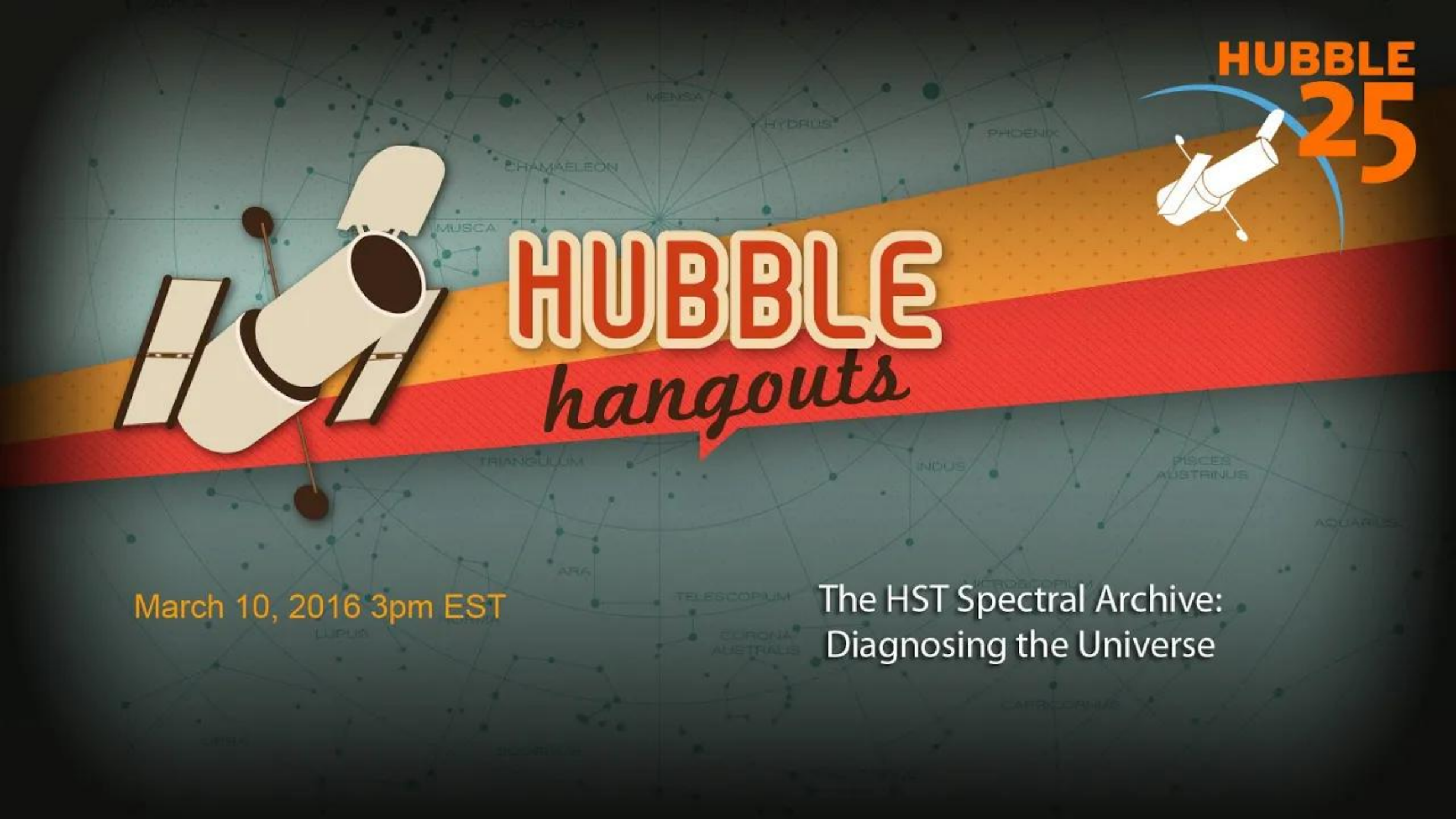
HUBBLE 25
HUBBLE
hangouts
March 10, 2016 3pm EST
The HST Spectral Archive:
Diagnosing the Universe

