1
00:02:16,050 --> 00:00:25,390
[Music]

2
00:03:19,030 --> 00:02:16,060
do

3
00:03:22,710 --> 00:03:21,110
sky watchers this is it

4
00:03:24,390 --> 00:03:22,720
this is the day we get the first science

5
00:03:26,630 --> 00:03:24,400
images back from the james webb space

6
00:03:38,789 --> 00:03:26,640
telescope and you've got a front row

7
00:03:42,309 --> 00:03:40,390
i'm michelle thaller your host bro can

8
00:03:44,869 --> 00:03:42,319
only be described as a celebration for

9
00:03:46,149 --> 00:03:44,879
everyone on earth so think about this

10
00:03:47,990 --> 00:03:46,159
light from the earliest days of the

11
00:03:49,509 --> 00:03:48,000
universe has been traveling to us for

12
00:03:51,670 --> 00:03:49,519
billions of years

13
00:03:52,869 --> 00:03:51,680

just over the last few weeks we've

14
00:03:54,949 --> 00:03:52,879
captured some of that light with the

15
00:03:57,270 --> 00:03:54,959
telescope that sees the universe in an

16
00:03:59,110 --> 00:03:57,280
entirely new way and today we share the

17
00:04:00,869 --> 00:03:59,120
very first results

18
00:04:02,869 --> 00:04:00,879
so long time space fans are going to

19
00:04:04,390 --> 00:04:02,879
know who this is this is dr john mather

20
00:04:05,990 --> 00:04:04,400
he's the senior project scientist for

21
00:04:08,070 --> 00:04:06,000
the webb telescope and a nobel prize

22
00:04:09,750 --> 00:04:08,080
winner and john i couldn't be happier to

23
00:04:11,830 --> 00:04:09,760
be here with you today thank you it's a

24
00:04:13,990 --> 00:04:11,840
thrill to be here for this very special

25
00:04:15,509 --> 00:04:14,000
day how are you feeling i am thrilled

26
00:04:17,590 --> 00:04:15,519
and i'm relieved because you know when

27
00:04:19,590 --> 00:04:17,600
you start something this big you know

28
00:04:23,110 --> 00:04:19,600
there's always a possibility it might

29
00:04:24,629 --> 00:04:23,120
not work it did work we are so proud

30
00:04:26,870 --> 00:04:24,639
and you've been on this project for a

31
00:04:28,390 --> 00:04:26,880
very long time right yeah started in

32
00:04:30,150 --> 00:04:28,400
1995

33
00:04:32,230 --> 00:04:30,160
we had just finished measuring the big

34
00:04:33,749 --> 00:04:32,240
bang we measured it with the cosmic

35
00:04:35,510 --> 00:04:33,759
background explorer satellite that we

36
00:04:37,189 --> 00:04:35,520
built right here at goddard

37
00:04:38,710 --> 00:04:37,199
and we measured the

38
00:04:40,629 --> 00:04:38,720

spectrum we've measured there are hot

39
00:04:42,390 --> 00:04:40,639
and cold spots in the big bang so we

40
00:04:44,390 --> 00:04:42,400
said now we know it all how it all got

41
00:04:45,110 --> 00:04:44,400
started but then what happened after

42
00:04:46,870 --> 00:04:45,120
that

43
00:04:48,230 --> 00:04:46,880
so then i got a call from nasa

44
00:04:50,150 --> 00:04:48,240
headquarters would i like to work on

45
00:04:52,150 --> 00:04:50,160
this new telescope that's going to help

46
00:04:53,830 --> 00:04:52,160
answer those questions what happened

47
00:04:56,550 --> 00:04:53,840
after the big bang how did the galaxies

48
00:04:58,070 --> 00:04:56,560
grow how did the first black holes grow

49
00:05:00,230 --> 00:04:58,080
what happened all the way from there to

50
00:05:02,150 --> 00:05:00,240
here so this is our time machine and i

51
00:05:04,310 --> 00:05:02,160
just wanted to be part of it i am so

52
00:05:05,270 --> 00:05:04,320
thrilled that we got a chance to do it

53
00:05:06,710 --> 00:05:05,280
one of the things that i remember you

54
00:05:08,469 --> 00:05:06,720
saying this is kind of amazing that you

55
00:05:09,990 --> 00:05:08,479
after you win the nobel prize you

56
00:05:12,070 --> 00:05:10,000
thought that this mission was the most

57
00:05:13,909 --> 00:05:12,080
important thing to work on absolutely

58
00:05:15,830 --> 00:05:13,919
it's the next question after you know

59
00:05:16,710 --> 00:05:15,840
how it started what happened then

60
00:05:18,310 --> 00:05:16,720
and

61
00:05:20,950 --> 00:05:18,320
you know when suddenly we now have the

62
00:05:23,270 --> 00:05:20,960
technology to do it we didn't have

63
00:05:25,510 --> 00:05:23,280

50 years ago didn't have the technology

64
00:05:27,350 --> 00:05:25,520
25 years ago even when they started this

65
00:05:30,070 --> 00:05:27,360
we had to invent things along the way so

66
00:05:31,029 --> 00:05:30,080
we did that and here it is

67
00:05:32,790 --> 00:05:31,039
well thank you we'll be back to you in

68
00:05:34,150 --> 00:05:32,800
just a moment so at the moment we're

69
00:05:35,670 --> 00:05:34,160
going to talk about the way that web is

70
00:05:38,150 --> 00:05:35,680
a completely new way to explore the

71
00:05:40,550 --> 00:05:38,160
universe so today the mission releases

72
00:05:42,390 --> 00:05:40,560
its first science images and gives wings

73
00:05:45,029 --> 00:05:42,400
to the dreams of so many people who

74
00:05:47,670 --> 00:05:45,039
worked so hard for so long to make this

75
00:05:50,550 --> 00:05:47,680
possible for everyone on earth this is

76
00:05:53,110 --> 00:05:50,560
your telescope this is the largest most

77
00:05:54,870 --> 00:05:53,120
powerful observatory ever put into space

78
00:05:57,189 --> 00:05:54,880
it's the product of thousands of people

79
00:05:58,950 --> 00:05:57,199
working for more than two decades this

80
00:06:01,110 --> 00:05:58,960
is a mission that's singularly focused

81
00:06:02,870 --> 00:06:01,120
on the biggest questions in science

82
00:06:05,590 --> 00:06:02,880
so the following phrase is often used

83
00:06:07,749 --> 00:06:05,600
too easily but today actually does mark

84
00:06:09,909 --> 00:06:07,759
the dawn of a new era today the web

85
00:06:11,909 --> 00:06:09,919
mission is open for scientific business

86
00:06:13,670 --> 00:06:11,919
and this is just the beginning the best

87
00:06:15,189 --> 00:06:13,680
is yet to come

88
00:06:16,309 --> 00:06:15,199

so john one of the things you told me

89
00:06:17,590 --> 00:06:16,319
about is that you really want to make

90
00:06:19,270 --> 00:06:17,600
sure there are some people that get

91
00:06:21,430 --> 00:06:19,280
thanked people that put a huge amount of

92
00:06:24,469 --> 00:06:21,440
effort into this absolutely

93
00:06:26,790 --> 00:06:24,479
our current project manager bill oaks uh

94
00:06:28,629 --> 00:06:26,800
took the project from a time of trouble

95
00:06:30,710 --> 00:06:28,639
when we didn't exactly know how we were

96
00:06:32,550 --> 00:06:30,720
going to get this to work and got it all

97
00:06:34,710 --> 00:06:32,560
the way to the end here it is it is

98
00:06:37,270 --> 00:06:34,720
working and it's because of bill made

99
00:06:39,029 --> 00:06:37,280
this worldwide team 20 000 people around

100
00:06:40,710 --> 00:06:39,039
the world were involved in making this

101
00:06:42,150 --> 00:06:40,720
thing all work and bill has been there

102
00:06:43,909 --> 00:06:42,160
every day

103
00:06:44,710 --> 00:06:43,919
making sure that it would happen

104
00:06:49,589 --> 00:06:44,720
so

105
00:06:51,589 --> 00:06:49,599
barbara mikulski she saved our telescope

106
00:06:53,670 --> 00:06:51,599
and she saved the telescope before us

107
00:06:55,350 --> 00:06:53,680
she made sure after the hubble telescope

108
00:06:57,029 --> 00:06:55,360
was launched and it was not in focus

109
00:06:58,629 --> 00:06:57,039
that we would go up and fix it she made

110
00:07:00,870 --> 00:06:58,639
sure that happened when the webb

111
00:07:03,189 --> 00:07:00,880
telescope needed more resources she made

112
00:07:05,270 --> 00:07:03,199
sure we could get that so barbara we

113
00:07:06,629 --> 00:07:05,280

thank you

114
00:07:07,990 --> 00:07:06,639
well it is such an honor to be with you

115
00:07:09,029 --> 00:07:08,000
jay i mean it's been a pleasure to be

116
00:07:11,270 --> 00:07:09,039
working with you through this whole

117
00:07:13,990 --> 00:07:11,280
thing thank you so much congratulations

118
00:07:16,790 --> 00:07:14,000
and go webb thank you

119
00:07:19,270 --> 00:07:16,800
so this broadcast much like every part

120
00:07:20,870 --> 00:07:19,280
of this mission is a partnership on our

121
00:07:22,469 --> 00:07:20,880
journey to explore distant places in

122
00:07:24,309 --> 00:07:22,479
space we've been joined by intrepid

123
00:07:26,710 --> 00:07:24,319
travelers from around the globe we have

124
00:07:28,070 --> 00:07:26,720
so many extraordinary collaborators so

125
00:07:29,670 --> 00:07:28,080
let's check in with our partners who

126
00:07:31,749 --> 00:07:29,680
will be sharing the stage with us today

127
00:07:32,870 --> 00:07:31,759
as we reveal webb's five first science

128
00:07:34,550 --> 00:07:32,880
images

129
00:07:36,309 --> 00:07:34,560
from the european space agency i'm

130
00:07:42,629 --> 00:07:36,319
joined by katie haswell in darmstadt

131
00:07:46,309 --> 00:07:44,710
i see katie in the background there

132
00:07:48,150 --> 00:07:46,319
also joining us from the canadian space

133
00:07:53,749 --> 00:07:48,160
agency in montreal we have natalie

134
00:07:57,990 --> 00:07:56,790
i see katie in the background there

135
00:07:59,110 --> 00:07:58,000
and so naturally we're also going to be

136
00:08:00,790 --> 00:07:59,120
visiting the nerve center of this

137
00:08:02,710 --> 00:08:00,800
mission the space telescope science

138
00:08:04,309 --> 00:08:02,720

institute on the campus of johns hopkins

139
00:08:05,990 --> 00:08:04,319
university in baltimore maryland and

140
00:08:07,110 --> 00:08:06,000
there we have alex lockwood and carl

141
00:08:11,430 --> 00:08:07,120
gordon and they're going to give us

142
00:08:14,469 --> 00:08:12,950
great so we'll be back with our

143
00:08:15,670 --> 00:08:14,479
international partners shortly where

144
00:08:17,589 --> 00:08:15,680
they'll each reveal one of the new

145
00:08:19,430 --> 00:08:17,599
images but today we're also going to be

146
00:08:21,270 --> 00:08:19,440
joined by millions of science fans from

147
00:08:23,350 --> 00:08:21,280
around the world many of your gathered

148
00:08:25,189 --> 00:08:23,360
watch parties just for this event so

149
00:08:27,830 --> 00:08:25,199
here we are really going international

150
00:08:30,230 --> 00:08:27,840
so i'm beginning with bhopal india

151
00:08:31,830 --> 00:08:30,240
do we have a signal from bhopal yes

152
00:08:33,190 --> 00:08:31,840
excellent welcome to nasa hello

153
00:08:34,630 --> 00:08:33,200
everybody there

154
00:08:40,949 --> 00:08:34,640
wonderful to be talking to you today all

155
00:08:45,350 --> 00:08:42,949
we'll be back to them later yes great to

156
00:08:46,710 --> 00:08:45,360
wave to you hi wonderful

157
00:08:48,790 --> 00:08:46,720
and we're also we also have a warm

158
00:08:51,750 --> 00:08:48,800
welcome now in portland oregon so we

159
00:08:53,269 --> 00:08:51,760
have the feeding from portland

160
00:08:55,350 --> 00:08:53,279
a bit dark but is everybody there hello

161
00:08:57,190 --> 00:08:55,360
portland

162
00:08:58,870 --> 00:08:57,200
they're an auditorium i see okay okay

163
00:09:01,110 --> 00:08:58,880

next we're going to go off to milan

