
HUBBLE
hangouts

1
00:00:08,310 --> 00:00:05,590
hello hubble huggers and here i am the

2
00:00:10,470 --> 00:00:08,320
second day in a row with another hubble

3
00:00:11,830 --> 00:00:10,480
hangout and i almost want to call them

4
00:00:13,589 --> 00:00:11,840
humble hangouts but you know because i

5
00:00:15,270 --> 00:00:13,599
was doing my alliteration yesterday i

6
00:00:17,590 --> 00:00:15,280
got a little carried away so

7
00:00:19,510 --> 00:00:17,600
this is uh two in a row they tend to get

8
00:00:21,269 --> 00:00:19,520
there we're not bunching them up on

9
00:00:23,349 --> 00:00:21,279
purpose they just sort of happen this

10
00:00:25,590 --> 00:00:23,359
way with people's schedules so the

11
00:00:27,109 --> 00:00:25,600
hangout yesterday uh with the greatest

12
00:00:29,750 --> 00:00:27,119
hubble images we wanted to do early in

13
00:00:30,790 --> 00:00:29,760

the week to make sure that we got enough

14
00:00:32,870 --> 00:00:30,800
time out there for you guys to

15
00:00:35,590 --> 00:00:32,880
participate in that campaign and today

16
00:00:37,830 --> 00:00:35,600
this is this is the time of our or our

17
00:00:39,510 --> 00:00:37,840
normal hubble hangout so uh that's kind

18
00:00:41,270 --> 00:00:39,520
of why they're you're getting two in one

19
00:00:43,590 --> 00:00:41,280
week i also want to make a quick

20
00:00:44,869 --> 00:00:43,600
announcement that uh we're probably

21
00:00:46,470 --> 00:00:44,879
going to start seeing more of these

22
00:00:49,110 --> 00:00:46,480
hubble hangouts on them on a regular

23
00:00:50,630 --> 00:00:49,120
basis in the future i'm working more now

24
00:00:52,150 --> 00:00:50,640
at the institute in my capacity with

25
00:00:55,430 --> 00:00:52,160
social media so

26
00:00:57,189 --> 00:00:55,440
uh my goal is to have more of these

27
00:00:58,630 --> 00:00:57,199
on a regular basis on a variety of

28
00:00:59,990 --> 00:00:58,640
topics so start looking for those as

29
00:01:02,310 --> 00:01:00,000
well they'll be posted on the google

30
00:01:05,270 --> 00:01:02,320
plus the hubble uh site or the hubble

31
00:01:06,710 --> 00:01:05,280
space telescope google plus page

32
00:01:09,510 --> 00:01:06,720
so today

33
00:01:11,190 --> 00:01:09,520
we're going to talk about comet ison and

34
00:01:13,270 --> 00:01:11,200
this is the second of our comet ice and

35
00:01:14,630 --> 00:01:13,280
hangout we've already had one where we

36
00:01:16,469 --> 00:01:14,640
talked a lot about the nature of the

37
00:01:18,789 --> 00:01:16,479
comment and what to

38
00:01:21,990 --> 00:01:18,799

hopefully expect when it comes through

39
00:01:23,510 --> 00:01:22,000
so we want you to ask us some questions

40
00:01:24,630 --> 00:01:23,520
and comments because today we're going

41
00:01:27,030 --> 00:01:24,640
to show you

42
00:01:29,749 --> 00:01:27,040
how you can get your hands on your very

43
00:01:31,670 --> 00:01:29,759
own comet ice and data uh from the

44
00:01:33,990 --> 00:01:31,680
hubble space telescope

45
00:01:35,830 --> 00:01:34,000
and we so you can interact with us in a

46
00:01:37,510 --> 00:01:35,840
variety of ways you can leave comments

47
00:01:39,830 --> 00:01:37,520
on the google plus page we're looking at

48
00:01:41,350 --> 00:01:39,840
that uh where this video was embedded

49
00:01:44,870 --> 00:01:41,360
i'm looking at the youtube comments

50
00:01:46,789 --> 00:01:44,880
right now and you can also tweet using

51
00:01:48,550 --> 00:01:46,799
we always forget what's up what's our

52
00:01:51,190 --> 00:01:48,560
hashtag

53
00:01:52,789 --> 00:01:51,200
hubble hangouts okay

54
00:01:55,990 --> 00:01:52,799
i'll be scouring twitter and everywhere

55
00:01:57,990 --> 00:01:56,000
else too yeah thank you okay so let me

56
00:02:01,429 --> 00:01:58,000
start my introductions with me

57
00:02:04,069 --> 00:02:01,439
i gotta say alberto is on vacation and

58
00:02:07,109 --> 00:02:04,079
being dedicated has is still with us

59
00:02:08,630 --> 00:02:07,119
welcome alberto hey tony

60
00:02:09,830 --> 00:02:08,640
it's a pleasure to be here as always so

61
00:02:10,710 --> 00:02:09,840
i wouldn't miss it for the world you

62
00:02:12,710 --> 00:02:10,720
know

63
00:02:14,630 --> 00:02:12,720

i can't tell you how much i would be so

64
00:02:16,710 --> 00:02:14,640
lost without you so thank you for taking

65
00:02:18,710 --> 00:02:16,720
time out uh on your on your first day of

66
00:02:20,309 --> 00:02:18,720
vacation to do this with us uh you're

67
00:02:22,630 --> 00:02:20,319
awesome and now you won't happen

68
00:02:24,550 --> 00:02:22,640
tomorrow by the way what's that it's not

69
00:02:26,070 --> 00:02:24,560
gonna happen tomorrow yeah better not

70
00:02:27,589 --> 00:02:26,080
right i'm gonna hear about that fair

71
00:02:29,750 --> 00:02:27,599
enough

72
00:02:31,990 --> 00:02:29,760
i will leave you alone it's you are now

73
00:02:33,509 --> 00:02:32,000
free to move about the country

74
00:02:35,830 --> 00:02:33,519
okay

75
00:02:38,390 --> 00:02:35,840
and also with me is my cohort co-host

76
00:02:41,350 --> 00:02:38,400
co-conspirator

77
00:02:44,790 --> 00:02:41,360
yeah yes the bold astronomer

78
00:02:46,869 --> 00:02:44,800
scott lewis from thecosmos.com hi scott

79
00:02:47,910 --> 00:02:46,879
thanks for joining us again

80
00:02:50,150 --> 00:02:47,920
again

81
00:02:52,070 --> 00:02:50,160
for many more and for hopefully that's

82
00:02:54,390 --> 00:02:52,080
true that's true it's a pleasure to have

83
00:02:56,790 --> 00:02:54,400
you here and it's fun and scott will be

84
00:02:59,350 --> 00:02:56,800
uh active on the g plus page helping you

85
00:03:00,550 --> 00:02:59,360
know with any sort of uh uh issues and

86
00:03:02,710 --> 00:03:00,560
comments and questions and getting

87
00:03:04,630 --> 00:03:02,720
images up there hopefully if we uh if we

88
00:03:05,750 --> 00:03:04,640

have if we you probably don't have any

89
00:03:07,430 --> 00:03:05,760
do you

90
00:03:08,229 --> 00:03:07,440
i can we didn't we didn't provide you

91
00:03:09,190 --> 00:03:08,239
with this

92
00:03:14,710 --> 00:03:09,200
business

93
00:03:17,509 --> 00:03:14,720
okay or go to hubblesite.org

94
00:03:19,270 --> 00:03:17,519
and you can go to the common isomer

95
00:03:22,149 --> 00:03:19,280
or go to where we show you you're about

96
00:03:24,229 --> 00:03:22,159
to go to get the get these data

97
00:03:26,869 --> 00:03:24,239
okay and i also like to welcome with us

98
00:03:28,949 --> 00:03:26,879
dr bonnie meinke is it do i pronounce it

99
00:03:31,750 --> 00:03:28,959
mine key yeah it's like i asked you that

100
00:03:32,710 --> 00:03:31,760
okay thank you i got lucky um i should

101
00:03:34,229 --> 00:03:32,720
have asked you that before i just

102
00:03:36,309 --> 00:03:34,239
started blurting that out that's all

103
00:03:38,309 --> 00:03:36,319
right nobody ever gets it right really

104
00:03:42,869 --> 00:03:38,319
what do you get like meineke's and i've

105
00:03:48,149 --> 00:03:45,670
it's usually a monkey or a mean key or a

106
00:03:49,620 --> 00:03:48,159
minor key and people like oh you're

107
00:03:52,789 --> 00:03:49,630
related to muffler people

108
00:03:56,149 --> 00:03:52,799
[Laughter]