1
00:00:09,080 --> 00:00:07,010
hello everybody welcome back for this

2
00:00:10,669 --> 00:00:09,090
week's Hubble hang out my name is Tony

3
00:00:12,049 --> 00:00:10,679
Darnell and I think we've got another

4
00:00:13,839 --> 00:00:12,059
great hangout planned for you this week

5
00:00:18,500 --> 00:00:13,849
we're going to be talking about data and

6
00:00:20,179 --> 00:00:18,510
analyzing the universe and so we we've

7
00:00:21,349 --> 00:00:20,189
got all kinds of new stuff to show you

8
00:00:24,050 --> 00:00:21,359
some new data sets that are available

9
00:00:25,490 --> 00:00:24,060
not only just for astronomers and people

10
00:00:28,099 --> 00:00:25,500
doing research but also to the general

11
00:00:30,019 --> 00:00:28,109
public and so we're going to show you

12
00:00:31,040 --> 00:00:30,029
some of these tools we're going to talk

13
00:00:32,479 --> 00:00:31,050

about some of the data and some of the

14
00:00:34,700 --> 00:00:32,489
things you can learn from them and how

15
00:00:36,200 --> 00:00:34,710
you can access them as well but before I

16
00:00:40,450 --> 00:00:36,210
get into all of that I have to introduce

17
00:00:46,670 --> 00:00:44,240
introduce my co-host dr. carol christian

18
00:00:47,990 --> 00:00:46,680
she is the HST outreach project

19
00:00:51,740 --> 00:00:48,000
scientist see i can read i'm reading

20
00:00:53,990 --> 00:00:51,750
your little lower third prize hello

21
00:00:55,880 --> 00:00:54,000
everybody i have new skills i've just

22
00:00:58,910 --> 00:00:55,890
got mad skills and also joining me is

23
00:01:01,939 --> 00:00:58,920
scott lewis the online outreach what's

24
00:01:05,600 --> 00:01:01,949
that word specialist i am just special

25
00:01:07,609 --> 00:01:05,610
just put special no botanist yeah you

26
00:01:09,679 --> 00:01:07,619
know Scott our little a little meme of

27
00:01:11,690 --> 00:01:09,689
mo bigger mo better didn't catch on last

28
00:01:14,149 --> 00:01:11,700
week you know there's a I'd be as I

29
00:01:17,120 --> 00:01:14,159
didn't see it well I'll work on that

30
00:01:18,859 --> 00:01:17,130
yeah mo mo bigger mo bigger well today

31
00:01:20,539 --> 00:01:18,869
we're talking about mo better we r mo

32
00:01:22,219 --> 00:01:20,549
better today because we are going to be

33
00:01:24,530 --> 00:01:22,229
talking about some data that are coming

34
00:01:27,859 --> 00:01:24,540
from the Hubble Space Telescope and is

35
00:01:29,840 --> 00:01:27,869
being archived on that on the Mikulski

36
00:01:31,490 --> 00:01:29,850
archive for space telescopes now one of

37
00:01:32,929 --> 00:01:31,500
the things that you may not realize

38
00:01:35,450 --> 00:01:32,939

about what the Institute does in

39
00:01:37,219 --> 00:01:35,460
addition to operating the Hubble on a

40
00:01:38,960 --> 00:01:37,229
day to day basis it employs great many

41
00:01:41,929 --> 00:01:38,970
astronomers who do science with it also

42
00:01:46,219 --> 00:01:41,939
on a daily basis and but we also handle

43
00:01:47,960 --> 00:01:46,229
and distribute and serve the data that

44
00:01:49,700 --> 00:01:47,970
comes off of not just humble but a lot

45
00:01:51,020 --> 00:01:49,710
of different instruments and we're going

46
00:01:52,160 --> 00:01:51,030
to talk about that today with some of

47
00:01:54,410 --> 00:01:52,170
the people who were working on and

48
00:01:59,359 --> 00:01:54,420
joining me today is dr. Molly peoples

49
00:02:00,980 --> 00:01:59,369
estranha Molly ok and add she's gonna

50
00:02:02,510 --> 00:02:00,990
here to tell us about it she's been in

51
00:02:04,999 --> 00:02:02,520
hangouts before welcome back Polly it's

52
00:02:06,830 --> 00:02:05,009
good to see you again we're also to

53
00:02:08,240 --> 00:02:06,840
explain the archive with us dr. Jason

54
00:02:13,100 --> 00:02:08,250
Tomlinson he's been on these before he

55
00:02:13,700 --> 00:02:13,110
is not on Twitter as his as the has in

56
00:02:15,470 --> 00:02:13,710
his

57
00:02:18,860 --> 00:02:15,480
heard everybody says I'm getting a lot

58
00:02:21,260 --> 00:02:18,870
of sweet Lonnie yeah so welcome Jason

59
00:02:25,580 --> 00:02:21,270
good glad notice a note on Twitter okay

60
00:02:27,410 --> 00:02:25,590
I get it no no tundra not on Twitter yes

61
00:02:29,450 --> 00:02:27,420
and so everybody says eating a lot of

62
00:02:31,460 --> 00:02:29,460
glare from my glasses so I should

63
00:02:34,580 --> 00:02:31,470

probably back up I'll do this then okay

64
00:02:37,070 --> 00:02:34,590
so there we go sorry I can't do it it's

65
00:02:40,280 --> 00:02:37,080
still there yeah that's okay I'll dirt

66
00:02:42,980 --> 00:02:40,290
yeah that's good that's good how about I

67
00:02:45,230 --> 00:02:42,990
can look up like this yeah so can we do

68
00:02:47,360 --> 00:02:45,240
spectroscopy and what's being reflected

69
00:02:49,070 --> 00:02:47,370
the dresser you can watch me surf the

70
00:02:51,650 --> 00:02:49,080
internet while I'm gonna doing to hang

71
00:02:54,170 --> 00:02:51,660
out I got I guess I better keep it clean

72
00:02:55,940 --> 00:02:54,180
huh okay so we we want you guys to

73
00:02:58,970 --> 00:02:55,950
interact with us and ask us questions

74
00:03:00,680 --> 00:02:58,980
and talk to us about these the the

75
00:03:01,730 --> 00:03:00,690
babies we're going to be showing you as

76
00:03:03,710 --> 00:03:01,740
well as any questions you might have

77
00:03:05,710 --> 00:03:03,720
regarding Hubble or some of the science

78
00:03:07,640 --> 00:03:05,720
that can be done with this with this

79
00:03:09,260 --> 00:03:07,650
data that we're going to be showing you

80
00:03:11,750 --> 00:03:09,270
but before we do we should tell you how

81
00:03:13,940 --> 00:03:11,760
to do it now one of a there's a hint

82
00:03:16,040 --> 00:03:13,950
right there on my lower third I am on

83
00:03:17,570 --> 00:03:16,050
Twitter but I'm also looking for that

84
00:03:19,340 --> 00:03:17,580
and I'm gonna have Scott tell you how to

85
00:03:20,930 --> 00:03:19,350
do it Scotty that's right i mean it kind

86
00:03:23,060 --> 00:03:20,940
of helps if we show you how we can do

87
00:03:24,770 --> 00:03:23,070
that so he bests the way since you're

88
00:03:26,450 --> 00:03:24,780

watching it's live right now hopefully

89
00:03:27,710 --> 00:03:26,460
I'm if you're not we'll we'll give you

90
00:03:29,090 --> 00:03:27,720
those other things later but as I'm

91
00:03:30,620 --> 00:03:29,100
seeing here we have a bunch of people in

92
00:03:32,870 --> 00:03:30,630
our live chat so we're up on YouTube

93
00:03:35,060 --> 00:03:32,880
right now i'm using a youtube live event

94
00:03:37,130 --> 00:03:35,070
and so i'm seeing a bunch of people

95
00:03:40,490 --> 00:03:37,140
already commenting so hello everyone in

96
00:03:42,860 --> 00:03:40,500
the youtube live chat hello is Tony had

97
00:03:44,480 --> 00:03:42,870
mentioned we are on Twitter she will be

98
00:03:46,370 --> 00:03:44,490
live tweeting this event ins as far as

99
00:03:47,750 --> 00:03:46,380
any pictures and links that are going on

100
00:03:49,370 --> 00:03:47,760
with it and we'll be using the hashtag

101
00:03:51,680 --> 00:03:49,380
Hubble hang out so if you have any

102
00:03:54,140 --> 00:03:51,690
questions or comments about spectroscopy

103
00:03:56,720 --> 00:03:54,150
and the topics that will be hitting

104
00:03:59,120 --> 00:03:56,730
today please use that hashtag hub will

105
00:04:00,200 --> 00:03:59,130
hang out and I'm also monitoring the the

106
00:04:02,090 --> 00:04:00,210
comments that are being put up on her

107
00:04:03,680 --> 00:04:02,100
Facebook and Google+ events so if you

108
00:04:05,720 --> 00:04:03,690
have anything like that I will try to

109
00:04:07,310 --> 00:04:05,730
get to them but the best and most

110
00:04:10,640 --> 00:04:07,320
efficient way is the YouTube live chat

111
00:04:12,920 --> 00:04:10,650
and on Twitter okay so someone just

112
00:04:15,110 --> 00:04:12,930
joined who is this John yeah this is

113
00:04:18,050 --> 00:04:15,120

John okay hi John you want to reduce

114
00:04:19,310 --> 00:04:18,060
yourself yeah I'm John O'Mara from st.

