
the deep space Network which are these

1605
01:10:31,669 --> 01:10:29,040
huge radio dishes across the world uh

1606
01:10:33,950 --> 01:10:31,679
where these dishes receive that data and

1607
01:10:36,770 --> 01:10:33,960
transfer it here or will transfer here

1608
01:10:39,590 --> 01:10:36,780
to Space Telescope for processing

1609
01:10:41,209 --> 01:10:39,600
cool cool fact you can actually go

1610
01:10:43,850 --> 01:10:41,219
online and see what the deep space

1611
01:10:46,490 --> 01:10:43,860
network is doing at any given time and

1612
01:10:50,750 --> 01:10:46,500
they're going to get so busy uh when we

1613
01:10:54,770 --> 01:10:52,910

cool well what does that mean integrated

1614
01:10:58,250 --> 01:10:54,780
over time

1615
01:11:02,209 --> 01:10:58,260
all of the HST data taken for 30 years

1616
01:11:05,750 --> 01:11:02,219
is about 172 terabytes you could

1617
01:11:08,990 --> 01:11:05,760
probably like go to some sales online

1618
01:11:11,630 --> 01:11:09,000
and get yourself 172 terabytes of disk

1619
01:11:13,490 --> 01:11:11,640
space even as a single human being with

1620
01:11:14,750 --> 01:11:13,500
spare time and disposable income

1621
01:11:16,070 --> 01:11:14,760
but

1622
01:11:18,350 --> 01:11:16,080
um

1623
01:11:20,570 --> 01:11:18,360
when we think about the jwst five-year

1624
01:11:23,209 --> 01:11:20,580
Mission we're talking about one petabyte

1625
01:11:26,510 --> 01:11:23,219
a thousand terabytes that's sort of out

1626
01:11:27,890 --> 01:11:26,520
of scale for even a small astronomical

1627
01:11:29,450 --> 01:11:27,900
department is definitely out of scale

1628
01:11:31,030 --> 01:11:29,460
from an individual or an individual

1629
01:11:33,530 --> 01:11:31,040
research group

1630
01:11:39,189 --> 01:11:33,540
Roman's five-year Mission will produce

1631
01:11:41,990 --> 01:11:39,199
20 000 terabytes 20 petabytes of data

1632
01:11:45,410 --> 01:11:42,000
that is not data that everyone is going

1633
01:11:47,450 --> 01:11:45,420
to look at so for HST and jwst a human

1634
01:11:48,470 --> 01:11:47,460
looks at every image to make sure it's

1635
01:11:52,130 --> 01:11:48,480
okay

1636
01:11:54,350 --> 01:11:52,140
for Roman my colleague John who might be

1637
01:11:56,450 --> 01:11:54,360
here he might have gone home is actually

1638
01:11:58,310 --> 01:11:56,460

devising how do we use machine learning

1639
01:12:01,189 --> 01:11:58,320
to actually tell us the images that look

1640
01:12:04,310 --> 01:12:01,199
good and look bad it's so cool

1641
01:12:06,050 --> 01:12:04,320
um but that's a sense for what our

1642
01:12:07,850 --> 01:12:06,060
archive is going to be for the Roman

1643
01:12:09,590 --> 01:12:07,860
data and why we have to transform the

1644
01:12:11,630 --> 01:12:09,600
way we do science we have to do it in a

1645
01:12:13,490 --> 01:12:11,640
more Community Driven fashion we have to

1646
01:12:16,370 --> 01:12:13,500
share resources and this is going to

1647
01:12:18,530 --> 01:12:16,380
transform astronomy just the ground

1648
01:12:21,649 --> 01:12:18,540
testing data that I spend time thinking

1649
01:12:26,270 --> 01:12:21,659
about is about the size is about twice

1650
01:12:28,729 --> 01:12:26,280
uh this uh jwst five-year mission

1651
01:12:31,490 --> 01:12:28,739
like oh I get to manage a jwst t size

1652
01:12:34,310 --> 01:12:31,500
data chunk for a ground testing cool

1653
01:12:36,229 --> 01:12:34,320
that's definitely on my resume uh but

1654
01:12:39,830 --> 01:12:36,239
anyway just think about that over time

1655
01:12:44,570 --> 01:12:42,169
if I brought anything to the Hubble

1656
01:12:46,850 --> 01:12:44,580
project it was perseverance and belief

1657
01:12:49,250 --> 01:12:46,860
that it was possible how humble is that

1658
01:12:51,410 --> 01:12:49,260
she testified for NASA she got an entire

1659
01:12:53,149 --> 01:12:51,420
astronomical community at a time when

1660
01:12:55,970 --> 01:12:53,159
all astronomers didn't really get along

1661
01:12:57,950 --> 01:12:55,980
to go behind this Mission form the

1662
01:13:00,709 --> 01:12:57,960
committee she invented the type of NASA

1663
01:13:02,209 --> 01:13:00,719

peer review she was the peer review for

1664
01:13:04,430 --> 01:13:02,219
a really long time and then she started

1665
01:13:07,010 --> 01:13:04,440
Outsourcing it she did all of this to

1666
01:13:09,229 --> 01:13:07,020
bring Hubble around it was greenlit for

1667
01:13:11,030 --> 01:13:09,239
funding about 1978 about a year before

1668
01:13:11,750 --> 01:13:11,040
she retired

1669
01:13:13,910 --> 01:13:11,760
um

1670
01:13:15,709 --> 01:13:13,920
it's more than just perseverance and

1671
01:13:18,229 --> 01:13:15,719
belief it's being incredibly effective

1672
01:13:20,990 --> 01:13:18,239
and personable and going all across the

1673
01:13:23,689 --> 01:13:21,000