109
00:03:57,990 --> 00:03:56,159
well bonnie is an oppose an astronomer

110
00:03:59,910 --> 00:03:58,000
at the office of public outreach and she

111
00:04:02,789 --> 00:03:59,920
specializes in solar system and

112
00:04:05,429 --> 00:04:02,799
planetary objects and she's here to talk

113
00:04:07,270 --> 00:04:05,439

about some of the science aspects of

114
00:04:09,110 --> 00:04:07,280
comet ison with us and i love having you

115
00:04:10,949 --> 00:04:09,120
here thanks bonnie for joining us glad

116
00:04:15,110 --> 00:04:10,959
to be here okay

117
00:04:16,390 --> 00:04:15,120
and max mutchler he is the uh uh he is

118
00:04:18,550 --> 00:04:16,400
in charge of a lot of the stuff that

119
00:04:20,229 --> 00:04:18,560
goes on with the uh

120
00:04:22,150 --> 00:04:20,239
getting hubble data processing hubble

121
00:04:23,990 --> 00:04:22,160
data and he's also

122
00:04:26,070 --> 00:04:24,000
here to talk to us about how to get

123
00:04:27,670 --> 00:04:26,080
comet ison data hi max

124
00:04:29,110 --> 00:04:27,680
hi tony it's always great to do these

125
00:04:31,030 --> 00:04:29,120
with you a lot of fun

126
00:04:32,710 --> 00:04:31,040
they are fun yeah so we're going to get

127
00:04:35,350 --> 00:04:32,720
started in just a moment but first i

128
00:04:37,110 --> 00:04:35,360
have to introduce zolave who is like

129
00:04:46,150 --> 00:04:37,120
you're becoming a co-host dude i mean

130
00:04:49,749 --> 00:04:48,150
hi everybody

131
00:04:51,350 --> 00:04:49,759
and he's here to talk to us up again

132
00:04:52,629 --> 00:04:51,360
about some of the processing steps for

133
00:04:54,550 --> 00:04:52,639
some of the data that we're going to see

134
00:04:56,950 --> 00:04:54,560
as well as show us some images he's got

135
00:04:58,469 --> 00:04:56,960
uh of the comet as well so let's get

136
00:05:00,310 --> 00:04:58,479
started real quick uh bonnie let me ask

137
00:05:03,590 --> 00:05:00,320
you a quick question so we're here to

138
00:05:05,670 --> 00:05:03,600

talk about comet ison uh it's on its way

139
00:05:06,950 --> 00:05:05,680
still presumably around the sun uh have

140
00:05:08,790 --> 00:05:06,960
you heard anything

141
00:05:11,830 --> 00:05:08,800
new lately since the last time we met

142
00:05:14,469 --> 00:05:11,840
about the comet itself yes there is been

143
00:05:16,390 --> 00:05:14,479
one potential uh observation that

144
00:05:18,950 --> 00:05:16,400
happened i think monday night

145
00:05:20,310 --> 00:05:18,960
in australia by an amateur named bruce

146
00:05:21,350 --> 00:05:20,320
gary

147
00:05:25,270 --> 00:05:21,360
and

148
00:05:27,590 --> 00:05:25,280
i have an image of it if i can figure

149
00:05:30,230 --> 00:05:27,600
out how to show you guys

150
00:05:34,950 --> 00:05:31,990
the screen the screen share button on

151
00:05:40,150 --> 00:05:36,629
now max made the point starting there

152
00:05:41,670 --> 00:05:40,160
you go um this little smudge is the guy

153
00:05:43,270 --> 00:05:41,680
and

154
00:05:45,029 --> 00:05:43,280
um i there's been no follow-up

155
00:05:46,710 --> 00:05:45,039
observations i can't i've been googling

156
00:05:48,710 --> 00:05:46,720
around all day to try to find or at

157
00:05:51,909 --> 00:05:48,720
least the last 30 minutes try to find

158
00:05:53,830 --> 00:05:51,919
something and uh i can't i can't figure

159
00:05:57,430 --> 00:05:53,840
out if anybody else saw this last night

160
00:06:00,070 --> 00:05:57,440
what's his name bruce gary gary g-a-r-y

161
00:06:01,749 --> 00:06:00,080
okay this is an amateur photo any any

162
00:06:03,189 --> 00:06:01,759
any info in there on the scope oh he's

163
00:06:05,270 --> 00:06:03,199

got an 11 inch

164
00:06:07,670 --> 00:06:05,280
uh

165
00:06:09,350 --> 00:06:07,680
yeah who's down in arizona okay great

166
00:06:12,230 --> 00:06:09,360
great so they're starting to see it in

167
00:06:15,670 --> 00:06:12,240
amateur land and max made the point that

168
00:06:18,070 --> 00:06:15,680
while this is not uh our source of uh uh

169
00:06:19,670 --> 00:06:18,080
image um we are monitoring all of these

170
00:06:21,670 --> 00:06:19,680
sources right max

171
00:06:23,590 --> 00:06:21,680
yeah well um you know it would be nice

172
00:06:24,790 --> 00:06:23,600
to have more confirmation it's typically

173
00:06:27,189 --> 00:06:24,800
going to be an amateur who's going to

174
00:06:28,710 --> 00:06:27,199
recover ison and i think this is a

175
00:06:29,909 --> 00:06:28,720
little earlier than expected you know

176
00:06:31,430 --> 00:06:29,919
people are thinking it might be a few

177
00:06:33,749 --> 00:06:31,440
more weeks or maybe even a whole month

178
00:06:34,790 --> 00:06:33,759
before we see it again when the sun gets

179
00:06:36,870 --> 00:06:34,800
out of the way

180
00:06:38,950 --> 00:06:36,880
so a little more confirmation will be

181
00:06:40,469 --> 00:06:38,960
great but uh you know it certainly seems

182
00:06:42,070 --> 00:06:40,479
to be an object showing up in roughly

183
00:06:43,350 --> 00:06:42,080
the same spot that you know roughly the

184
00:06:44,230 --> 00:06:43,360
spot that it should be so it could be

185
00:06:46,150 --> 00:06:44,240
real

186
00:06:47,590 --> 00:06:46,160
um and we're watching it just because

187
00:06:50,070 --> 00:06:47,600
obviously that's what's going to trigger

188
00:06:51,510 --> 00:06:50,080

the next round of hubble observations uh

189
00:06:53,350 --> 00:06:51,520
as we mentioned last time and as i'll

190
00:06:54,950 --> 00:06:53,360
get into a little bit today

191
00:06:57,189 --> 00:06:54,960
you know we have a whole bunch of new

192
00:06:58,710 --> 00:06:57,199
hubble observations uh you know lined up

193
00:07:00,390 --> 00:06:58,720
for this fall so

194
00:07:03,270 --> 00:07:00,400
we need to know when you know the status

195
00:07:05,110 --> 00:07:03,280
of the comet and uh and uh when it's

196
00:07:07,830 --> 00:07:05,120
observable again

197
00:07:10,710 --> 00:07:07,840
okay so now confirmation there's not a

198
00:07:12,710 --> 00:07:10,720
doubt that it's there is there really

199
00:07:14,309 --> 00:07:12,720
well you know there's only one image and

200
00:07:16,309 --> 00:07:14,319
there has been some thought that you

201
00:07:18,150 --> 00:07:16,319
know what if this thing you there were

202
00:07:20,390 --> 00:07:18,160
some early reports about maybe it's

203
00:07:22,390 --> 00:07:20,400
starting to fizzle or if it is a very

204
00:07:24,390 --> 00:07:22,400
fragile or cloud comet could it actually

205
00:07:27,110 --> 00:07:24,400
start to break up before it gets even

206
00:07:28,870 --> 00:07:27,120
close to the sun you know so if nothing

207
00:07:30,469 --> 00:07:28,880
else if this is real it would confirm

208
00:07:32,150 --> 00:07:30,479
that those kind of scenarios haven't

209
00:07:33,670 --> 00:07:32,160
played out yet you know that the comet

210
00:07:36,309 --> 00:07:33,680
is still intact

211
00:07:38,390 --> 00:07:36,319
and you know uh but you know again it's

212
00:07:40,469 --> 00:07:38,400
so early and we're not sure if you know

213
00:07:42,710 --> 00:07:40,479

one observation is not much to base it

214
00:07:44,790 --> 00:07:42,720
on would mean one observation but hubble

215
00:07:46,070 --> 00:07:44,800
has some too i mean there's plenty

216
00:07:48,469 --> 00:07:46,080
there's plenty of observations right

217
00:07:50,309 --> 00:07:48,479
there i just a few months ago

218
00:07:51,990 --> 00:07:50,319
the other night there's only this one

219
00:07:54,309 --> 00:07:52,000
amateur observation from the other night

220
00:07:56,869 --> 00:07:54,319
to confirm that you know the comet is

221
00:07:58,469 --> 00:07:56,879
is still on track and still intact um

222
00:08:01,350 --> 00:07:58,479
you know following this big we've just

223
00:08:03,350 --> 00:08:01,360
had this big hiatus right since may

224
00:08:04,950 --> 00:08:03,360
where nobody's been able to observe the

225
00:08:07,350 --> 00:08:04,960
comet and so there's been a lot of

226
00:08:09,110 --> 00:08:07,360
anticipation about

227
00:08:11,189 --> 00:08:09,120
covering it and just seeing is it still

228
00:08:13,110 --> 00:08:11,199
on track is it still intact is it help

229
00:08:14,710 --> 00:08:13,120
right is it and those kind of things and

230
00:08:16,309 --> 00:08:14,720
it's too early to say all those things

231
00:08:18,309 --> 00:08:16,319
now but it's very exciting to think that

232
00:08:20,070 --> 00:08:18,319
somebody may have actually recovered it

233
00:08:21,990 --> 00:08:20,080
and so obviously the next steps is other

234
00:08:24,150 --> 00:08:22,000
observers including professional

235
00:08:25,909 --> 00:08:24,160
observers will try to see if they can

236
00:08:27,670 --> 00:08:25,919
confirm that and start to understand

237
00:08:28,950 --> 00:08:27,680
what the current status of because we

238
00:08:30,950 --> 00:08:28,960

this is a comment we haven't actually

239
00:08:32,230 --> 00:08:30,960
seen since early may right sure sure

240
00:08:33,190 --> 00:08:32,240
well what's your take on this bonnie

241
00:08:34,630 --> 00:08:33,200
what do you think

242
00:08:35,509 --> 00:08:34,640
if all you had to go by was that picture

243
00:08:37,509 --> 00:08:35,519
and i know that's putting you on the

244
00:08:39,990 --> 00:08:37,519
spot but you know does it what do you

245
00:08:41,909 --> 00:08:40,000
think do you anything stand out in

246
00:08:45,910 --> 00:08:41,919
particular

247
00:08:48,310 --> 00:08:45,920
patch right

248
00:08:50,389 --> 00:08:48,320
for right now and you know to confirm

249
00:08:52,870 --> 00:08:50,399
that we're being able to see ison again

250
00:08:53,590 --> 00:08:52,880
i'd really like a couple more shots of

251
00:08:56,389 --> 00:08:53,600
it

252
00:08:59,110 --> 00:08:56,399
one thing is not is not something to get

253
00:09:02,230 --> 00:08:59,120
your hopes set on but it is good to see

254
00:09:04,470 --> 00:09:02,240
it again and uh hopefully we'll get to

255
00:09:06,150 --> 00:09:04,480
see a lot more of it coming up soon yeah

256
00:09:07,750 --> 00:09:06,160
hopefully it will in fact be the comment

257
00:09:09,910 --> 00:09:07,760
of the century yeah but it's good to

258
00:09:13,829 --> 00:09:09,920
know it's still there yes fair enough

259
00:09:16,310 --> 00:09:13,839
okay uh images i want to get some

260
00:09:17,829 --> 00:09:16,320
i want comment icon images and i want

261
00:09:20,070 --> 00:09:17,839
them now

262
00:09:22,150 --> 00:09:20,080
how do i get them

263
00:09:24,949 --> 00:09:22,160

well one thing i'd like to start with is

264
00:09:27,590 --> 00:09:24,959
just a semantic thing okay um you know

265
00:09:29,829 --> 00:09:27,600
we use the words images and data almost

266
00:09:31,750 --> 00:09:29,839
interchangeably right um when some

267
00:09:34,070 --> 00:09:31,760
people say images what they mean is the

268
00:09:35,269 --> 00:09:34,080
press release images that we that anyone

269
00:09:38,389 --> 00:09:35,279
can get right they're out in the media

270
00:09:40,150 --> 00:09:38,399
they're on our website hubblesite.org

271
00:09:41,910 --> 00:09:40,160
and i think what we're focusing on today

272
00:09:44,230 --> 00:09:41,920
is the underlying data and i always have

273
00:09:46,470 --> 00:09:44,240
to remind myself that when i say data

274
00:09:48,070 --> 00:09:46,480
for me data is images because i work on

275
00:09:50,070 --> 00:09:48,080
images

276
00:09:52,150 --> 00:09:50,080
but uh what we're talking about now is

277
00:09:55,110 --> 00:09:52,160
not like the press release images in

278
00:09:56,949 --> 00:09:55,120
jpeg form um but the actual data in fits

279
00:09:58,790 --> 00:09:56,959
format and so if you don't know what

280
00:09:59,590 --> 00:09:58,800
fits format is you probably don't want

281
00:10:02,710 --> 00:09:59,600
it

282
00:10:04,710 --> 00:10:02,720
that's so true

283
00:10:06,710 --> 00:10:04,720
um you know but i know there's a lot of

284
00:10:08,949 --> 00:10:06,720
people as as we said before we've been

285
00:10:10,949 --> 00:10:08,959
encouraging lots of people to maybe uh

286
00:10:12,150 --> 00:10:10,959
get into our archive and and try their

287
00:10:13,750 --> 00:10:12,160
hand certainly lots of amateur

288
00:10:15,829 --> 00:10:13,760

astronomers are very familiar with fits

289
00:10:17,750 --> 00:10:15,839
format and we've been encouraging even

290
00:10:19,509 --> 00:10:17,760
teachers to to you know get data into

291
00:10:21,269 --> 00:10:19,519
the classroom and then play with actual

292
00:10:23,190 --> 00:10:21,279
data not just press release images but

293
00:10:25,269 --> 00:10:23,200
the actual fits data

294
00:10:26,870 --> 00:10:25,279
so the important thing there i would say

295
00:10:28,949 --> 00:10:26,880
what we want to guide people towards

296
00:10:30,550 --> 00:10:28,959
today for comet ison is

297
00:10:31,750 --> 00:10:30,560
what do you what do you want to go after

298
00:10:32,949 --> 00:10:31,760
you know we want to point people in the

299
00:10:35,269 --> 00:10:32,959
right direction so they won't be

300
00:10:36,710 --> 00:10:35,279
frustrated or find the wrong stuff

301
00:10:39,269 --> 00:10:36,720
because i'll say that we kind of have

302
00:10:41,509 --> 00:10:39,279
several different archive archival tools

303
00:10:44,150 --> 00:10:41,519
to get out our data

304
00:10:46,310 --> 00:10:44,160
and they don't all necessarily prepare

305
00:10:48,150 --> 00:10:46,320
moving target data you know objects in

306
00:10:50,150 --> 00:10:48,160
the solar system which are in motion are

307
00:10:51,030 --> 00:10:50,160
tougher you can imagine why it's tougher

308
00:10:52,710 --> 00:10:51,040
um

309
00:10:54,550 --> 00:10:52,720
and our you know the data isn't

310
00:10:57,350 --> 00:10:54,560
necessarily treated as nicely as the

311
00:10:59,350 --> 00:10:57,360
fixed target data say of a galaxy or a

312
00:11:01,590 --> 00:10:59,360
star cluster that isn't moving

313
00:11:03,590 --> 00:11:01,600

is is a much easier case

314
00:11:05,990 --> 00:11:03,600
so i can i'll show some examples of that

315
00:11:08,150 --> 00:11:06,000
in a few minutes um and why it takes

316
00:11:09,910 --> 00:11:08,160
some careful expert offline processing

317
00:11:10,710 --> 00:11:09,920
to produce data so i produced some of

318
00:11:13,030 --> 00:11:10,720
those

319
00:11:14,550 --> 00:11:13,040
data sets for comet ison and posted them

320
00:11:16,150 --> 00:11:14,560
specially in an area that we call a

321
00:11:17,829 --> 00:11:16,160
high-level science products which is

322
00:11:19,509 --> 00:11:17,839
generally something where an expert like

323
00:11:21,269 --> 00:11:19,519
me has carefully prepared the data and

324
00:11:22,630 --> 00:11:21,279
then put it back into the archive in a

325
00:11:24,550 --> 00:11:22,640
special area

326
00:11:26,470 --> 00:11:24,560
so that's why i put those links by the

327
00:11:28,710 --> 00:11:26,480
way in the description of the event so

328
00:11:31,030 --> 00:11:28,720
you guys can go there as max is talking

329
00:11:33,269 --> 00:11:31,040
about it as well now you're not saying

330
00:11:35,030 --> 00:11:33,279
that there's a problem with hubble

331
00:11:37,590 --> 00:11:35,040
taking the images it's a problem of how

332
00:11:39,670 --> 00:11:37,600
we process them they're just yeah so

333
00:11:41,509 --> 00:11:39,680
it's more difficult we mentioned last

334
00:11:42,630 --> 00:11:41,519
time and uh you know i mentioned earlier

335