115
00:04:21,590 --> 00:04:19,320
Michael's College in the great state of

116
00:04:22,730 --> 00:04:21,600
Vermont frequent Hubble user oh cool

117
00:04:24,500 --> 00:04:22,740
alright so you're here to tell us about

118
00:04:26,450 --> 00:04:24,510
the spectral archive as well you're

119
00:04:27,660 --> 00:04:26,460
awesome great well we're getting started

120
00:04:29,220 --> 00:04:27,670
just now so welcome

121
00:04:30,390 --> 00:04:29,230
uh we would like to have you have a

122
00:04:31,740 --> 00:04:30,400
lower third but we don't have time to

123
00:04:34,170 --> 00:04:31,750
get into that right now so we'll just go

124
00:04:36,090 --> 00:04:34,180
ahead and get started so as I mentioned

125
00:04:39,330 --> 00:04:36,100
at the start of this we are we're

126
00:04:41,400 --> 00:04:39,340
talking about the Hubble uh the Hubble

127
00:04:44,910 --> 00:04:41,410
spectral archive now we in the past

128
00:04:46,710 --> 00:04:44,920
we've given you hangouts on the Hubble

129
00:04:48,480 --> 00:04:46,720
legacy archive which has to do with old

130
00:04:50,250 --> 00:04:48,490
the older data that the hubble hubble

131
00:04:52,470 --> 00:04:50,260
spin around for 25 years folks so we've

132
00:04:53,610 --> 00:04:52,480
got a lot of data to serve and from all

133
00:04:56,330 --> 00:04:53,620
kinds of different instruments there's

134
00:04:58,710 --> 00:04:56,340
also the mast archive in general which

135
00:05:00,780 --> 00:04:58,720
hosts not just data from Hubble but

136
00:05:02,790 --> 00:05:00,790
carol can you give us a brief background

137
00:05:05,580 --> 00:05:02,800
what are some of the other instruments

138
00:05:10,050 --> 00:05:05,590

that we're serving data from in the in

139
00:05:13,070 --> 00:05:10,060
the archive oh my god well it's a lot

140
00:05:16,140 --> 00:05:13,080
right there's no yo yes all the Hubble

141
00:05:19,680 --> 00:05:16,150
and people are most familiar with the

142
00:05:21,120 --> 00:05:19,690
imagery from the old cameras you know we

143
00:05:23,850 --> 00:05:21,130
still we have all the imagery from the

144
00:05:26,390 --> 00:05:23,860
old cameras that were removed like with

145
00:05:30,300 --> 00:05:26,400
pick and pick two and things like that

146
00:05:33,000 --> 00:05:30,310
we had wide field camera 3 advanced

147
00:05:35,340 --> 00:05:33,010
camera for surveys etc and then the

148
00:05:38,160 --> 00:05:35,350
spectrographs this dis and call cost as

149
00:05:43,350 --> 00:05:38,170
they're called but we have something

150
00:05:46,910 --> 00:05:43,360
like 13 missions in the archive and the

151
00:05:50,250 --> 00:05:46,920
great thing is that with those data now

152
00:05:53,490 --> 00:05:50,260
you don't have to select each mission

153
00:05:55,320 --> 00:05:53,500
and look for your favorite object you

154
00:05:58,260 --> 00:05:55,330
can go to something called the portal

155
00:06:02,520 --> 00:05:58,270
and you enter the name or the

156
00:06:04,410 --> 00:06:02,530
coordinates of the object and it will go

157
00:06:06,630 --> 00:06:04,420
out and depending on what you have

158
00:06:08,700 --> 00:06:06,640
specified if you specify nothing it's it

159
00:06:12,660 --> 00:06:08,710
searches for everything if you specify

160
00:06:15,210 --> 00:06:12,670
like a oval or spitzer or genre or other

161
00:06:17,070 --> 00:06:15,220
other archives it will tell you what

162
00:06:20,790 --> 00:06:17,080
data it has and then if you want that

163
00:06:23,390 --> 00:06:20,800

data to analyze you can get it and

164
00:06:26,040 --> 00:06:23,400
download it and use your favorite

165
00:06:30,480 --> 00:06:26,050
reduction technique the idea what the

166
00:06:32,520 --> 00:06:30,490
spectra is well imagery it's true for

167
00:06:35,010 --> 00:06:32,530
imagery to is that that one of the ideas

168
00:06:37,350 --> 00:06:35,020
of the hubble legacy archive was that

169
00:06:40,910 --> 00:06:37,360
you don't want to just astronomers are

170
00:06:42,680 --> 00:06:40,920
tired of downloading all of the raw

171
00:06:44,900 --> 00:06:42,690
before they can even see what they're

172
00:06:47,770 --> 00:06:44,910
going to get so the idea of the Hubble

173
00:06:50,000 --> 00:06:47,780
legacy archive was to process the data

174
00:06:51,860 --> 00:06:50,010
calibrate it to an astronomer can take

175
00:06:53,720 --> 00:06:51,870
the data and say wow that's what I have

176
00:06:56,150 --> 00:06:53,730
yes that's what I want now I'm going to

177
00:06:58,550 --> 00:06:56,160
do some analysis on it so the spectral

178
00:07:00,650 --> 00:06:58,560
archive we haven't had that and so the

179
00:07:02,630 --> 00:07:00,660
idea it's a it's a lot of work to put it

180
00:07:06,530 --> 00:07:02,640
together and you have to be careful that

181
00:07:08,750 --> 00:07:06,540
the calibration is right and collect as

182
00:07:11,330 --> 00:07:08,760
much of the specter as possible and now

183
00:07:12,620 --> 00:07:11,340
people will be able to you know get the

184
00:07:16,400 --> 00:07:12,630
spectra so we're going to learn all

185
00:07:17,810 --> 00:07:16,410
about that because astronomers hey they

186
00:07:19,760 --> 00:07:17,820
would like to look at the data as its

187
00:07:22,040 --> 00:07:19,770
process apiece some of us are lazy and

188
00:07:24,260 --> 00:07:22,050

we just like to have the observatory do

189
00:07:26,630 --> 00:07:24,270
that calibration for us and at least get

190
00:07:28,640 --> 00:07:26,640
a first hint of the kind of astrophysics

191
00:07:33,140 --> 00:07:28,650
that we can do with that so it's pretty

192
00:07:36,740 --> 00:07:33,150
cool it's not just laziness it's also

193
00:07:39,110 --> 00:07:36,750
okay on my part I said like me well it's

194
00:07:41,870 --> 00:07:39,120
also you know 10 years from now 15 years

195
00:07:43,820 --> 00:07:41,880
from now when these instruments haven't

196
00:07:45,800 --> 00:07:43,830
forbid or no longer active we want the

197
00:07:48,640 --> 00:07:45,810
data to still be useful and they will

198
00:07:51,530 --> 00:07:48,650
still be useful um but as the expertise

199
00:07:54,070 --> 00:07:51,540
moves on to other things and the people

200
00:07:56,030 --> 00:07:54,080
who are actively maintaining the

201
00:07:58,510 --> 00:07:56,040
calibration and integrity of the

202
00:08:01,310 --> 00:07:58,520
instruments are not doing that anymore

203
00:08:04,430 --> 00:08:01,320
we want to leave behind a strong legacy

204
00:08:06,620 --> 00:08:04,440
of data for future generations of people

205
00:08:08,900 --> 00:08:06,630
to still be able to use and discover new

206
00:08:10,670 --> 00:08:08,910
things from okay so let's go ahead and

207
00:08:12,950 --> 00:08:10,680
get to this particular archive there now

208
00:08:14,660 --> 00:08:12,960
the over the years this this interface

209
00:08:16,280 --> 00:08:14,670
has undergone quite a quite a bit of

210
00:08:18,290 --> 00:08:16,290
quite a few changes it's gotten a lot

211
00:08:19,550 --> 00:08:18,300
easier to use for scientists oh look I'm

212
00:08:21,380 --> 00:08:19,560
going to do this now so people don't

213
00:08:23,990 --> 00:08:21,390

have to would be with that people have

214
00:08:25,940 --> 00:08:24,000
gotten it's gotten a lot more easier to

215
00:08:29,210 --> 00:08:25,950
use over the years but Jason can you

216
00:08:30,650 --> 00:08:29,220
give us some background on what the what

217
00:08:31,880 --> 00:08:30,660
we're talking about today the spectral

218
00:08:34,670 --> 00:08:31,890
archive itself give us some background

219
00:08:36,350 --> 00:08:34,680
on why why has just been set up and have

220
00:08:37,670 --> 00:08:36,360
the data always been there and it's just