country to convince astronomers

1674
01:13:25,250 --> 01:13:23,699
um to do this Mission uh if I had to

1675
01:13:28,189 --> 01:13:25,260
pick something that Roman's gonna do

1676
01:13:30,110 --> 01:13:28,199
that requires perseverance and belief

1677
01:13:31,729 --> 01:13:30,120
it's got to be the corona graph which I

1678
01:13:35,870 --> 01:13:31,739
haven't talked about

1679
01:13:39,169 --> 01:13:35,880
a fun fact in 1959 the year she took the

1680
01:13:41,149 --> 01:13:39,179
job with NASA Nancy Grace Roman

1681
01:13:42,290 --> 01:13:41,159
presented a paper called planets of

1682
01:13:44,630 --> 01:13:42,300
other Sons

1683
01:13:48,470 --> 01:13:44,640
and where she describes what it would

1684
01:13:50,750 --> 01:13:48,480
take to observe uh Venus Earth and

1685
01:13:53,149 --> 01:13:50,760
Saturn at their maximum brightness and

1686
01:13:56,149 --> 01:13:53,159
separations around Alpha Centauri which

1687
01:13:59,149 --> 01:13:56,159
is a nearby star so cool this is

1688
01:14:00,770 --> 01:13:59,159

actually cited and the 2023 jwst early

1689
01:14:02,630 --> 01:14:00,780
release science paper but otherwise

1690
01:14:04,070 --> 01:14:02,640
hasn't gotten a lot of citations but

1691
01:14:07,490 --> 01:14:04,080
this is how ahead of the curve she was

1692
01:14:09,770 --> 01:14:07,500
in thinking about this kind of stuff

1693
01:14:13,550 --> 01:14:09,780
so what is the coronagraph

1694
01:14:16,370 --> 01:14:13,560
chronograph is a bit of magic it's

1695
01:14:17,830 --> 01:14:16,380
technology so Advanced that it's pretty

1696
01:14:21,110 --> 01:14:17,840
close to Magic

1697
01:14:23,270 --> 01:14:21,120
that allows you to see Earths around

1698
01:14:25,970 --> 01:14:23,280
distant Stars not too distant very

1699
01:14:28,850 --> 01:14:25,980
nearby stars but pretty far away

1700
01:14:30,229 --> 01:14:28,860
and this is an image of a bright star if

1701
01:14:32,510 --> 01:14:30,239
you simulated like you were trying to

1702
01:14:35,270 --> 01:14:32,520
look at it with a Space Telescope

1703
01:14:38,030 --> 01:14:35,280
the planet the Earth-like planet would

1704
01:14:41,030 --> 01:14:38,040
be 10 billion times fainter than the

1705
01:14:45,229 --> 01:14:43,130
I hate to disappoint you but we're not

1706
01:14:46,729 --> 01:14:45,239
going to be Imaging Earths with the

1707
01:14:48,350 --> 01:14:46,739
Roman chronograph

1708
01:14:51,050 --> 01:14:48,360
we'll probably be Imaging things that

1709
01:14:53,030 --> 01:14:51,060
are a little bit brighter like Saturn uh

1710
01:14:55,370 --> 01:14:53,040
Uranus Jupiter

1711
01:14:57,470 --> 01:14:55,380
but we're going to be able to image them

1712
01:15:00,709 --> 01:14:57,480
so these things are more like you know

1713
01:15:02,390 --> 01:15:00,719

just casually like 10 million to 100

1714
01:15:04,850 --> 01:15:02,400
million times fainter than their star

1715
01:15:06,350 --> 01:15:04,860
than their host star just just you know

1716
01:15:08,630 --> 01:15:06,360
10 to the seven

1717
01:15:10,189 --> 01:15:08,640
uh but the way we do this is with this

1718
01:15:12,050 --> 01:15:10,199
fancy technology called a coronagraph

1719
01:15:14,209 --> 01:15:12,060
and so imagine here this is our super

1720
01:15:16,250 --> 01:15:14,219
bright star and this is the the light

1721
01:15:18,290 --> 01:15:16,260
that we're collecting from it and it's

1722
01:15:21,290 --> 01:15:18,300
going to go to this first mirror and

1723
01:15:24,590 --> 01:15:21,300
then into some lenses so the actual

1724
01:15:27,950 --> 01:15:24,600
image of that point like star has this

1725
01:15:29,570 --> 01:15:27,960
wavy pattern because of how Optics work

1726
01:15:32,930 --> 01:15:29,580
and Fourier transforms we don't have

1727
01:15:36,410 --> 01:15:32,940
time for that but just trust me

1728
01:15:39,410 --> 01:15:36,420
um how are we going to dim this by 10 to

1729
01:15:41,870 --> 01:15:39,420
100 million times

1730
01:15:43,370 --> 01:15:41,880
that was a duplicate slide so let's zoom

1731
01:15:44,990 --> 01:15:43,380
in we're going to blow out the contrast

1732
01:15:46,729 --> 01:15:45,000
here so we can see that pattern it's

1733
01:15:48,590 --> 01:15:46,739
called an Airy pattern

1734
01:15:50,570 --> 01:15:48,600
and here are two lenses that are going

1735
01:15:52,550 --> 01:15:50,580
to do a lot of the magic

1736
01:15:55,070 --> 01:15:52,560
the first thing we do is we slide in

1737
01:15:56,930 --> 01:15:55,080
this occulting device which is basically

1738
01:15:59,030 --> 01:15:56,940

going to take the light from the center

1739
01:16:01,430 --> 01:15:59,040
and it's going to spread it out to the

1740
01:16:03,470 --> 01:16:01,440
outside where we block it and that gets

1741
01:16:05,990 --> 01:16:03,480
rid of a lot of the central obscuration

1742
01:16:07,790 --> 01:16:06,000
but if you note I still don't see a