00:11:44,630 --> 00:11:42,640
that there's a number of different

336
00:11:46,069 --> 00:11:44,640
observing programs uh that have already

337
00:11:47,910 --> 00:11:46,079
executed and a number of that will go

338
00:11:49,430 --> 00:11:47,920

again well those are all individual

339
00:11:50,710 --> 00:11:49,440
principal investigators who all have

340
00:11:52,230 --> 00:11:50,720
different strategies and different

341
00:11:53,350 --> 00:11:52,240
approaches we might be using different

342
00:11:54,870 --> 00:11:53,360
instruments

343
00:11:56,550 --> 00:11:54,880
so there's not necessarily a ton of

344
00:11:58,310 --> 00:11:56,560
uniformity there

345
00:12:00,150 --> 00:11:58,320
in terms of how the data was taken and

346
00:12:01,670 --> 00:12:00,160
how the data was taken often dictates

347
00:12:04,150 --> 00:12:01,680
what you need to do to the data when you

348
00:12:05,829 --> 00:12:04,160
actually get it you know the strategy

349
00:12:07,430 --> 00:12:05,839
and how to reduce the data it might just

350
00:12:09,190 --> 00:12:07,440
seem like well don't you just point

351
00:12:10,870 --> 00:12:09,200
hubble at something and take a picture

352
00:12:13,269 --> 00:12:10,880
and boom there you get the press release

353
00:12:15,110 --> 00:12:13,279
image no there's actually a lot of i

354
00:12:17,269 --> 00:12:15,120
refer to it as a craft you know i mean

355
00:12:18,230 --> 00:12:17,279
both in terms of designing observations

356
00:12:20,150 --> 00:12:18,240
uh

357
00:12:21,509 --> 00:12:20,160
to get the best data and then how you

358
00:12:22,389 --> 00:12:21,519
treat the data once it comes to the

359
00:12:24,069 --> 00:12:22,399
ground

360
00:12:25,829 --> 00:12:24,079
and there's a lot of steps there and

361
00:12:27,829 --> 00:12:25,839
then what most people see of course is

362
00:12:30,069 --> 00:12:27,839
the end of that process is maybe like a

363
00:12:31,350 --> 00:12:30,079

nice color image i think zolt will talk

364
00:12:33,030 --> 00:12:31,360
about that a little bit later and i know

365
00:12:35,430 --> 00:12:33,040
he's talked about it before

366
00:12:36,790 --> 00:12:35,440
um but there's a lot of steps in between

367
00:12:38,629 --> 00:12:36,800
you know the

368
00:12:40,230 --> 00:12:38,639
the observation as it's designed and

369
00:12:42,629 --> 00:12:40,240
then the data as it comes down and what

370
00:12:44,150 --> 00:12:42,639
you see in a press release type type

371
00:12:46,230 --> 00:12:44,160
image

372
00:12:48,230 --> 00:12:46,240
um so but in terms of getting at the

373
00:12:49,910 --> 00:12:48,240
data we certainly want to point people

374
00:12:51,509 --> 00:12:49,920
to the most carefully prepared version

375
00:12:53,829 --> 00:12:51,519
of the data in other words just the best

376
00:12:55,910 --> 00:12:53,839
version that's that's most free of uh

377
00:12:58,230 --> 00:12:55,920
all the artifacts and

378
00:13:00,550 --> 00:12:58,240
you know um and other things that might

379
00:13:03,829 --> 00:13:00,560
just be confusing to the the non-expert

380
00:13:06,710 --> 00:13:03,839
who's trying to uh use this data

381
00:13:09,110 --> 00:13:06,720
okay um i want to get to this i really

382
00:13:11,110 --> 00:13:09,120
but we were just having a side chat here

383
00:13:13,110 --> 00:13:11,120
that i would like to highlight but goes

384
00:13:15,269 --> 00:13:13,120
back to what we were talking about with

385
00:13:18,550 --> 00:13:15,279
the status of the comments scott found

386
00:13:20,710 --> 00:13:18,560
or scott was given a hero that was our

387
00:13:23,190 --> 00:13:20,720
friend zero villa ah from cereal villa

388
00:13:24,470 --> 00:13:23,200

hi cyril uh from sky and telescope uh

389
00:13:26,550 --> 00:13:24,480
scott do you want to do a screen share

390
00:13:28,550 --> 00:13:26,560
on that yeah let me pull it back up a

391
00:13:30,389 --> 00:13:28,560
sky in the telescope and i'm and i know

392
00:13:32,150 --> 00:13:30,399
this is i i'm going back to it because

393
00:13:35,110 --> 00:13:32,160
we were talking about the status of the

394
00:13:37,110 --> 00:13:35,120
comet and sky and telescope based on

395
00:13:40,629 --> 00:13:37,120
this one image

396
00:13:43,190 --> 00:13:41,910
it's not

397
00:13:47,110 --> 00:13:43,200
good

398
00:13:50,310 --> 00:13:48,870
go ahead alberto

399
00:13:52,310 --> 00:13:50,320
right

400
00:13:54,550 --> 00:13:52,320
no i was just saying it would be i don't

401
00:13:56,310 --> 00:13:54,560
know i was just reading this as uh after

402
00:13:57,829 --> 00:13:56,320
scott posted it and i thought

403
00:13:59,670 --> 00:13:57,839
and i think i agree with bonn it's a

404
00:14:00,870 --> 00:13:59,680
little premature to actually call this

405
00:14:02,550 --> 00:14:00,880
uh

406
00:14:04,069 --> 00:14:02,560
an issue i mean they have one data point

407
00:14:05,750 --> 00:14:04,079
that suggests that it might be less

408
00:14:07,910 --> 00:14:05,760
bright than we expected but i mean again

409
00:14:09,590 --> 00:14:07,920
it's a one data point and it's yeah but

410
00:14:11,750 --> 00:14:09,600
not right

411
00:14:14,069 --> 00:14:11,760
i mean we max was looking just for

412
00:14:15,590 --> 00:14:14,079
confirmation that it was still there so

413
00:14:17,590 --> 00:14:15,600

the fact that it was still there is

414
00:14:19,829 --> 00:14:17,600
promising enough i mean how would we be

415
00:14:20,629 --> 00:14:19,839
able to predict its brightness at this

416
00:14:23,269 --> 00:14:20,639
point

417
00:14:24,629 --> 00:14:23,279
could we even do that bonnie

418
00:14:26,389 --> 00:14:24,639
well

419
00:14:28,470 --> 00:14:26,399
it's really difficult to predict a

420
00:14:32,790 --> 00:14:28,480
brightness for comets

421
00:14:35,030 --> 00:14:32,800
they can vary a lot and i think it's

422
00:14:37,030 --> 00:14:35,040
it's it's really premature to say that

423
00:14:40,389 --> 00:14:37,040
you know to anticipate it getting really

424
00:14:42,550 --> 00:14:40,399
bright or for it completely fizzling out

425
00:14:44,470 --> 00:14:42,560
and i know that there's a lot of people

426
00:14:46,150 --> 00:14:44,480
out there anticipating a lot about this

427
00:14:47,990 --> 00:14:46,160
and talking a lot about this and they

428
00:14:50,790 --> 00:14:48,000
want to be the first person to have

429
00:14:53,509 --> 00:14:50,800
shown that you know this thing was dead

430
00:14:55,990 --> 00:14:53,519
or this thing was super bright and they

431
00:14:58,389 --> 00:14:56,000
want their name attached to that and i

432
00:15:02,230 --> 00:14:58,399
worry that over hyping this

433
00:15:03,750 --> 00:15:02,240
um as like oh yeah this thing's done for

434
00:15:06,470 --> 00:15:03,760
it's premature to do that we shouldn't

435
00:15:07,590 --> 00:15:06,480
do one data point

436
00:15:08,790 --> 00:15:07,600
well it already says there's a

437
00:15:10,870 --> 00:15:08,800
disagreement that's emerged on

438
00:15:13,350 --> 00:15:10,880

discussion lists about the the

439
00:15:15,430 --> 00:15:13,360
magnitudes already so i guess i guess

440
00:15:17,509 --> 00:15:15,440
you were not alone in being a little bit

441
00:15:19,430 --> 00:15:17,519
skeptical about some of this stuff is

442
00:15:23,509 --> 00:15:19,440
this a block that's what scientists do

443
00:15:25,030 --> 00:15:23,519
they're skeptical yes exactly

444
00:15:27,910 --> 00:15:25,040
a feature article

445
00:15:31,189 --> 00:15:27,920
uh let's see here this looks like it was

446
00:15:32,710 --> 00:15:31,199
by alan mc roberts robert yeah

447
00:15:34,470 --> 00:15:32,720
but i think it's a great thing too is

448
00:15:36,870 --> 00:15:34,480
showing the fact that

449
00:15:38,629 --> 00:15:36,880
citizen astronomers are out there

450
00:15:39,829 --> 00:15:38,639
looking for this it's not you don't need

451
00:15:41,430 --> 00:15:39,839
to have the latest and greatest

452
00:15:43,269 --> 00:15:41,440
technology for it but it's something

453
00:15:45,189 --> 00:15:43,279
that we can use tools like the hubble

454
00:15:47,509 --> 00:15:45,199
space telescope and

455
00:15:50,310 --> 00:15:47,519
and consumer level

456
00:15:53,269 --> 00:15:50,320
telescopes and detectors to help get

457
00:15:55,509 --> 00:15:53,279
more data right right this in many

458
00:15:57,110 --> 00:15:55,519
different forms and gather

459
00:15:59,829 --> 00:15:57,120
this data and these images from all over

460
00:16:02,069 --> 00:15:59,839
the place to have more concrete evidence

461
00:16:03,829 --> 00:16:02,079
for what's happening out there

462
00:16:05,910 --> 00:16:03,839
well this is interesting i'm gonna i

463
00:16:08,710 --> 00:16:05,920

just saw it so i i don't i haven't read

464
00:16:10,629 --> 00:16:08,720
it um so i won't comment but uh it does

465
00:16:12,069 --> 00:16:10,639
it does look uh like people are already

466
00:16:14,150 --> 00:16:12,079
getting kind of engaged about this whole

467
00:16:15,430 --> 00:16:14,160
thing which is good news um okay so uh

468
00:16:17,030 --> 00:16:15,440
let me get back to what max was

469
00:16:18,949 --> 00:16:17,040
discussing thanks for the segue guys i

470
00:16:21,269 --> 00:16:18,959
just wanted to get back before too much

471
00:16:22,629 --> 00:16:21,279
time passed uh so max

472
00:16:24,230 --> 00:16:22,639
you were making the point that you want

473
00:16:28,230 --> 00:16:24,240
to point people to the right data the

474
00:16:29,670 --> 00:16:28,240
right products the the right uh

475
00:16:31,350 --> 00:16:29,680
based on whatever questions they're

476
00:16:33,990 --> 00:16:31,360
going to ask of the data or what they

477
00:16:37,110 --> 00:16:34,000
want to get out of it and so you have

478
00:16:39,910 --> 00:16:37,120
these sites that give the highest

479
00:16:41,590 --> 00:16:39,920
data quality are the highest your term

480
00:16:43,910 --> 00:16:41,600
was data products i think the most

481
00:16:46,710 --> 00:16:43,920
processed data product um

482
00:16:50,150 --> 00:16:46,720
what's wrong with getting just raw data

483
00:16:50,949 --> 00:16:50,160
it seems to me like um if i had you know

484
00:16:53,030 --> 00:16:50,959
if i wa

485
00:16:54,550 --> 00:16:53,040
raw data is almost like the getting the

486
00:16:56,710 --> 00:16:54,560
negative of a photograph right you can

487
00:16:58,389 --> 00:16:56,720
always get the highest quality anything

488
00:16:59,189 --> 00:16:58,399

if you start there is it just too much

489
00:17:00,949 --> 00:16:59,199
work

490
00:17:03,829 --> 00:17:00,959
well it is pretty tough start like the

491
00:17:05,669 --> 00:17:03,839
raw data um for you know for somebody

492
00:17:07,350 --> 00:17:05,679
because i i can show you some examples

493
00:17:09,029 --> 00:17:07,360
of this uh if you want to get into that

494
00:17:10,710 --> 00:17:09,039
right now i could screen share and show

495
00:17:12,150 --> 00:17:10,720
some data

496
00:17:13,429 --> 00:17:12,160
yeah let's just take a look at some some

497
00:17:15,429 --> 00:17:13,439
what you're what you were making the

498
00:17:19,829 --> 00:17:15,439
point about the the different data

499
00:17:21,590 --> 00:17:19,839
products let's show people what you mean

500
00:17:24,630 --> 00:17:21,600
so uh

501
00:17:26,789 --> 00:17:24,640
you know first um i'm just showing

502
00:17:28,230 --> 00:17:26,799
you know there's a lot of artifacts and

503
00:17:30,549 --> 00:17:28,240
the raw data you kind of have to know

504
00:17:32,789 --> 00:17:30,559
what you're looking at um this is a raw

505
00:17:34,630 --> 00:17:32,799
image of comet ison no actually i would

506
00:17:36,710 --> 00:17:34,640
say you asked the question um you know

507
00:17:38,630 --> 00:17:36,720
where does it go wrong i would say and

508
00:17:40,390 --> 00:17:38,640
our pipelines do an outstanding job of

509
00:17:42,549 --> 00:17:40,400
basic calibrations

510
00:17:44,150 --> 00:17:42,559
uh and so you kind of what you kind of

511
00:17:46,470 --> 00:17:44,160
want from our archive typically is just

512
00:17:48,150 --> 00:17:46,480
the best calibrated stuff

513
00:17:49,750 --> 00:17:48,160

and where it goes wrong is i would say

514
00:17:51,909 --> 00:17:49,760
where it attempts to combine images

515
00:17:53,590 --> 00:17:51,919
normally we combine images with hubble

516
00:17:55,590 --> 00:17:53,600
to clean them up

517
00:17:57,270 --> 00:17:55,600
we have we can have a lot of cosmic rays

518
00:17:59,190 --> 00:17:57,280
and other detector artifacts sitting in

519
00:18:02,230 --> 00:17:59,200
the image and the way we clean those out

520
00:18:04,470 --> 00:18:02,240
is by combining many images and you know

521
00:18:06,470 --> 00:18:04,480
real stuff like a comet or a galaxy kind

522
00:18:08,549 --> 00:18:06,480
of looks the same in every image and

523
00:18:10,070 --> 00:18:08,559
whereas the artifacts are generally in

524
00:18:13,590 --> 00:18:10,080
random locations

525
00:18:15,029 --> 00:18:13,600
and we tend to shift the images around

526
00:18:16,230 --> 00:18:15,039
so that detector artifacts are in

527
00:18:17,990 --> 00:18:16,240
different locations and then it's very

528
00:18:18,789 --> 00:18:18,000
easy to subtract out those artifacts

529
00:18:20,950 --> 00:18:18,799
because

530
00:18:22,950 --> 00:18:20,960
you know they're not staying put

531
00:18:24,950 --> 00:18:22,960
um the problem is

532
00:18:26,950 --> 00:18:24,960
for moving targets obviously the target

533
00:18:28,870 --> 00:18:26,960
itself is moving and so

534
00:18:31,110 --> 00:18:28,880
you know if you have software that's

535
00:18:32,950 --> 00:18:31,120
trying to remove things that are are not

536
00:18:34,390 --> 00:18:32,960
in the same place in both images and

537
00:18:36,470 --> 00:18:34,400
assuming that they're junk that you want

538
00:18:38,070 --> 00:18:36,480

to remove from the image well in the

539
00:18:39,590 --> 00:18:38,080
case of moving targets it will attempt

540
00:18:41,270 --> 00:18:39,600
to remove your target

541
00:18:43,750 --> 00:18:41,280
so what

542
00:18:45,590 --> 00:18:43,760
what you're seeing here is

543
00:18:46,630 --> 00:18:45,600
a standard drizzle product from our

544
00:18:49,110 --> 00:18:46,640
archive

545
00:18:51,190 --> 00:18:49,120
and uh it's you know we saw people sort

546
00:18:53,029 --> 00:18:51,200
of posting this online and you know

547
00:18:55,270 --> 00:18:53,039
speculating about what they're seeing

548
00:18:57,190 --> 00:18:55,280
and it certainly looks very exciting um

549
00:18:59,350 --> 00:18:57,200
the problem is what you're seeing is

550
00:19:01,029 --> 00:18:59,360
just a very poorly rejected you know

551
00:19:03,110 --> 00:19:01,039
image where it's actually rejecting

552
00:19:04,710 --> 00:19:03,120
large parts of the comet tail and the

553
00:19:06,390 --> 00:19:04,720
coma making it look much more

554
00:19:08,470 --> 00:19:06,400
interesting than it really is frankly

555
00:19:10,630 --> 00:19:08,480
and what i'm going to toggle to next is

556
00:19:11,830 --> 00:19:10,640
my version my version of the exact same

557
00:19:13,510 --> 00:19:11,840
image

558
00:19:16,230 --> 00:19:13,520
and this is what you know we put out as

559
00:19:18,150 --> 00:19:16,240
our one of our initial press releases um

560
00:19:19,990 --> 00:19:18,160
you know looking just like a comet right

561
00:19:21,350 --> 00:19:20,000
where i've done a much more careful and

562
00:19:23,669 --> 00:19:21,360
offline

563
00:19:25,830 --> 00:19:23,679

i've done a much more careful job of of