221
00:08:39,530 --> 00:08:37,680
recently become available through this

222
00:08:41,630 --> 00:08:39,540
yeah or give us a background on this

223
00:08:44,350 --> 00:08:41,640
yeah so it's funny you say that the

224
00:08:47,360 --> 00:08:44,360
interface has changed all over the years

225
00:08:50,840 --> 00:08:47,370
you know I like to think I'm still pre

226
00:08:53,480 --> 00:08:50,850
mid career so I'm not that old that I

227
00:08:55,010 --> 00:08:53,490
remember when you got used to get your

228
00:09:01,880 --> 00:08:55,020
hair is a lot less greater than

229
00:09:04,370 --> 00:09:01,890
fine in fact I don't see any hahahaha I

230
00:09:05,720 --> 00:09:04,380
remember the days back in the 90s when

231
00:09:07,070 --> 00:09:05,730
we were working with the instrument

232
00:09:09,050 --> 00:09:07,080
called the faint object spectrograph

233
00:09:11,030 --> 00:09:09,060
that was the first generation instrument

234
00:09:13,100 --> 00:09:11,040
on Hubble and you would get your data

235
00:09:14,720 --> 00:09:13,110
mailed to you on these little magnetic

236
00:09:17,420 --> 00:09:14,730
tapes that were about as big as a

237
00:09:19,250 --> 00:09:17,430
playing card sort of like maybes big the

238
00:09:21,230 --> 00:09:19,260

business card and you would put that in

239
00:09:22,940 --> 00:09:21,240
your machine and you would issue lots of

240
00:09:26,030 --> 00:09:22,950
obscure commands to read your day off

241
00:09:28,880 --> 00:09:26,040
with a deal T tapes ordeal tease exabyte

242
00:09:30,680 --> 00:09:28,890
was what I had X of my tonight and we

243
00:09:36,860 --> 00:09:30,690
had to carry the stacks of them through

244
00:09:39,020 --> 00:09:36,870
the snow remember I better punch cards

245
00:09:41,510 --> 00:09:39,030
in floppy disks okay I'm to the old mag

246
00:09:44,390 --> 00:09:41,520
day and remember though is Jason's to

247
00:09:46,040 --> 00:09:44,400
you Irene was Kirk was a tape into your

248
00:09:48,230 --> 00:09:46,050
machine you then had to shovel work hole

249
00:09:51,680 --> 00:09:48,240
into the machine to read the tape I know

250
00:09:53,810 --> 00:09:51,690
or and pray it was based on videotape

251
00:09:55,940 --> 00:09:53,820
technology so was amazing the stuff ran

252
00:09:57,620 --> 00:09:55,950
at all and you're always like oh god I

253
00:10:00,770 --> 00:09:57,630
hope I can rehash data back off again

254
00:10:02,330 --> 00:10:00,780
yeah yeah those days you is a huge deal

255
00:10:05,540 --> 00:10:02,340
when you started being able to get your

256
00:10:06,710 --> 00:10:05,550
data from Hubble over the internet

257
00:10:08,450 --> 00:10:06,720
because then you could get it within a

258
00:10:11,750 --> 00:10:08,460
matter of you know weeks instead of

259
00:10:14,290 --> 00:10:11,760
months and it's now down to the point

260
00:10:16,520 --> 00:10:14,300
because the archive has that

261
00:10:19,040 --> 00:10:16,530
continuously improve this technology

262
00:10:20,750 --> 00:10:19,050
it's now down to the point where you can

263
00:10:22,790 --> 00:10:20,760

get your data sometimes within hours of

264
00:10:25,850 --> 00:10:22,800
the telescope taking your data my

265
00:10:28,460 --> 00:10:25,860
personal record a program i did a few

266
00:10:30,980 --> 00:10:28,470
years ago with Hubble the data made it

267
00:10:33,320 --> 00:10:30,990
from the instrument costs to the

268
00:10:35,330 --> 00:10:33,330
computers on the observatory down

269
00:10:36,740 --> 00:10:35,340
through the TDRs satellites that NASA

270
00:10:39,110 --> 00:10:36,750
operates to communicate with the

271
00:10:40,460 --> 00:10:39,120
satellite in orbit through White Sands

272
00:10:42,020 --> 00:10:40,470
Missile Range through goddard space

273
00:10:45,950 --> 00:10:42,030
flight center and here to the Institute

274
00:10:47,690 --> 00:10:45,960
in two and a half hours so you know two

275
00:10:50,060 --> 00:10:47,700
and a half hours from the data being

276
00:10:51,710 --> 00:10:50,070
taken by Hubble we had it on my postdocs

277
00:10:54,830 --> 00:10:51,720
laptop and we were dancing a little you

278
00:10:57,530 --> 00:10:54,840
know Jacob haha and what one was a paper

279
00:11:01,820 --> 00:10:57,540
written uh about a year and a half later

280
00:11:04,580 --> 00:11:01,830
oh so that little okay so I make it

281
00:11:04,580 --> 00:11:04,590
short period of time

282
00:11:08,580 --> 00:11:07,350
well we've talked about data quite a few

283
00:11:10,019 --> 00:11:08,590
quite a bit here on these on these

284
00:11:11,400 --> 00:11:10,029
hangouts where the Hubble data the

285
00:11:13,710 --> 00:11:11,410
process for getting in the fact that

286
00:11:16,380 --> 00:11:13,720
because Hubble is run by NASA and as a

287
00:11:19,769 --> 00:11:16,390
taxpayer funded program everybody

288
00:11:21,660 --> 00:11:19,779

ultimately gets access to the data but

289
00:11:22,769 --> 00:11:21,670
the scientists the ones who and carol

290
00:11:24,060 --> 00:11:22,779
has told us about this before with the

291
00:11:25,890 --> 00:11:24,070
time allocation committee and things

292
00:11:28,410 --> 00:11:25,900
like that where when you get time on

293
00:11:31,050 --> 00:11:28,420
hubble and you take your data you're

294
00:11:33,510 --> 00:11:31,060
given the first usually the first shot

295
00:11:36,390 --> 00:11:33,520
at that data it's something called one

296
00:11:37,980 --> 00:11:36,400
bar going proprietary period for well

297
00:11:40,260 --> 00:11:37,990
usually it's less about a year unless

298
00:11:41,579 --> 00:11:40,270
something special is arranged or unless

299
00:11:43,200 --> 00:11:41,589
there's it's done with double the

300
00:11:44,550 --> 00:11:43,210
director discretionary time in which

301
00:11:47,130 --> 00:11:44,560
case the data become available to the

302
00:11:51,290 --> 00:11:47,140
public right away for everybody and this

303
00:11:54,000 --> 00:11:51,300
so somali this stuff here this this uh

304
00:11:56,790 --> 00:11:54,010
spectral data that we've got it does it

305
00:11:58,500 --> 00:11:56,800
fall under the same kind of umbrella as

306
00:12:00,269 --> 00:11:58,510
the other visual data my goods are

307
00:12:02,010 --> 00:12:00,279
proprietary period does it take is there

308
00:12:04,019 --> 00:12:02,020
a delay between when it's taken and when

309
00:12:08,310 --> 00:12:04,029
it's available the we're talking about

310
00:12:10,770 --> 00:12:08,320
today are the the actual data is the

311
00:12:12,120 --> 00:12:10,780
exact same data that if you went into

312
00:12:16,200 --> 00:12:12,130
the mass portal that carol was

313
00:12:19,860 --> 00:12:16,210

describing and searched for what is

314
00:12:22,440 --> 00:12:19,870
publicly available data that cost has

315
00:12:24,630 --> 00:12:22,450
looked at in the far ultraviolet and you

316
00:12:26,100 --> 00:12:24,640
just downloaded all of that which is

317
00:12:29,250 --> 00:12:26,110
what we did a few weeks ago when

318
00:12:31,260 --> 00:12:29,260
preparing the final release uh that's

319
00:12:35,760 --> 00:12:31,270
the data that we're talking about today

320
00:12:39,180 --> 00:12:35,770
um but the extra value that we've given

321
00:12:40,590 --> 00:12:39,190
to that is uh when the data are taken

322
00:12:43,620 --> 00:12:40,600
they're taken in lots of different

323
00:12:45,720 --> 00:12:43,630
exposures that in order to actually do

324
00:12:47,490 --> 00:12:45,730
science on you want to add up the

325
00:12:51,090 --> 00:12:47,500
different exposures to get a deeper

326
00:12:54,900 --> 00:12:51,100
higher signal-to-noise spectrum the same

327
00:12:56,760 --> 00:12:54,910
way that with images you take a bunch of