1743
01:16:10,070 --> 01:16:07,800
planet there

1744
01:16:12,410 --> 01:16:10,080
uh so that's not enough

1745
01:16:14,270 --> 01:16:12,420
the next thing that we do okay and so

1746
01:16:15,770 --> 01:16:14,280
this is the effective image once we put

1747
01:16:17,090 --> 01:16:15,780
the Blocker in that's the effective

1748
01:16:18,770 --> 01:16:17,100
image you're still not seeing a planet

1749
01:16:22,790 --> 01:16:18,780
but you've gotten rid of all those Airy

1750
01:16:25,010 --> 01:16:22,800
patterns I added a step there

1751
01:16:26,930 --> 01:16:25,020
um so let's blow up the contrast again

1752
01:16:29,810 --> 01:16:26,940
and look at that pattern

1753
01:16:32,149 --> 01:16:29,820
that pattern is fuzzy because the mirror

1754
01:16:34,189 --> 01:16:32,159
here isn't perfectly matching what the

1755
01:16:35,990 --> 01:16:34,199
Optics the telescope is doing to the

1756
01:16:38,270 --> 01:16:36,000
beam of light and the beam of light is

1757
01:16:41,090 --> 01:16:38,280
only so stable because of the pointing

1758
01:16:44,810 --> 01:16:41,100
in other systems and so that is the

1759
01:16:50,450 --> 01:16:48,169
so what we do is you actually take this

1760
01:16:53,390 --> 01:16:50,460
mirror and you deform it

1761
01:16:56,030 --> 01:16:53,400
until it matches the incoming pattern

1762
01:16:57,830 --> 01:16:56,040
and when you do that or when magic

1763
01:16:59,510 --> 01:16:57,840

people do that

1764
01:17:02,209 --> 01:16:59,520
um these wonderful sciences that work on

1765
01:17:05,630 --> 01:17:02,219
this uh you all of a sudden start to see

1766
01:17:10,250 --> 01:17:07,490
and when you stabilize it and take the

1767
01:17:12,830 --> 01:17:10,260
exposure around that star were two

1768
01:17:14,870 --> 01:17:12,840
planets that are sort of out you know at

1769
01:17:16,370 --> 01:17:14,880
Jupiter kind of radii and Jupiter kind

1770
01:17:18,050 --> 01:17:16,380
of Jupiter and Neptune kind of

1771
01:17:20,510 --> 01:17:18,060
brightnesses

1772
01:17:22,310 --> 01:17:20,520
and these are 10 to 100 million times

1773
01:17:24,649 --> 01:17:22,320
fainter than their star

1774
01:17:26,450 --> 01:17:24,659
and so this project is considered a

1775
01:17:28,669 --> 01:17:26,460
technology demonstration it's to prove

1776
01:17:30,290 --> 01:17:28,679
that we can do this so that in our next

1777
01:17:32,149 --> 01:17:30,300
great Observatory which people are

1778
01:17:34,130 --> 01:17:32,159
starting to think about we can go after

1779
01:17:36,110 --> 01:17:34,140
the Earths that are 1 billion times

1780
01:17:38,149 --> 01:17:36,120
fainter

1781
01:17:41,510 --> 01:17:38,159
luck and perseverance and bravery for

1782
01:17:44,630 --> 01:17:41,520
this one but it's going to be tremendous

1783
01:17:47,810 --> 01:17:44,640
okay I'm almost done I promise

1784
01:17:50,149 --> 01:17:47,820
um another thing Nancy says is that my

1785
01:17:51,950 --> 01:17:50,159
career was quite unusual so my main

1786
01:17:54,530 --> 01:17:51,960
advice to someone interested in a career

1787
01:17:57,410 --> 01:17:54,540
similar to my own is to remain open to

1788
01:17:59,030 --> 01:17:57,420

change and New Opportunities I like to

1789
01:18:02,209 --> 01:17:59,040
tell students that the jobs I took after

1790
01:18:04,490 --> 01:18:02,219
my PhD were not in existence only a few

1791
01:18:06,050 --> 01:18:04,500
years before

1792
01:18:08,090 --> 01:18:06,060
I like to tell this to Young

1793
01:18:10,610 --> 01:18:08,100
undergraduates to think about the people

1794
01:18:12,530 --> 01:18:10,620
who are retiring this year the year they

1795
01:18:14,689 --> 01:18:12,540
entered the workforce and what the

1796
01:18:17,209 --> 01:18:14,699
technology was then and the types of

1797
01:18:19,610 --> 01:18:17,219
jobs they were people did and the types

1798
01:18:21,229 --> 01:18:19,620
of jobs what the jobs look like now so

1799
01:18:23,390 --> 01:18:21,239
one of your best

1800
01:18:26,209 --> 01:18:23,400
skills to learn is the skill to be

1801
01:18:28,630 --> 01:18:26,219
flexible and learn the skill to learn

1802
01:18:33,110 --> 01:18:28,640
to put things in perspective

1803
01:18:35,570 --> 01:18:33,120
Roman was once uh called W first

1804
01:18:37,729 --> 01:18:35,580
um and that mission was uh kind of put

1805
01:18:40,070 --> 01:18:37,739
together around this time frame around

1806
01:18:41,990 --> 01:18:40,080
2010

1807
01:18:44,990 --> 01:18:42,000
um and so my job working here at the

1808
01:18:48,350 --> 01:18:45,000
science operations center was not in

1809
01:18:50,930 --> 01:18:48,360
existence it was not conceptualized even

1810
01:18:53,810 --> 01:18:50,940
10 or 15 years ago

1811
01:18:56,030 --> 01:18:53,820
uh just to emphasize that science is

1812
01:18:58,250 --> 01:18:56,040
changing the jobs do change so we're way