564
00:19:27,909 --> 00:19:25,840
aligning and cleaning and combining the

565
00:19:29,750 --> 00:19:27,919
images so that i'm only rejecting the

566
00:19:31,350 --> 00:19:29,760
artifacts and not any part of the

567
00:19:33,270 --> 00:19:31,360
comment and so of course you see what

568
00:19:35,270 --> 00:19:33,280
looks like an intact comet

569
00:19:37,510 --> 00:19:35,280
and uh again just to toggle back to the

570
00:19:39,669 --> 00:19:37,520
other one and so you know

571
00:19:41,270 --> 00:19:39,679
and most of the professional scientists

572
00:19:43,029 --> 00:19:41,280
who use our archive know that they just

573
00:19:44,870 --> 00:19:43,039
go for the basic calibrated files and

574
00:19:46,230 --> 00:19:44,880
they do their own offline combinations

575
00:19:47,029 --> 00:19:46,240
and things like that

576
00:19:48,150 --> 00:19:47,039
um

577
00:19:49,909 --> 00:19:48,160
you know and

578
00:19:51,909 --> 00:19:49,919
in some cases you know this is maybe the

579
00:19:54,070 --> 00:19:51,919
worst example obviously i'm showing you

580
00:19:56,230 --> 00:19:54,080
one of the worst examples of a bad

581
00:19:57,669 --> 00:19:56,240
attempt to combine the images but it's a

582
00:19:59,510 --> 00:19:57,679
pipeline it's not you know sort of sort

583
00:20:01,430 --> 00:19:59,520
of a one size fits all

584
00:20:03,350 --> 00:20:01,440
and these products are mainly just look

585
00:20:04,950 --> 00:20:03,360
designed for quick look

586
00:20:06,470 --> 00:20:04,960
just to reassure people that they got

587
00:20:08,310 --> 00:20:06,480
what they wanted and uh you know

588
00:20:09,990 --> 00:20:08,320

obviously i'm showing you a bad case you

589
00:20:11,669 --> 00:20:10,000
know in most cases it produces an image

590
00:20:13,270 --> 00:20:11,679
that's pretty good to look at but even

591
00:20:14,789 --> 00:20:13,280
then people don't necessarily use that

592
00:20:16,710 --> 00:20:14,799
image they always feel like they can do

593
00:20:17,669 --> 00:20:16,720
a better job offline of preparing the

594
00:20:19,510 --> 00:20:17,679
data

595
00:20:21,190 --> 00:20:19,520
and uh you know we take all these steps

596
00:20:22,710 --> 00:20:21,200
very you know

597
00:20:24,070 --> 00:20:22,720
pay a lot of attention to these because

598
00:20:25,110 --> 00:20:24,080
you know these aren't just images for

599
00:20:27,350 --> 00:20:25,120
looking at

600
00:20:28,710 --> 00:20:27,360
um certainly online and everything or

601
00:20:30,390 --> 00:20:28,720
you know for the general public they're

602
00:20:31,909 --> 00:20:30,400
just for looking at but for scientists

603
00:20:33,669 --> 00:20:31,919
this is scientific data that we're

604
00:20:35,510 --> 00:20:33,679
trying to make very careful scientific

605
00:20:37,029 --> 00:20:35,520
measurements from so we need to know

606
00:20:38,630 --> 00:20:37,039
that we're cleaning out only the junk

607
00:20:39,750 --> 00:20:38,640
and not affecting the actual you know

608
00:20:41,590 --> 00:20:39,760
objects that we're trying to measure

609
00:20:43,270 --> 00:20:41,600
because we we will actually use this to

610
00:20:44,950 --> 00:20:43,280
make very careful measurements uh in

611
00:20:46,630 --> 00:20:44,960
this case you know the size and

612
00:20:48,470 --> 00:20:46,640
brightness of the comet i'm glad you

613
00:20:49,909 --> 00:20:48,480

brought that up because these are these

614
00:20:51,909 --> 00:20:49,919
are what you mentioned before it's fixed

615
00:20:54,310 --> 00:20:51,919
images and these are these are actual

616
00:20:57,270 --> 00:20:54,320
the nut the the pixels go back to that

617
00:20:59,029 --> 00:20:57,280
one yeah the pixel values in there if

618
00:21:01,190 --> 00:20:59,039
you hover the mouse over one of those

619
00:21:03,590 --> 00:21:01,200
those brightnesses that you see in the

620
00:21:05,190 --> 00:21:03,600
upper right there those numbers

621
00:21:06,710 --> 00:21:05,200
in the upper left those actually mean

622
00:21:08,789 --> 00:21:06,720
something don't they

623
00:21:11,350 --> 00:21:08,799
that's right i mean these are very i

624
00:21:12,950 --> 00:21:11,360
mean i can't overstate how carefully we

625
00:21:15,190 --> 00:21:12,960
calibrate these images and how much

626
00:21:17,190 --> 00:21:15,200
attention we pay to every single pixel

627
00:21:19,430 --> 00:21:17,200
in every image because again we're you

628
00:21:21,190 --> 00:21:19,440
know these numbers you see up there

629
00:21:23,909 --> 00:21:21,200
we're going to use those numbers uh you

630
00:21:25,110 --> 00:21:23,919
know do very careful uh analysis uh

631
00:21:27,669 --> 00:21:25,120
measurement of the brightness of the

632
00:21:29,190 --> 00:21:27,679
comet based on these so we have to know

633
00:21:30,710 --> 00:21:29,200
that the data has been very carefully

634
00:21:32,950 --> 00:21:30,720
calibrated we're not being tricked by

635
00:21:35,029 --> 00:21:32,960
detector artifacts or cosmic rays or

636
00:21:37,270 --> 00:21:35,039
star trails i'll show some better

637
00:21:38,870 --> 00:21:37,280
example of star trails but

638
00:21:39,909 --> 00:21:38,880

in some of the what i call the sum

639
00:21:41,830 --> 00:21:39,919
images

640
00:21:43,350 --> 00:21:41,840
i can get into that later

641
00:21:44,789 --> 00:21:43,360
you know you'll just see how much junk

642
00:21:46,630 --> 00:21:44,799
it's kind of a needle in a haystack

643
00:21:48,630 --> 00:21:46,640
problem and i think you'll be surprised

644
00:21:49,909 --> 00:21:48,640
to see just how much junk is in these

645
00:21:52,470 --> 00:21:49,919
images that needs to be carefully

646
00:21:53,990 --> 00:21:52,480
removed to make not only the nice clean

647
00:21:56,070 --> 00:21:54,000
press release image but to make data

648
00:21:57,990 --> 00:21:56,080
that where we can make very precise

649
00:21:59,750 --> 00:21:58,000
careful scientific measurements from it

650
00:22:02,070 --> 00:21:59,760
right so if you're an amateur and you

651
00:22:03,830 --> 00:22:02,080
want to do science on an image you don't

652
00:22:05,430 --> 00:22:03,840
necessarily want the pretty ones the

653
00:22:06,549 --> 00:22:05,440
ones that make the pretty images you

654
00:22:08,070 --> 00:22:06,559
want this

655
00:22:09,830 --> 00:22:08,080
because these are the ones that will

656
00:22:11,350 --> 00:22:09,840
give you actual those numbers like i

657
00:22:13,590 --> 00:22:11,360
said mean something and the units that

658
00:22:15,270 --> 00:22:13,600
those numbers are in will vary depending

659
00:22:17,190 --> 00:22:15,280
on the type of data where you're looking

660
00:22:19,510 --> 00:22:17,200
at sometimes it's just counts but

661
00:22:22,470 --> 00:22:19,520
sometimes it's in units of flux or

662
00:22:24,630 --> 00:22:22,480
energy or something like that so so

663
00:22:26,470 --> 00:22:24,640

if you want to do science

664
00:22:28,630 --> 00:22:26,480
understand what's going on in a comet

665
00:22:30,630 --> 00:22:28,640
these are the images you want so i just

666
00:22:32,870 --> 00:22:30,640
toggled to an image this what i call the

667
00:22:35,510 --> 00:22:32,880
sum image so this is the same image you

668
00:22:37,190 --> 00:22:35,520
know uh here's the clean version

669
00:22:38,310 --> 00:22:37,200
here's the kind of poorly rejected

670
00:22:39,990 --> 00:22:38,320
version

671
00:22:41,510 --> 00:22:40,000
and now here's what we start with if i

672
00:22:43,270 --> 00:22:41,520
just combine all those images without

673
00:22:45,669 --> 00:22:43,280
any rejection you see the comet it's

674
00:22:47,909 --> 00:22:45,679
intact it's not rejected at all because

675
00:22:49,270 --> 00:22:47,919
but you also see a ton of cosmic rays

676
00:22:51,190 --> 00:22:49,280
all these little flecks that look like

677
00:22:53,430 --> 00:22:51,200
somebody shook salt and pepper all over

678
00:22:54,710 --> 00:22:53,440
the image are just cosmic rays that are

679
00:22:56,070 --> 00:22:54,720
flying around in space and they just

680
00:22:57,990 --> 00:22:56,080
pass right through the image as we're

681
00:22:59,029 --> 00:22:58,000
taking it they're not ufos flying in

682
00:23:01,430 --> 00:22:59,039
formation

683
00:23:03,590 --> 00:23:01,440
not at all

684
00:23:05,110 --> 00:23:03,600
and then you see these dotted lines some

685
00:23:07,190 --> 00:23:05,120
bright dotted lines

686
00:23:08,789 --> 00:23:07,200
and those are stars those are individual

687
00:23:10,149 --> 00:23:08,799
stars because in this image we're

688
00:23:12,310 --> 00:23:10,159

tracking the comet which means that

689
00:23:13,909 --> 00:23:12,320
we're tr stars are getting trailed

690
00:23:15,750 --> 00:23:13,919
they're smeared out a long time and i

691
00:23:17,270 --> 00:23:15,760
think in our last hangout we did too we

692
00:23:19,909 --> 00:23:17,280
were showing how we were focusing in the

693
00:23:21,510 --> 00:23:19,919
background stars and watching

694
00:23:23,430 --> 00:23:21,520
the comet and now we're focusing on the

695
00:23:24,789 --> 00:23:23,440
comet and so we are going to see star

696
00:23:27,190 --> 00:23:24,799
trails happening just like doing any

697
00:23:28,710 --> 00:23:27,200
sort of astrophotography from earth

698
00:23:29,830 --> 00:23:28,720
you can see star trails for longer

699
00:23:33,270 --> 00:23:29,840
exposures

700
00:23:35,750 --> 00:23:33,280
so that's why for every star you see a

701
00:23:37,990 --> 00:23:35,760
dotted line that has eight dashes in it

702
00:23:39,830 --> 00:23:38,000
um and some very bright stars there's

703
00:23:41,510 --> 00:23:39,840
very bright one at lower left and some

704
00:23:43,110 --> 00:23:41,520
medium bright ones then you can even see

705
00:23:45,029 --> 00:23:43,120
some faint ones that kind of go right

706
00:23:46,630 --> 00:23:45,039
into the comet tail here and so

707
00:23:48,310 --> 00:23:46,640
obviously you want to clean this image

708
00:23:50,149 --> 00:23:48,320
out very carefully you want to remove

709
00:23:52,549 --> 00:23:50,159
the cosmic rays and star trails you can

710
00:23:54,630 --> 00:23:52,559
see cosmic rays very near the nucleus so

711
00:23:56,310 --> 00:23:54,640
if you're not careful you know it's it's

712
00:23:58,470 --> 00:23:56,320
it's kind of like surgery right you want

713
00:24:00,149 --> 00:23:58,480

to remove the bad stuff but not not harm

714
00:24:02,870 --> 00:24:00,159
the good stuff and is this all done

715
00:24:05,110 --> 00:24:02,880
automatically or do you do it manually

716
00:24:06,870 --> 00:24:05,120
no there are so the pipeline does

717
00:24:08,549 --> 00:24:06,880
attempt to do it automatically but

718
00:24:10,710 --> 00:24:08,559
that's when it in this case in tough

719
00:24:12,950 --> 00:24:10,720
cases it can fail like this last image

720
00:24:14,310 --> 00:24:12,960
where okay it clearly has attempted to

721
00:24:16,149 --> 00:24:14,320
clean this image and you can see that

722
00:24:17,669 --> 00:24:16,159
it's removed a lot of those stars or

723
00:24:19,269 --> 00:24:17,679
things like that but it's also removed

724
00:24:21,510 --> 00:24:19,279
part of the comet so just not careful

725
00:24:22,870 --> 00:24:21,520
enough okay and uh

726
00:24:25,430 --> 00:24:22,880
in cases like this and tough

727
00:24:27,029 --> 00:24:25,440
observations you know of moving targets

728
00:24:28,950 --> 00:24:27,039
we often have to do this processing

729
00:24:30,950 --> 00:24:28,960
offline to get it right

730
00:24:32,789 --> 00:24:30,960
i see now i want to bring alberto in

731
00:24:35,110 --> 00:24:32,799
real quick alberto you've probably got

732
00:24:37,510 --> 00:24:35,120
some comments to make i uh max has said

733
00:24:39,590 --> 00:24:37,520
this several times about pipelines um

734
00:24:42,070 --> 00:24:39,600
why don't you tell us what a pipeline is

735
00:24:43,510 --> 00:24:42,080
first of all so as max basically said

736
00:24:58,470 --> 00:24:43,520
and hopefully you can hear me where my

737
00:25:03,190 --> 00:25:01,350
anyway um no but i think as max

738
00:25:04,870 --> 00:25:03,200

basically said is that uh when people

739
00:25:07,110 --> 00:25:04,880
see the images that sold put together

740
00:25:09,110 --> 00:25:07,120
which are very very very aesthetically

741
00:25:10,950 --> 00:25:09,120
pleasing very very clean and very nice

742
00:25:13,750 --> 00:25:10,960
there's an entire pipeline this entire

743
00:25:15,750 --> 00:25:13,760
process that takes place that goes from

744
00:25:17,350 --> 00:25:15,760
the raw data that max has just shown to

745
00:25:20,549 --> 00:25:17,360
the complete product and i think the

746
00:25:22,310 --> 00:25:20,559
important thing to to um to

747
00:25:24,070 --> 00:25:22,320
sort of address is the fact that these

748
00:25:26,310 --> 00:25:24,080
images need to be clean in very

749
00:25:27,909 --> 00:25:26,320
different ways so max perhaps showed you

750
00:25:29,909 --> 00:25:27,919
now what we need to do for something

751
00:25:31,750 --> 00:25:29,919
that is moving which is introducing some

752
00:25:34,310 --> 00:25:31,760
set of complexities but we also have to

753
00:25:35,430 --> 00:25:34,320
do the same sort of cleaning in in a

754
00:25:37,110 --> 00:25:35,440
different way perhaps in a more

755
00:25:39,190 --> 00:25:37,120
automated way for things that are like

756
00:25:41,190 --> 00:25:39,200
deep fields for example where things are

757
00:25:42,950 --> 00:25:41,200
we're not tracking for example comments

758
00:25:45,190 --> 00:25:42,960
but we're just trying to clean

759
00:25:48,390 --> 00:25:45,200
the field of view of artifacts if you

760
00:25:49,990 --> 00:25:48,400
will and so there's an entire

761
00:25:52,149 --> 00:25:50,000
group of people here that actually has

762
00:25:54,870 --> 00:25:52,159
the job to produce those types of

763
00:25:56,470 --> 00:25:54,880

software that tries to in most cases

764
00:25:58,950 --> 00:25:56,480
guess basically where

765
00:26:00,630 --> 00:25:58,960
uh where the real data really lies and

766
00:26:03,669 --> 00:26:00,640
where are the artifacts that we know we

767
00:26:04,789 --> 00:26:03,679
can remove and so in most cases actually

768
00:26:06,390 --> 00:26:04,799
the pipeline

769
00:26:08,470 --> 00:26:06,400
are actually quite effective at trying

770
00:26:10,390 --> 00:26:08,480
to remove these artifacts where they're

771
00:26:13,190 --> 00:26:10,400
not very effective and where i think max

772
00:26:14,950 --> 00:26:13,200
expertise come in and where they're key

773
00:26:16,390 --> 00:26:14,960
are for moving targets you know not just

774
00:26:18,070 --> 00:26:16,400
comments but also for objects in our

775
00:26:19,909 --> 00:26:18,080
solar system and max can address this

776
00:26:21,590 --> 00:26:19,919
length and it's very very important

777
00:26:23,269 --> 00:26:21,600
there that the role of the scientists in

778
00:26:25,990 --> 00:26:23,279
this in these moving targets is actually

779
00:26:27,669 --> 00:26:26,000
much more dominant i would argue than in

780
00:26:29,750 --> 00:26:27,679
other in other pipelines

781
00:26:31,350 --> 00:26:29,760
at the same time when you go to the

782
00:26:33,430 --> 00:26:31,360
other extent when you actually produce

783
00:26:35,110 --> 00:26:33,440
the the the greatest images that zolt

784
00:26:36,789 --> 00:26:35,120
does so i think dol zolt maybe can

785
00:26:38,470 --> 00:26:36,799
address this i mean i don't know if

786
00:26:39,830 --> 00:26:38,480
there's more work to produce an image