328
00:13:00,240 --> 00:12:56,770
images and then you combine them to get

329
00:13:03,960 --> 00:13:00,250
a higher resolution deeper image and

330
00:13:06,810 --> 00:13:03,970
that combining of images has been

331
00:13:10,410 --> 00:13:06,820
available in the archive for users for

332
00:13:12,230 --> 00:13:10,420
decades but has not yet been available

333
00:13:15,740 --> 00:13:12,240
at the level we are delivered

334
00:13:17,570 --> 00:13:15,750
in this archive now for spectra yeah I

335
00:13:20,870 --> 00:13:17,580
would say the analogy I would use is

336
00:13:23,510 --> 00:13:20,880
that you know imagine you're going to do

337
00:13:25,880 --> 00:13:23,520
research on a paper you're writing it

338
00:13:27,560 --> 00:13:25,890

most people wrote their term papers in

339
00:13:28,850 --> 00:13:27,570
there with college and let's say you're

340
00:13:31,160 --> 00:13:28,860
going to do research and you went to the

341
00:13:35,180 --> 00:13:31,170
library and the librarian handed you a

342
00:13:37,220 --> 00:13:35,190
stack of pages instead of a book and you

343
00:13:38,449 --> 00:13:37,230
had to figure out what paid what or the

344
00:13:40,850 --> 00:13:38,459
pages should be in before you can even

345
00:13:42,019 --> 00:13:40,860
get started on on your research that's

346
00:13:44,810 --> 00:13:42,029
kind of where we've been with our

347
00:13:47,300 --> 00:13:44,820
spectroscopy for years and years we gave

348
00:13:49,280 --> 00:13:47,310
people the individual exposures but we

349
00:13:51,260 --> 00:13:49,290
weren't putting them together into that

350
00:13:53,180 --> 00:13:51,270
fully combined way that would allow them

351
00:13:54,860 --> 00:13:53,190
to do their science from day one Scott

352
00:13:57,380 --> 00:13:54,870
could you float that flow chart what

353
00:13:59,870 --> 00:13:57,390
hang on hang on just a sec so while you

354
00:14:01,610 --> 00:13:59,880
while you are looking at the data or

355
00:14:03,620 --> 00:14:01,620
you're going through the data in this

356
00:14:06,440 --> 00:14:03,630
sort of difficult format you were

357
00:14:08,510 --> 00:14:06,450
talking about Jason doing the science on

358
00:14:10,760 --> 00:14:08,520
it has been somewhat difficult now most

359
00:14:12,769 --> 00:14:10,770
people who use Hubble data like to use

360
00:14:14,630 --> 00:14:12,779
the images they most Hubble huggers that

361
00:14:16,250 --> 00:14:14,640
I know of in the pub general public we

362
00:14:19,460 --> 00:14:16,260
care about the images but molly was just

363
00:14:21,680 --> 00:14:19,470

mentioning before before we started that

364
00:14:23,449 --> 00:14:21,690
real science is done with the spectrum

365
00:14:24,889 --> 00:14:23,459
so let's go ahead and start and then

366
00:14:26,600 --> 00:14:24,899
we'll put up the the flowchart that

367
00:14:27,949 --> 00:14:26,610
Molly talking about but list I want to

368
00:14:29,870 --> 00:14:27,959
take a look at the archive so Scott if

369
00:14:32,090 --> 00:14:29,880
you'll put that up let's let's take a

370
00:14:35,750 --> 00:14:32,100
look at what what we're talking about

371
00:14:38,389 --> 00:14:35,760
here this is available this is there it

372
00:14:40,960 --> 00:14:38,399
is so this is based off of the Mikulski

373
00:14:44,660 --> 00:14:40,970
archive for space telescopes masked and

374
00:14:47,600 --> 00:14:44,670
this so tell us a little bit about what

375
00:14:49,100 --> 00:14:47,610
we're looking at here Molly um well

376
00:14:51,980 --> 00:14:49,110
right now what's slipping through or

377
00:14:55,329 --> 00:14:51,990
just some images of what you get if you

378
00:14:58,550 --> 00:14:55,339
click through the individual portal um

379
00:15:01,730 --> 00:14:58,560
which will will do in a bit if you

380
00:15:03,350 --> 00:15:01,740
wanted to go back to this question of

381
00:15:04,699 --> 00:15:03,360
what what is the science that you're

382
00:15:08,990 --> 00:15:04,709
able to do with spectra that you just

383
00:15:13,490 --> 00:15:09,000
simply aren't able to get with regular

384
00:15:15,290 --> 00:15:13,500
images um the traditional way I mean so

385
00:15:17,420 --> 00:15:15,300
one way to think of it is these images

386
00:15:20,230 --> 00:15:17,430
keep keep flipping through is you see

387
00:15:24,160 --> 00:15:20,240
all these squiggly lines on here um

388
00:15:26,139 --> 00:15:24,170

that's not noise that's where the

389
00:15:28,629 --> 00:15:26,149
information is so in these where you see

390
00:15:30,699 --> 00:15:28,639
these bright emission lines the lights

391
00:15:32,560 --> 00:15:30,709
going up a lot of these absorption lines

392
00:15:33,910 --> 00:15:32,570
where you see little divots in the light

393
00:15:37,900 --> 00:15:33,920
or like you know this one that's this

394
00:15:42,280 --> 00:15:37,910
big comb of lines or this one um there

395
00:15:45,879 --> 00:15:42,290
those correspond to individual elements

396
00:15:49,030 --> 00:15:45,889
have different quantum signatures that

397
00:15:53,710 --> 00:15:49,040
respond to light differently and as it

398
00:15:56,650 --> 00:15:53,720
turns out um most of the gas in the

399
00:15:59,769 --> 00:15:56,660
universe um is that temperatures and

400
00:16:01,660 --> 00:15:59,779
densities such that the wavelengths of

401
00:16:04,269 --> 00:16:01,670
light that it most interacts with are in

402
00:16:06,040 --> 00:16:04,279
the ultraviolet um and so you have to go

403
00:16:09,040 --> 00:16:06,050
to space in order to see this light

404
00:16:12,310 --> 00:16:09,050
which is why this Hubble spectryx Copic

405
00:16:14,350 --> 00:16:12,320
archive is so powerful um and eat the

406
00:16:16,600 --> 00:16:14,360
location of each of these lines and the

407
00:16:20,470 --> 00:16:16,610
patterns tell you about the physical

408
00:16:22,780 --> 00:16:20,480
conditions of what's causing either the

409
00:16:24,970 --> 00:16:22,790
submission or absorption which can

410
00:16:29,650 --> 00:16:24,980
really get at what what is the physics

411
00:16:32,769 --> 00:16:29,660
of this star or this diffuse gas around

412
00:16:34,689 --> 00:16:32,779
this galaxy or the atmosphere of this

413
00:16:37,840 --> 00:16:34,699

planet that's passing in front of front

414
00:16:39,610 --> 00:16:37,850
of most are so I wanted to interject

415
00:16:43,900 --> 00:16:39,620
that as people are looking at the

416
00:16:46,540 --> 00:16:43,910
spectra when you see the big dips that's

417
00:16:50,560 --> 00:16:46,550
where an element or a molecule has

418
00:16:52,600 --> 00:16:50,570
absorbed the light so for example we see

419
00:16:55,480 --> 00:16:52,610
this in the Sun as well so you have the

420
00:16:57,490 --> 00:16:55,490
light that comes from the Sun and then

421
00:17:00,759 --> 00:16:57,500
in the outer atmosphere or there are

422
00:17:03,610 --> 00:17:00,769
elements that absorb in other cases

423
00:17:08,140 --> 00:17:03,620
there might the the absorption might be

424
00:17:10,539 --> 00:17:08,150
done at the store or it might be

425
00:17:12,880 --> 00:17:10,549
intervening material sometimes we use

426
00:17:15,069 --> 00:17:12,890
the parent star and the light that goes

427
00:17:16,990 --> 00:17:15,079
through the atmosphere of a planet if it

428
00:17:19,230 --> 00:17:17,000
happens to pass in front of it and we

429
00:17:22,539 --> 00:17:19,240
can look at what molecule or chem

430
00:17:24,340 --> 00:17:22,549
chemical is absorbing in other cases in

431
00:17:27,340 --> 00:17:24,350
some of these things you're seeing when

432
00:17:30,310 --> 00:17:27,350
you see these spikes that go up that's

433
00:17:33,399 --> 00:17:30,320