164
00:09:04,310 --> 00:09:01,120
italy so afternoon in italy do we have

165
00:09:08,949 --> 00:09:07,110
i guess we have a screen from italy

166
00:09:10,070 --> 00:09:08,959
and uh next we're gonna go to rutland

167
00:09:13,750 --> 00:09:10,080
vermont

168
00:09:15,350 --> 00:09:13,760
everybody

169
00:09:17,350 --> 00:09:15,360
nice to see you thank you for being part

170
00:09:18,550 --> 00:09:17,360
of this today

171
00:09:22,470 --> 00:09:18,560
okay going even a little bit further

172
00:09:24,630 --> 00:09:22,480
afield we have natanya israel hello

173
00:09:27,670 --> 00:09:24,640
hello israel yay

174
00:09:30,070 --> 00:09:27,680
really nice to see you guys

175
00:09:31,030 --> 00:09:30,080
okay just one more for now uh i i see

176
00:09:32,550 --> 00:09:31,040
people like

177
00:09:34,550 --> 00:09:32,560
giving me hugs

178
00:09:37,350 --> 00:09:34,560
okay we also have vancouver canada hey

179
00:09:38,790 --> 00:09:37,360
vancouver hi all right wonderful

180
00:09:39,750 --> 00:09:38,800
wonderful to have all these people with

181
00:09:41,509 --> 00:09:39,760
you

182
00:09:43,190 --> 00:09:41,519
so right across from the campus for me

183
00:09:45,590 --> 00:09:43,200
there's also a huge watch party taking

184
00:09:46,870 --> 00:09:45,600
place with members of the web team so

185
00:09:48,470 --> 00:09:46,880
the wonderful thing is that they

186
00:09:49,829 --> 00:09:48,480
actually are people that have worked on

187
00:09:52,470 --> 00:09:49,839
the mission and they are part of our

188
00:09:58,550 --> 00:09:52,480

nasa funny stamp the family so hello

189
00:09:58,560 --> 00:10:02,790
there they are yes

190
00:10:06,790 --> 00:10:05,110
a lot of people i recognize there

191
00:10:08,949 --> 00:10:06,800
so it's incredibly important to me

192
00:10:11,110 --> 00:10:08,959
personally and also to all of us at nasa

193
00:10:12,550 --> 00:10:11,120
that the universe belongs to everyone

194
00:10:14,630 --> 00:10:12,560
and we are thrilled to share this day

195
00:10:15,910 --> 00:10:14,640
with fans everywhere around the world

196
00:10:17,030 --> 00:10:15,920
we'll say hello to some more later in

197
00:10:19,110 --> 00:10:17,040
our broadcast

198
00:10:20,630 --> 00:10:19,120
so now it's time to start the main event

199
00:10:22,150 --> 00:10:20,640
what you'll see over the next hour will

200
00:10:24,470 --> 00:10:22,160
be a collection of images newly

201
00:10:26,069 --> 00:10:24,480
processed by the web science team only a

202
00:10:28,230 --> 00:10:26,079
tiny handful of experts have seen the

203
00:10:30,069 --> 00:10:28,240
images so far and i can tell you that we

204
00:10:32,310 --> 00:10:30,079
have been so excited to unwrap them for

205
00:10:34,870 --> 00:10:32,320
everyone we'll be releasing each image

206
00:10:36,150 --> 00:10:34,880
in turn in real time as soon as you see

207
00:10:38,230 --> 00:10:36,160
it on this broadcast it will be

208
00:10:39,829 --> 00:10:38,240
available for download on the internet

209
00:10:41,350 --> 00:10:39,839
on the screen below you can see a

210
00:10:43,350 --> 00:10:41,360
timeline showing where we are in the

211
00:10:45,829 --> 00:10:43,360
show and what's coming up next and by

212
00:10:47,670 --> 00:10:45,839
the end of the show all five images will

213
00:10:50,069 --> 00:10:47,680

be available to everyone

214
00:11:08,949 --> 00:10:50,079
so hopefully you can tell i'm excited

215
00:11:11,910 --> 00:11:10,230
okay we're going to release the first

216
00:11:13,350 --> 00:11:11,920
image right here at nasa goddard space

217
00:11:15,670 --> 00:11:13,360
flight center maryland and we're just

218
00:11:17,110 --> 00:11:15,680
outside of washington dc nasa goddard is

219
00:11:19,430 --> 00:11:17,120
home to the project office of the webb

220
00:11:20,790 --> 00:11:19,440
telescope and the observatory portion of

221
00:11:22,630 --> 00:11:20,800
the telescope the mirrors and the

222
00:11:24,949 --> 00:11:22,640
science instruments were integrated and

223
00:11:27,190 --> 00:11:24,959
tested here before launch so for many of

224
00:11:28,870 --> 00:11:27,200
us including myself seeing web come

225
00:11:30,790 --> 00:11:28,880
together bit by bit right in front of

226
00:11:32,949 --> 00:11:30,800
our eyes was an emotional and very

227
00:11:34,550 --> 00:11:32,959
inspiring experience so it's kind of

228
00:11:37,269 --> 00:11:34,560
like a part of us was out there with

229
00:11:39,509 --> 00:11:37,279
webb right now a million miles away part

230
00:11:41,030 --> 00:11:39,519
of our hopes and dreams are out there

231
00:11:43,269 --> 00:11:41,040
so i'm joined we're seeing as they

232
00:11:44,550 --> 00:11:43,279
looked about the time the sun and the

233
00:11:47,269 --> 00:11:44,560
earth formed

234
00:11:48,949 --> 00:11:47,279
and then behind the cluster we have

235
00:11:51,350 --> 00:11:48,959
the cluster the

236
00:11:54,550 --> 00:11:51,360
the gravity of the cluster is distorting

237
00:11:56,230 --> 00:11:54,560
and warping our view of what's behind

238
00:11:59,110 --> 00:11:56,240

and so there are these galaxies that

239
00:12:00,790 --> 00:11:59,120
look stretched and pulled kind of like

240
00:12:03,030 --> 00:12:00,800
like they've been magnified because

241
00:12:04,949 --> 00:12:03,040
they've been magnified by the gravity of

242
00:12:07,509 --> 00:12:04,959
the cluster just like einstein said they

243
00:12:09,829 --> 00:12:07,519
would and you know it's really there's

244
00:12:11,590 --> 00:12:09,839
so much detail here we're seeing these

245
00:12:13,590 --> 00:12:11,600
galaxies in a way that we've never been

246
00:12:16,150 --> 00:12:13,600
able to see before there's just a

247
00:12:17,910 --> 00:12:16,160
sharpness and a clarity we've never had

248
00:12:19,269 --> 00:12:17,920
and so we can look at if we zoom in on

249
00:12:21,590 --> 00:12:19,279
this image and i encourage you as you

250
00:12:24,069 --> 00:12:21,600
grab this image at home like zoom in it

251
00:12:26,230 --> 00:12:24,079
you can you know really zoom in and play

252
00:12:28,069 --> 00:12:26,240
around there are galaxies here in which

253
00:12:31,269 --> 00:12:28,079
you're seeing individual clusters of

254
00:12:32,470 --> 00:12:31,279
stars forming popping up just like

255
00:12:33,829 --> 00:12:32,480
popcorn

256
00:12:36,069 --> 00:12:33,839
um and then

257
00:12:38,710 --> 00:12:36,079
we also see in the background of the

258
00:12:40,870 --> 00:12:38,720
scallop of this image kind of littered

259
00:12:42,949 --> 00:12:40,880
like jewels all over the back of the

260
00:12:44,870 --> 00:12:42,959
image are these faint

261
00:12:47,269 --> 00:12:44,880
red galaxies

262
00:12:48,790 --> 00:12:47,279
now that was what we built the telescope

263
00:12:51,190 --> 00:12:48,800

to do

264
00:12:52,710 --> 00:12:51,200
the most distant of those are

265
00:12:56,230 --> 00:12:52,720
billions of you we're seeing as they

266
00:12:58,710 --> 00:12:56,240
looked more than 13 billion years ago

267
00:13:00,550 --> 00:12:58,720
and so galaxies like that one right

268
00:13:03,910 --> 00:13:00,560
there this little red guy you're like

269
00:13:05,750 --> 00:13:03,920
okay yup what is that well webb got

270
00:13:08,310 --> 00:13:05,760
spectra to figure out what those

271
00:13:10,430 --> 00:13:08,320
galaxies are made of and this is that

272
00:13:13,910 --> 00:13:10,440
one we're seeing as it looked

273
00:13:16,230 --> 00:13:13,920
13.1 billion years in the past less than

274
00:13:19,350 --> 00:13:16,240
a billion years after the big bang and

275
00:13:21,590 --> 00:13:19,360
we're seeing the elements of oxygen and

276
00:13:23,910 --> 00:13:21,600
hydrogen as well as neon you know this

277
00:13:26,870 --> 00:13:23,920
is the kind this is how the oxygen in

278
00:13:28,470 --> 00:13:26,880
our bodies was made in stars

279
00:13:30,710 --> 00:13:28,480
in galaxies and we're seeing that

280
00:13:32,629 --> 00:13:30,720
process get started yeah i just i want

281
00:13:34,710 --> 00:13:32,639
to give this a little bit of context so

282
00:13:36,069 --> 00:13:34,720
this is now the farthest away galaxy

283
00:13:37,430 --> 00:13:36,079
that we have this sort of detailed

284
00:13:39,189 --> 00:13:37,440
information about that we know what it's

285
00:13:41,269 --> 00:13:39,199
made we know what it's made of

286
00:13:43,910 --> 00:13:41,279
and this was not a long exposure for web

287
00:13:45,750 --> 00:13:43,920
no the the the the private the previous

288
00:13:48,470 --> 00:13:45,760

record holder right the hubble uh

289
00:13:50,389 --> 00:13:48,480
extreme deep field was two weeks of

290
00:13:53,189 --> 00:13:50,399
continuous work with hubble and it was

291
00:13:54,870 --> 00:13:53,199
just imaging with web we took that image

292
00:13:56,949 --> 00:13:54,880
before breakfast

293
00:13:59,430 --> 00:13:56,959
the amazing thing about web is the speed

294
00:14:01,110 --> 00:13:59,440
at which we can churn out discoveries so

295
00:14:02,470 --> 00:14:01,120
everything that you're going to see here

296
00:14:03,189 --> 00:14:02,480
in this broadcast

297
00:14:05,430 --> 00:14:03,199
is

298
00:14:07,750 --> 00:14:05,440
a week and we're going to be doing

299
00:14:09,350 --> 00:14:07,760
discoveries like this every week

300
00:14:11,670 --> 00:14:09,360
that is absolutely incredible jane so

301
00:14:12,790 --> 00:14:11,680
thank you so much for joining us i it's

302
00:14:15,030 --> 00:14:12,800
been an honor to be working with you

303
00:14:16,629 --> 00:14:15,040
congratulations on all your hard work

304
00:14:17,910 --> 00:14:16,639
thank you it's so wonderful to see it

305
00:14:19,430 --> 00:14:17,920
pay off

306
00:14:21,750 --> 00:14:19,440
so thank you and i'll see you later on

307
00:14:22,629 --> 00:14:21,760
today i hope so enjoy the day thank you

308
00:14:24,550 --> 00:14:22,639
right

309
00:14:26,310 --> 00:14:24,560
so from distant galaxies we now turn our

310
00:14:28,949 --> 00:14:26,320
eye to something a bit closer it's a

311
00:14:30,550 --> 00:14:28,959
planet but not one in our solar system

312
00:14:31,910 --> 00:14:30,560
remember that earth and its sibling

313
00:14:33,829 --> 00:14:31,920

planets aren't the only show in the

314
00:14:36,150 --> 00:14:33,839
universe when scientists and engineers

315
00:14:38,150 --> 00:14:36,160
started developing jwst the search for

316
00:14:39,509 --> 00:14:38,160
exoplanets wasn't even part of the plan

317
00:14:41,350 --> 00:14:39,519
that's changed

318
00:14:43,030 --> 00:14:41,360
exploring exoplanets is now a major

319
00:14:45,030 --> 00:14:43,040
component of the mission and the subject

320
00:14:46,470 --> 00:14:45,040
of our second big reveal of the day

321
00:14:48,150 --> 00:14:46,480
i'm going to send it down to our friends

322
00:14:50,310 --> 00:14:48,160
natalie willette and sarah gallagher at

323
00:14:59,189 --> 00:14:50,320
the canadian space agency in montreal so

324
00:14:59,199 --> 00:15:20,470
i guess we're we're having a little

325
00:15:32,629 --> 00:15:22,069
sorry for the brief pause there we're

326
00:15:36,870 --> 00:15:35,670
yep we're all ready yeah

327