787
00:26:41,830 --> 00:26:39,840
from common izone than it is for the

788
00:26:44,070 --> 00:26:41,840

hubble the field or not but i think the

789
00:26:45,029 --> 00:26:44,080
process is i think is similar even

790
00:26:47,029 --> 00:26:45,039
though they probably have different

791
00:26:48,070 --> 00:26:47,039
challenges is that true so

792
00:26:50,549 --> 00:26:48,080
uh

793
00:26:52,789 --> 00:26:50,559
actually in some respects the comet

794
00:26:54,870 --> 00:26:52,799
images are more difficult

795
00:26:56,390 --> 00:26:54,880
well on the one hand they're simpler and

796
00:26:58,470 --> 00:26:56,400
on the other hand uh they're more

797
00:27:01,350 --> 00:26:58,480
difficult so what's so difficult about

798
00:27:03,510 --> 00:27:01,360
it um well in the case of the the last

799
00:27:06,789 --> 00:27:03,520
image we put out which i described in

800
00:27:07,990 --> 00:27:06,799
the earlier hangout which was a color

801
00:27:09,190 --> 00:27:08,000
image

802
00:27:10,470 --> 00:27:09,200
we had

803
00:27:11,190 --> 00:27:10,480
um

804
00:27:15,590 --> 00:27:11,200
two

805
00:27:17,430 --> 00:27:15,600
and so we were able to put together a

806
00:27:20,470 --> 00:27:17,440
color composite image

807
00:27:22,789 --> 00:27:20,480
but as max has just been showing the

808
00:27:23,590 --> 00:27:22,799
comet moves in the sky

809
00:27:26,149 --> 00:27:23,600
uh

810
00:27:28,070 --> 00:27:26,159
and moves with respect to the stars

811
00:27:29,110 --> 00:27:28,080
because it's a solar nearby solar system

812
00:27:29,830 --> 00:27:29,120
object

813
00:27:31,909 --> 00:27:29,840

so

814
00:27:35,510 --> 00:27:31,919
everything's moving in the image

815
00:27:38,789 --> 00:27:35,520
so what we did was we uh i won't say

816
00:27:40,630 --> 00:27:38,799
cheated but we fudged it a little bit

817
00:27:42,710 --> 00:27:40,640
and that we made a

818
00:27:44,950 --> 00:27:42,720
color composite image

819
00:27:47,029 --> 00:27:44,960
of basically of the background and

820
00:27:48,470 --> 00:27:47,039
essentially removed the comet and

821
00:27:49,669 --> 00:27:48,480
replaced it

822
00:27:50,630 --> 00:27:49,679
with a

823
00:27:55,750 --> 00:27:50,640
single

824
00:27:56,549 --> 00:27:55,760
monochrome only one color

825
00:27:59,110 --> 00:27:56,559
uh

826
00:28:01,269 --> 00:27:59,120
and where where the comet should be so

827
00:28:03,830 --> 00:28:01,279
in that sense that image was

828
00:28:05,909 --> 00:28:03,840
a little bit more uh

829
00:28:06,710 --> 00:28:05,919
a little bit more processing going on

830
00:28:08,950 --> 00:28:06,720
there

831
00:28:10,870 --> 00:28:08,960
than than usual we we try to stay as

832
00:28:12,310 --> 00:28:10,880
close to the data as possible

833
00:28:14,549 --> 00:28:12,320
sure are you sure you're not trying to

834
00:28:25,269 --> 00:28:14,559
like hide things from i heard i heard

835
00:28:29,350 --> 00:28:27,029
once you identify them then they're no

836
00:28:33,430 --> 00:28:29,360
longer ufos and so we do have to remove

837
00:28:33,440 --> 00:28:37,269
i'm not going there

838
00:28:41,510 --> 00:28:39,750

okay max what are you showing us

839
00:28:44,549 --> 00:28:41,520
so i just thought i would pull up the

840
00:28:46,630 --> 00:28:44,559
data so again sort of the the actual

841
00:28:48,789 --> 00:28:46,640
data the fits data that zolt is talking

842
00:28:50,710 --> 00:28:48,799
about so what i'm going to do first is

843
00:28:52,310 --> 00:28:50,720
uh i was kind of doing it in movie mode

844
00:28:54,870 --> 00:28:52,320
here where you can kind of see there was

845
00:28:56,789 --> 00:28:54,880
five consecutive exposures that we took

846
00:28:58,470 --> 00:28:56,799
to make that color composite image that

847
00:29:00,389 --> 00:28:58,480
zolt is talking about

848
00:29:02,630 --> 00:29:00,399
and um come on though you got to say

849
00:29:04,789 --> 00:29:02,640
that real quick that's each image taken

850
00:29:07,190 --> 00:29:04,799
with a different filter right well

851
00:29:09,510 --> 00:29:07,200
really only two so alternating so okay

852
00:29:12,549 --> 00:29:09,520
but different filters yeah just toggling

853
00:29:14,789 --> 00:29:12,559
back and forth forth between a visual

854
00:29:16,149 --> 00:29:14,799
filter and an infrared filter

855
00:29:18,310 --> 00:29:16,159
and i'm just clicking through the

856
00:29:19,990 --> 00:29:18,320
sequence here of five exposures

857
00:29:21,510 --> 00:29:20,000
so you can see the comet moving at the

858
00:29:23,990 --> 00:29:21,520
right there

859
00:29:25,750 --> 00:29:24,000
uh you know the stars stay put right as

860
00:29:27,830 --> 00:29:25,760
i'm clicking that big

861
00:29:29,590 --> 00:29:27,840
that's a cosmic ray

862
00:29:31,830 --> 00:29:29,600
so you see that you see that the cosmic

863
00:29:34,549 --> 00:29:31,840

rays are in random locations right you

864
00:29:36,310 --> 00:29:34,559
see the comet moving and you see

865
00:29:37,590 --> 00:29:36,320
you see the stars and galaxies staying

866
00:29:39,510 --> 00:29:37,600
put

867
00:29:41,909 --> 00:29:39,520
right so that's what we're dealing with

868
00:29:43,909 --> 00:29:41,919
a big diagonal line is a cosmic ray

869
00:29:47,029 --> 00:29:43,919
that's right sometimes they come in

870
00:29:48,870 --> 00:29:47,039
no no no no no this is that no no no no

871
00:29:50,710 --> 00:29:48,880
it means the white line that's the white

872
00:29:52,470 --> 00:29:50,720
line yeah what is that

873
00:29:54,710 --> 00:29:52,480
sorry the big white line okay there's

874
00:29:56,630 --> 00:29:54,720
two white there's a really thick one

875
00:29:59,350 --> 00:29:56,640
that i'm pointing at now is actually the

876
00:30:01,510 --> 00:29:59,360
gap this camera has two ccd chips and

877
00:30:04,549 --> 00:30:01,520
there's a little space between them yeah

878
00:30:06,630 --> 00:30:04,559
so the bigger that's what i thought

879
00:30:08,789 --> 00:30:06,640
this white line the thick white line is

880
00:30:11,510 --> 00:30:08,799
that gap now i'm also pointing you see

881
00:30:13,750 --> 00:30:11,520
there are some dramatic huge cosmic rays

882
00:30:15,269 --> 00:30:13,760
yes that is a cosmic ray okay good

883
00:30:17,269 --> 00:30:15,279
smaller ones and then up at the upper

884
00:30:19,029 --> 00:30:17,279
left you see a bad column so that's an

885
00:30:20,310 --> 00:30:19,039
artifact of the camera as well it's just

886
00:30:22,870 --> 00:30:20,320
a bad column and that you know it

887
00:30:24,870 --> 00:30:22,880
doesn't gather data so this kind of

888
00:30:27,269 --> 00:30:24,880

shows you what we're up against here you

889
00:30:30,310 --> 00:30:27,279
know cosmic rays stars

890
00:30:32,470 --> 00:30:30,320
bad you know bad columns um you know

891
00:30:35,110 --> 00:30:32,480
just this isn't really a problem the gap

892
00:30:36,789 --> 00:30:35,120
no you just move it just moving targets

893
00:30:38,470 --> 00:30:36,799
so you know you can see that we do

894
00:30:39,750 --> 00:30:38,480
dither it you know when we shift the

895
00:30:41,430 --> 00:30:39,760
images that helps with all these

896
00:30:43,029 --> 00:30:41,440
artifacts you see between these two the

897
00:30:44,710 --> 00:30:43,039
gap moves

898
00:30:46,630 --> 00:30:44,720
that's called a dither

899
00:30:48,549 --> 00:30:46,640
so it helps not only with the uh the gap

900
00:30:50,630 --> 00:30:48,559
but also any artifacts like this bad

901
00:30:52,950 --> 00:30:50,640
column up here or bad hot pixels or

902
00:30:54,310 --> 00:30:52,960
things like that so with the observing

903
00:30:57,669 --> 00:30:54,320
strategy i mentioned it's kind of a

904
00:30:59,190 --> 00:30:57,679
craft you know with five exposures

905
00:31:01,830 --> 00:30:59,200
you know a very limited amount of time

906
00:31:04,149 --> 00:31:01,840
we're trying to gather color information

907
00:31:05,750 --> 00:31:04,159
um and also get you know come up with a

908
00:31:07,430 --> 00:31:05,760
strategy that allows us to get rid of

909
00:31:09,510 --> 00:31:07,440
all these artifacts you need all these

910
00:31:11,190 --> 00:31:09,520
extra all these multiple exposures to

911
00:31:13,110 --> 00:31:11,200
have the leverage to remove it and it

912
00:31:15,430 --> 00:31:13,120
gets to a point that came up i saw in

913
00:31:16,630 --> 00:31:15,440

the facebook group um you know somebody

914
00:31:18,389 --> 00:31:16,640
was saying well why don't you just get a

915
00:31:19,909 --> 00:31:18,399
deep image of this background and then

916
00:31:21,750 --> 00:31:19,919
wait for the comet to come into view and

917
00:31:23,750 --> 00:31:21,760
then get a nice image of that well the

918
00:31:25,350 --> 00:31:23,760
simple answer to that you know that

919
00:31:26,630 --> 00:31:25,360
would be great it's just that we

920
00:31:28,230 --> 00:31:26,640
actually talked about that it's just

921
00:31:30,630 --> 00:31:28,240
that that's twice as expensive that

922
00:31:32,389 --> 00:31:30,640
would take two orbits of orbits instead

923
00:31:34,310 --> 00:31:32,399
of one and you know when you're an

924
00:31:35,750 --> 00:31:34,320
amateur in your backyard you got all

925
00:31:37,909 --> 00:31:35,760
night to do whatever you want with

926
00:31:39,509 --> 00:31:37,919
hubble it costs you know about ten

927
00:31:41,669 --> 00:31:39,519
thousand dollars an hour to operate the

928
00:31:43,350 --> 00:31:41,679
telescope it's a highly you know

929
00:31:45,430 --> 00:31:43,360
sought after resource you know lots of

930
00:31:47,509 --> 00:31:45,440
competition so we have to we have to

931
00:31:48,549 --> 00:31:47,519
keep what we do to an absolute minimum i

932
00:31:49,750 --> 00:31:48,559
did not know

933
00:31:51,669 --> 00:31:49,760
you know so if we come up with a

934
00:31:53,029 --> 00:31:51,679
strategy to do it in one orbit then we

935
00:31:54,230 --> 00:31:53,039
don't want to spend two orbits on it

936
00:31:55,830 --> 00:31:54,240
because we'd like to do something else

937
00:31:57,830 --> 00:31:55,840
with that other orbit so this was a

938
00:32:00,710 --> 00:31:57,840

strategy that was made a little bit more

939
00:32:02,870 --> 00:32:00,720
work for me and for zolt but

940
00:32:04,630 --> 00:32:02,880
allowed us in one orbit of hubble time

941
00:32:06,870 --> 00:32:04,640
which is pretty modest

942
00:32:08,549 --> 00:32:06,880
to produce a typically deep

943
00:32:10,870 --> 00:32:08,559
hubble image that has a com has the

944
00:32:12,870 --> 00:32:10,880
comet in it all in one orbit so

945
00:32:14,630 --> 00:32:12,880
um certainly if we had a second orbit or

946
00:32:16,070 --> 00:32:14,640
expended that we could do it you know do

947
00:32:18,470 --> 00:32:16,080
it even better but we were pretty

948
00:32:19,590 --> 00:32:18,480
pleased with the output and uh so just

949
00:32:21,029 --> 00:32:19,600
to kind of

950
00:32:23,029 --> 00:32:21,039
keep moving along here's sort of a

951
00:32:24,310 --> 00:32:23,039
cleaned up image you know once i i've

952
00:32:26,389 --> 00:32:24,320
worked on it and kind of cleaned out all

953
00:32:27,830 --> 00:32:26,399
the artifacts you know here's the one

954
00:32:29,269 --> 00:32:27,840
single image that is closest to the

955
00:32:30,950 --> 00:32:29,279
final product but of course it's still

956
00:32:33,350 --> 00:32:30,960
not the final product because we haven't

957
00:32:34,549 --> 00:32:33,360
combined the two the two colors

958
00:32:36,389 --> 00:32:34,559
um

959
00:32:38,470 --> 00:32:36,399
and here's if i just combine the clean

960
00:32:40,310 --> 00:32:38,480
images from just the visual band you see

961
00:32:43,190 --> 00:32:40,320
the three streaks there

962
00:32:44,870 --> 00:32:43,200
and uh and then again just a comparison

963
00:32:46,470 --> 00:32:44,880

of all the junk that got moved out so

964
00:32:48,630 --> 00:32:46,480
let's just sort of comparing the needle

965
00:32:51,509 --> 00:32:48,640
in the haystack here you know cleaning

966
00:32:53,509 --> 00:32:51,519
out all the junk from the image

967
00:32:55,029 --> 00:32:53,519
and and then here's here's if i did it

968
00:32:56,950 --> 00:32:55,039
poorly here's what you might you know

969
00:32:58,549 --> 00:32:56,960
get from a clumsy kinda like the other

970
00:33:00,230 --> 00:32:58,559
one where you're actually unfortunately

971
00:33:01,029 --> 00:33:00,240
rejecting a lot of the comment you know

972
00:33:04,710 --> 00:33:01,039
so

973
00:33:06,149 --> 00:33:04,720
result was a whole bunch of these

974
00:33:07,830 --> 00:33:06,159
what you're looking at right now of

975
00:33:09,830 --> 00:33:07,840
those five frames

976
00:33:11,029 --> 00:33:09,840
and then he had i'll let him talk about

977
00:33:13,830 --> 00:33:11,039
you know he had the

978
00:33:16,070 --> 00:33:13,840
equally tough task of you know combining

979
00:33:17,509 --> 00:33:16,080
the images that the color filters so

980
00:33:19,750 --> 00:33:17,519
that we'd have colorful stars and

981
00:33:21,509 --> 00:33:19,760
galaxies but then in a sense removing

982
00:33:23,350 --> 00:33:21,519
the cop the comet but then putting the

983
00:33:25,350 --> 00:33:23,360
comment that you see back you know here

984
00:33:26,950 --> 00:33:25,360
back into the image

985
00:33:28,870 --> 00:33:26,960
but there's nothing there's no hocus

986
00:33:30,149 --> 00:33:28,880
pocus here really and as you see this

987
00:33:31,990 --> 00:33:30,159
right here that you're looking at is a

988
00:33:34,549 --> 00:33:32,000

real hubble image of

989
00:33:37,269 --> 00:33:34,559
comet ison against a deep background of

990
00:33:38,789 --> 00:33:37,279
stars and galaxies so

991
00:33:41,029 --> 00:33:38,799
you know there's nothing there's nothing

992
00:33:43,190 --> 00:33:41,039
kind of constructed about this image the

993
00:33:45,830 --> 00:33:43,200
comet was right there and yes we cleaned

994
00:33:47,590 --> 00:33:45,840
out artifacts and cosmic rays and also

995
00:33:49,350 --> 00:33:47,600
in a sense chose just one position of

996
00:33:51,029 --> 00:33:49,360
the comet instead of putting all five

997
00:33:52,310 --> 00:33:51,039
because of course the comet doesn't

998
00:33:53,750 --> 00:33:52,320
really look like what i'm showing right

999
00:33:56,470 --> 00:33:53,760
now right

1000
00:33:57,990 --> 00:33:56,480
um we know um the comment looks you know

1001
00:33:59,990 --> 00:33:58,000
like it does in any one of these single

1002
00:34:02,230 --> 00:34:00,000
frames like this one here

1003
00:34:03,990 --> 00:34:02,240
so it is a composite and all of our

1004
00:34:05,590 --> 00:34:04,000
color images are composites in this case

1005
00:34:07,350 --> 00:34:05,600
though it's a composite that involves

1006
00:34:08,790 --> 00:34:07,360
you know images from different you know

1007
00:34:10,710 --> 00:34:08,800
with the target in different positions

1008
00:34:12,069 --> 00:34:10,720
so it's just a a different kind of a

1009
00:34:13,909 --> 00:34:12,079
composite

1010
00:34:15,909 --> 00:34:13,919
awesome now i just got something in from

1011
00:34:18,310 --> 00:34:15,919
twitter from one of the one of our

1012
00:34:20,950 --> 00:34:18,320
amateur processors so i'm not sure this

1013
00:34:22,389 --> 00:34:20,960

is what we had in mind i laughed really

1014
00:34:23,669 --> 00:34:22,399
loudly when i saw this this is from

1015
00:34:26,430 --> 00:34:23,679
marco

1016
00:34:29,109 --> 00:34:26,440
and um apparently

1017
00:34:29,909 --> 00:34:29,119
[Laughter]