when a particular chemical element is

434
00:17:35,770 --> 00:17:33,409
emitting and then you can also determine

435
00:17:37,990 --> 00:17:35,780
not only that the chemical is there but

436
00:17:42,460 --> 00:17:38,000
as Molly said what's the temp

437
00:17:44,530 --> 00:17:42,470
what the conditions are that create an

438
00:17:46,360 --> 00:17:44,540

environment for the chemical and so you

439
00:17:48,970 --> 00:17:46,370
don't look at just one chemical you look

440
00:17:50,170 --> 00:17:48,980
at all of them so that you can and

441
00:17:52,570 --> 00:17:50,180
that's why it's astrophysics you're

442
00:17:55,480 --> 00:17:52,580
looking at the physical conditions in

443
00:17:58,180 --> 00:17:55,490
which caused either the absorption the

444
00:18:01,300 --> 00:17:58,190
emission or sometimes you get both and

445
00:18:03,880 --> 00:18:01,310
in an object right and so as we've

446
00:18:07,000 --> 00:18:03,890
pointed out before with past data

447
00:18:08,680 --> 00:18:07,010
archive hangouts the images that we see

448
00:18:10,660 --> 00:18:08,690
from Hubble usually come from things

449
00:18:12,130 --> 00:18:10,670
like wide field camera 3 the whip c3

450
00:18:14,230 --> 00:18:12,140
they also in the past have come through

451
00:18:15,610 --> 00:18:14,240
over the 25 years Hubble has been up

452
00:18:17,680 --> 00:18:15,620
there it has had a lot of different

453
00:18:20,020 --> 00:18:17,690
cameras they take really amazing

454
00:18:22,240 --> 00:18:20,030
pictures we've all seen that but as both

455
00:18:24,310 --> 00:18:22,250
both Molly and Carol just pointed out

456
00:18:26,710 --> 00:18:24,320
these are these are the kinds of data

457
00:18:28,960 --> 00:18:26,720
that you can get different information

458
00:18:32,680 --> 00:18:28,970
from remember last week when we told you

459
00:18:35,140 --> 00:18:32,690
that we told you about exactly Alex this

460
00:18:36,610 --> 00:18:35,150
most distant galaxies and the end they

461
00:18:38,140 --> 00:18:36,620
were looking at it through through

462
00:18:39,430 --> 00:18:38,150
different filters and they can kind of

463
00:18:41,860 --> 00:18:39,440

get a sense because of how bright it

464
00:18:43,450 --> 00:18:41,870
wasn't a filter where how far away that

465
00:18:46,090 --> 00:18:43,460
galaxy was that's called a photometric

466
00:18:47,860 --> 00:18:46,100
redshift is nowhere near is accurate as

467
00:18:49,390 --> 00:18:47,870
what we're talking about here by looking

468
00:18:51,850 --> 00:18:49,400
at that galaxy through getting its

469
00:18:53,170 --> 00:18:51,860
spectra you can actually see the red

470
00:18:55,900 --> 00:18:53,180
shift and Molly was alluding to the fact

471
00:18:58,030 --> 00:18:55,910
that this is where the meat the the meat

472
00:18:59,800 --> 00:18:58,040
potatoes are where the tire the the

473
00:19:03,460 --> 00:18:59,810
rubber hits the road whether analogy can

474
00:19:06,940 --> 00:19:03,470
I hit it's like this is gonna make the

475
00:19:08,920 --> 00:19:06,950
same check yeah it's just a very wise

476
00:19:11,140 --> 00:19:08,930
man once said the astronomer of

477
00:19:15,810 --> 00:19:11,150
spectroscopy somebody help train me said

478
00:19:17,950 --> 00:19:15,820
a spectrum is worth a thousand pictures

479
00:19:21,480 --> 00:19:17,960
spectrum is worth a thousand pictures so

480
00:19:23,650 --> 00:19:21,490
there you go and with with the with the

481
00:19:25,270 --> 00:19:23,660
two int there's two instruments on

482
00:19:27,310 --> 00:19:25,280
hubble right now that from which this

483
00:19:28,870 --> 00:19:27,320
data are well maybe there's more Molly

484
00:19:30,670 --> 00:19:28,880
and you guys can tell me know but this

485
00:19:33,010 --> 00:19:30,680
is the cosmic origins spectrograph and

486
00:19:34,810 --> 00:19:33,020
the spectrograph which I don't remember

487
00:19:37,540 --> 00:19:34,820
what that stands for its telescope

488
00:19:40,060 --> 00:19:37,550

imaging spectrograph oh there you go and

489
00:19:42,280 --> 00:19:40,070
these were mostly everything as it turns

490
00:19:45,250 --> 00:19:42,290
out it has a imaging camera it has a

491
00:19:47,110 --> 00:19:45,260
spectrograph and has a coronagraph it

492
00:19:49,060 --> 00:19:47,120
can you know make your coffee in the

493
00:19:50,740 --> 00:19:49,070
morning it does basically everything

494
00:19:52,240 --> 00:19:50,750
doesn't do back rubs cuz that would be

495
00:19:55,120 --> 00:19:52,250
okay well that's great so

496
00:19:56,860 --> 00:19:55,130
so and at and as we've talked about in

497
00:19:58,090 --> 00:19:56,870
his curls and both Molly have said in

498
00:20:00,760 --> 00:19:58,100
this this hangout this is it these are

499
00:20:02,020 --> 00:20:00,770
give you wavelengths that you have to

500
00:20:04,510 --> 00:20:02,030
get out into space to see the

501
00:20:06,190 --> 00:20:04,520
ultraviolet and help us Hubble's the

502
00:20:09,550 --> 00:20:06,200
only one in town the only game in town

503
00:20:11,380 --> 00:20:09,560
for this wavelength right guys so so the

504
00:20:14,320 --> 00:20:11,390
interesting thing about this is that you

505
00:20:16,380 --> 00:20:14,330
know the reason we can't see these

506
00:20:18,970 --> 00:20:16,390
wavelengths from the ground is that the

507
00:20:21,430 --> 00:20:18,980
atmosphere and particularly the ozone in

508
00:20:22,960 --> 00:20:21,440
the atmosphere very efficiently blocks

509
00:20:24,760 --> 00:20:22,970
these wavelengths these are the

510
00:20:26,800 --> 00:20:24,770
wavelengths in the ultraviolet that

511
00:20:28,780 --> 00:20:26,810
would give you a very very bad suntan

512
00:20:31,120 --> 00:20:28,790
right so it's a good thing you're right

513
00:20:33,190 --> 00:20:31,130

okay I like to stay you can either have

514
00:20:35,230 --> 00:20:33,200
UV astronomy from the ground or you can

515
00:20:40,420 --> 00:20:35,240
have all life on Earth but you can't

516
00:20:44,320 --> 00:20:40,430
have both choose wisely so since we

517
00:20:45,910 --> 00:20:44,330
decided it was no UV astronomy and well

518
00:20:48,040 --> 00:20:45,920
you know there's a few of us already

519
00:20:50,170 --> 00:20:48,050
burst into flames when I'm outside as is

520
00:20:53,020 --> 00:20:50,180
so if that happened to where if not

521
00:20:54,670 --> 00:20:53,030
being absorbed by we're I'm just faced

522
00:20:58,270 --> 00:20:54,680
and do your duty astronomy from the

523
00:21:00,310 --> 00:20:58,280
ground but anyway uh yeah so that's it

524
00:21:03,190 --> 00:21:00,320
that's the chief reason why we had to

525
00:21:04,600 --> 00:21:03,200
move our observatories into space it's

526
00:21:06,880 --> 00:21:04,610
not only the blurring of the atmosphere

527
00:21:08,860 --> 00:21:06,890
that makes the stars twinkle it's the

528
00:21:09,940 --> 00:21:08,870
fact that there are some some colors of

529
00:21:11,890 --> 00:21:09,950
lighter some wavelengths of light you

530
00:21:15,340 --> 00:21:11,900
simply can't see from the ground at all

531
00:21:16,930 --> 00:21:15,350
oh my gosh I think I'm gonna have to

532
00:21:18,910 --> 00:21:16,940
read this Scott just posted it in the

533
00:21:20,650 --> 00:21:18,920
chat room so Michael jobin this up this

534
00:21:24,340 --> 00:21:20,660
is terrible but Scott you're the one

535
00:21:27,550 --> 00:21:24,350
responsible no I love punter storms oh I

536
00:21:30,910 --> 00:21:27,560
think his comment is I think Molly knows

537
00:21:36,250 --> 00:21:30,920
something about molecules let's but I

538
00:21:38,560 --> 00:21:36,260

mean ah ok so never heard that before

539
00:21:40,660 --> 00:21:38,570
alright so let's guess I because of data

540