1813
01:19:00,290 --> 01:18:58,260

on the other side and Roman will launch

1814
01:19:01,910 --> 01:19:00,300
just on the edge of the slide deck over

1815
01:19:05,149 --> 01:19:01,920
there on the screen

1816
01:19:07,310 --> 01:19:05,159
uh just to take that point home

1817
01:19:10,370 --> 01:19:07,320
um Nancy was one of about 25 people that

1818
01:19:13,130 --> 01:19:10,380
graduated with a PhD in astronomy in

1819
01:19:15,590 --> 01:19:13,140
1940

1820
01:19:18,410 --> 01:19:15,600
49 Maybe

1821
01:19:21,290 --> 01:19:18,420
49ish ish

1822
01:19:23,030 --> 01:19:21,300
um today thousands of people graduate we

1823
01:19:24,290 --> 01:19:23,040
have this new facility that you know

1824
01:19:26,570 --> 01:19:24,300
we're working on here that's going to

1825
01:19:27,770 --> 01:19:26,580
require new ideas and new thoughts and

1826
01:19:29,930 --> 01:19:27,780
we're already planning for something

1827
01:19:33,410 --> 01:19:29,940
that will launch in 2030 way off the

1828
01:19:35,990 --> 01:19:33,420
chart and almost into the other room

1829
01:19:38,090 --> 01:19:36,000
um and those jobs will look different uh

1830
01:19:40,010 --> 01:19:38,100
so I think you know I always like to end

1831
01:19:41,750 --> 01:19:40,020
on a moving forward note which is those

1832
01:19:43,490 --> 01:19:41,760
that are listening

1833
01:19:45,229 --> 01:19:43,500
um to to think about what those jobs

1834
01:19:46,850 --> 01:19:45,239
might look like to always think a little

1835
01:19:48,470 --> 01:19:46,860
bit further ahead

1836
01:19:50,330 --> 01:19:48,480
um and just because a skill isn't

1837
01:19:51,950 --> 01:19:50,340
necessary directly applicable with

1838
01:19:54,110 --> 01:19:51,960

what's going on now it doesn't mean it's

1839
01:19:56,090 --> 01:19:54,120
not worth thinking about it or investing

1840
01:19:57,470 --> 01:19:56,100
in it when Nancy graduated through PhD

1841
01:20:00,169 --> 01:19:57,480
there's no such thing as a NASA

1842
01:20:03,110 --> 01:20:00,179
administrator it was a for astrophysics

1843
01:20:05,090 --> 01:20:03,120
it was a job that she

1844
01:20:06,590 --> 01:20:05,100
created basically uh when she was first

1845
01:20:09,350 --> 01:20:06,600
hired

1846
01:20:11,030 --> 01:20:09,360
and this is my last slide which is again

1847
01:20:15,050 --> 01:20:11,040
the

1848
01:20:17,689 --> 01:20:15,060
I never seriously considered any

1849
01:20:19,070 --> 01:20:17,699
occupation other than astronomy a piece

1850
01:20:21,169 --> 01:20:19,080
of artwork I did when I was in third

1851
01:20:22,850 --> 01:20:21,179
grade she was a girl gazing out the

1852
01:20:24,709 --> 01:20:22,860
window at the night sky next to a poem

1853
01:20:26,209 --> 01:20:24,719
about looking at the stars

1854
01:20:27,830 --> 01:20:26,219
so again this comes from the children's

1855
01:20:30,530 --> 01:20:27,840
book

1856
01:20:32,149 --> 01:20:30,540
um but it's just to hit home that I

1857
01:20:34,250 --> 01:20:32,159
think a lot of us scientists and

1858
01:20:37,850 --> 01:20:34,260
especially astronomers we start looking

1859
01:20:41,149 --> 01:20:37,860
up we start with these uh this awe and

1860
01:20:44,270 --> 01:20:41,159
curiosity about the night sky and

1861
01:20:47,510 --> 01:20:44,280
um don't you know keep that I mean don't

1862
01:20:50,930 --> 01:20:47,520
not keep it keep that that's where a lot

1863
01:20:53,209 --> 01:20:50,940

of us start and eventually you could be

1864
01:20:55,790 --> 01:20:53,219
the mother of the next Hubble

1865
01:20:57,830 --> 01:20:55,800
so thank you very much for listening to

1866
01:20:59,060 --> 01:20:57,840
Roman Mission I hope you understand a

1867
01:21:08,750 --> 01:20:59,070
little bit more

1868
01:21:14,930 --> 01:21:11,590
thank you thank you thank you Rachel uh

1869
01:21:16,490 --> 01:21:14,940
so this is um we have some we have time

1870
01:21:17,450 --> 01:21:16,500
for some questions

1871
01:21:19,550 --> 01:21:17,460
um and this is a little bit of an

1872
01:21:21,350 --> 01:21:19,560
unusual public lecture in that we don't

1873
01:21:23,090 --> 01:21:21,360
normally have a room full of other

1874
01:21:25,370 --> 01:21:23,100
scientists

1875
01:21:27,890 --> 01:21:25,380
um and so uh

1876
01:21:29,990 --> 01:21:27,900
Rachel and and Joan you get the you get

1877
01:21:32,090 --> 01:21:30,000
first crack at any questions but if they

1878
01:21:34,610 --> 01:21:32,100
want to punt to any of you experts out

1879
01:21:36,350 --> 01:21:34,620
here any of you scientists or Engineers

1880
01:21:38,930 --> 01:21:36,360
um we have a room full of them so if we

1881
01:21:41,270 --> 01:21:38,940
get really hard online questions this

1882
01:21:43,370 --> 01:21:41,280
might be a group effort all right they

1883
01:21:45,830 --> 01:21:43,380
brought their own backup yeah that's

1884
01:21:48,649 --> 01:21:45,840