00:15:38,629 --> 00:15:36,880
okay i apologize we're having some

328
00:15:40,389 --> 00:15:38,639
trouble with the signal from canada but

329
00:15:42,069 --> 00:15:40,399
luckily for us we have an exoplanet

330
00:15:44,069 --> 00:15:42,079
expert right here just in case that

331
00:15:46,470 --> 00:15:44,079
happened so this is nicole colon and

332
00:15:47,749 --> 00:15:46,480
she's an exoplanet scientist at nasa and

333
00:15:50,470 --> 00:15:47,759
we're going to talk about this amazing

334
00:15:51,990 --> 00:15:50,480
new result from a very hot planet i

335
00:15:54,710 --> 00:15:52,000
understand about a thousand light years

336
00:15:56,629 --> 00:15:54,720
away that's right the exoplanet is named

337
00:15:59,829 --> 00:15:56,639
wasp 96b

338
00:16:01,670 --> 00:15:59,839

and it is this hot gaseous giant puffy

339
00:16:03,910 --> 00:16:01,680
planet that it is about a thousand light

340
00:16:08,949 --> 00:16:03,920
years away so that's why today's release

341
00:16:12,949 --> 00:16:11,189
absolutely so talk us through what this

342
00:16:14,310 --> 00:16:12,959
discovery is and why this is so

343
00:16:16,550 --> 00:16:14,320
significant

344
00:16:19,430 --> 00:16:16,560
well this uh reveal that you're going to

345
00:16:20,230 --> 00:16:19,440
see is going to show the first spectrum

346
00:16:21,990 --> 00:16:20,240
of

347
00:16:24,949 --> 00:16:22,000
an exoplanet as taken from the webb

348
00:16:27,509 --> 00:16:24,959
telescope and this is exciting because

349
00:16:30,389 --> 00:16:27,519
it covers infrared wavelengths of light

350
00:16:32,470 --> 00:16:30,399
that we have not had access to

351
00:16:34,310 --> 00:16:32,480
before so we've been able to use other

352
00:16:36,069 --> 00:16:34,320
telescopes to explore exoplanet

353
00:16:38,870 --> 00:16:36,079
atmospheres in the infrared but not to

354
00:16:41,430 --> 00:16:38,880
this level of detail and this is just

355
00:16:43,269 --> 00:16:41,440
one sliver of data that webb is

356
00:16:45,110 --> 00:16:43,279
providing us using the nearest

357
00:16:47,189 --> 00:16:45,120
instrument specifically and there's

358
00:16:48,790 --> 00:16:47,199
something about um infrared that is

359
00:16:50,550 --> 00:16:48,800
actually particularly good for the

360
00:16:51,670 --> 00:16:50,560
spectrum so in this in this case what

361
00:16:53,430 --> 00:16:51,680
we're doing is we're actually going to

362
00:16:55,910 --> 00:16:53,440
take the light and break it up into a

363
00:16:58,150 --> 00:16:55,920

rainbow and look very very carefully at

364
00:16:59,829 --> 00:16:58,160
how much color is coming in each cut in

365
00:17:01,509 --> 00:16:59,839
each part of the spectrum so i believe

366
00:17:03,670 --> 00:17:01,519
we have that image if we can put that up

367
00:17:06,470 --> 00:17:03,680
okay yes i i believe we're revealing the

368
00:17:08,549 --> 00:17:06,480
spectrum right here so we now have our

369
00:17:10,069 --> 00:17:08,559
spectrum and this is exactly what you're

370
00:17:12,710 --> 00:17:10,079
seeing as you just described with

371
00:17:15,829 --> 00:17:12,720
spectroscopy what we did was we observed

372
00:17:17,429 --> 00:17:15,839
a transit of an exoplanet we observed

373
00:17:19,270 --> 00:17:17,439
the planet as it passed in front of the

374
00:17:21,750 --> 00:17:19,280
star now mind you this is not a direct

375
00:17:23,429 --> 00:17:21,760
image this is an indirect image so we've

376
00:17:25,029 --> 00:17:23,439
seen the effect of what happens when the

377
00:17:26,870 --> 00:17:25,039
planet and its atmosphere passes in

378
00:17:28,390 --> 00:17:26,880
front of the star the starlight filters

379
00:17:30,789 --> 00:17:28,400
through the atmosphere

380
00:17:33,190 --> 00:17:30,799
and then you can break that down into

381
00:17:34,789 --> 00:17:33,200
wavelengths of light and you get a bunch

382
00:17:36,789 --> 00:17:34,799
of what looks like bumps and wiggles to

383
00:17:39,510 --> 00:17:36,799
some people but it's actually full of

384
00:17:41,590 --> 00:17:39,520
information content so you're actually

385
00:17:43,350 --> 00:17:41,600
seeing bumps and wiggles that indicate

386
00:17:45,510 --> 00:17:43,360
the presence of water vapor in the

387
00:17:47,190 --> 00:17:45,520
atmosphere of this exoplanet

388
00:17:48,150 --> 00:17:47,200

so we have the spectrum up here is there

389
00:17:49,270 --> 00:17:48,160
anything you'd like to highlight

390
00:17:52,070 --> 00:17:49,280
particularly

391
00:17:53,830 --> 00:17:52,080
yeah absolutely so we have um several

392
00:17:55,669 --> 00:17:53,840
features marked here so i call them

393
00:17:57,590 --> 00:17:55,679
features they're these what i just

394
00:17:59,190 --> 00:17:57,600
referred to as bumps and wiggles but

395
00:18:01,190 --> 00:17:59,200
what you're seeing here is a telltale

396
00:18:03,750 --> 00:18:01,200
signature the chemical fingerprint of

397
00:18:05,110 --> 00:18:03,760
water vapor in these atmospheres in the

398
00:18:07,830 --> 00:18:05,120
in the atmosphere of this specific

399
00:18:09,590 --> 00:18:07,840
exoplanet and the other thing we can

400
00:18:12,470 --> 00:18:09,600
tell actually is that there's evidence

401
00:18:14,630 --> 00:18:12,480
of clouds and hazes because the water

402
00:18:17,270 --> 00:18:14,640
features are not quite as large as we

403
00:18:18,470 --> 00:18:17,280
predicted so we can take that and infer

404
00:18:20,470 --> 00:18:18,480
that there are presence of clouds and

405
00:18:21,750 --> 00:18:20,480
hazes right now one thing that we really

406
00:18:23,190 --> 00:18:21,760
want to make sure people understand is

407
00:18:25,270 --> 00:18:23,200
with this particular planet this is a

408
00:18:27,430 --> 00:18:25,280
hot world it's actually closer to its

409
00:18:29,270 --> 00:18:27,440
star than mercury is to our sun and so

410
00:18:31,029 --> 00:18:29,280
we're not looking at liquid water here

411
00:18:33,029 --> 00:18:31,039
but we're looking inside that sort of

412
00:18:35,190 --> 00:18:33,039
steam water vapor yes this is a an

413
00:18:37,669 --> 00:18:35,200

exoplanet it's about the size of jupiter

414
00:18:39,270 --> 00:18:37,679
about half the mass of jupiter it orbits

415
00:18:41,510 --> 00:18:39,280
around a sunlight star but it does it

416
00:18:43,430 --> 00:18:41,520
every about three and a half days so

417
00:18:45,110 --> 00:18:43,440
it's extremely hot extremely close in

418
00:18:47,190 --> 00:18:45,120
nothing like our solar system planets

419
00:18:50,070 --> 00:18:47,200
but that's okay because what we're

420
00:18:52,310 --> 00:18:50,080
seeing is again the first exoplanet data

421
00:18:53,590 --> 00:18:52,320
from web and this is just the beginning

422
00:18:54,710 --> 00:18:53,600
we're going to start pushing down to

423
00:18:57,110 --> 00:18:54,720
further

424
00:18:58,549 --> 00:18:57,120
smaller planets and being able to take

425
00:19:01,110 --> 00:18:58,559
measurements just like this with the

426
00:19:03,750 --> 00:19:01,120
nearest instrument that was built by the

427
00:19:05,270 --> 00:19:03,760
canadian space agency but also there's

428
00:19:06,710 --> 00:19:05,280
other three three other science

429
00:19:08,789 --> 00:19:06,720
instruments that will add to our

430
00:19:11,029 --> 00:19:08,799
knowledge in the infrared as well as

431
00:19:12,789 --> 00:19:11,039
direct imaging modes along with the

432
00:19:14,390 --> 00:19:12,799
transit method so there's a lot more to

433
00:19:15,430 --> 00:19:14,400
come i guess one thing we should mention

434
00:19:16,870 --> 00:19:15,440
is not only are we going to be looking

435
00:19:18,390 --> 00:19:16,880
at planets that are more like the earth

436
00:19:19,590 --> 00:19:18,400
in the future but we'll also be looking

437
00:19:21,510 --> 00:19:19,600
at planets in our own solar system

438
00:19:23,270 --> 00:19:21,520

absolutely yes we're going to have

439
00:19:25,909 --> 00:19:23,280
exciting data from planets in our solar

440
00:19:28,390 --> 00:19:25,919
system from mars uh outward as well as

441
00:19:29,909 --> 00:19:28,400
asteroids and comets so stay tuned for a

442
00:19:31,350 --> 00:19:29,919
lot more to come thank you so much

443
00:19:32,870 --> 00:19:31,360
nicole thank you so much for telling us

444
00:19:35,350 --> 00:19:32,880
about the spectrum and i'll be seeing

445
00:19:37,430 --> 00:19:35,360
you later on today

446
00:19:39,029 --> 00:19:37,440
so we have three more big image reveals

447
00:19:40,789 --> 00:19:39,039
and with that new and more exciting

448
00:19:42,150 --> 00:19:40,799
science but first let's take a look back

449
00:19:43,350 --> 00:19:42,160
at the journey that brought us to this

450
00:19:44,789 --> 00:19:43,360
moment

451
00:19:46,630 --> 00:19:44,799
celebrations on this one are only

452
00:19:48,630 --> 00:19:46,640
possible with years of hard work from a

453
00:19:50,710 --> 00:19:48,640
cast of thousands when a new mission is

454
00:19:52,470 --> 00:19:50,720
being built even the most enthusiastic

455
00:19:54,470 --> 00:19:52,480
space fans only get to see dramatic

456
00:19:55,830 --> 00:19:54,480
moments in this life cycle the news and

457
00:19:57,909 --> 00:19:55,840
images that come out of updates and

458
00:19:59,510 --> 00:19:57,919
press releases but that doesn't really

459
00:20:01,830 --> 00:19:59,520
give you the sense of the huge effort

460
00:20:03,669 --> 00:20:01,840
that goes on behind the scenes every day

461
00:20:05,669 --> 00:20:03,679
the plan schedules an organization to

462
00:20:06,870 --> 00:20:05,679
keep everything moving forward really

463
00:20:08,390 --> 00:20:06,880

happens for the most part out of

464
00:20:10,470 --> 00:20:08,400
people's gaze

465
00:20:12,710 --> 00:20:10,480
web started as an idea that took root at

466
00:20:15,029 --> 00:20:12,720
nasa goddard it grew first into planning

467
00:20:17,110 --> 00:20:15,039
teams research projects schematics

468
00:20:18,789 --> 00:20:17,120
requirements then it began the long

469
00:20:20,789 --> 00:20:18,799
journey to become real with the

470
00:20:23,029 --> 00:20:20,799
development of new technologies cutting

471
00:20:24,549 --> 00:20:23,039
edge engineering and finally fabrication

472
00:20:25,909 --> 00:20:24,559
putting it all together

473
00:20:27,830 --> 00:20:25,919
let's take a brief look back at the

474
00:20:29,350 --> 00:20:27,840
visionary journey to how we all got here

475
00:20:33,510 --> 00:20:29,360
today

476
00:20:34,870 --> 00:20:33,520
final close-out of the purge okay guys i

477
00:20:36,870 --> 00:20:34,880
can hear rupa it's been a pretty

478
00:20:38,070 --> 00:20:36,880
emotional moment to be in there and

479
00:20:40,149 --> 00:20:38,080
actually

480
00:20:41,590 --> 00:20:40,159
you know closing it up for the very last

481
00:20:43,669 --> 00:20:41,600
time right you know you're the last one

482
00:20:46,630 --> 00:20:43,679
to touch this

483
00:20:49,029 --> 00:20:46,640
so that was the final operation and once

484
00:20:50,789 --> 00:20:49,039
that fitting is closed out

485
00:20:56,260 --> 00:20:50,799
there's no more touching of the vehicle

486
00:20:56,270 --> 00:21:03,669
[Music]