00:21:42,010 --> 00:21:40,670
here help us I want to get some data

541
00:21:44,020 --> 00:21:42,020
from this a Scott's been showing this

542
00:21:45,460 --> 00:21:44,030
thing flash madness so help us get some

543
00:21:48,490 --> 00:21:45,470
data Molly out and tell me what to do

544
00:21:50,790 --> 00:21:48,500
though um the other unique thing that

545
00:21:56,470 --> 00:21:50,800
we've done about this it done with this

546
00:21:58,300 --> 00:21:56,480
archive is the way that you normally

547
00:22:01,540 --> 00:21:58,310
would get data from the art so for

548
00:22:03,430 --> 00:22:01,550
example if both Jason and I work on

549
00:22:04,600 --> 00:22:03,440
quasar absorption lines and so if you

550
00:22:07,960 --> 00:22:04,610
wanted to get a

551
00:22:10,539 --> 00:22:07,970
sample of all the quasars that Hubble

552
00:22:12,280 --> 00:22:10,549
has looked at before this archaic away

553
00:22:14,530 --> 00:22:12,290
you would do that if you would say well

554
00:22:16,360 --> 00:22:14,540
that Tomlinson guys sure looked at a

555
00:22:18,039 --> 00:22:16,370
bunch you'd go search for Tomlinson in

556
00:22:21,250 --> 00:22:18,049
the archive and download all of his data

557
00:22:23,260 --> 00:22:21,260
and then you'd be like uh uh Markarian

558
00:22:24,640 --> 00:22:23,270
509 that's a good place are maybe

559
00:22:26,049 --> 00:22:24,650
somebody's looked at that one and see

560
00:22:30,070 --> 00:22:26,059
look you try to kind of hodgepodge

561
00:22:32,049 --> 00:22:30,080
things together that way um but one of

562
00:22:35,049 --> 00:22:32,059
the kind of breakthroughs we had when

563
00:22:39,909 --> 00:22:35,059

constructing this archive is despite all

564
00:22:42,580 --> 00:22:39,919
of its power and high popularity on the

565
00:22:47,169 --> 00:22:42,590
observatory cost has only been around

566
00:22:48,820 --> 00:22:47,179
since 2009 and they're actually hasn't

567
00:22:51,580 --> 00:22:48,830
really been that much data taken with it

568
00:22:54,970 --> 00:22:51,590
only about 1200 objects or so we've been

569
00:22:56,919 --> 00:22:54,980
looked at with cost um which in terms of

570
00:22:59,049 --> 00:22:56,929
scientific potential is enormous but in

571
00:23:00,970 --> 00:22:59,059
terms of data volume really isn't that

572
00:23:04,350 --> 00:23:00,980
much it actually all fits all the data

573
00:23:06,580 --> 00:23:04,360
about to show you fit onto one of these

574
00:23:09,789 --> 00:23:06,590
so you can just put in your pocket and

575
00:23:11,710 --> 00:23:09,799
you know download what's on here and use

576
00:23:15,010 --> 00:23:11,720
I don't everyone around with me just for

577
00:23:16,539 --> 00:23:15,020
some just in case you know um spectral

578
00:23:18,400 --> 00:23:16,549
so you say spectral data doesn't take up

579
00:23:20,560 --> 00:23:18,410
as much room as a as I guess that image

580
00:23:21,730 --> 00:23:20,570
would that reduced yeah you know it's

581
00:23:23,350 --> 00:23:21,740
one-dimensional instead of

582
00:23:25,780 --> 00:23:23,360
two-dimensional just row in numbers

583
00:23:27,400 --> 00:23:25,790
awesome okay yeah all the bits that came

584
00:23:28,690 --> 00:23:27,410
off the telescope is quite a bit because

585
00:23:31,090 --> 00:23:28,700
it is a true device that street

586
00:23:32,289 --> 00:23:31,100
dimensional and sexually i think though

587
00:23:34,120 --> 00:23:32,299
if i pulled the whole thing it would be

588
00:23:35,409 --> 00:23:34,130

five terabytes but when you used like

589
00:23:37,419 --> 00:23:35,419
the reduced data and then you combine it

590
00:23:40,900 --> 00:23:37,429
exactly it works out i think our whole

591
00:23:43,659 --> 00:23:40,910
18 gigabyte good yeah wish got Scrolls

592
00:23:45,970 --> 00:23:43,669
down there's actually a link on here you

593
00:23:47,409 --> 00:23:45,980
can just download the entire thing want

594
00:23:50,500 --> 00:23:47,419
the entire thing it's just like right

595
00:23:51,940 --> 00:23:50,510
there don't don't do it it'll get oh i

596
00:23:57,490 --> 00:23:51,950
have the bandwidth but i'm not going to

597
00:24:00,580 --> 00:23:57,500
do highest was that the 1200 ish objects

598
00:24:03,010 --> 00:24:00,590
means that we could just go in and sort

599
00:24:04,690 --> 00:24:03,020
them into well which ones are galaxies

600
00:24:06,700 --> 00:24:04,700
which ones are quasars which ones are

601
00:24:07,900 --> 00:24:06,710
stars okay i want to get i want to get

602
00:24:09,250 --> 00:24:07,910
to that in a minute but now i want to

603
00:24:11,230 --> 00:24:09,260
get some data so show us how to do it

604
00:24:14,380 --> 00:24:11,240
that's what we're doing so scroll down

605
00:24:17,330 --> 00:24:14,390
go down so click on pre-sorted target

606
00:24:21,860 --> 00:24:19,370
and that's what this is so the top we

607
00:24:25,190 --> 00:24:21,870
have all the data um which you can

608
00:24:27,200 --> 00:24:25,200
download from up there and then we have

609
00:24:28,880 --> 00:24:27,210
things sorted by you know what's in the

610
00:24:30,950 --> 00:24:28,890
solar system what are galaxies and

611
00:24:33,350 --> 00:24:30,960
clusters what kind of you know what

612
00:24:34,730 --> 00:24:33,360
what's your favorite kind of star oh so

613
00:24:36,440 --> 00:24:34,740

wait wait a minute wait a minute I don't

614
00:24:38,900 --> 00:24:36,450
have to query this thing at all then

615
00:24:40,880 --> 00:24:38,910
you've got it already so what up great

616
00:24:45,170 --> 00:24:40,890
things if you just want to download all

617
00:24:46,640 --> 00:24:45,180
of the you know every extrasolar planet

618
00:24:49,640 --> 00:24:46,650
that's been looked at with costs that we

619
00:24:51,170 --> 00:24:49,650
can identify or scroll down um yeah

620
00:24:54,140 --> 00:24:51,180
Scott if you click the targets link

621
00:24:56,240 --> 00:24:54,150
there yeah so actually so too yeah

622
00:24:58,880 --> 00:24:56,250
that's a good one I think that n n dash

623
00:25:02,300 --> 00:24:58,890
14 means what that there's only for the

624
00:25:04,760 --> 00:25:02,310
tell me draw two targets and so now you

625
00:25:06,260 --> 00:25:04,770
can get an idea well what data exists we

626
00:25:09,020 --> 00:25:06,270
have the names with the location on the

627
00:25:14,110 --> 00:25:09,030
sky how many individual exposures the

628
00:25:16,970 --> 00:25:14,120
target description that the person who

629
00:25:18,830 --> 00:25:16,980
asked for the data gave it a the

630
00:25:22,490 --> 00:25:18,840
alternative name which is often the

631
00:25:26,060 --> 00:25:22,500
official name and either of the Ned

632
00:25:27,890 --> 00:25:26,070
which is the kind of official extra

633
00:25:31,160 --> 00:25:27,900
galactic database of objects or Sinbad

634
00:25:33,110 --> 00:25:31,170
which is the same thing for stars the

635
00:25:34,340 --> 00:25:33,120
link to the mast portal which is what

636
00:25:37,670 --> 00:25:34,350
you would normally get for one of these

637
00:25:39,530 --> 00:25:37,680
if you just click on one this is

638
00:25:42,250 --> 00:25:39,540

normally if you would search for this

639
00:25:44,450 --> 00:25:42,260
target and mast and this is what um

640
00:25:47,750 --> 00:25:44,460
carol was talking about earlier this is

641
00:25:50,210 --> 00:25:47,760
what it shows up you get all the images

642
00:25:53,600 --> 00:25:50,220
and spectra of this target that have

643
00:25:56,150 --> 00:25:53,610
been taken with different observatories

644
00:25:57,740 --> 00:25:56,160
so for example Swift has looked at this

645
00:26:00,440 --> 00:25:57,750
one you can see what they on the left

646
00:26:06,410 --> 00:26:00,450