right okay so uh do we want to start

1885
01:21:50,510 --> 01:21:48,659
with some online sure

1886
01:21:52,490 --> 01:21:50,520
all right so I'll be bringing the first

1887
01:21:54,950 --> 01:21:52,500
question from online

1888
01:21:58,729 --> 01:21:54,960

um which is a little more engineering

1889
01:22:01,550 --> 01:21:58,739
but will the telescope have the ability

1890
01:22:03,530 --> 01:22:01,560
to be upgraded or changed over time is

1891
01:22:05,930 --> 01:22:03,540
it possible to do an over-the-air like

1892
01:22:08,270 --> 01:22:05,940
firmware update is there any plan for

1893
01:22:15,050 --> 01:22:08,280
Hardware changes is there servicing

1894
01:22:15,060 --> 01:22:23,649
clean

1895
01:22:31,550 --> 01:22:27,590
yeah I got it into a new mode

1896
01:22:33,950 --> 01:22:31,560
um right so the telescope will be at L2

1897
01:22:36,470 --> 01:22:33,960
which is not in orbit around the Earth

1898
01:22:38,390 --> 01:22:36,480
it's pretty far away

1899
01:22:42,290 --> 01:22:38,400
um you can do

1900
01:22:43,130 --> 01:22:42,300
uh software changes sort of

1901
01:22:46,370 --> 01:22:43,140
um

1902
01:22:48,130 --> 01:22:46,380
but you can and it's possible with

1903
01:22:51,649 --> 01:22:48,140
appropriate

1904
01:22:54,410 --> 01:22:51,659
robots that you could send a robot out

1905
01:22:55,729 --> 01:22:54,420
there to swap things out

1906
01:22:59,810 --> 01:22:55,739
um

1907
01:23:03,110 --> 01:22:59,820
and maybe you could send a person like

1908
01:23:06,229 --> 01:23:03,120
in a long time but um in general the the

1909
01:23:08,990 --> 01:23:06,239
mission is five-year lifetime uh just a

1910
01:23:11,750 --> 01:23:09,000
reminder Hubble I think was a 10 year or

1911
01:23:13,370 --> 01:23:11,760
15 year it went on for 30 years so these

1912
01:23:14,750 --> 01:23:13,380
missions do tend to stay around but

1913
01:23:16,250 --> 01:23:14,760

we're only planning for those five years

1914
01:23:19,430 --> 01:23:16,260
right now with the hope that it will

1915
01:23:21,890 --> 01:23:19,440
stay around for us so it's possible uh

1916
01:23:23,990 --> 01:23:21,900
but the technology

1917
01:23:28,250 --> 01:23:24,000
does not exist at the moment that would

1918
01:23:31,010 --> 01:23:30,050
that kind of leads us directly into our

1919
01:23:33,950 --> 01:23:31,020
next

1920
01:23:36,770 --> 01:23:33,960
question from online which is why do we

1921
01:23:39,229 --> 01:23:36,780
hear talks of five-year missions when

1922
01:23:42,050 --> 01:23:39,239
you have fuel or ability for 20-year

1923
01:23:45,169 --> 01:23:43,370
right

1924
01:23:46,970 --> 01:23:45,179
so

1925
01:23:49,070 --> 01:23:46,980
um

1926
01:23:50,689 --> 01:23:49,080
you design a mission to meet

1927
01:23:52,550 --> 01:23:50,699
requirements

1928
01:23:56,950 --> 01:23:52,560
and you want it to meet those

1929
01:23:56,960 --> 01:24:01,669
99.9999999 confidence

1930
01:24:07,550 --> 01:24:05,050
and it turns out when you are 99.999

1931
01:24:10,189 --> 01:24:07,560
confidence in engineering you've usually

1932
01:24:11,689 --> 01:24:10,199
done a really good job and that thing

1933
01:24:13,910 --> 01:24:11,699
will

1934
01:24:17,510 --> 01:24:13,920
surpass its lifetime so when we talk

1935
01:24:19,189 --> 01:24:17,520
about jwst Fuel and in particular this

1936
01:24:21,590 --> 01:24:19,199
is I think probably come up in people's

1937
01:24:23,689 --> 01:24:21,600
minds around jdbst

1938
01:24:25,790 --> 01:24:23,699

um you know you think about all the

1939
01:24:29,570 --> 01:24:25,800
possible things that could happen on its

1940
01:24:31,430 --> 01:24:29,580
trip from Earth uh to L2 all the

1941
01:24:34,010 --> 01:24:31,440
possible ways that it could have to use

1942
01:24:35,410 --> 01:24:34,020
extra Fuel and you add all that up and

1943
01:24:36,970 --> 01:24:35,420
that goes into that

1944
01:24:39,649 --> 01:24:36,980
99.999999

1945
01:24:40,790 --> 01:24:39,659
confidence that this mission is going to

1946
01:24:43,970 --> 01:24:40,800
be successful

1947
01:24:45,830 --> 01:24:43,980
so sometimes you end up with extra

1948
01:24:47,630 --> 01:24:45,840
because you

1949
01:24:49,250 --> 01:24:47,640
prepared

1950
01:24:51,890 --> 01:24:49,260
really well

1951
01:24:55,689 --> 01:24:51,900
and maybe those things didn't happen uh

1952
01:24:58,010 --> 01:24:55,699
it's also a matter of you know money

1953
01:25:00,830 --> 01:24:58,020
it's also a matter of having science

1954
01:25:02,570 --> 01:25:00,840
requirements uh the things that we are

1955
01:25:04,250 --> 01:25:02,580
required to do and that we will try to

1956
01:25:06,050 --> 01:25:04,260
do can be achieved in that five-year

1957
01:25:08,390 --> 01:25:06,060
time frame

1958
01:25:10,790 --> 01:25:08,400
um you know it's also practical uh to

1959
01:25:13,250 --> 01:25:10,800