1018
00:34:32,149 --> 00:34:29,919
so

1019
00:34:33,750 --> 00:34:32,159
oh there's an artifact you know as we're

1020
00:34:34,710 --> 00:34:33,760
looking for the comet out there and why

1021
00:34:37,190 --> 00:34:34,720
do you know if it's still going to be

1022
00:34:38,869 --> 00:34:37,200
there it's just you mad bro it's we

1023
00:34:41,829 --> 00:34:38,879
don't know if it's there

1024
00:34:43,510 --> 00:34:41,839
but uh thank you uh marco frisson from

1025
00:34:46,829 --> 00:34:43,520
twitter that was awesome maybe that'll

1026
00:34:49,190 --> 00:34:46,839
start a meme maybe we should

1027
00:34:50,230 --> 00:34:49,200
really okay one thing i did want to jump

1028
00:34:51,510 --> 00:34:50,240
in and say

1029
00:34:53,750 --> 00:34:51,520
we've been talking about color and

1030
00:34:55,750 --> 00:34:53,760
various colors and car composites and

1031
00:34:56,790 --> 00:34:55,760
stuff the images of the max has been

1032
00:34:58,950 --> 00:34:56,800
showing

1033
00:35:00,870 --> 00:34:58,960
they they appear in color but in fact

1034
00:35:03,589 --> 00:35:00,880
they're black and white images

1035
00:35:05,510 --> 00:35:03,599
and max is displaying them in a color to

1036
00:35:06,630 --> 00:35:05,520
kind of better see the tonality of the

1037
00:35:08,630 --> 00:35:06,640
images

1038
00:35:11,430 --> 00:35:08,640

uh but they're not color composites the

1039
00:35:13,349 --> 00:35:11,440
color is really doesn't have anything

1040
00:35:15,829 --> 00:35:13,359
about the the inherent nature of the

1041
00:35:17,270 --> 00:35:15,839
data that's right in ds9 i can use any

1042
00:35:19,270 --> 00:35:17,280
color lookup table i want there's

1043
00:35:21,430 --> 00:35:19,280
psychedelic ones

1044
00:35:23,190 --> 00:35:21,440
you know you can have all the fun

1045
00:35:24,310 --> 00:35:23,200
speaking of trolls

1046
00:35:25,990 --> 00:35:24,320
yeah

1047
00:35:27,670 --> 00:35:26,000
hey now you can't be using things like

1048
00:35:29,589 --> 00:35:27,680
ds9 without saying what it is you're

1049
00:35:35,109 --> 00:35:29,599
using that's a it's a fits viewer that

1050
00:35:38,390 --> 00:35:37,030
it's free you can download it from that

1051
00:35:40,550 --> 00:35:38,400
all he's doing is just changing the

1052
00:35:41,349 --> 00:35:40,560
lookup table that's right

1053
00:35:53,270 --> 00:35:41,359
yeah

1054
00:35:54,710 --> 00:35:53,280
so fun with color tables yes

1055
00:35:56,630 --> 00:35:54,720
yeah

1056
00:36:00,150 --> 00:35:56,640
okay so do you get people that might

1057
00:36:02,069 --> 00:36:00,160
want to use ds9 is it difficult to do

1058
00:36:03,910 --> 00:36:02,079
this to learn how to do this

1059
00:36:05,670 --> 00:36:03,920
no and that's kind of the point today is

1060
00:36:06,870 --> 00:36:05,680
like ds9 is a free tool that you can

1061
00:36:08,069 --> 00:36:06,880
download and it's pretty you know

1062
00:36:09,589 --> 00:36:08,079
there's good instructions and it's

1063
00:36:11,589 --> 00:36:09,599

pretty easy to figure out how to open up

1064
00:36:13,109 --> 00:36:11,599
a fits file and then if you use our

1065
00:36:14,710 --> 00:36:13,119
high-level science products you will

1066
00:36:16,150 --> 00:36:14,720
have nice images like this that are very

1067
00:36:17,750 --> 00:36:16,160
easy to manipulate

1068
00:36:19,109 --> 00:36:17,760
so you know to me that's kind of the

1069
00:36:20,390 --> 00:36:19,119
mate one of the main points one of the

1070
00:36:22,310 --> 00:36:20,400
main messages we want to get out there

1071
00:36:24,150 --> 00:36:22,320
is give you the you know the tools and

1072
00:36:25,430 --> 00:36:24,160
point you to the right data where you'll

1073
00:36:26,550 --> 00:36:25,440
instead of having a frustrating

1074
00:36:27,990 --> 00:36:26,560
experience you know you'll actually have

1075
00:36:29,510 --> 00:36:28,000
a really fun experience and you can do

1076
00:36:31,430 --> 00:36:29,520
what i'm doing right now

1077
00:36:33,349 --> 00:36:31,440
uh with my carefully prepared version of

1078
00:36:35,030 --> 00:36:33,359
the data whereas i think if people got

1079
00:36:36,310 --> 00:36:35,040
into our archive and got the raw data

1080
00:36:38,470 --> 00:36:36,320
out they can easily get kind of

1081
00:36:40,550 --> 00:36:38,480
frustrated or or get like you know not

1082
00:36:41,910 --> 00:36:40,560
necessarily the best versions so

1083
00:36:43,430 --> 00:36:41,920
okay well let's go on to that because

1084
00:36:44,870 --> 00:36:43,440
we're about 35 minutes into it we

1085
00:36:45,589 --> 00:36:44,880
haven't talked about how to get it yet

1086
00:36:48,470 --> 00:36:45,599
so

1087
00:36:50,390 --> 00:36:48,480
uh you want to you want to um show us

1088
00:36:52,630 --> 00:36:50,400

what you have in my how we have a viewer

1089
00:36:54,069 --> 00:36:52,640
now or at least we will i will post that

1090
00:36:55,750 --> 00:36:54,079
link by the way in the in the event

1091
00:36:58,069 --> 00:36:55,760
after the hangout uh where they were to

1092
00:37:00,950 --> 00:36:58,079
download ds9 um

1093
00:37:03,190 --> 00:37:00,960
what's next what do i how do i get some

1094
00:37:06,550 --> 00:37:03,200
where do i go um so i think i don't know

1095
00:37:07,910 --> 00:37:06,560
if bonnie had uh displayed the uh

1096
00:37:10,150 --> 00:37:07,920
you know i just realized yeah which

1097
00:37:12,870 --> 00:37:10,160
which one do you do you want to show

1098
00:37:15,750 --> 00:37:12,880
well there's the comet ison hlsp

1099
00:37:17,510 --> 00:37:15,760
okay i'll have i have that one um

1100
00:37:19,750 --> 00:37:17,520
and actually can you screen share when

1101
00:37:22,470 --> 00:37:19,760
you're using the same browser uh to show

1102
00:37:24,630 --> 00:37:22,480
something in another browser tab uh i

1103
00:37:27,430 --> 00:37:24,640
just pulled the tab out

1104
00:37:29,109 --> 00:37:27,440
to share it okay so so bonnie's showing

1105
00:37:30,790 --> 00:37:29,119
what she's showing right now is is the

1106
00:37:32,550 --> 00:37:30,800
one place you want to go for comment

1107
00:37:34,390 --> 00:37:32,560
ison data right now

1108
00:37:37,190 --> 00:37:34,400
um for the for the data that's being

1109
00:37:40,150 --> 00:37:37,200
prepared by me and other experts uh you

1110
00:37:41,190 --> 00:37:40,160
see there a long list of uh programs i

1111
00:37:43,190 --> 00:37:41,200
mentioned

1112
00:37:45,430 --> 00:37:43,200
uh all these programs the ones with zolt

1113
00:37:47,030 --> 00:37:45,440

levy is the pi that's the heritage team

1114
00:37:47,750 --> 00:37:47,040
that's the ones that we've been focusing

1115
00:37:51,430 --> 00:37:47,760
on

1116
00:37:53,670 --> 00:37:51,440
that's out there at the bottom you see

1117
00:37:55,990 --> 00:37:53,680
um you see a link to download the data

1118
00:37:57,589 --> 00:37:56,000
and you click on the word data

1119
00:37:59,990 --> 00:37:57,599
and then you see there are a bunch of

1120
00:38:02,069 --> 00:38:00,000
fitz files and there's a readme file at

1121
00:38:03,990 --> 00:38:02,079
the bottom that describes them describes

1122
00:38:05,910 --> 00:38:04,000
what each file is it's it's a lot of the

1123
00:38:07,589 --> 00:38:05,920
files i've just been showing you so i

1124
00:38:09,430 --> 00:38:07,599
click on the number to get the image is

1125
00:38:11,430 --> 00:38:09,440
that what i do

1126
00:38:13,750 --> 00:38:11,440
um you click on the word data at the

1127
00:38:16,069 --> 00:38:13,760
bottom of the page

1128
00:38:17,430 --> 00:38:16,079
oh i see okay and then you get just sort

1129
00:38:19,750 --> 00:38:17,440
of a listing here and you can kind of i

1130
00:38:21,190 --> 00:38:19,760
think you can right click on these fits

1131
00:38:23,030 --> 00:38:21,200
file names to download them to your

1132
00:38:24,710 --> 00:38:23,040
computer yeah yeah okay

1133
00:38:26,310 --> 00:38:24,720
and there's a text file at the bottom

1134
00:38:28,470 --> 00:38:26,320
you can click on it's a readme file that

1135
00:38:29,990 --> 00:38:28,480
kind of describes it you know what those

1136
00:38:31,670 --> 00:38:30,000
files are

1137
00:38:33,430 --> 00:38:31,680
um you know where they came from and as

1138
00:38:35,430 --> 00:38:33,440

i said at the moment only the heritage

1139
00:38:36,550 --> 00:38:35,440
team has put files there but i'm working

1140
00:38:38,950 --> 00:38:36,560
with all those

1141
00:38:40,870 --> 00:38:38,960
uh most of the other teams you know from

1142
00:38:41,990 --> 00:38:40,880
the other programs to try to have this

1143
00:38:43,990 --> 00:38:42,000
become

1144
00:38:47,510 --> 00:38:44,000
the one-stop shopping you know ultimate

1145
00:38:49,430 --> 00:38:47,520
repository of hubble data of comet ison

1146
00:38:51,030 --> 00:38:49,440
so if you come back later

1147
00:38:52,710 --> 00:38:51,040
a lot of those teams are still analyzing

1148
00:38:54,550 --> 00:38:52,720
their data so and they don't necessarily

1149
00:38:56,550 --> 00:38:54,560
have the best versions available yet but

1150
00:38:58,790 --> 00:38:56,560
as soon as they are comfortable you know

1151
00:39:01,750 --> 00:38:58,800
to post something there i will continue

1152
00:39:03,190 --> 00:39:01,760
to populate this site with all the best

1153
00:39:06,150 --> 00:39:03,200
you know highest quality high level

1154
00:39:07,349 --> 00:39:06,160
science products of comet ison data

1155
00:39:08,310 --> 00:39:07,359
and uh

1156
00:39:09,990 --> 00:39:08,320
you know we've been doing this with

1157
00:39:12,550 --> 00:39:10,000
heritage for a while so if you want to

1158
00:39:14,310 --> 00:39:12,560
get into that tony we could also show

1159
00:39:15,990 --> 00:39:14,320
where people could get or interested in

1160
00:39:19,030 --> 00:39:16,000
data in general could get you know even

1161
00:39:19,829 --> 00:39:19,040
more data sets from heritage or others

1162
00:39:21,430 --> 00:39:19,839
um

1163
00:39:24,150 --> 00:39:21,440

what do you mean for other objects for

1164
00:39:27,190 --> 00:39:24,160
other objects you mean

1165
00:39:32,470 --> 00:39:30,390
sorry i was full screening uh

1166
00:39:34,710 --> 00:39:32,480
so um

1167
00:39:36,310 --> 00:39:34,720
yes shoot i was just i was just sitting

1168
00:39:38,550 --> 00:39:36,320
there looking at that webpage oh i know

1169
00:39:40,950 --> 00:39:38,560
what i wanted to say max so when you

1170
00:39:44,470 --> 00:39:40,960
when you do add or when someone does add

1171
00:39:46,870 --> 00:39:44,480
more images to the uh to this directory

1172
00:39:50,069 --> 00:39:46,880
if you'll let me know and alberto know

1173
00:39:51,750 --> 00:39:50,079
we will and scott too we will interact

1174
00:39:53,589 --> 00:39:51,760
and all kinds of other things to let the

1175
00:39:54,950 --> 00:39:53,599
world know that there's there's new data

1176
00:39:57,670 --> 00:39:54,960
to be gathered

1177
00:39:59,829 --> 00:39:57,680
from the site too so

1178
00:40:01,510 --> 00:39:59,839
sure i wanted to say math maybe you can

1179
00:40:02,550 --> 00:40:01,520
you can spend one second explaining a

1180
00:40:03,910 --> 00:40:02,560
little bit

1181
00:40:05,510 --> 00:40:03,920
about what the difference is between

1182
00:40:07,910 --> 00:40:05,520
normal data products and the high-level

1183
00:40:11,190 --> 00:40:07,920
science products well he didn't i think

1184
00:40:13,030 --> 00:40:11,200
he did that earlier right with yeah um

1185
00:40:15,589 --> 00:40:13,040
you may have dropped out okay maybe i

1186
00:40:16,870 --> 00:40:15,599
cut it out okay that's okay um yeah the

1187
00:40:19,910 --> 00:40:16,880
high level science products are

1188
00:40:21,829 --> 00:40:19,920

generally prepared by experts offline

1189
00:40:23,910 --> 00:40:21,839
and then kind of donated back and you

1190
00:40:26,230 --> 00:40:23,920
know generally they they create the

1191
00:40:27,990 --> 00:40:26,240
archive creates a web page like this you

1192
00:40:29,510 --> 00:40:28,000
know with nice descriptions and you can

1193
00:40:30,550 --> 00:40:29,520
download and what bonnie's showing right

1194
00:40:32,550 --> 00:40:30,560
now

1195
00:40:33,990 --> 00:40:32,560
is actually the larger hubble heritage

1196
00:40:35,430 --> 00:40:34,000
collection so you see the horsehead

1197
00:40:38,310 --> 00:40:35,440
nebula there which many people might

1198
00:40:39,990 --> 00:40:38,320
recall was our 23rd anniversary image

1199
00:40:41,829 --> 00:40:40,000
and several other data collections there

1200
00:40:43,750 --> 00:40:41,839
so again these are the fitz data sets

1201
00:40:45,430 --> 00:40:43,760
for some of the most famous hub hubble

1202
00:40:47,109 --> 00:40:45,440
heritage images

1203
00:40:49,190 --> 00:40:47,119
and uh so you know if you really get

1204
00:40:50,790 --> 00:40:49,200
into this you can have fun with those uh

1205
00:40:52,470 --> 00:40:50,800
and beyond that there's even larger

1206
00:40:53,990 --> 00:40:52,480
collections of high-level science

1207
00:40:55,910 --> 00:40:54,000
products you know beyond just what the

1208
00:40:59,109 --> 00:40:55,920
hubble heritage teams does there's just

1209
00:41:00,309 --> 00:40:59,119
dozens of them so again for for most

1210
00:41:02,630 --> 00:41:00,319
people out there who are not

1211
00:41:04,710 --> 00:41:02,640
professionals um you really want to go

1212
00:41:06,150 --> 00:41:04,720
after these high-level science products

1213
00:41:08,230 --> 00:41:06,160

you know these are the the highest

1214
00:41:09,589 --> 00:41:08,240
quality products that we produce and the

1215
00:41:11,270 --> 00:41:09,599
easiest to just download and do

1216
00:41:12,950 --> 00:41:11,280
something with if you like to if you

1217
00:41:14,550 --> 00:41:12,960
like to have fun trying to be like a

1218
00:41:16,550 --> 00:41:14,560
assault level you know making your own

1219
00:41:18,550 --> 00:41:16,560
color composite images it's a good

1220
00:41:20,630 --> 00:41:18,560
opportunity to to download it and try to

1221
00:41:22,870 --> 00:41:20,640
make color composites or if you're a

1222
00:41:24,390 --> 00:41:22,880
teacher who is interested in having your

1223
00:41:25,670 --> 00:41:24,400
students maybe make some scientific

1224
00:41:27,670 --> 00:41:25,680
measurements from some carefully

1225
00:41:29,270 --> 00:41:27,680
prepared data this would be great you

1226
00:41:31,030 --> 00:41:29,280
know there's tools you can use within

1227
00:41:32,390 --> 00:41:31,040
ds9 or other free tools that are

1228
00:41:34,470 --> 00:41:32,400
available i don't think we're going to

1229
00:41:36,230 --> 00:41:34,480
get into that today but you know again

1230
00:41:38,390 --> 00:41:36,240
this is scientific data not just pretty

1231
00:41:40,069 --> 00:41:38,400
pictures we're looking at so you could

1232
00:41:41,990 --> 00:41:40,079
imagine amateurs making their own

1233
00:41:43,430 --> 00:41:42,000
scientific measurements or teachers uh

1234
00:41:44,870 --> 00:41:43,440
having their students do it or a high

1235
00:41:46,550 --> 00:41:44,880
school student could do it for a science

1236
00:41:48,390 --> 00:41:46,560
fair project

1237
00:41:50,390 --> 00:41:48,400
but most of the products you know in our

1238
00:41:52,069 --> 00:41:50,400

archive are not as carefully prepared it

1239
00:41:54,230 --> 00:41:52,079
would be a tougher start you know for

1240
00:41:56,150 --> 00:41:54,240
somebody who's not already an expert

1241
00:41:58,309 --> 00:41:56,160
right i know i want to be

1242
00:41:59,750 --> 00:41:58,319
when i grow up well i think we all do

1243
00:42:01,109 --> 00:41:59,760
but that's another that's another

1244
00:42:03,349 --> 00:42:01,119
hangout topic

1245
00:42:05,910 --> 00:42:03,359
um so this is a great opportunity for me

1246
00:42:08,069 --> 00:42:05,920
to ask you a question from youtube robot

1247
00:42:10,790 --> 00:42:08,079
the industrial asks do you have

1248
00:42:13,109 --> 00:42:10,800
information on how you calibrated the

1249
00:42:15,670 --> 00:42:13,119
image max i mean i guess this means so

1250
00:42:17,750 --> 00:42:15,680
you've created the higher level product

1251
00:42:19,349 --> 00:42:17,760
do you have is that what you did put

1252
00:42:21,829 --> 00:42:19,359
somewhere

1253
00:42:23,589 --> 00:42:21,839
yeah so we that's what the institute

1254
00:42:24,470 --> 00:42:23,599
does i work in the instruments division

1255
00:42:27,829 --> 00:42:24,480
here

1256
00:42:29,510 --> 00:42:27,839
and uh so you know that's what we do is

1257
00:42:31,510 --> 00:42:29,520
we you you'd be

1258
00:42:33,349 --> 00:42:31,520
amazed at how much attention we give to

1259
00:42:35,910 --> 00:42:33,359
carefully calibrating all the data that

1260
00:42:38,309 --> 00:42:35,920
comes from our cameras and spectrographs

1261
00:42:40,150 --> 00:42:38,319
um we have a huge division of almost 100

1262
00:42:41,670 --> 00:42:40,160
people and that's what we're knocking

1263
00:42:43,670 --> 00:42:41,680

ourselves out to do is to understand

1264
00:42:45,430 --> 00:42:43,680
these detectors and cameras

1265
00:42:47,190 --> 00:42:45,440
you know to almost an absurd level you

1266
00:42:49,190 --> 00:42:47,200
know really how what they produce and

1267
00:42:50,950 --> 00:42:49,200
how best to calibrate them a lot of the

1268
00:42:53,109 --> 00:42:50,960
observations on hubble are not of

1269
00:42:54,870 --> 00:42:53,119
external objects but of just basic

1270
00:42:57,030 --> 00:42:54,880
calibration frames

1271
00:42:58,630 --> 00:42:57,040
bias dark flat field anyone who's ever

1272
00:42:59,829 --> 00:42:58,640
calibrated telescope data knows what

1273
00:43:01,430 --> 00:42:59,839
that means

1274
00:43:03,190 --> 00:43:01,440
and and then all kinds of other

1275
00:43:05,670 --> 00:43:03,200
artifacts about you know about how

1276
00:43:07,510 --> 00:43:05,680
detectors age in space um you know how

1277
00:43:09,109 --> 00:43:07,520
they decay over time and we have to

1278
00:43:11,030 --> 00:43:09,119
understand those things at such a deep

1279
00:43:13,510 --> 00:43:11,040
level in order to provide the best

1280
00:43:15,589 --> 00:43:13,520
calibrations so to take that raw data

1281
00:43:17,190 --> 00:43:15,599
you know and and get all as much of the

1282
00:43:19,349 --> 00:43:17,200
you know artifacts and detector

1283
00:43:20,710 --> 00:43:19,359
signatures out of it that we can

1284
00:43:22,790 --> 00:43:20,720
and uh

1285
00:43:25,190 --> 00:43:22,800
so i can't possibly you know overstate

1286
00:43:26,550 --> 00:43:25,200
how much effort is put into that

1287
00:43:29,430 --> 00:43:26,560
okay good thank you so let me i'm going

1288
00:43:30,790 --> 00:43:29,440

to get zolt back up in here um i know do

1289
00:43:32,710 --> 00:43:30,800
you have some things you wanted to show

1290
00:43:34,309 --> 00:43:32,720
about combining images because i know

1291
00:43:35,910 --> 00:43:34,319
that we're running i don't want to let

1292
00:43:37,670 --> 00:43:35,920
this go too long before i give you a

1293
00:43:41,190 --> 00:43:37,680
chance to show us yeah what i wanted to

1294
00:43:42,710 --> 00:43:41,200
do is uh show some of the

1295
00:43:44,470 --> 00:43:42,720
things that we've done with the data

1296
00:43:45,190 --> 00:43:44,480
that max is talking about

1297
00:43:48,150 --> 00:43:45,200
so

1298
00:43:49,430 --> 00:43:48,160
i had shown previously one of those but

1299
00:43:52,309 --> 00:43:49,440
uh let me

1300
00:43:54,470 --> 00:43:52,319
let me share my screen here

1301
00:43:57,270 --> 00:43:54,480
screen share

1302
00:43:57,280 --> 00:44:00,790
okay

1303
00:44:05,990 --> 00:44:03,510
it's a little slow for some reason start

1304
00:44:06,790 --> 00:44:06,000
screen share

1305
00:44:14,069 --> 00:44:06,800
okay

1306
00:44:16,630 --> 00:44:15,829
so here are

1307
00:44:18,870 --> 00:44:16,640
uh

1308
00:44:20,630 --> 00:44:18,880
the eight images from the from the data

1309
00:44:24,150 --> 00:44:20,640
we had on may 8.