487
00:21:10,630 --> 00:21:07,350
the james webb space telescope

488
00:21:17,669 --> 00:21:10,640

born from the desires of astronomers

489
00:21:17,679 --> 00:21:26,870
is the culmination of 20 years of work

490
00:21:32,789 --> 00:21:29,750
humanity has unlimited questions about

491
00:21:35,909 --> 00:21:32,799
our universe engineering a way to

492
00:21:37,270 --> 00:21:35,919
investigate them requires enormous

493
00:21:39,110 --> 00:21:37,280
creativity

494
00:21:40,789 --> 00:21:39,120
web has been a trade-off between

495
00:21:42,230 --> 00:21:40,799
engineering performance what the

496
00:21:44,390 --> 00:21:42,240
astronomers want

497
00:21:46,230 --> 00:21:44,400
risk in fact when we started 20 years

498
00:21:47,830 --> 00:21:46,240
ago we were actually looking at an 8

499
00:21:50,070 --> 00:21:47,840
meter telescope

500
00:21:52,470 --> 00:21:50,080
developing the most sensitive

501
00:21:55,029 --> 00:21:52,480
instruments

502
00:22:04,230 --> 00:21:55,039
and testing

503
00:22:07,830 --> 00:22:05,830
and so you don't want to build one

504
00:22:09,110 --> 00:22:07,840
that's just incrementally better than

505
00:22:10,310 --> 00:22:09,120
what you've got

506
00:22:11,990 --> 00:22:10,320
because if that's the case you would

507
00:22:14,310 --> 00:22:12,000
just observe longer on the telescope

508
00:22:16,789 --> 00:22:14,320
that you already got and so every time

509
00:22:19,750 --> 00:22:16,799
nasa builds a new astrophysics mission a

510
00:22:21,830 --> 00:22:19,760
new telescope it needs to be

511
00:22:23,350 --> 00:22:21,840
way more sensitive you know way more

512
00:22:25,110 --> 00:22:23,360
capable than anything we've ever built

513
00:22:26,630 --> 00:22:25,120

before

514
00:22:28,710 --> 00:22:26,640
we all got together in that conference

515
00:22:30,470 --> 00:22:28,720
room and we played real time as the

516
00:22:32,149 --> 00:22:30,480
images came down

517
00:22:33,430 --> 00:22:32,159
from the spacecraft

518
00:22:35,430 --> 00:22:33,440
the very first

519
00:22:37,750 --> 00:22:35,440
diffraction limited images

520
00:22:39,990 --> 00:22:37,760
ever obtained with webb and what we

521
00:22:41,750 --> 00:22:40,000
collectively saw as a group was the

522
00:22:43,270 --> 00:22:41,760
highest resolution

523
00:22:48,070 --> 00:22:43,280
infrared image

524
00:22:51,029 --> 00:22:49,510
if you're just joining us i'm michelle

525
00:22:52,710 --> 00:22:51,039
thallar at nasa's goddard space flight

526
00:22:54,230 --> 00:22:52,720
center and you are watching live

527
00:22:56,149 --> 00:22:54,240
coverage of the release of the first

528
00:22:57,270 --> 00:22:56,159
science images from the james webb space

529
00:22:58,710 --> 00:22:57,280
telescope

530
00:23:00,310 --> 00:22:58,720
so it's appropriate now that i send the

531
00:23:01,990 --> 00:23:00,320
broadcast to our colleagues and friends

532
00:23:04,149 --> 00:23:02,000
at the space telescope science institute

533
00:23:06,149 --> 00:23:04,159
in baltimore that's the scientific nerd

534
00:23:08,070 --> 00:23:06,159
center of the entire web mission so

535
00:23:12,230 --> 00:23:08,080
hello good morning alex the show is

536
00:23:15,909 --> 00:23:13,909
hey michelle

537
00:23:19,990 --> 00:23:15,919
welcome to the space telescope science

538
00:23:22,950 --> 00:23:20,000

institute i'm alex awkwood and i'm here

539
00:23:24,470 --> 00:23:22,960
with carl gordon who is an astronomer

540
00:23:26,310 --> 00:23:24,480
and one of the

541
00:23:29,190 --> 00:23:26,320
key people in delivering the images that

542
00:23:31,350 --> 00:23:29,200
you're going to see here today

543
00:23:32,789 --> 00:23:31,360
but actually before we get into the

544
00:23:34,470 --> 00:23:32,799
amazing images we're going to talk a

545
00:23:35,909 --> 00:23:34,480
little bit about where we are

546
00:23:37,830 --> 00:23:35,919
we're standing here outside of the

547
00:23:41,029 --> 00:23:37,840
mission operations center

548
00:23:43,350 --> 00:23:41,039
which is the key central hub for web

549
00:23:46,149 --> 00:23:43,360
for the past six months scientists and

550
00:23:47,750 --> 00:23:46,159
engineers have been working 24 7 since

551
00:23:49,830 --> 00:23:47,760
they took control of the telescope 30

552
00:23:52,149 --> 00:23:49,840
minutes after launch to prepare for

553
00:23:53,110 --> 00:23:52,159
today and for the amazing science to

554
00:23:54,789 --> 00:23:53,120
come

555
00:23:56,950 --> 00:23:54,799
through all of the major deployments

556
00:23:58,870 --> 00:23:56,960
focusing aligning the telescope and

557
00:24:00,630 --> 00:23:58,880
calibrating those four amazing science

558
00:24:01,590 --> 00:24:00,640
instruments it was all done in this

559
00:24:03,190 --> 00:24:01,600
building

560
00:24:05,269 --> 00:24:03,200
and from here on out we'll have daily

561
00:24:07,110 --> 00:24:05,279
communications with the telescope

562
00:24:08,789 --> 00:24:07,120
including sending commands and

563
00:24:10,870 --> 00:24:08,799

downloading data with the help of the

564
00:24:12,789 --> 00:24:10,880
deep space network

565
00:24:15,110 --> 00:24:12,799
in addition to mission operations we are

566
00:24:16,789 --> 00:24:15,120
also the home of science operations well

567
00:24:18,789 --> 00:24:16,799
what does that mean

568
00:24:21,590 --> 00:24:18,799
every year we solicit proposals from

569
00:24:23,590 --> 00:24:21,600
astronomers across the country for and

570
00:24:25,110 --> 00:24:23,600
the world for what they would like to

571
00:24:26,710 --> 00:24:25,120
look at with web

572
00:24:28,950 --> 00:24:26,720
then we hold a rigorous selection

573
00:24:31,750 --> 00:24:28,960
process to select the ideas that will

574
00:24:33,430 --> 00:24:31,760
best utilize web to study and understand

575
00:24:35,190 --> 00:24:33,440
our universe

576
00:24:36,950 --> 00:24:35,200
when the data come down and astronomers

577
00:24:39,029 --> 00:24:36,960
analyze their results

578
00:24:40,870 --> 00:24:39,039
we are the lucky ones who get to share

579
00:24:43,029 --> 00:24:40,880
that data and those amazing science

580
00:24:45,029 --> 00:24:43,039
results with you

581
00:24:47,029 --> 00:24:45,039
and we knew that today was going to be

582
00:24:50,390 --> 00:24:47,039
so exciting with the first images so

583
00:24:52,230 --> 00:24:50,400
we've actually been preparing for years

584
00:24:54,549 --> 00:24:52,240
here is klaus pentapidin project

585
00:24:56,390 --> 00:24:54,559
scientist for web and the technical lead

586
00:24:59,029 --> 00:24:56,400
for the first image it's been a year to

587
00:25:01,909 --> 00:24:59,039
tell you about the process of the past

588
00:25:05,190 --> 00:25:01,919

my first email related to the the first

589
00:25:06,950 --> 00:25:05,200
images was back from 2016.

590
00:25:09,110 --> 00:25:06,960
so back then

591
00:25:11,909 --> 00:25:09,120
a committee was created and this

592
00:25:14,789 --> 00:25:11,919
committee was charged with

593
00:25:16,549 --> 00:25:14,799
coming up with a long list of targets

594
00:25:17,990 --> 00:25:16,559
for the first images

595
00:25:20,950 --> 00:25:18,000
and the reason for that is that the

596
00:25:22,710 --> 00:25:20,960
observatory can't see the entire sky

597
00:25:24,549 --> 00:25:22,720
at any given time

598
00:25:25,750 --> 00:25:24,559
and this is because you want to avoid

599
00:25:28,390 --> 00:25:25,760
the mirror

600
00:25:29,990 --> 00:25:28,400
seeing direct sunlight to keep it cold

601
00:25:32,870 --> 00:25:30,000
it actually had to be quite a long list

602
00:25:34,789 --> 00:25:32,880
we ended up with about 70 targets

603
00:25:36,310 --> 00:25:34,799
from which we had to select only a

604
00:25:37,909 --> 00:25:36,320
handful

605
00:25:39,830 --> 00:25:37,919
you know what would create the most

606
00:25:41,990 --> 00:25:39,840
beautiful images what would highlight

607
00:25:44,149 --> 00:25:42,000
the instruments the four different four

608
00:25:46,310 --> 00:25:44,159
science instruments for web and what

609
00:25:49,350 --> 00:25:46,320
would highlight the four

610
00:25:51,830 --> 00:25:49,360
major science themes for web and it's a

611
00:25:57,430 --> 00:25:51,840
celebration as well of the beginning of

612
00:26:01,269 --> 00:25:59,590
and we knew that selecting the images

613
00:26:03,510 --> 00:26:01,279

was just the beginning that we would

614
00:26:05,830 --> 00:26:03,520
need a trained eye to take these

615
00:26:07,750 --> 00:26:05,840
exquisite data and pull out the beauty

616
00:26:10,230 --> 00:26:07,760
and the science potential

617
00:26:12,470 --> 00:26:10,240
so here's jody pasquale and elisa pagan

618
00:26:15,710 --> 00:26:12,480
to tell you about how they processed

619
00:26:24,710 --> 00:26:15,720
these beautiful images

620
00:26:28,549 --> 00:26:26,470
we're basically translating light that

621
00:26:31,190 --> 00:26:28,559
we can't see into light that we can see

622
00:26:32,710 --> 00:26:31,200
by applying uh color like red green and

623
00:26:34,310 --> 00:26:32,720
blue to the different filters that we

624
00:26:35,590 --> 00:26:34,320
have from web

625
00:26:37,510 --> 00:26:35,600
and the reason we want to color the

626
00:26:39,029 --> 00:26:37,520
images is because there's actually more

627
00:26:40,549 --> 00:26:39,039
that you can get more information that

628
00:26:42,630 --> 00:26:40,559
you can get from the image if you see it

629
00:26:45,110 --> 00:26:42,640
in color so it's a matter of picking and

630
00:26:47,029 --> 00:26:45,120
choosing filters and colors that enhance

631
00:26:49,510 --> 00:26:47,039
the details and the structure in the

632
00:26:51,029 --> 00:26:49,520
image itself

633
00:26:53,350 --> 00:26:51,039
the shortest wavelengths of infrared

634
00:26:55,430 --> 00:26:53,360
light and assign those blue colors

635
00:26:56,710 --> 00:26:55,440
and then move our way down to green and

636
00:26:59,029 --> 00:26:56,720
red as we go to longer and longer

637
00:27:00,549 --> 00:26:59,039
wavelengths and then we additively

638
00:27:03,830 --> 00:27:00,559

combine those together to get our full

639
00:27:07,669 --> 00:27:05,669
but there is a lot of aesthetics that

640
00:27:10,149 --> 00:27:07,679
are involved in this painstakingly going

641
00:27:12,230 --> 00:27:10,159
through and cleaning these images up uh

642
00:27:14,310 --> 00:27:12,240
with an attention to detail a level of

643
00:27:16,230 --> 00:27:14,320
detail like at the pixel level in every

644
00:27:19,590 --> 00:27:16,240
image

645
00:27:22,310 --> 00:27:19,600
so when i'm working on the astronomical

646
00:27:23,909 --> 00:27:22,320
data it is this sort of marriage between

647
00:27:26,870 --> 00:27:23,919
art and science when you're choosing

648
00:27:29,590 --> 00:27:26,880
colors for the filters you really are

649
00:27:31,190 --> 00:27:29,600
trying to show the different details and

650
00:27:33,590 --> 00:27:31,200
the processes that are happening in

651
00:27:34,870 --> 00:27:33,600
astronomical images but at the end of

652
00:27:36,230 --> 00:27:34,880
the day you want it to be very

653
00:27:45,350 --> 00:27:36,240
compelling you want it to be very

654
00:27:50,950 --> 00:27:47,830
and after those images were processed it

655
00:27:55,130 --> 00:27:50,960
was a select few of us very lucky few of

656
00:27:59,990 --> 00:27:55,140
us who got to see the first images

657
00:28:02,549 --> 00:28:01,029
so just to make it a little more and

658
00:28:04,310 --> 00:28:02,559
more handy so it's actually higher

659
00:28:06,470 --> 00:28:04,320
resolution

660
00:28:09,190 --> 00:28:06,480
so we have a team of about 30 people who

661
00:28:12,389 --> 00:28:09,200
are producing these images and we feel

662
00:28:14,070 --> 00:28:12,399
incredibly privileged to be the ones

663
00:28:17,190 --> 00:28:14,080

who are the first to see these

664
00:28:19,830 --> 00:28:17,200
science-like images

665
00:28:21,740 --> 00:28:19,840
when when we saw the first data come

666
00:28:23,269 --> 00:28:21,750
down of real targets

667
00:28:25,110 --> 00:28:23,279
[Music]