think in those kinds of terms so we do

1960
01:25:14,510 --> 01:25:13,260
have admin so hopefully this was a who

1961
01:25:16,130 --> 01:25:14,520
who think about this a lot more than I

1962
01:25:18,770 --> 01:25:16,140
do probably that's a reasonable answer

1963
01:25:20,930 --> 01:25:18,780

but it's often just that you plan

1964
01:25:23,750 --> 01:25:20,940
something to such a Precision that you

1965
01:25:26,209 --> 01:25:23,760
you're you were 85 percent confident

1966
01:25:28,430 --> 01:25:26,219
that you would get 10 years say making

1967
01:25:31,729 --> 01:25:28,440
those numbers up uh but we only report

1968
01:25:34,490 --> 01:25:31,739
what we're 99.999 confident we're going

1969
01:25:42,470 --> 01:25:36,709
all right um we've had an online let's

1970
01:25:46,490 --> 01:25:44,510
oh and we'd rather hear you please

1971
01:25:49,729 --> 01:25:46,500
please

1972
01:25:52,310 --> 01:25:49,739
okay so this has been fascinating

1973
01:25:53,689 --> 01:25:52,320
um I thoroughly enjoyed it I almost see

1974
01:25:57,410 --> 01:25:53,699
you as the

1975
01:25:59,149 --> 01:25:57,420
the follow-on of Nancy Grace Roman

1976
01:26:04,250 --> 01:25:59,159
um so I just wanted to say that publicly

1977
01:26:11,810 --> 01:26:07,610
what do you think the capabilities will

1978
01:26:13,010 --> 01:26:11,820
be then especially with telescopes

1979
01:26:15,530 --> 01:26:13,020
Etc

1980
01:26:18,110 --> 01:26:15,540
if you if you had unlimited budget you

1981
01:26:20,629 --> 01:26:18,120
had people with the right skill set

1982
01:26:24,110 --> 01:26:20,639
and all how how would it look in the

1983
01:26:31,070 --> 01:26:26,689
maybe that's not a fair question but no

1984
01:26:36,590 --> 01:26:34,070
there's a tricky thing you can do called

1985
01:26:39,350 --> 01:26:36,600
interferometry and that's where you put

1986
01:26:41,149 --> 01:26:39,360
multiple telescopes together and you

1987
01:26:43,629 --> 01:26:41,159
combine the light beams from each

1988
01:26:45,950 --> 01:26:43,639

telescope and you get the effective

1989
01:26:48,590 --> 01:26:45,960
telescope resolution

1990
01:26:51,229 --> 01:26:48,600
of this huge of this huge thing it's

1991
01:26:54,229 --> 01:26:51,239
used a lot in radio astronomy because

1992
01:26:55,250 --> 01:26:54,239
the wavelengths are so large that I

1993
01:26:57,649 --> 01:26:55,260
don't want to say it's easy it's

1994
01:27:00,050 --> 01:26:57,659
extremely difficult but it's much easier

1995
01:27:03,110 --> 01:27:00,060
than like the light we see

1996
01:27:05,629 --> 01:27:03,120
um to to use this technique there are

1997
01:27:07,910 --> 01:27:05,639
interferometers on the ground

1998
01:27:09,290 --> 01:27:07,920
um they're sort of like the size Optical

1999
01:27:11,030 --> 01:27:09,300
interferometers they're like the size of

2000
01:27:13,550 --> 01:27:11,040
a campus say

2001
01:27:15,530 --> 01:27:13,560
the radio interferometers are about the

2002
01:27:16,910 --> 01:27:15,540
size of the Earth there's telescopes all

2003
01:27:18,830 --> 01:27:16,920
over the Earth and you can combine them

2004
01:27:22,250 --> 01:27:18,840
together and get an earth-sized beam

2005
01:27:25,189 --> 01:27:22,260
this is what was used to say observe the

2006
01:27:27,649 --> 01:27:25,199
black hole in m87 among other really

2007
01:27:31,910 --> 01:27:27,659
exciting things

2008
01:27:33,370 --> 01:27:31,920
in 2075 I would hope we would be able to

2009
01:27:35,330 --> 01:27:33,380
have

2010
01:27:37,430 --> 01:27:35,340
interferometers

2011
01:27:39,770 --> 01:27:37,440
maybe an optical

2012
01:27:43,010 --> 01:27:39,780
but across the size of like the Earth's

2013
01:27:49,370 --> 01:27:46,790

that would be cool that's really hard

2014
01:27:50,390 --> 01:27:49,380
that is extremely hard

2015
01:27:52,970 --> 01:27:50,400
um

2016
01:27:55,010 --> 01:27:52,980
but you know if you had to aim for

2017
01:27:57,610 --> 01:27:55,020
something that would really make the

2018
01:27:59,590 --> 01:27:57,620
engineers and the data

2019
01:28:02,090 --> 01:27:59,600
scientists

2020
01:28:03,649 --> 01:28:02,100
really have to think hard it would be

2021
01:28:05,330 --> 01:28:03,659
trying to do something like that it's

2022
01:28:09,169 --> 01:28:05,340
borderline impossible it's definitely

2023
01:28:10,490 --> 01:28:09,179
impossible now but it would yeah that

2024
01:28:13,729 --> 01:28:10,500
would be cool because then you would

2025
01:28:16,790 --> 01:28:13,739
have effectively a planetary orbit-sized

2026
01:28:18,410 --> 01:28:16,800
resolution machine which would be it's

2027
01:28:24,850 --> 01:28:18,420
unfathomable I can't do the numbers off

2028
01:28:24,860 --> 01:28:34,750
any other questions in the room

2029
01:28:39,530 --> 01:28:37,070
so just briefly thank you for talking

2030
01:28:40,910 --> 01:28:39,540