1310
00:44:26,150 --> 00:44:24,160
so there were eight exposures from

1311
00:44:30,790 --> 00:44:26,160
the single filter

1312
00:44:34,230 --> 00:44:30,800
and um as max has described

1313
00:44:38,309 --> 00:44:34,240

and so max already showed this combined

1314
00:44:40,710 --> 00:44:38,319
image so uh this is the combined images

1315
00:44:43,430 --> 00:44:40,720
registered on the comet and since we

1316
00:44:46,390 --> 00:44:43,440
attract on the comet with the telescope

1317
00:44:48,630 --> 00:44:46,400
uh during the exposures and and between

1318
00:44:50,470 --> 00:44:48,640
the separate exposures the stars have

1319
00:44:52,550 --> 00:44:50,480
moved across the sky

1320
00:44:54,470 --> 00:44:52,560
and they moved in this funny pattern

1321
00:44:56,710 --> 00:44:54,480
which we can talk about if people are

1322
00:44:58,390 --> 00:44:56,720
interested not in a straight line

1323
00:45:00,630 --> 00:44:58,400
but um

1324
00:45:02,550 --> 00:45:00,640
but then we built up the exposure on the

1325
00:45:05,829 --> 00:45:02,560
on the comet the other way to combine

1326
00:45:07,030 --> 00:45:05,839
the images is also max has uh has talked

1327
00:45:09,430 --> 00:45:07,040
about is to

1328
00:45:11,589 --> 00:45:09,440
remove everything that's changed from

1329
00:45:13,430 --> 00:45:11,599
image to image so

1330
00:45:15,349 --> 00:45:13,440
there's all the cosmic rays and stuff

1331
00:45:16,230 --> 00:45:15,359
and all the artifacts

1332
00:45:18,470 --> 00:45:16,240
and

1333
00:45:20,870 --> 00:45:18,480
when you subtract all those out between

1334
00:45:22,710 --> 00:45:20,880
the images then you end up with this v

1335
00:45:25,430 --> 00:45:22,720
on the right you end up this very clean

1336
00:45:27,589 --> 00:45:25,440
image and just the comet which which is

1337
00:45:30,390 --> 00:45:27,599
the comet has stayed stationary

1338
00:45:33,589 --> 00:45:30,400

in the on the camera uh between the

1339
00:45:35,030 --> 00:45:33,599
exposures so max has done that combined

1340
00:45:38,390 --> 00:45:35,040
and that's what i'm showing here and

1341
00:45:40,550 --> 00:45:38,400
again it's colorized to this blue

1342
00:45:42,790 --> 00:45:40,560
sort of color map just to make it a

1343
00:45:45,109 --> 00:45:42,800
little bit more interesting than just a

1344
00:45:47,910 --> 00:45:45,119
black and white image so that was

1345
00:45:49,349 --> 00:45:47,920
essentially our image product for that

1346
00:45:50,710 --> 00:45:49,359
that may 8th

1347
00:45:52,870 --> 00:45:50,720
release

1348
00:45:54,230 --> 00:45:52,880
um and so that's that's what we did a

1349
00:45:57,190 --> 00:45:54,240
very nice clean image and the other

1350
00:45:59,910 --> 00:45:57,200
thing we did was take the eight frames

1351
00:46:02,150 --> 00:45:59,920
and make a little movie out of it and so

1352
00:46:04,630 --> 00:46:02,160
we just are dissolving

1353
00:46:07,349 --> 00:46:04,640
between those eight frames

1354
00:46:10,230 --> 00:46:07,359
and you and this time

1355
00:46:13,430 --> 00:46:10,240
uh what we did was register the images

1356
00:46:14,390 --> 00:46:13,440
on the with the stars so the stars stay

1357
00:46:16,470 --> 00:46:14,400
motionless

1358
00:46:19,510 --> 00:46:16,480
frame to frame

1359
00:46:21,670 --> 00:46:19,520
i guess it uh only cycled so many times

1360
00:46:23,750 --> 00:46:21,680
and then went to black sorry about that

1361
00:46:27,589 --> 00:46:23,760
um now we also give it by this too did

1362
00:46:29,829 --> 00:46:27,599
we origified yes there's a there is a

1363
00:46:32,630 --> 00:46:29,839

movie available online

1364
00:46:35,030 --> 00:46:32,640
uh that you can that you can watch

1365
00:46:35,990 --> 00:46:35,040
until you get sick of it i guess

1366
00:46:38,470 --> 00:46:36,000
so now

1367
00:46:40,550 --> 00:46:38,480
we're seeing the comet um

1368
00:46:44,150 --> 00:46:40,560
move across the field of stars kind of

1369
00:46:46,069 --> 00:46:44,160
as it would if you were if you would uh

1370
00:46:48,230 --> 00:46:46,079
keep the telescope fixed on the stars

1371
00:46:50,950 --> 00:46:48,240
and you can watch the comment but this

1372
00:46:52,550 --> 00:46:50,960
is this is about 40 minutes of real time

1373
00:46:53,589 --> 00:46:52,560
it's a few seconds

1374
00:46:55,990 --> 00:46:53,599
uh

1375
00:46:59,510 --> 00:46:56,000
of watching time but you're actually

1376
00:47:01,510 --> 00:46:59,520
watching about 40 minutes of the comment

1377
00:47:03,349 --> 00:47:01,520
of telescope time on the comment now

1378
00:47:05,109 --> 00:47:03,359
this you can download on the

1379
00:47:07,589 --> 00:47:05,119
press release page

1380
00:47:08,790 --> 00:47:07,599
yes that's right

1381
00:47:11,109 --> 00:47:08,800
and

1382
00:47:12,390 --> 00:47:11,119
the thing i've talked about before we we

1383
00:47:13,109 --> 00:47:12,400
talked about a little bit earlier was

1384
00:47:17,829 --> 00:47:13,119
the

1385
00:47:21,990 --> 00:47:17,839
uh which was a different data set so

1386
00:47:24,470 --> 00:47:22,000
this is my favorite we we took uh

1387
00:47:26,470 --> 00:47:24,480
separate expo five separate exposures

1388
00:47:28,069 --> 00:47:26,480

three exposures through one filter and

1389
00:47:29,109 --> 00:47:28,079
two exposures through a different color

1390
00:47:30,710 --> 00:47:29,119
filter

1391
00:47:32,710 --> 00:47:30,720
and uh

1392
00:47:35,190 --> 00:47:32,720
again still one orbit of the telescope

1393
00:47:36,870 --> 00:47:35,200
so roughly a total of something like 40

1394
00:47:38,470 --> 00:47:36,880
minutes of time

1395
00:47:41,109 --> 00:47:38,480
um

1396
00:47:43,190 --> 00:47:41,119
but we were able to build up a deeper

1397
00:47:46,710 --> 00:47:43,200
exposure of the background

1398
00:47:47,750 --> 00:47:46,720
but in that time the comet has moved

1399
00:47:50,230 --> 00:47:47,760
uh

1400
00:47:53,589 --> 00:47:50,240
across the field of stars

1401
00:47:56,309 --> 00:47:53,599
so here are the five separate exposures

1402
00:47:57,270 --> 00:47:56,319
three in the v filter at the top and two

1403
00:47:59,990 --> 00:47:57,280
in the

1404
00:48:01,990 --> 00:48:00,000
i band filter at the bottom and

1405
00:48:03,670 --> 00:48:02,000
um you know the images look roughly the

1406
00:48:05,589 --> 00:48:03,680
same if you look very closely you can

1407
00:48:07,510 --> 00:48:05,599
see that the comet has moved a little

1408
00:48:09,349 --> 00:48:07,520
bit in each frame and in fact if you

1409
00:48:11,030 --> 00:48:09,359
look really we're able to look really

1410
00:48:11,910 --> 00:48:11,040
closely you can actually see the comets

1411
00:48:15,030 --> 00:48:11,920
trail

1412
00:48:16,150 --> 00:48:15,040
a little bit in in each exposure

1413
00:48:17,910 --> 00:48:16,160

um

1414
00:48:19,030 --> 00:48:17,920
and you can see that better here i've

1415
00:48:21,829 --> 00:48:19,040
combined

1416
00:48:24,230 --> 00:48:21,839
the three v exposures together

1417
00:48:26,710 --> 00:48:24,240
and the three eye exposures together

1418
00:48:28,710 --> 00:48:26,720
and you can see how the comet has moved

1419
00:48:30,549 --> 00:48:28,720
between the exposures but the stars and

1420
00:48:32,549 --> 00:48:30,559
the background galaxies are are

1421
00:48:34,630 --> 00:48:32,559
registered so you get a nice deep image

1422
00:48:37,349 --> 00:48:34,640
of those so then

1423
00:48:38,870 --> 00:48:37,359
we colorize those so the the

1424
00:48:40,950 --> 00:48:38,880
eye band image

1425
00:48:43,109 --> 00:48:40,960
is colorized red and the v-band image is

1426
00:48:45,190 --> 00:48:43,119
colorized blue and by that you just mean

1427
00:48:47,270 --> 00:48:45,200
that you applied that for every color in

1428
00:48:48,950 --> 00:48:47,280
the pixel scale of that image you

1429
00:48:51,270 --> 00:48:48,960
applied a blue color table and a red

1430
00:48:53,670 --> 00:48:51,280
color correct when it goes from from

1431
00:48:56,790 --> 00:48:53,680
black to white and the grayscale image

1432
00:48:57,829 --> 00:48:56,800
we we have colors that go from the

1433
00:49:03,190 --> 00:48:57,839
the

1434
00:49:05,829 --> 00:49:03,200
actually cyan in this case a combination

1435
00:49:07,190 --> 00:49:05,839
of blue green and and the red

1436
00:49:11,270 --> 00:49:07,200
um

1437
00:49:12,390 --> 00:49:11,280
when you combine those together you get

1438
00:49:15,190 --> 00:49:12,400

the full

1439
00:49:17,030 --> 00:49:15,200
gamut of colors this is actually colors

1440
00:49:19,030 --> 00:49:17,040
180 degrees apart on the color wheel

1441
00:49:20,390 --> 00:49:19,040
that is so awesome i love the galaxies

1442
00:49:22,309 --> 00:49:20,400
back there

1443
00:49:24,230 --> 00:49:22,319
yeah it's really cool how you see all

1444
00:49:26,470 --> 00:49:24,240
that stuff but now you see this is the

1445
00:49:28,470 --> 00:49:26,480
raw combined image so now you see that

1446
00:49:31,109 --> 00:49:28,480
the comment looks kind of funny

1447
00:49:33,030 --> 00:49:31,119
because the comment trailed between the

1448
00:49:34,870 --> 00:49:33,040
exposures so that's why

1449
00:49:36,870 --> 00:49:34,880
we we kind of wanted to clean this image

1450
00:49:38,630 --> 00:49:36,880
up a little bit and uh not have the

1451
00:49:40,710 --> 00:49:38,640
comment look funny

1452
00:49:43,430 --> 00:49:40,720
so

1453
00:49:44,950 --> 00:49:43,440
we we basically replaced the comet with

1454
00:49:48,150 --> 00:49:44,960
one of the

1455
00:49:50,870 --> 00:49:48,160
uh individual exposures and the comet is

1456
00:49:53,109 --> 00:49:50,880
is gray anyway there's no real color

1457
00:49:54,950 --> 00:49:53,119
uh in the color information the comet i

1458
00:49:55,990 --> 00:49:54,960
mean the comet is

1459
00:50:00,549 --> 00:49:56,000
it

1460
00:50:02,710 --> 00:50:00,559
color throughout the visible spectrum

1461
00:50:04,230 --> 00:50:02,720
essentially so we're not seeing any

1462
00:50:06,309 --> 00:50:04,240
color even though you're seeing color in

1463
00:50:08,390 --> 00:50:06,319

the stars some of the stars are bluer

1464
00:50:10,390 --> 00:50:08,400
some of the stars are yellow yellow or

1465
00:50:12,150 --> 00:50:10,400
red and even the galaxies show a little

1466
00:50:13,990 --> 00:50:12,160
bit of color

1467
00:50:16,390 --> 00:50:14,000
um so that that's what we did with this

1468
00:50:19,109 --> 00:50:16,400
data set

1469
00:50:21,990 --> 00:50:19,119
oh alberto do you are you with us you're

1470
00:50:23,829 --> 00:50:22,000
saying you have a slow connection

1471
00:50:26,150 --> 00:50:23,839
are you there i can hear you but i have

1472
00:50:28,150 --> 00:50:26,160
a lot i have a long delay okay there was

1473
00:50:30,150 --> 00:50:28,160
a point you wanted to make when zolt was

1474
00:50:31,910 --> 00:50:30,160
showing us the uh

1475
00:50:33,829 --> 00:50:31,920
the animated gif i think it was or not

1476
00:50:36,470 --> 00:50:33,839
the animated gif but the the comet

1477
00:50:38,230 --> 00:50:36,480
moving against the stars yeah

1478
00:50:40,710 --> 00:50:38,240
go ahead yeah there's a lot of people

1479
00:50:43,030 --> 00:50:40,720
that have asked you know if if you look

1480
00:50:44,950 --> 00:50:43,040
at the gif image basically

1481
00:50:46,390 --> 00:50:44,960
um you know the coma is pointing the

1482
00:50:48,150 --> 00:50:46,400
opposite direction of the sun because

1483
00:50:50,549 --> 00:50:48,160
the sun radiation is actually creating

1484
00:50:52,710 --> 00:50:50,559
that coma and uh over those 40 minutes

1485
00:50:53,670 --> 00:50:52,720
that uh zolta's shown the comet is

1486
00:50:55,510 --> 00:50:53,680
moving

1487
00:50:56,950 --> 00:50:55,520
opposite to what you would expect you

1488
00:50:58,230 --> 00:50:56,960

know it's moving away from the sun even

1489
00:51:00,470 --> 00:50:58,240
though it was actually

1490
00:51:01,750 --> 00:51:00,480
sort of hurling toward the sun and so

1491
00:51:03,349 --> 00:51:01,760
the explanation of that is actually

1492
00:51:04,549 --> 00:51:03,359
hubble during the time of those 40

1493
00:51:07,430 --> 00:51:04,559
minutes actually moving around this

1494
00:51:09,910 --> 00:51:07,440
orbit and so the earth as the system is

1495
00:51:11,190 --> 00:51:09,920
moving around as well and so it's all

1496
00:51:12,710 --> 00:51:11,200
the effect is pure in an optical

1497
00:51:14,710 --> 00:51:12,720
illusion if you will but the comments

1498
00:51:18,150 --> 00:51:14,720
still move in the direction of the sun

1499
00:51:21,829 --> 00:51:20,150
uh yeah the the

1500
00:51:24,309 --> 00:51:21,839
motion we see in the images is

1501
00:51:26,390 --> 00:51:24,319
independent of the motion of the comet

1502
00:51:27,670 --> 00:51:26,400
in the solar system

1503
00:51:30,630 --> 00:51:27,680
and the comet

1504
00:51:33,750 --> 00:51:30,640
also isn't necessarily moving

1505
00:51:35,589 --> 00:51:33,760
toward directly toward the sun so it's

1506
00:51:37,030 --> 00:51:35,599
not really even moving in the same

1507
00:51:38,790 --> 00:51:37,040
direction as the

1508
00:51:40,950 --> 00:51:38,800
as the tail

1509
00:51:42,470 --> 00:51:40,960
in the direction of the tail

1510
00:51:43,829 --> 00:51:42,480
well that's like i said this is a great

1511
00:51:45,190 --> 00:51:43,839
segue into the next thing i want to talk

1512
00:51:46,710 --> 00:51:45,200
about before we run out of time and

1513
00:51:49,430 --> 00:51:46,720

bonnie you can jump in on this too if

1514
00:51:51,109 --> 00:51:49,440
you want to misconceptions based on

1515
00:51:52,230 --> 00:51:51,119
observations that we've had out there

1516
00:51:54,470 --> 00:51:52,240
what have you guys heard of what are

1517
00:51:56,309 --> 00:51:54,480
some common misconceptions out there

1518
00:51:58,309 --> 00:51:56,319
that you have been hearing or that

1519
00:52:00,309 --> 00:51:58,319
you've read about that you'd like to

1520
00:52:02,390 --> 00:52:00,319
maybe clarify because i know max you had

1521
00:52:05,349 --> 00:52:02,400
mentioned a couple before we started i

1522
00:52:08,230 --> 00:52:05,359
have my favorite too oh and scott yes of

1523
00:52:10,230 --> 00:52:08,240
course scott is full of misconceptions i

1524
00:52:11,670 --> 00:52:10,240
am full of misconceptions

1525
00:52:13,910 --> 00:52:11,680
well let's have one

1526
00:52:16,230 --> 00:52:13,920
uh my favorite i heard is that comet

1527
00:52:18,549 --> 00:52:16,240
ison is really half the size of jupiter

1528
00:52:20,390 --> 00:52:18,559
and it's a huge thing flying towards us

1529
00:52:23,030 --> 00:52:20,400
so we're covering it up

1530
00:52:25,910 --> 00:52:23,040
and it's actually planet x or nibiru and

1531
00:52:26,950 --> 00:52:25,920
we're actually this huge conspiracy

1532
00:52:28,549 --> 00:52:26,960
yeah

1533
00:52:29,510 --> 00:52:28,559
you're hiding it in your shirt right

1534
00:52:33,430 --> 00:52:29,520
because

1535
00:52:35,190 --> 00:52:33,440
i suggest in this pocket right

1536
00:52:36,790 --> 00:52:35,200
it was a comment there was a comment on

1537
00:52:38,309 --> 00:52:36,800
there about how you wear your fancy

1538
00:52:40,470 --> 00:52:38,319