668
00:28:26,310 --> 00:28:25,120
people were speechless and there were

669
00:28:28,950 --> 00:28:26,320
emotions

670
00:28:31,590 --> 00:28:28,960
because we immediately we could see

671
00:28:35,190 --> 00:28:31,600
how amazing this observatory would be

672
00:28:37,510 --> 00:28:35,200
the detail the sharpness the depth

673
00:28:39,770 --> 00:28:37,520
and when we saw the first color images

674
00:28:43,269 --> 00:28:39,780
we knew that we had a winner

675
00:28:47,430 --> 00:28:44,389
and now

676
00:28:49,990 --> 00:28:47,440
we are ready to see webb's first image

677
00:28:52,630 --> 00:28:50,000
of a star dying a planetary nebula

678
00:28:57,510 --> 00:28:52,640
called the southern ring

679
00:29:19,909 --> 00:28:58,549
wow

680
00:29:21,430 --> 00:29:19,919
near-infrared image on our left or on

681
00:29:22,950 --> 00:29:21,440
maybe your right

682
00:29:26,230 --> 00:29:22,960
and here on the right we have a

683
00:29:28,230 --> 00:29:26,240
near-infrared image um and so i'm here

684
00:29:29,909 --> 00:29:28,240
with carl our our astronomer uh

685
00:29:31,830 --> 00:29:29,919
specialist can you tell us what we're

686
00:29:34,310 --> 00:29:31,840
looking at in these images so this is a

687
00:29:36,310 --> 00:29:34,320
planetary nebula it's caused by a dying

688
00:29:39,590 --> 00:29:36,320

star that has expelled a large fraction

689
00:29:41,350 --> 00:29:39,600
of its mass over in successive waves

690
00:29:43,190 --> 00:29:41,360
okay so we actually see those waves in

691
00:29:45,590 --> 00:29:43,200
these images yes

692
00:29:46,950 --> 00:29:45,600
um wow wow and so there's a lot of

693
00:29:48,230 --> 00:29:46,960
structure can you tell us a little more

694
00:29:49,909 --> 00:29:48,240
detail about what we're looking maybe

695
00:29:52,070 --> 00:29:49,919
start with this one on the left yeah so

696
00:29:54,070 --> 00:29:52,080
in the in the near cam image you see

697
00:29:55,669 --> 00:29:54,080
this kind of bubbly uh you know almost

698
00:29:58,149 --> 00:29:55,679
foamy appearance throughout the whole

699
00:30:00,310 --> 00:29:58,159
nebula with some very structured uh

700
00:30:02,870 --> 00:30:00,320
shells but the and this foaminess is

701
00:30:04,870 --> 00:30:02,880
showing up in orange mainly and this is

702
00:30:07,510 --> 00:30:04,880
this is due to the molecular hydrogen

703
00:30:09,190 --> 00:30:07,520
that's newly formed in the expansion uh

704
00:30:10,389 --> 00:30:09,200
just lighting up the gas and dust of

705
00:30:11,830 --> 00:30:10,399
this nebula

706
00:30:13,830 --> 00:30:11,840
and then as we move inward you see this

707
00:30:15,909 --> 00:30:13,840
kind of very blue haze in the inner

708
00:30:18,149 --> 00:30:15,919
region and this is actually due to very

709
00:30:19,190 --> 00:30:18,159
hot ionized gas that emits well in the

710
00:30:21,110 --> 00:30:19,200
blue

711
00:30:23,269 --> 00:30:21,120
that's heated by the core the leftover

712
00:30:25,029 --> 00:30:23,279
very hot core of this star

713
00:30:26,470 --> 00:30:25,039

and what about these like rays that i'm

714
00:30:28,070 --> 00:30:26,480
seeing in this image right there so

715
00:30:29,430 --> 00:30:28,080
there's also rays in the outer regions

716
00:30:31,669 --> 00:30:29,440
that you can kind of see and these are

717
00:30:33,669 --> 00:30:31,679
holes in the inner nebula that are

718
00:30:36,149 --> 00:30:33,679
actually allowing the the central star's

719
00:30:38,950 --> 00:30:36,159
lights to come out and kind of light it

720
00:30:41,430 --> 00:30:38,960
up like you know patchy clouds with the

721
00:30:43,669 --> 00:30:41,440
sun shining through wow oh yeah that's

722
00:30:44,470 --> 00:30:43,679
what it looks like that's so cool

723
00:30:46,710 --> 00:30:44,480
um

724
00:30:48,149 --> 00:30:46,720
so you're actually a mid-infrared

725
00:30:50,470 --> 00:30:48,159
astronomer which is different than

726
00:30:51,830 --> 00:30:50,480
near-infrared and so what can you tell

727
00:30:54,389 --> 00:30:51,840
us about the details in this

728
00:30:56,630 --> 00:30:54,399
mid-infrared image so this is it looks

729
00:30:58,389 --> 00:30:56,640
quite different in color um partly

730
00:30:59,750 --> 00:30:58,399
because we're seeing different kinds of

731
00:31:01,509 --> 00:30:59,760
physics going on here so we're actually

732
00:31:03,509 --> 00:31:01,519
seeing in the blue you see a lot of blue

733
00:31:05,430 --> 00:31:03,519
the blue is actually due to hydrocarbon

734
00:31:07,669 --> 00:31:05,440
grains that are emitting very strongly

735
00:31:09,190 --> 00:31:07,679
in the blue for mary and they show the

736
00:31:11,669 --> 00:31:09,200
very similar structures to what we see

737
00:31:13,190 --> 00:31:11,679
in orange and near camp because the the

738
00:31:15,350 --> 00:31:13,200

hydrocarbon the

739
00:31:17,430 --> 00:31:15,360
molecular hydrocarbon actually forms on

740
00:31:19,990 --> 00:31:17,440
the surface of dust grains and so again

741
00:31:21,830 --> 00:31:20,000
as we move inward we we see that the

742
00:31:23,909 --> 00:31:21,840
inner region is again hot ionized gas

743
00:31:26,070 --> 00:31:23,919
but now it glows red because that's

744
00:31:28,549 --> 00:31:26,080
where it emits longest for the strongest

745
00:31:30,310 --> 00:31:28,559
for miri wavelengths okay and then as we

746
00:31:32,789 --> 00:31:30,320
go into the center we see kind of the

747
00:31:35,029 --> 00:31:32,799
surprise for us which is we knew this

748
00:31:36,789 --> 00:31:35,039
was a binary star but we base we

749
00:31:38,470 --> 00:31:36,799
effectively didn't really see much of

750
00:31:40,710 --> 00:31:38,480
this of the the actual star that

751
00:31:42,549 --> 00:31:40,720
produced the nebula but now in mary this

752
00:31:44,470 --> 00:31:42,559
star glows red because it has dust

753
00:31:47,190 --> 00:31:44,480
around it so in mary we got to see both

754
00:31:48,549 --> 00:31:47,200
stars very clearly yeah yeah you can't

755
00:31:50,470 --> 00:31:48,559
see it in first image really but there's

756
00:31:52,870 --> 00:31:50,480
two stars there

757
00:31:54,549 --> 00:31:52,880
so that's a fun surprise um and i think

758
00:31:56,630 --> 00:31:54,559
that there's another little easter egg

759
00:31:58,789 --> 00:31:56,640
you want to tell us about yeah so this

760
00:32:00,389 --> 00:31:58,799
was uh the easter egg is this kind of

761
00:32:02,070 --> 00:32:00,399
narrow filament up in the

762
00:32:03,269 --> 00:32:02,080
up in the top that's radially aligned

763
00:32:04,789 --> 00:32:03,279

you can kind of see it very clearly in

764
00:32:07,750 --> 00:32:04,799
the mirror image it shows up as this

765
00:32:09,990 --> 00:32:07,760
blue blue structure and it points very

766
00:32:11,430 --> 00:32:10,000
much to the central sources so i thought

767
00:32:13,669 --> 00:32:11,440
oh this must just be a density

768
00:32:15,509 --> 00:32:13,679
enhancement in the outer nebula i

769
00:32:17,750 --> 00:32:15,519
thought that very very strongly but

770
00:32:19,909 --> 00:32:17,760
other people on the team were like no

771
00:32:21,509 --> 00:32:19,919
it's a background edge on galaxy well i

772
00:32:23,830 --> 00:32:21,519
made a bet that said no it's part of the

773
00:32:26,070 --> 00:32:23,840
nebula by the way i lost the bet because

774
00:32:28,310 --> 00:32:26,080
then we looked more carefully at both

775
00:32:30,549 --> 00:32:28,320
the near cam and miri images and it's

776
00:32:33,430 --> 00:32:30,559
very clearly an edge-on galaxy with a

777
00:32:35,430 --> 00:32:33,440
dust lane and a bulge so i lost the bet

778
00:32:38,389 --> 00:32:35,440
well you lost the bet but you got these

779
00:32:39,750 --> 00:32:38,399
gorgeous images so i think it's a win

780
00:32:41,509 --> 00:32:39,760
for everybody

781
00:32:43,350 --> 00:32:41,519
anything else you'd like to say today i

782
00:32:45,830 --> 00:32:43,360
can't wait to see where we go from here

783
00:32:56,070 --> 00:32:45,840
oh neither can i all right thanks so

784
00:32:59,669 --> 00:32:57,430
thank you alex and carl and i have to

785
00:33:01,269 --> 00:32:59,679
say that image is absolutely spectacular

786
00:33:02,870 --> 00:33:01,279
so as you know people from all over the

787
00:33:05,110 --> 00:33:02,880
world are watching us today and joining

788
00:33:06,950 --> 00:33:05,120

in in our excitement as we release for

789
00:33:08,070 --> 00:33:06,960
webs first science images we've been

790
00:33:09,830 --> 00:33:08,080
checking in with our colleagues in

791
00:33:11,190 --> 00:33:09,840
europe and canada throughout the program

792
00:33:13,110 --> 00:33:11,200
but we also want to take a moment to

793
00:33:14,630 --> 00:33:13,120
include the people at the oh so many

794
00:33:16,870 --> 00:33:14,640
viewing parties scattered around the

795
00:33:18,630 --> 00:33:16,880
world like stars in the night sky so

796
00:33:20,310 --> 00:33:18,640
let's check in with some of them now

797
00:33:25,190 --> 00:33:20,320
first we go all the way to perth

798
00:33:29,269 --> 00:33:27,909
i guess nothing from perth right now

799
00:33:30,389 --> 00:33:29,279
maybe we have some of our other feeds

800
00:33:32,549 --> 00:33:30,399
we're going to check in with them right

801
00:33:35,509 --> 00:33:32,559
now

802
00:33:36,870 --> 00:33:35,519
do we have winnipeg canada

803
00:33:39,430 --> 00:33:36,880
oh there it is there's australia there's

804
00:33:41,990 --> 00:33:39,440
perth hey waving to perth australia

805
00:33:43,590 --> 00:33:42,000
thank you so much for joining us today

806
00:33:45,269 --> 00:33:43,600
and uh next we're going to winnipeg

807
00:33:47,669 --> 00:33:45,279
winnipeg canada

808
00:33:49,190 --> 00:33:47,679
hello winnipeg

809
00:33:51,029 --> 00:33:49,200
at a planetarium everybody's enjoying

810
00:33:54,470 --> 00:33:51,039
the show i hope

811
00:33:58,310 --> 00:33:56,389
everybody's watching on the uh

812
00:34:01,909 --> 00:33:58,320
there we go dayton ohio hello everybody

813
00:34:04,230 --> 00:34:03,350

there we go yes

814
00:34:10,149 --> 00:34:04,240
hey

815
00:34:12,550 --> 00:34:10,159
hi

816
00:34:14,310 --> 00:34:12,560
okay all the way bangalore india india

817
00:34:20,470 --> 00:34:14,320
bangalore

818
00:34:20,480 --> 00:34:24,710
it's absolutely wonderful hey

819
00:34:28,149 --> 00:34:26,149
okay

820
00:34:30,149 --> 00:34:28,159
so i i hope you enjoy the rest of the

821
00:34:32,149 --> 00:34:30,159
images we're releasing

822
00:34:33,829 --> 00:34:32,159
okay of course nasa's family extends all

823
00:34:35,750 --> 00:34:33,839
over the country the team at jpl in

824
00:34:38,629 --> 00:34:35,760
pasadena california they're on site to

825
00:34:39,990 --> 00:34:38,639
celebrate with us so hello jbl

826
00:34:43,430 --> 00:34:40,000
some of my favorite people in the world

827
00:34:46,149 --> 00:34:44,629
and i think the last place we're going

828
00:34:47,750 --> 00:34:46,159
to right now is northrop grumman one of

829
00:34:48,869 --> 00:34:47,760
our major contractors hello north of

830
00:34:50,520 --> 00:34:48,879
brahmin

831
00:34:52,869 --> 00:34:50,530
oh hey all right

832
00:34:54,230 --> 00:34:52,879
[Laughter]