about the chronograph capabilities of

2031
01:28:42,350 --> 01:28:40,920
Roman

2032
01:28:43,310 --> 01:28:42,360
this is kind of a little bit of a

2033
01:28:45,430 --> 01:28:43,320
general question but how would you

2034
01:28:48,950 --> 01:28:45,440
compare these sort of capabilities to

2035
01:28:51,290 --> 01:28:48,960
detect and characterize exoplanets from

2036
01:28:54,350 --> 01:28:51,300
jwst to Roman what are kind of the major

2037
01:28:55,850 --> 01:28:54,360
advances beyond what what jwst can do

2038
01:28:58,189 --> 01:28:55,860

yeah

2039
01:28:59,930 --> 01:28:58,199
um I know this because someone asked

2040
01:29:02,629 --> 01:28:59,940
this question in the scientific session

2041
01:29:05,090 --> 01:29:02,639
so this is both a this is a real like

2042
01:29:07,129 --> 01:29:05,100
this is a really good question and so

2043
01:29:10,189 --> 01:29:07,139
I'm going to say what my colleague

2044
01:29:12,970 --> 01:29:10,199
Julian said uh jwst does not have

2045
01:29:16,490 --> 01:29:12,980
deformable mirrors so I showed that step

2046
01:29:19,610 --> 01:29:16,500
where we adjust the mirror to take into

2047
01:29:22,129 --> 01:29:19,620
account the intrinsic variation in the

2048
01:29:24,950 --> 01:29:22,139
light beam jwc can't do that that's what

2049
01:29:27,169 --> 01:29:24,960
got us to

2050
01:29:30,590 --> 01:29:27,179
um that amazing ability to see that

2051
01:29:32,450 --> 01:29:30,600
contrast ratio jbst has a coronagraph

2052
01:29:34,129 --> 01:29:32,460
one of the instruments does hsd does as

2053
01:29:35,510 --> 01:29:34,139
well but they're just doing that part

2054
01:29:37,070 --> 01:29:35,520
where they take the middle part of the

2055
01:29:39,229 --> 01:29:37,080
light and send it out to the outside and

2056
01:29:40,970 --> 01:29:39,239
block it they're not doing that part

2057
01:29:42,070 --> 01:29:40,980
where they hyper stabilize everything

2058
01:29:44,689 --> 01:29:42,080
and

2059
01:29:46,550 --> 01:29:44,699
reduce that noise pattern that we were

2060
01:29:49,550 --> 01:29:46,560
showing

2061
01:29:51,950 --> 01:29:49,560
um that's the difference

2062
01:29:55,030 --> 01:29:51,960
um this technology

2063
01:29:57,350 --> 01:29:55,040

we have um coronagraphs on the ground

2064
01:30:00,830 --> 01:29:57,360
but they can't reach that Precision

2065
01:30:02,570 --> 01:30:00,840
either because uh

2066
01:30:04,250 --> 01:30:02,580
things are moving it's very hard to

2067
01:30:06,770 --> 01:30:04,260
stabilize

2068
01:30:08,990 --> 01:30:06,780
um so that is and the atmosphere

2069
01:30:10,790 --> 01:30:09,000
um but that's the difference is that

2070
01:30:13,790 --> 01:30:10,800
it's that deformable mirror that last

2071
01:30:16,970 --> 01:30:13,800
step is something that jwst can't do

2072
01:30:19,490 --> 01:30:16,980
jwst can do other things and the really

2073
01:30:22,129 --> 01:30:19,500
exciting thing is to think about what we

2074
01:30:23,510 --> 01:30:22,139
learn from the Roman coronagraph

2075
01:30:26,689 --> 01:30:23,520
Community program this technology

2076
01:30:29,209 --> 01:30:26,699
demonstration and how that changes how

2077
01:30:32,149 --> 01:30:29,219
we look at things with jwst and then how

2078
01:30:33,950 --> 01:30:32,159
that influences the Next Generation that

2079
01:30:37,129 --> 01:30:33,960
will fly on the habitable worlds I saw

2080
01:30:40,729 --> 01:30:37,139
these in the lab at the jet propulsion

2081
01:30:42,950 --> 01:30:40,739
laboratory and just walking around the

2082
01:30:44,629 --> 01:30:42,960
instrument is enough that they can see

2083
01:30:46,430 --> 01:30:44,639
that in the data that they're taking

2084
01:30:49,790 --> 01:30:46,440
like this is how precise they have to

2085
01:30:52,430 --> 01:30:49,800
position the electronics to picometer so

2086
01:30:54,770 --> 01:30:52,440
one part and a billion to make this

2087
01:30:56,689 --> 01:30:54,780
thing work and I ask them how they do

2088
01:30:58,430 --> 01:30:56,699

that and I was like lasers right and

2089
01:31:01,370 --> 01:30:58,440
like yes lasers and it would take all

2090
01:31:03,709 --> 01:31:01,380
afternoon to explain it cool

2091
01:31:05,930 --> 01:31:03,719
um but that's the difference that

2092
01:31:07,550 --> 01:31:05,940
technology it really is on the edge of

2093
01:31:08,870 --> 01:31:07,560
magic

2094
01:31:11,270 --> 01:31:08,880
um but it's very believable when you

2095
01:31:16,310 --> 01:31:11,280
meet the astronomers that do it yeah I

2096
01:31:19,090 --> 01:31:18,110
all right we have another question from

2097
01:31:21,970 --> 01:31:19,100
online

2098
01:31:24,229 --> 01:31:21,980
which is we've talked a lot about

2099
01:31:27,709 --> 01:31:24,239
ground-based or at least alluded to

2100
01:31:29,750 --> 01:31:27,719
ground base versus orbital telescopes if

2101
01:31:32,990 --> 01:31:29,760