shirts during these hand at hangout so

1539
00:52:42,390 --> 00:52:40,480
you're just chilling during vsp

1540
00:52:43,910 --> 00:52:42,400
yeah

1541
00:52:47,990 --> 00:52:43,920
any others have you heard that you guys

1542
00:52:51,109 --> 00:52:48,870
i don't know

1543
00:52:53,990 --> 00:52:51,119
one of the best yeah i follow that stuff

1544
00:52:58,470 --> 00:52:56,069
i i addressed the one that i saw you

1545
00:52:59,910 --> 00:52:58,480
know people uh you know kind of getting

1546
00:53:01,510 --> 00:52:59,920
the data out of archive and

1547
00:53:03,510 --> 00:53:01,520
misinterpreting you know some of our

1548
00:53:05,190 --> 00:53:03,520
products which is understandable you

1549
00:53:06,870 --> 00:53:05,200
know given how i described it that's the

1550
00:53:08,150 --> 00:53:06,880
only that's the only thing i've really

1551
00:53:10,390 --> 00:53:08,160
been addressing and other than that i've

1552
00:53:12,549 --> 00:53:10,400
been too busy to keep track of uh any

1553
00:53:14,630 --> 00:53:12,559
experience that's fair enough and that's

1554
00:53:15,910 --> 00:53:14,640
important yeah you want you don't want

1555
00:53:18,549 --> 00:53:15,920
you don't want people to be looking at

1556
00:53:20,230 --> 00:53:18,559
data that we've provided and and

1557
00:53:21,670 --> 00:53:20,240
misunderstanding what they're looking at

1558
00:53:24,549 --> 00:53:21,680
that's the whole purpose of this hangout

1559
00:53:26,069 --> 00:53:24,559
anyways to help people understand it um

1560
00:53:28,390 --> 00:53:26,079
well certainly one of the things that

1561
00:53:30,069 --> 00:53:28,400
people ask about is is the comment going

1562
00:53:32,390 --> 00:53:30,079
to hit the earth

1563
00:53:34,390 --> 00:53:32,400

yeah we made a video about that one yeah

1564
00:53:36,790 --> 00:53:34,400
and i think alberto has it right on the

1565
00:53:38,790 --> 00:53:36,800
head and how he wants to reply

1566
00:53:40,630 --> 00:53:38,800
yeah it's just now

1567
00:53:41,990 --> 00:53:40,640
no no yeah

1568
00:53:43,670 --> 00:53:42,000
yeah that's where we're going to make a

1569
00:53:45,270 --> 00:53:43,680
we're going to make a vine video on that

1570
00:53:48,710 --> 00:53:45,280
one it's just will come with ice and hit

1571
00:53:53,750 --> 00:53:51,430
and then mike rock

1572
00:53:55,430 --> 00:53:53,760
so bonnie you have um been posting some

1573
00:53:56,630 --> 00:53:55,440
really interesting links on the event

1574
00:53:58,790 --> 00:53:56,640
page i'd like you to tell us a little

1575
00:54:01,030 --> 00:53:58,800
bit about these so you've you've posted

1576
00:54:02,309 --> 00:54:01,040
uh one on amateur efforts and another on

1577
00:54:03,829 --> 00:54:02,319
the observing campaign you want to

1578
00:54:05,270 --> 00:54:03,839
comment on this a little bit right well

1579
00:54:07,430 --> 00:54:05,280
since we were talking about going in and

1580
00:54:10,390 --> 00:54:07,440
getting the data yourself if and this

1581
00:54:11,589 --> 00:54:10,400
this image that was taken uh

1582
00:54:13,670 --> 00:54:11,599
by bruce

1583
00:54:16,230 --> 00:54:13,680
gary almost forgot his name it was gary

1584
00:54:18,470 --> 00:54:16,240
the other day uh amateurs are gonna play

1585
00:54:21,589 --> 00:54:18,480
a big role in

1586
00:54:23,589 --> 00:54:21,599
this whole campaign and

1587
00:54:24,630 --> 00:54:23,599
because the this comment will be

1588
00:54:27,510 --> 00:54:24,640

you'll be able to see it with your

1589
00:54:29,349 --> 00:54:27,520
regular telescope so there's lots of

1590
00:54:31,910 --> 00:54:29,359
initiatives out there observing

1591
00:54:32,710 --> 00:54:31,920
campaigns that you can take part in

1592
00:54:34,470 --> 00:54:32,720
um

1593
00:54:36,470 --> 00:54:34,480
one of the links i posted is to this

1594
00:54:38,549 --> 00:54:36,480
amateur observers

1595
00:54:40,870 --> 00:54:38,559
thing through the university of maryland

1596
00:54:43,349 --> 00:54:40,880
now i can't find the link that i posted

1597
00:54:45,430 --> 00:54:43,359
yeah it fell down the comments

1598
00:54:48,390 --> 00:54:45,440
it'll help you find

1599
00:54:50,069 --> 00:54:48,400
uh connect to the greater campaign find

1600
00:54:51,430 --> 00:54:50,079
out what you need to do

1601
00:54:53,670 --> 00:54:51,440
uh

1602
00:54:56,230 --> 00:54:53,680
the professionals out there that will

1603
00:54:59,270 --> 00:54:56,240
use this data uh they're excited they

1604
00:55:01,349 --> 00:54:59,280
want to use your data if you have it so

1605
00:55:02,069 --> 00:55:01,359
tyson campaign.org you posted i think

1606
00:55:05,109 --> 00:55:02,079
right

1607
00:55:07,510 --> 00:55:05,119
yes so there's there's one that

1608
00:55:09,190 --> 00:55:07,520
is the overall ison campaign which is

1609
00:55:10,230 --> 00:55:09,200
the cioc

1610
00:55:11,910 --> 00:55:10,240
and

1611
00:55:14,150 --> 00:55:11,920
that one

1612
00:55:15,030 --> 00:55:14,160
is the comet ison observing campaign

1613
00:55:17,030 --> 00:55:15,040

they

1614
00:55:20,309 --> 00:55:17,040
are professionals amateurs it's the

1615
00:55:22,630 --> 00:55:20,319
whole worldwide effort to observe ison

1616
00:55:25,430 --> 00:55:22,640
and then there's the

1617
00:55:27,109 --> 00:55:25,440
effort to uh just for amateurs within

1618
00:55:29,750 --> 00:55:27,119
that and that's through the university

1619
00:55:31,510 --> 00:55:29,760
of maryland and

1620
00:55:32,790 --> 00:55:31,520
they have a whole web page that i posted

1621
00:55:35,510 --> 00:55:32,800
way down in the comments yeah it's in

1622
00:55:39,270 --> 00:55:35,520
the comments guys so definitely let me

1623
00:55:43,589 --> 00:55:41,510
okay thank you scott yeah

1624
00:55:44,790 --> 00:55:43,599
and andy cowley also posted a comment i

1625
00:55:47,190 --> 00:55:44,800
just want to say real quick on where he

1626
00:55:48,710 --> 00:55:47,200
got ds9 from and that looks right to me

1627
00:55:50,230 --> 00:55:48,720
i think that's where they

1628
00:55:51,109 --> 00:55:50,240
yeah that's right link i double checked

1629
00:55:52,789 --> 00:55:51,119
it that's fine

1630
00:55:55,109 --> 00:55:52,799
okay so there you go thanks andy that

1631
00:55:57,670 --> 00:55:55,119
was really helpful

1632
00:55:59,030 --> 00:55:57,680
from the he's our he's our card guy yes

1633
00:56:01,670 --> 00:55:59,040
yeah yeah that's what it looked right to

1634
00:56:03,510 --> 00:56:01,680
me but the he a-www thing looked weird

1635
00:56:05,990 --> 00:56:03,520
but

1636
00:56:08,069 --> 00:56:06,000
okay so um

1637
00:56:10,230 --> 00:56:08,079
i is there any other do you guys have

1638
00:56:11,589 --> 00:56:10,240

any other things that we didn't get to

1639
00:56:13,109 --> 00:56:11,599
that you'd like to cover i'm checking

1640
00:56:16,309 --> 00:56:13,119
the comments while i'm

1641
00:56:17,829 --> 00:56:16,319
checking uh asking you this i think

1642
00:56:19,910 --> 00:56:17,839
there's one other thing i'd like to add

1643
00:56:21,349 --> 00:56:19,920
i alluded before that you know one thing

1644
00:56:22,710 --> 00:56:21,359
one of the things people could do with

1645
00:56:24,950 --> 00:56:22,720
our high level science products is

1646
00:56:26,549 --> 00:56:24,960
attempt to be a zolt level and make

1647
00:56:28,829 --> 00:56:26,559
color composites but we should probably

1648
00:56:31,670 --> 00:56:28,839
mention that there's a tool called fits

1649
00:56:34,150 --> 00:56:31,680
liberator oh yes talk about this

1650
00:56:35,430 --> 00:56:34,160
liberator so i actually maybe i should

1651
00:56:37,190 --> 00:56:35,440
turn it back over to zolt to just

1652
00:56:38,549 --> 00:56:37,200
describe fitz liberator which is a key

1653
00:56:40,390 --> 00:56:38,559
part of that

1654
00:56:42,789 --> 00:56:40,400
and where to get it too

1655
00:56:44,390 --> 00:56:42,799
yeah uh i don't have the link handy

1656
00:56:46,309 --> 00:56:44,400
right now but okay we'll look it up

1657
00:56:47,990 --> 00:56:46,319
later you can just google fits liberator

1658
00:56:50,630 --> 00:56:48,000
and this is a tool

1659
00:56:54,390 --> 00:56:50,640
provided by the european space agency

1660
00:56:56,390 --> 00:56:54,400
that uh is a general purpose fits a

1661
00:56:59,670 --> 00:56:56,400
reading tool

1662
00:57:01,750 --> 00:56:59,680
and it allows you to convert fits into

1663
00:57:03,430 --> 00:57:01,760

something that an actual image

1664
00:57:06,470 --> 00:57:03,440
processing program

1665
00:57:08,150 --> 00:57:06,480
like photoshop can understand so it'll

1666
00:57:09,750 --> 00:57:08,160
write out a tiff

1667
00:57:12,710 --> 00:57:09,760
format image but

1668
00:57:15,670 --> 00:57:12,720
uh since fitz generally is a high

1669
00:57:18,950 --> 00:57:15,680
dynamic range data format you can

1670
00:57:21,589 --> 00:57:18,960
extract what part of the tonal range you

1671
00:57:23,430 --> 00:57:21,599
want in the image apply

1672
00:57:26,630 --> 00:57:23,440
different kinds of

1673
00:57:28,710 --> 00:57:26,640
functions transform functions to scale

1674
00:57:30,470 --> 00:57:28,720
the data in different ways log function

1675
00:57:33,510 --> 00:57:30,480
and various other things

1676
00:57:34,870 --> 00:57:33,520
uh so it's and it's it's interactive so

1677
00:57:37,109 --> 00:57:34,880
you can see

1678
00:57:38,309 --> 00:57:37,119
what you're doing as you're doing it and

1679
00:57:41,589 --> 00:57:38,319
and see what the image is going to look

1680
00:57:43,190 --> 00:57:41,599
like before you hit save and and write

1681
00:57:45,910 --> 00:57:43,200
it out as a tiff file then you can bring

1682
00:57:48,150 --> 00:57:45,920
those images into photoshop or your

1683
00:57:51,030 --> 00:57:48,160
favorite image processing program

1684
00:57:53,109 --> 00:57:51,040
and produce the images color composites

1685
00:57:55,910 --> 00:57:53,119
or whatever it fits liberator doesn't do

1686
00:57:57,910 --> 00:57:55,920
color composites itself

1687
00:57:59,270 --> 00:57:57,920
it allows you to

1688
00:58:01,829 --> 00:57:59,280

uh

1689
00:58:03,670 --> 00:58:01,839
take any fitz file and create a tiff

1690
00:58:05,589 --> 00:58:03,680
from that that's basically all it does

1691
00:58:08,069 --> 00:58:05,599
but it has all the flexibility built

1692
00:58:10,150 --> 00:58:08,079
into it to do that in the best possible

1693
00:58:11,990 --> 00:58:10,160
and alberto just posted the link on the

1694
00:58:13,349 --> 00:58:12,000
events page to where to get it so thanks

1695
00:58:15,270 --> 00:58:13,359
thanks alberto

1696
00:58:16,789 --> 00:58:15,280
okay guys well um i've been going i

1697
00:58:19,109 --> 00:58:16,799
didn't see any actual any more questions

1698
00:58:20,710 --> 00:58:19,119
on the youtube part and i'm in the i

1699
00:58:23,670 --> 00:58:20,720
think we've covered most of what the

1700
00:58:25,750 --> 00:58:23,680
discussion uh on the events page so i

1701
00:58:26,710 --> 00:58:25,760
want to thank everybody for attending

1702
00:58:29,510 --> 00:58:26,720
bonnie

1703
00:58:31,190 --> 00:58:29,520
max zolt thank you very much this is

1704
00:58:32,390 --> 00:58:31,200
we're not done with comet ison are we

1705
00:58:34,549 --> 00:58:32,400
we're going to be doing this again i

1706
00:58:37,030 --> 00:58:34,559
hope okay more hangouts in the future

1707
00:58:38,549 --> 00:58:37,040
right yeah let's hope so the brighter it

1708
00:58:39,190 --> 00:58:38,559
is the more we're going to do

1709
00:58:41,030 --> 00:58:39,200
yes

1710
00:58:42,870 --> 00:58:41,040
[Music]

1711
00:58:45,030 --> 00:58:42,880
that's right the brighter it is the more

1712
00:58:48,069 --> 00:58:45,040
and and if it whether it fizzles or

1713
00:58:51,109 --> 00:58:48,079

blows us away or

1714
00:58:53,109 --> 00:58:51,119
i wanted to say that you know

1715
00:58:54,710 --> 00:58:53,119
even if it's not real bright and and

1716
00:58:56,309 --> 00:58:54,720
visible from your backyard the

1717
00:58:58,230 --> 00:58:56,319
scientists are still excited about it

1718
00:59:00,950 --> 00:58:58,240
it's still exactly producing a lot of

1719
00:59:02,710 --> 00:59:00,960
cool science and understanding

1720
00:59:03,990 --> 00:59:02,720
yeah it's just not a question

1721
00:59:05,829 --> 00:59:04,000
bonnie doesn't worry about it she's like

1722
00:59:08,150 --> 00:59:05,839
it's going to be cool no matter what

1723
00:59:09,589 --> 00:59:08,160
yeah

1724
00:59:11,190 --> 00:59:09,599
this is awesome

1725
00:59:12,390 --> 00:59:11,200
regardless especially if you know what

1726
00:59:14,950 --> 00:59:12,400
we talked about last time what we were

1727
00:59:16,870 --> 00:59:14,960
really excited for is if on its you know

1728
00:59:18,950 --> 00:59:16,880
it grazes the sun and comes back out and

1729
00:59:23,270 --> 00:59:18,960
it happens to fall apart and we can

1730
00:59:27,510 --> 00:59:23,280
watch it that would be even cooler

1731
00:59:32,230 --> 00:59:29,670
okay guys thanks everybody alberto you

1732
00:59:33,829 --> 00:59:32,240
need to get on your vacation man and you

1733
00:59:34,950 --> 00:59:33,839
need to have a couple margaritas for me

1734
00:59:36,470 --> 00:59:34,960
while uh

1735
00:59:38,390 --> 00:59:36,480
i wish i were there because i would be

1736
00:59:40,549 --> 00:59:38,400
joining you so it didn't work i had a

1737
00:59:42,309 --> 00:59:40,559
few already so it's okay

1738
00:59:44,360 --> 00:59:42,319

you've already started then oh that's

1739
00:59:51,270 --> 00:59:44,370
how

1740
00:59:54,549 --> 00:59:53,270
okay so have fun alberto and i will see

1741
00:59:55,910 --> 00:59:54,559
you in the next hangout i don't know

1742
00:59:57,829 --> 00:59:55,920
when that's going to be actually we're

1743
00:59:59,990 --> 00:59:57,839
going to work on a schedule for these

1744
01:00:01,829 --> 01:00:00,000
and post them more regularly so i hope

1745
01:00:03,190 --> 01:00:01,839
you guys will check out the

1746
01:00:05,829 --> 01:00:03,200
hubble site

1747
01:00:07,829 --> 01:00:05,839
uh hubble hangout event page or follow

1748
01:00:09,430 --> 01:00:07,839
uh hubble space telescope on g plus to

1749
01:00:12,230 --> 01:00:09,440
find out we'll also post these on

1750
01:00:13,430 --> 01:00:12,240
facebook and twitter when we get closer

1751
01:00:15,270 --> 01:00:13,440
i don't know what the next one's going

1752
01:00:16,950 --> 01:00:15,280
to be but it'll be something with hubble

1753
01:00:20,150 --> 01:00:16,960
in it you can be sure

1754
01:00:22,950 --> 01:00:20,160
bonnie thank you so much you're welcome

1755
01:00:24,390 --> 01:00:22,960
all right max zolt thank you both you're

1756
01:00:26,549 --> 01:00:24,400
welcome all right we're looking forward

1757
01:00:27,349 --> 01:00:26,559
to calling you again that's it for this

1758
01:00:29,109 --> 01:00:27,359
oh

1759
01:00:31,190 --> 01:00:29,119
i'm sorry go ahead

1760
01:00:33,589 --> 01:00:31,200
no just see you next time oh

1761
01:00:35,190 --> 01:00:33,599
fair enough and that's my sign off so

1762
01:00:37,829 --> 01:00:35,200
thank you guys for watching and as

1763
01:00:39,109 --> 01:00:37,839

always keep looking up