833
00:34:58,230 --> 00:34:54,240
yay

834
00:35:01,270 --> 00:34:59,750
all right now there's also a big watch

835
00:35:03,109 --> 00:35:01,280
party right here on the nasa goddard

836
00:35:05,430 --> 00:35:03,119
campus many of these people have worked

837
00:35:07,030 --> 00:35:05,440
on the mission itself we also top nasa

838
00:35:09,510 --> 00:35:07,040

leadership and representatives from our

839
00:35:17,030 --> 00:35:09,520
government so hello

840
00:35:20,790 --> 00:35:19,430
okay wonderful so i mean at nasa we are

841
00:35:22,710 --> 00:35:20,800
so fortunate to have all of these

842
00:35:24,630 --> 00:35:22,720
friends and colleagues around the globe

843
00:35:26,630 --> 00:35:24,640
a major partner in the web mission is

844
00:35:28,550 --> 00:35:26,640
the european space agency esa

845
00:35:30,710 --> 00:35:28,560
contributions have been essential to so

846
00:35:32,950 --> 00:35:30,720
many aspects of this project including

847
00:35:35,270 --> 00:35:32,960
webb's spectacular launch on the ariane

848
00:35:36,630 --> 00:35:35,280
5 rocket last december i'm very pleased

849
00:35:38,390 --> 00:35:36,640
to turn over the show for a few minutes

850
00:35:40,230 --> 00:35:38,400
to katie haswell she's joining me from

851
00:35:42,390 --> 00:35:40,240
the european space operations center in

852
00:35:49,670 --> 00:35:42,400
darmstadt germany hello katie good

853
00:35:49,680 --> 00:35:52,550
thanks michelle

854
00:35:57,030 --> 00:35:54,950
thank you michelle and welcome to

855
00:35:58,950 --> 00:35:57,040
germany we're at the

856
00:36:01,430 --> 00:35:58,960
european space space i'm still getting

857
00:36:03,589 --> 00:36:01,440
all kinds of isp from water center

858
00:36:05,510 --> 00:36:03,599
that's where the teams effectively fly

859
00:36:07,990 --> 00:36:05,520
the satellites they're a little bit of a

860
00:36:10,150 --> 00:36:08,000
cross between air traffic controllers

861
00:36:13,030 --> 00:36:10,160
and uh pilots we have lots of different

862
00:36:14,630 --> 00:36:13,040
control rooms here this is the main

863
00:36:16,390 --> 00:36:14,640

control room and as you can see today

864
00:36:17,510 --> 00:36:16,400
it's not in use so we've been lucky

865
00:36:21,510 --> 00:36:17,520
enough to

866
00:36:24,150 --> 00:36:21,520
move in here for today i have two very

867
00:36:25,510 --> 00:36:24,160
special um experts with me both

868
00:36:26,550 --> 00:36:25,520
scientists from the european space

869
00:36:27,510 --> 00:36:26,560
agency

870
00:36:30,390 --> 00:36:27,520
uh

871
00:36:32,150 --> 00:36:30,400
giovanna giardino is a near spec

872
00:36:33,990 --> 00:36:32,160
scientist giovanna

873
00:36:35,589 --> 00:36:34,000
is uh has been working on that for for

874
00:36:37,910 --> 00:36:35,599
many years and lots to tell us about

875
00:36:41,349 --> 00:36:37,920
that and mark mccorkern is a special

876
00:36:43,349 --> 00:36:41,359
advisor for space for science and

877
00:36:45,030 --> 00:36:43,359
exploration these two guys have been

878
00:36:46,550 --> 00:36:45,040
working on the web space telescope for a

879
00:36:49,190 --> 00:36:46,560
long time so we're very grateful to have

880
00:36:52,230 --> 00:36:49,200
you with us thanks folks

881
00:36:54,230 --> 00:36:52,240
we are excited to reveal our image with

882
00:36:56,150 --> 00:36:54,240
you but before we do that we thought

883
00:36:59,030 --> 00:36:56,160
we'd give you a little bit of background

884
00:37:01,349 --> 00:36:59,040
um because we've come here today because

885
00:37:03,349 --> 00:37:01,359
these guys were the first ones uh to

886
00:37:04,790 --> 00:37:03,359
pick up the signal

887
00:37:07,270 --> 00:37:04,800
during the

888
00:37:09,910 --> 00:37:07,280

web launch when web first launched

889
00:37:11,829 --> 00:37:09,920
they run a system called s track which

890
00:37:14,069 --> 00:37:11,839
is nasa's deep space

891
00:37:15,349 --> 00:37:14,079
uh tracking system and they were

892
00:37:17,910 --> 00:37:15,359
listening out

893
00:37:19,430 --> 00:37:17,920
when webb called home and uh the

894
00:37:21,349 --> 00:37:19,440
controllers here have been looking after

895
00:37:22,390 --> 00:37:21,359
a whole very very impressive list of

896
00:37:23,349 --> 00:37:22,400
missions

897
00:37:27,430 --> 00:37:23,359
since

898
00:37:34,069 --> 00:37:31,190
esa has played a very very important

899
00:37:36,390 --> 00:37:34,079
role during the web for the web space

900
00:37:39,349 --> 00:37:36,400
telescope they provided the launch on

901
00:37:41,910 --> 00:37:39,359
board the awesome ariane 5 launch

902
00:37:43,589 --> 00:37:41,920
vehicle from the guyana space center the

903
00:37:44,550 --> 00:37:43,599
atmosphere in the mission control center

904
00:37:49,750 --> 00:37:44,560
was

905
00:37:52,150 --> 00:37:49,760
they've also provided people we have 15

906
00:37:54,870 --> 00:37:52,160
esa scientists working at a space

907
00:37:58,150 --> 00:37:54,880
telescope in baltimore and also they

908
00:37:59,510 --> 00:37:58,160
have provided the

909
00:38:01,109 --> 00:37:59,520
infrared

910
00:38:07,190 --> 00:38:01,119
spectrograph

911
00:38:09,430 --> 00:38:07,200
half of the merry instrument which is

912
00:38:10,870 --> 00:38:09,440
the mid infrared instrument let's take a

913
00:38:12,950 --> 00:38:10,880

look at those now

914
00:38:15,670 --> 00:38:12,960
webb's four scientific instruments

915
00:38:19,589 --> 00:38:15,680
include nearspec the near infrared

916
00:38:21,829 --> 00:38:19,599
spectrograph led by issa nirspec splits

917
00:38:24,310 --> 00:38:21,839
near infrared light from astronomical

918
00:38:25,990 --> 00:38:24,320
objects into its components

919
00:38:27,990 --> 00:38:26,000
like a bar code this will help

920
00:38:29,910 --> 00:38:28,000
scientists understand the physics of the

921
00:38:32,790 --> 00:38:29,920
objects they're observing from their

922
00:38:35,270 --> 00:38:32,800
temperature to atomic makeup

923
00:38:38,470 --> 00:38:35,280
nearspec can observe parts of an object

924
00:38:41,510 --> 00:38:38,480
or the sky using an image slicer and an

925
00:38:43,589 --> 00:38:41,520
array of microscopic shutters

926
00:38:46,390 --> 00:38:43,599
webb's integrated science instrument

927
00:38:49,910 --> 00:38:46,400
module located behind the main mirror

928
00:38:51,510 --> 00:38:49,920
also contains miri a mid infrared camera

929
00:38:53,829 --> 00:38:51,520
and spectrograph

930
00:38:55,750 --> 00:38:53,839
seen here during testing

931
00:38:58,390 --> 00:38:55,760
miri has been developed by a partnership

932
00:39:00,870 --> 00:38:58,400
between europe and the us

933
00:39:03,430 --> 00:39:00,880
miri detects mid-infrared light from

934
00:39:05,910 --> 00:39:03,440
planets stars and galaxies it can

935
00:39:08,470 --> 00:39:05,920
analyze molecules to help us deduce what

936
00:39:11,750 --> 00:39:08,480
astronomical objects are made of and

937
00:39:14,470 --> 00:39:11,760
peer into clouds of gas and dust where

938
00:39:16,310 --> 00:39:14,480

stars and planets are born

939
00:39:19,030 --> 00:39:16,320
together these instruments will help

940
00:39:21,270 --> 00:39:19,040
webb detect and analyze light from the

941
00:39:28,230 --> 00:39:21,280
very dawn of time

942
00:39:39,670 --> 00:39:33,030
so

943
00:39:42,630 --> 00:39:39,680
and remember that one of webb's jobs is

944
00:39:44,870 --> 00:39:42,640
to find out about galaxies more about

945
00:39:47,109 --> 00:39:44,880
the galaxies but also to help us to

946
00:39:49,589 --> 00:39:47,119
understand how they change and this

947
00:39:53,430 --> 00:39:49,599
image is going to be very very useful

948
00:39:57,670 --> 00:39:53,440
for that let's reveal it now

949
00:39:59,430 --> 00:39:57,680
there it is it's called stefan's quintet

950
00:40:01,910 --> 00:39:59,440
and it's wondrous

951
00:40:04,630 --> 00:40:01,920
giovanna what are we looking at yes like

952
00:40:05,990 --> 00:40:04,640
it's a quintet so we are looking at five

953
00:40:09,910 --> 00:40:06,000
galaxies

954
00:40:11,829 --> 00:40:09,920
this giant structure that as we've seen

955
00:40:14,630 --> 00:40:11,839
we see everywhere around us in the

956
00:40:17,829 --> 00:40:14,640
universe they contain from million to

957
00:40:20,550 --> 00:40:17,839
hundred billions of stars and in fact we

958
00:40:23,589 --> 00:40:20,560
live in one of them the milky way and

959
00:40:27,349 --> 00:40:23,599
here we see uh five of them this is a

960
00:40:30,790 --> 00:40:27,359
closer um galaxy in the foreground and

961
00:40:32,309 --> 00:40:30,800
these four are at a distance of about uh

962
00:40:34,550 --> 00:40:32,319
300

963
00:40:37,430 --> 00:40:34,560

million light years from us and they're

964
00:40:41,190 --> 00:40:37,440
locked in a close interaction a sort of

965
00:40:42,230 --> 00:40:41,200
cosmic dance driven by the gravitational

966
00:40:43,270 --> 00:40:42,240
force

967
00:40:45,270 --> 00:40:43,280
um

968
00:40:48,710 --> 00:40:45,280
you can see here these two uh in a

969
00:40:51,990 --> 00:40:48,720
process of merging uh within each other

970
00:40:53,670 --> 00:40:52,000
this is a very important image an area

971
00:40:56,550 --> 00:40:53,680
to study because it really shows that

972
00:40:59,030 --> 00:40:56,560
the type of interaction that drives the

973
00:41:01,190 --> 00:40:59,040
evolution of galaxy that that that's the

974
00:41:03,510 --> 00:41:01,200
mechanism of galaxies growth i love this

975
00:41:04,550 --> 00:41:03,520
image of the cosmic dance moving through

976
00:41:06,309 --> 00:41:04,560
each other

977
00:41:08,230 --> 00:41:06,319
mark there's a lot going on though in

978
00:41:10,630 --> 00:41:08,240
this image isn't there there is so this

979
00:41:12,630 --> 00:41:10,640
is a near-infrared image with nirspec we

980
00:41:14,710 --> 00:41:12,640
can zoom

981
00:41:18,950 --> 00:41:14,720
into this area and we have this

982
00:41:20,550 --> 00:41:18,960
technology that allows us to take

983
00:41:22,230 --> 00:41:20,560
thousands of image at different

984
00:41:24,630 --> 00:41:22,240
wavelength channels

985
00:41:26,790 --> 00:41:24,640
uh so see the uh

986
00:41:29,349 --> 00:41:26,800