you had your choice of anywhere you

2102
01:31:35,330 --> 01:31:33,000
could position in a like a station or an

2103
01:31:41,390 --> 01:31:35,340
observation where would you put your

2104
01:31:46,729 --> 01:31:43,729
so for some things the back of the moon

2105
01:31:49,850 --> 01:31:46,739
seems pretty cool

2106
01:31:51,890 --> 01:31:49,860
um you're always looking away uh

2107
01:31:55,070 --> 01:31:51,900
there's no light pollution it's very

2108
01:31:56,330 --> 01:31:55,080
quiet as well like radio quiet so that's

2109
01:31:57,890 --> 01:31:56,340
where a lot of really interesting things

2110
01:31:58,669 --> 01:31:57,900
could could be done on the back of the

2111
01:32:05,990 --> 01:31:58,679
Moon

2112
01:32:07,250 --> 01:32:06,000
quite sharp so you have to there's a lot

2113
01:32:09,229 --> 01:32:07,260

of things that you have to figure out

2114
01:32:11,090 --> 01:32:09,239
how to do but that would be really cool

2115
01:32:14,810 --> 01:32:11,100
because there are things that we just

2116
01:32:16,669 --> 01:32:14,820
can't do because of how loud everything

2117
01:32:18,470 --> 01:32:16,679
is here on Earth both in the radio and

2118
01:32:20,990 --> 01:32:18,480
in the optical

2119
01:32:28,370 --> 01:32:25,070
I really want a fancy space spectrograph

2120
01:32:30,169 --> 01:32:28,380
that does high resolution

2121
01:32:32,810 --> 01:32:30,179
um so when I say that a spectrograph

2122
01:32:35,330 --> 01:32:32,820
instead of taking light a picture in one

2123
01:32:37,370 --> 01:32:35,340
color it spreads the colors out and I

2124
01:32:39,649 --> 01:32:37,380
would love to have something at high

2125
01:32:40,790 --> 01:32:39,659
spectral resolution

2126
01:32:42,709 --> 01:32:40,800
um because that will give you the

2127
01:32:46,729 --> 01:32:42,719
ability to measure the chemistry of

2128
01:32:48,950 --> 01:32:46,739
stars uh things now aren't quite high

2129
01:32:52,129 --> 01:32:48,960
enough resolution that's the thing

2130
01:32:54,410 --> 01:32:52,139
that's not on the current menu of

2131
01:32:57,290 --> 01:32:54,420
options for this next telescope that I

2132
01:33:00,950 --> 01:32:57,300
would really want to have as far as

2133
01:33:07,729 --> 01:33:00,960
where to put it L2 seems pretty decent I

2134
01:33:11,990 --> 01:33:10,189
I'm going to take the Liberty to ask the

2135
01:33:13,370 --> 01:33:12,000
last question because I want to turn it

2136
01:33:16,370 --> 01:33:13,380
around a little bit on you Joan because

2137
01:33:18,830 --> 01:33:16,380
you asked a great question what would it

2138
01:33:20,390 --> 01:33:18,840

look like in 2075 I want to turn a

2139
01:33:22,669 --> 01:33:20,400
little bit around

2140
01:33:25,070 --> 01:33:22,679
what do you think Nancy Grace would say

2141
01:33:28,250 --> 01:33:25,080
to see the capabilities of her telescope

2142
01:33:30,110 --> 01:33:28,260
her namesake telescope

2143
01:33:31,490 --> 01:33:30,120
and we need it we actually need a mic

2144
01:33:35,629 --> 01:33:31,500
for you don't we

2145
01:33:42,050 --> 01:33:40,189
first of all she would be so honored

2146
01:33:45,410 --> 01:33:42,060
um and and she's the type of person

2147
01:33:46,910 --> 01:33:45,420
without you know I mean she she she's

2148
01:33:48,709 --> 01:33:46,920
the type who would ask that kind of

2149
01:33:52,790 --> 01:33:48,719
question in terms of well how would it

2150
01:33:55,070 --> 01:33:52,800
look in 2075. so her her thing is yeah I

2151
01:33:57,229 --> 01:33:55,080
can see what what it can do today

2152
01:33:59,330 --> 01:33:57,239
but I'm also want to start thinking in

2153
01:34:01,669 --> 01:33:59,340
terms of what it can do tomorrow and not

2154
01:34:03,770 --> 01:34:01,679
just tomorrow but let's go five years

2155
01:34:06,590 --> 01:34:03,780
from now 10 years from now 20 years from

2156
01:34:08,450 --> 01:34:06,600
now so that we can always be reaching

2157
01:34:11,450 --> 01:34:08,460
towards something and not become

2158
01:34:14,090 --> 01:34:11,460
stagnant in the present day and that

2159
01:34:15,770 --> 01:34:14,100
would give us an opportunity to learn to

2160
01:34:18,530 --> 01:34:15,780
learn from that and how to make certain

2161
01:34:21,649 --> 01:34:18,540
projections so I think that's that would

2162
01:34:23,629 --> 01:34:21,659
be her thing like oh this is great no

2163
01:34:25,850 --> 01:34:23,639

and I feel honored and whatnot okay

2164
01:34:28,790 --> 01:34:25,860
let's talk about the follow-on

2165
01:34:31,370 --> 01:34:28,800
all right and that way to be able to

2166
01:34:34,430 --> 01:34:31,380
inspire other people to be able to

2167
01:34:37,790 --> 01:34:34,440
participate in that as well so I think

2168
01:34:39,830 --> 01:34:37,800
that that would be her position great

2169
01:34:50,450 --> 01:34:39,840
thank you let's speak let's thank both