the this distribution of the gas was

987
00:41:33,349 --> 00:41:29,359
going on in the gas uh in different

988
00:41:35,589 --> 00:41:33,359

region uh of the of this core area and

989
00:41:37,190 --> 00:41:35,599
understand the composition of the gas

990
00:41:39,750 --> 00:41:37,200
the velocities

991
00:41:41,670 --> 00:41:39,760
um the temperature so that's very

992
00:41:43,589 --> 00:41:41,680
important to understand the physics so

993
00:41:45,750 --> 00:41:43,599
it's giving us so much information it

994
00:41:46,790 --> 00:41:45,760
just shows the power of this telescope

995
00:41:48,390 --> 00:41:46,800
mark

996
00:41:49,910 --> 00:41:48,400
this is just the beginning though isn't

997
00:41:51,829 --> 00:41:49,920
it i think that's a very important

998
00:41:53,430 --> 00:41:51,839
takeaway from today you know we these

999
00:41:55,990 --> 00:41:53,440
are like pictures just taken over a

1000
00:41:57,270 --> 00:41:56,000
period of five days and every five days

1001
00:41:58,790 --> 00:41:57,280
we're getting more data which will

1002
00:42:00,950 --> 00:41:58,800
contribute more in that in that

1003
00:42:02,470 --> 00:42:00,960
direction it's a culmination of decades

1004
00:42:04,630 --> 00:42:02,480
of work but it's just the beginning of

1005
00:42:06,790 --> 00:42:04,640
decades and you know what we've seen

1006
00:42:08,390 --> 00:42:06,800
today with these images is essentially

1007
00:42:10,790 --> 00:42:08,400
that we're ready now this telescope is

1008
00:42:12,790 --> 00:42:10,800
working fantastically well and you know

1009
00:42:14,390 --> 00:42:12,800
to to borrow a phrase from a famous rock

1010
00:42:16,390 --> 00:42:14,400
musician you know we're ready to turn

1011
00:42:18,069 --> 00:42:16,400
this telescope up to 11. it really is

1012
00:42:19,990 --> 00:42:18,079
time it's fantastic

1013
00:42:28,870 --> 00:42:20,000

thank you very much indeed both of you

1014
00:42:31,510 --> 00:42:30,309
thanks katie it's so great to have you

1015
00:42:32,950 --> 00:42:31,520
and your colleagues with us on this

1016
00:42:35,109 --> 00:42:32,960
historic day

1017
00:42:36,790 --> 00:42:35,119
so before we get to the fifth and final

1018
00:42:38,230 --> 00:42:36,800
image reveal of the day it cannot be

1019
00:42:39,990 --> 00:42:38,240
said enough that an achievement like the

1020
00:42:42,150 --> 00:42:40,000
james webb space telescope is something

1021
00:42:44,550 --> 00:42:42,160
bigger than any one of us it's bigger

1022
00:42:47,270 --> 00:42:44,560
than any organization any country

1023
00:42:48,870 --> 00:42:47,280
this truly takes a planet web belongs to

1024
00:42:50,390 --> 00:42:48,880
all of us and starting today the

1025
00:42:53,270 --> 00:42:50,400
discoveries start and they're not going

1026
00:42:54,550 --> 00:42:53,280
to stop this is just the beginning

1027
00:42:56,069 --> 00:42:54,560
we've said several times throughout the

1028
00:42:57,750 --> 00:42:56,079
broadcast that the web mission is about

1029
00:42:59,190 --> 00:42:57,760
people and during the construction of

1030
00:43:01,349 --> 00:42:59,200
the great telescope people started to

1031
00:43:02,950 --> 00:43:01,359
see themselves in it literally

1032
00:43:05,109 --> 00:43:02,960
day after day people visited the

1033
00:43:06,790 --> 00:43:05,119
observation window at nasa goddard and

1034
00:43:08,470 --> 00:43:06,800
looking through the glass they snapped

1035
00:43:11,589 --> 00:43:08,480
selfies of themselves reflected in the

1036
00:43:13,670 --> 00:43:11,599
gigantic golden mirror

1037
00:43:15,670 --> 00:43:13,680
these photos are actual reflections of

1038
00:43:17,190 --> 00:43:15,680

the enormous human investment and the

1039
00:43:18,630 --> 00:43:17,200
emotional commitment that brought this

1040
00:43:20,550 --> 00:43:18,640
mission to life

1041
00:43:21,990 --> 00:43:20,560
and now years later that mission is

1042
00:43:23,750 --> 00:43:22,000
finally collecting light from the

1043
00:43:25,750 --> 00:43:23,760
earliest days of the universe all the

1044
00:43:27,510 --> 00:43:25,760
way to worlds in our own solar system

1045
00:43:29,829 --> 00:43:27,520
it's the same mirror that reflected the

1046
00:43:31,270 --> 00:43:29,839
many faces who see themselves as part of

1047
00:43:32,630 --> 00:43:31,280
the journey to understand our shared

1048
00:43:35,030 --> 00:43:32,640
origins

1049
00:43:42,309 --> 00:43:35,040
let's stop for a moment and appreciate

1050
00:44:07,190 --> 00:43:44,390
okay it's time now for the last image to

1051
00:44:10,550 --> 00:44:09,190
so amber strawn is webb's deputy project

1052
00:44:12,710 --> 00:44:10,560
scientist he's here with me today to

1053
00:44:14,309 --> 00:44:12,720
share the final big reveal of the day so

1054
00:44:15,750 --> 00:44:14,319
amber it is so good to see you how are

1055
00:44:17,829 --> 00:44:15,760
you feeling oh

1056
00:44:19,750 --> 00:44:17,839
so great so exciting what a what a great

1057
00:44:21,109 --> 00:44:19,760
day this is yes so one of the things

1058
00:44:22,950 --> 00:44:21,119
that we're going to do is before we get

1059
00:44:25,030 --> 00:44:22,960
to the final image the james webster

1060
00:44:27,349 --> 00:44:25,040
just tell everybody i'm paid to worry uh

1061
00:44:28,870 --> 00:44:27,359
frankly uh and and and that's good uh

1062
00:44:30,550 --> 00:44:28,880
what we want to do though is you know

1063
00:44:32,390 --> 00:44:30,560

just really thank the team again you

1064
00:44:34,630 --> 00:44:32,400
know of course we heard uh bill and

1065
00:44:36,230 --> 00:44:34,640
scott and greg talking about the team

1066
00:44:38,230 --> 00:44:36,240
that is there i think what's also

1067
00:44:40,550 --> 00:44:38,240
important is to recognize that bernie is

1068
00:44:46,870 --> 00:44:40,560
sitting there it was the first manager i

1069
00:44:46,880 --> 00:44:50,230
and uh

1070
00:44:54,150 --> 00:44:51,589
and i want to mention that phil

1071
00:44:55,910 --> 00:44:54,160
stablehouse who is a manager uh also

1072
00:44:59,109 --> 00:44:55,920
during that time is no longer with us

1073
00:45:03,270 --> 00:44:59,119
but his heart is with us today

1074
00:45:07,030 --> 00:45:05,349
i have to tell you i have to tell you

1075
00:45:09,349 --> 00:45:07,040
john uh after each one of these

1076
00:45:11,510 --> 00:45:09,359
milestones i called a lot of people i

1077
00:45:13,750 --> 00:45:11,520
called bernie for example and i called

1078
00:45:15,589 --> 00:45:13,760
uh people at my job and people who are

1079
00:45:17,430 --> 00:45:15,599
administrators because there's many of

1080
00:45:19,109 --> 00:45:17,440
them and i just wonder how you feel

1081
00:45:21,190 --> 00:45:19,119
about the team to stack give you the

1082
00:45:22,870 --> 00:45:21,200
word here i am just so thrilled that we

1083
00:45:24,150 --> 00:45:22,880
had a privilege to assemble such a

1084
00:45:26,550 --> 00:45:24,160
brilliant team

1085
00:45:29,109 --> 00:45:26,560
we drew from the best of the best and

1086
00:45:31,670 --> 00:45:29,119
here we are so my

1087
00:45:34,390 --> 00:45:31,680
extreme deep thanks go to all the people

1088
00:45:36,790 --> 00:45:34,400

who built that team not only to bernie

1089
00:45:39,109 --> 00:45:36,800
who started us and helped us build up

1090
00:45:41,510 --> 00:45:39,119
all the technology to phil who made sure

1091
00:45:43,589 --> 00:45:41,520
we would have a plan and then when we

1092
00:45:45,750 --> 00:45:43,599
didn't have quite enough money to build

1093
00:45:47,829 --> 00:45:45,760
who pulled it all together and made it

1094
00:45:49,510 --> 00:45:47,839
get all the way to the end i am so

1095
00:45:51,750 --> 00:45:49,520
thrilled that we had so much talent to

1096
00:45:53,670 --> 00:45:51,760
draw on and here we are we have the

1097
00:45:55,910 --> 00:45:53,680
support of the country and the world to

1098
00:45:57,270 --> 00:45:55,920
take on this immense challenge

1099
00:45:59,750 --> 00:45:57,280
you know what i'm most excited about

1100
00:46:02,630 --> 00:45:59,760
there's ten of thousands of scientists

1101
00:46:04,390 --> 00:46:02,640
and frankly some of them just got born

1102
00:46:07,430 --> 00:46:04,400
or not even born

1103
00:46:09,430 --> 00:46:07,440
who are benefiting from this amazing

1104
00:46:11,990 --> 00:46:09,440
telescope because it will be with us for

1105
00:46:15,270 --> 00:46:12,000
decades it will be and we have it took

1106
00:46:18,309 --> 00:46:15,280
us about 25 years to get here since 1995

1107
00:46:21,109 --> 00:46:18,319
and we have at least 25 to go i hope

1108
00:46:22,950 --> 00:46:21,119
so look uh we are in a sense of of these

1109
00:46:24,790 --> 00:46:22,960
images the art that is out there in the

1110
00:46:26,309 --> 00:46:24,800
sky revealed for the first time we're

1111
00:46:28,550 --> 00:46:26,319
thinking of the team and we're thanking

1112
00:46:33,670 --> 00:46:28,560
them john thanks to you thanks to all of

1113
00:46:37,430 --> 00:46:35,430

thank you so much thomas and this entire

1114
00:46:38,790 --> 00:46:37,440
collection continues to just absolutely

1115
00:46:41,109 --> 00:46:38,800
astound me

1116
00:46:44,150 --> 00:46:41,119
okay amber so here it is can you walk us

1117
00:46:48,710 --> 00:46:44,160
through the final image reveal

1118
00:46:53,109 --> 00:46:50,710
the last image is

1119
00:46:54,470 --> 00:46:53,119
wow look at that

1120
00:46:56,390 --> 00:46:54,480
so amber can you can you tell us a bit

1121
00:46:59,270 --> 00:46:56,400
about what we're seeing here of course

1122
00:47:02,390 --> 00:46:59,280
this stunning vista of the cosmic cliffs

1123
00:47:05,430 --> 00:47:02,400
of the karina nebula reveals new details

1124
00:47:07,670 --> 00:47:05,440
about this vast stellar nursery today

1125
00:47:09,670 --> 00:47:07,680
for the first time we're seeing brand

1126
00:47:11,990 --> 00:47:09,680
new stars that were previously

1127
00:47:12,790 --> 00:47:12,000
completely hidden from our view

1128
00:47:15,510 --> 00:47:12,800
there's something you want to point out

1129
00:47:17,510 --> 00:47:15,520
here absolutely so

1130
00:47:19,109 --> 00:47:17,520
honestly it took me a while to even

1131
00:47:21,190 --> 00:47:19,119
figure out what to call out in this

1132
00:47:23,349 --> 00:47:21,200
image there's just so much going on here

1133
00:47:25,750 --> 00:47:23,359
it's so beautiful one thing that really

1134
00:47:28,230 --> 00:47:25,760
really stands out to me is you sort of

1135
00:47:29,829 --> 00:47:28,240
get this sense of depth and texture from

1136
00:47:31,510 --> 00:47:29,839
this new data

1137
00:47:33,829 --> 00:47:31,520
there's just there's a lot going on to

1138
00:47:36,230 --> 00:47:33,839

call out a few specifics first of all in

1139
00:47:38,230 --> 00:47:36,240
general the karina nebula is a nearby

1140
00:47:42,069 --> 00:47:38,240
star forming region within our own milky

1141
00:47:44,710 --> 00:47:42,079
way galaxy about 7 600 light years away

1142
00:47:47,190 --> 00:47:44,720
and in this view we see some great

1143
00:47:49,670 --> 00:47:47,200
examples first of all of hundreds of new

1144
00:47:53,270 --> 00:47:49,680
stars that we've never seen before we

1145
00:47:55,190 --> 00:47:53,280
see examples of bubbles and cavities and

1146
00:47:58,870 --> 00:47:55,200
jets that are being blown out by these

1147
00:48:00,710 --> 00:47:58,880
newborn stars we even see some galaxies

1148
00:48:03,510 --> 00:48:00,720
sort of lurking in the background up

1149
00:48:05,109 --> 00:48:03,520
here we see examples of structures that

1150
00:48:07,430 --> 00:48:05,119
honestly we don't even know what they

1151
00:48:10,470 --> 00:48:07,440
are like what's going on here there's

1152
00:48:11,510 --> 00:48:10,480
just there's the data is just so rich

1153
00:48:13,109 --> 00:48:11,520
and there's something really special

1154
00:48:14,549 --> 00:48:13,119
about the infrared infrared can actually

1155
00:48:16,309 --> 00:48:14,559
see deeper into these star-forming

1156
00:48:18,150 --> 00:48:16,319
regions absolutely that's one of the

1157
00:48:19,510 --> 00:48:18,160
great things about infrared is it really

1158
00:48:22,069 --> 00:48:19,520
does reveal

1159
00:48:24,470 --> 00:48:22,079
what's going on here in a really cosmic

1160
00:48:26,630 --> 00:48:24,480
sense and in general what's happening in

1161
00:48:29,829 --> 00:48:26,640
sort of this overall landscape is we

1162
00:48:32,710 --> 00:48:29,839
have these gigantic hot young stars up

1163
00:48:34,790 --> 00:48:32,720

here to the top of this rim and the

1164
00:48:37,190 --> 00:48:34,800
radiation and stellar winds from those

1165
00:48:40,390 --> 00:48:37,200
stars is sort of pushing down and

1166
00:48:42,790 --> 00:48:40,400
running into all of this this is gas and

1167
00:48:45,990 --> 00:48:42,800
dust and of course we know that gas and

1168
00:48:48,549 --> 00:48:46,000
dust is great raw material for newborn

1169
00:48:50,630 --> 00:48:48,559
stars and baby planets

1170
00:48:52,630 --> 00:48:50,640
but there's a flip side of this story

1171
00:48:55,030 --> 00:48:52,640
and also a little bit of a mystery

1172
00:48:57,829 --> 00:48:55,040
because these same processes can serve

1173
00:49:00,230 --> 00:48:57,839
to sort of erode away this material and

1174
00:49:02,470 --> 00:49:00,240
stop star formation so we have this sort

1175
00:49:04,549 --> 00:49:02,480
of delicate balance going on of new

1176
00:49:07,510 --> 00:49:04,559
stars being formed but at the same time

1177
00:49:08,630 --> 00:49:07,520
the star formation is being halted

1178
00:49:10,390 --> 00:49:08,640
and for me

1179
00:49:12,549 --> 00:49:10,400
when i see an image like this i can't

1180
00:49:15,109 --> 00:49:12,559
help but think about scale you know

1181
00:49:16,870 --> 00:49:15,119
every dot of light we see here is an

1182
00:49:18,870 --> 00:49:16,880
individual star

1183
00:49:20,950 --> 00:49:18,880
not unlike our sun

1184
00:49:23,430 --> 00:49:20,960
and many of these likely also have

1185
00:49:25,510 --> 00:49:23,440
planets and it just reminds me that you

1186
00:49:28,230 --> 00:49:25,520
know our sun and our planets and

1187
00:49:31,030 --> 00:49:28,240
ultimately us were formed out of the

1188
00:49:33,670 --> 00:49:31,040

same kind of stuff that we see here

1189
00:49:36,069 --> 00:49:33,680
we humans really are connected to the

1190
00:49:37,990 --> 00:49:36,079
universe we're made of the same stuff in

1191
00:49:39,750 --> 00:49:38,000
this beautiful landscape and actually

1192
00:49:41,030 --> 00:49:39,760
the korean nebula was one of my favorite

1193
00:49:43,349 --> 00:49:41,040
images from hubble so have a look at

1194
00:49:45,349 --> 00:49:43,359
this as well right absolutely yeah yeah

1195
00:49:47,670 --> 00:49:45,359
the hubble image of this is also

1196
00:49:50,150 --> 00:49:47,680
spectacular we saw it in a different

1197
00:49:52,390 --> 00:49:50,160
kind of light when when hubble uh took

1198
00:49:54,950 --> 00:49:52,400
an image of this of this uh particular

1199
00:49:56,710 --> 00:49:54,960
nebula and then you can see amazing

1200
00:49:59,670 --> 00:49:56,720
things with hubble but when we zoom in

1201
00:50:01,990 --> 00:49:59,680
to this new image we're able to see so

1202
00:50:03,670 --> 00:50:02,000
much more detail and of course all of us

1203
00:50:06,630 --> 00:50:03,680
you know i grew up

1204
00:50:08,390 --> 00:50:06,640
on hubble and all of us love hubble and

1205
00:50:11,109 --> 00:50:08,400
i'm just i'm so excited to see what

1206
00:50:13,430 --> 00:50:11,119
these two amazing observatories are able

1207
00:50:14,470 --> 00:50:13,440
to do really in tandem with each other

1208
00:50:16,150 --> 00:50:14,480
thank you so much and again

1209
00:50:18,069 --> 00:50:16,160
congratulations it's been a pleasure to

1210
00:50:19,910 --> 00:50:18,079
be working on this with you i'm just

1211
00:50:21,589 --> 00:50:19,920
amazed by what's been going on thank you

1212
00:50:23,430 --> 00:50:21,599
thank you

1213
00:50:25,910 --> 00:50:23,440

so as we're wrapping up one of the

1214
00:50:27,829 --> 00:50:25,920
things that i really have to say is the

1215
00:50:30,309 --> 00:50:27,839
the the journey that we've been going on

1216
00:50:33,030 --> 00:50:30,319
is so very dramatic for me so we've gone

1217
00:50:34,549 --> 00:50:33,040
all the way from the birth of stars and

1218
00:50:36,950 --> 00:50:34,559
we have all the way from the distant

1219
00:50:38,710 --> 00:50:36,960
galaxies to the birth of stars this is

1220
00:50:40,549 --> 00:50:38,720
where we all began this was the whole

1221
00:50:42,710 --> 00:50:40,559
point of the james webb space telescope

1222
00:50:44,950 --> 00:50:42,720
to figure out our origins from the very

1223
00:50:47,270 --> 00:50:44,960
very early days of the universe to star

1224
00:50:49,109 --> 00:50:47,280
and planet formation very nearby

1225
00:50:51,270 --> 00:50:49,119
so right now i'm very honored to have

1226
00:50:53,589 --> 00:50:51,280
our last special guest this is the

1227
00:50:55,030 --> 00:50:53,599
administrator of nasa bill nelson an

1228
00:50:57,670 --> 00:50:55,040
honor to be with you sir

1229
00:50:59,430 --> 00:50:57,680
hey what a pleasure what what a banner

1230
00:51:02,549 --> 00:50:59,440
day

1231
00:51:04,790 --> 00:51:02,559
it's clear that webb represents

1232
00:51:06,950 --> 00:51:04,800
the best of nasa

1233
00:51:10,309 --> 00:51:06,960
it maintains

1234
00:51:12,069 --> 00:51:10,319
our ability to propel us forward

1235
00:51:14,309 --> 00:51:12,079
for science

1236
00:51:16,470 --> 00:51:14,319
for risk-taking

1237
00:51:19,349 --> 00:51:16,480
or inspiration

1238
00:51:21,750 --> 00:51:19,359

and we don't want to ever stop exploring

1239
00:51:25,990 --> 00:51:21,760
the heavens nor stop daring to take

1240
00:51:29,990 --> 00:51:26,000
another step forward for humanity

1241
00:51:31,589 --> 00:51:30,000
in the words of the famous carl sagan

1242
00:51:34,630 --> 00:51:31,599
somewhere

1243
00:51:36,470 --> 00:51:34,640
something incredible is waiting to be

1244
00:51:40,710 --> 00:51:36,480
known

1245
00:51:42,870 --> 00:51:40,720
i think those words are becoming reality

1246
00:51:44,950 --> 00:51:42,880
absolutely thanks michelle honor to have

1247
00:51:45,910 --> 00:51:44,960
you here thank you very much

1248
00:51:47,430 --> 00:51:45,920
wow

1249
00:51:49,829 --> 00:51:47,440
so

1250
00:51:51,109 --> 00:51:49,839
this is a celebration for all humanity

1251
00:51:53,829 --> 00:51:51,119
if you've ever looked up at the night

1252
00:51:54,790 --> 00:51:53,839
sky and wonder whoever you are wherever

1253
00:51:56,710 --> 00:51:54,800
you are

1254
00:51:58,390 --> 00:51:56,720
this is your telescope

1255
00:51:59,910 --> 00:51:58,400
and we also salute the thousands of

1256
00:52:02,630 --> 00:51:59,920
people who have dedicated part of their

1257
00:52:04,150 --> 00:52:02,640
lives to making web a reality

1258
00:52:06,069 --> 00:52:04,160
i also want to give a big shout out for

1259
00:52:08,230 --> 00:52:06,079
the superb media team who's helping web

1260
00:52:10,549 --> 00:52:08,240
story to the world this broadcast is a

1261
00:52:12,710 --> 00:52:10,559
joint effort of the superstar producers

1262
00:52:15,750 --> 00:52:12,720
animators and social media specialists

1263
00:52:17,030 --> 00:52:15,760

at the canadian space agency esa nasa

1264
00:52:19,430 --> 00:52:17,040
and especially the goddard space flight

1265
00:52:21,349 --> 00:52:19,440
center webb captures light in distant

1266
00:52:23,990 --> 00:52:21,359
colors that the eye can't see and you've

1267
00:52:26,710 --> 00:52:24,000
actually made this visible to the world

1268
00:52:28,710 --> 00:52:26,720
so finally if you go to nasa.gov web

1269
00:52:30,390 --> 00:52:28,720
first images you can download all of the

1270
00:52:32,950 --> 00:52:30,400
images and data we've just shown in full

1271
00:52:35,030 --> 00:52:32,960
resolution and check back often from now

1272
00:52:37,109 --> 00:52:35,040
on we share new discoveries exciting new

1273
00:52:40,150 --> 00:52:37,119
destinations around the universe

1274
00:52:43,030 --> 00:52:40,160
july 12 2022 marks a huge day for

1275
00:52:45,829 --> 00:52:43,040
science it's only just the beginning

1276
00:52:47,670 --> 00:52:45,839
for everyone at csa esa and nasa i'm so

1277
00:52:54,270 --> 00:52:47,680
very pleased you could join us i'm