the galaxy's looked at it so if you

647
00:26:11,780 --> 00:26:06,420
click the back button well you we have

648
00:26:13,430 --> 00:26:11,790
uh okay okay hang on you're going you're

649
00:26:16,250 --> 00:26:13,440
going really fast here so what I want to

650
00:26:19,100 --> 00:26:16,260
stay here for a sec so I've got this I'm

651
00:26:22,220 --> 00:26:19,110
looking at a lot of stuff on the left

652
00:26:23,810 --> 00:26:22,230
the left column I'm seeing us but this

653
00:26:25,460 --> 00:26:23,820
is the mass portal that carol was

654
00:26:27,950 --> 00:26:25,470
talking about earlier if normally if you

655
00:26:30,110 --> 00:26:27,960
have a target that you have a name or a

656
00:26:30,620 --> 00:26:30,120
location on the sky and you search and

657
00:26:34,870 --> 00:26:30,630
you want to know

658
00:26:37,370 --> 00:26:34,880
Oh what data exists on this target you

659
00:26:39,110 --> 00:26:37,380
this is what you get you get here all

660
00:26:40,250 --> 00:26:39,120
the images here all the spectra here are

661
00:26:42,770 --> 00:26:40,260
different missions that have looked at

662
00:26:46,880 --> 00:26:42,780
it different instruments on the right is

663
00:26:48,590 --> 00:26:46,890

an overlay of wear on the sky the

664
00:26:50,390 --> 00:26:48,600
different footprints are so the big

665
00:26:52,160 --> 00:26:50,400
squares are going to be your images and

666
00:26:53,990 --> 00:26:52,170
then those little circles down right at

667
00:26:56,720 --> 00:26:54,000
where the star is that that's cost

668
00:26:58,520 --> 00:26:56,730
that's the cost aperture okay so that's

669
00:27:00,440 --> 00:26:58,530
the spectrum there so I can see that

670
00:27:02,000 --> 00:27:00,450
with this there's lots of there's three

671
00:27:03,920 --> 00:27:02,010
different missions that have seen it HST

672
00:27:05,390 --> 00:27:03,930
GALEX and Swift and there's lots of

673
00:27:07,880 --> 00:27:05,400
instruments that have seen it that's the

674
00:27:09,970 --> 00:27:07,890
ones below and in the middle column

675
00:27:13,310 --> 00:27:09,980
these are the actual observations with a

676
00:27:14,630 --> 00:27:13,320
thumbnail when avail all of what it is

677
00:27:16,280 --> 00:27:14,640
we're looking at of course there's an

678
00:27:17,480 --> 00:27:16,290
entire footprint off to the side there

679
00:27:19,100 --> 00:27:17,490
there there's some day there's some

680
00:27:22,070 --> 00:27:19,110
there's some squiggly lines right there

681
00:27:23,660 --> 00:27:22,080
so this is this data right here now John

682
00:27:26,120 --> 00:27:23,670
let me give let me get you into this

683
00:27:27,740 --> 00:27:26,130
just a little bit John oh no I just

684
00:27:30,740 --> 00:27:27,750
looked at your handle are you really a

685
00:27:33,200 --> 00:27:30,750
strong amira what I need to I need to

686
00:27:36,110 --> 00:27:33,210
get the best I need to get an M name now

687
00:27:37,130 --> 00:27:36,120
I call my daughter on a Darnell I got

688
00:27:40,760 --> 00:27:37,140

you i feel that strong a Molly

689
00:27:42,080 --> 00:27:40,770
astronomer photo/tony I have to I have

690
00:27:44,600 --> 00:27:42,090
to give credit where credit to do I

691
00:27:48,410 --> 00:27:44,610
stole that idea from from Molly's oh did

692
00:27:51,770 --> 00:27:48,420
you okay all right very create a strong

693
00:27:54,140 --> 00:27:51,780
at o'neill's oh you use this stuff

694
00:27:55,760 --> 00:27:54,150
you're a user of this data is this how

695
00:27:58,100 --> 00:27:55,770
you is this how you do it is this how

696
00:28:00,080 --> 00:27:58,110
you get it well I think traditionally

697
00:28:02,630 --> 00:28:00,090
how I would have done it in the past is

698
00:28:04,790 --> 00:28:02,640
is to go through your directly through

699
00:28:07,220 --> 00:28:04,800
mast after going after one hour one

700
00:28:09,920 --> 00:28:07,230
target in mind or 11 specific

701
00:28:12,380 --> 00:28:09,930
observation in mind but the really nice

702
00:28:14,420 --> 00:28:12,390
thing about having having it packaged up

703
00:28:17,150 --> 00:28:14,430
the way that they have now in the new

704
00:28:19,520 --> 00:28:17,160
archive is that it really facilitates

705
00:28:21,470 --> 00:28:19,530
discovery pates places for for people

706
00:28:22,910 --> 00:28:21,480
who don't have really good spectral kung

707
00:28:24,770 --> 00:28:22,920
fu and how to manipulate the data

708
00:28:26,480 --> 00:28:24,780
because when you take any individual

709
00:28:29,020 --> 00:28:26,490
frame and you're trying to get something

710
00:28:31,010 --> 00:28:29,030
out of it you may not completely

711
00:28:33,080 --> 00:28:31,020
understand what you're looking at a

712
00:28:34,640 --> 00:28:33,090
hundred percent whereas if you have an

713
00:28:36,440 --> 00:28:34,650

archive which has gone and taken all the

714
00:28:38,000 --> 00:28:36,450
exposures of something and put them

715
00:28:40,370 --> 00:28:38,010
together for you you can immediately

716
00:28:43,100 --> 00:28:40,380
start doing science with it so you

717
00:28:44,330 --> 00:28:43,110
either know astronomy yes a stroll

718
00:28:46,490 --> 00:28:44,340
astronomy no but no

719
00:28:48,620 --> 00:28:46,500
astronomy guess all you get squish like

720
00:28:51,080 --> 00:28:48,630
grape right see that you have you did

721
00:28:52,789 --> 00:28:51,090
you you did it you started with the with

722
00:28:56,960 --> 00:28:52,799
the spectral kunku I had to bring mr.

723
00:28:58,760 --> 00:28:56,970
Miyagi into it yeah well sir and and and

724
00:29:00,649 --> 00:28:58,770
i think what what's exciting about

725
00:29:02,659 --> 00:29:00,659
archives like this especially sort of

726
00:29:05,360 --> 00:29:02,669
refined data product archives like this

727
00:29:06,860 --> 00:29:05,370
is that it's going to open up a lot more

728
00:29:09,320 --> 00:29:06,870
people to to doing what's called

729
00:29:10,820 --> 00:29:09,330
archival proposals that's another type

730
00:29:12,500 --> 00:29:10,830
of proposals that have that happened

731
00:29:13,820 --> 00:29:12,510
with Space Telescope and it's and it's

732
00:29:16,159 --> 00:29:13,830
the way that I think that Hubble is

733
00:29:17,360 --> 00:29:16,169
really going to be a century telescope

734
00:29:19,549 --> 00:29:17,370
it's going to be a telescope people are

735
00:29:21,649 --> 00:29:19,559
using data from for a hundred years and

736
00:29:24,320 --> 00:29:21,659
that you know you can really mind this

737
00:29:26,899 --> 00:29:24,330
archive without having to do a lot of

738
00:29:28,730 --> 00:29:26,909

the work that takes a lot of time and

739
00:29:30,830 --> 00:29:28,740
preparing the data to go from something

740
00:29:32,360 --> 00:29:30,840
like that thumbnail on the mast portal

741
00:29:34,639 --> 00:29:32,370
that you have right now to something you

742
00:29:35,930 --> 00:29:34,649
can actually use to do science and if

743
00:29:37,549 --> 00:29:35,940
you can spend more of your time trying

744
00:29:39,590 --> 00:29:37,559
to do the science with the data and not

745
00:29:41,510 --> 00:29:39,600
trying to finesse the data that that

746
00:29:43,399 --> 00:29:41,520
really opens up a lot of possibilities

747
00:29:45,620 --> 00:29:43,409
and it opens up possibilities for people

748
00:29:47,029 --> 00:29:45,630
who may not always be safe quasar

749
00:29:49,669 --> 00:29:47,039
absorption like people but who are

750
00:29:52,220 --> 00:29:49,679
galaxies people and they can just go

751
00:29:54,769 --> 00:29:52,230
straight to a specific question in data

752
00:29:56,450 --> 00:29:54,779
that's ready for them to use yeah that

753
00:29:59,810 --> 00:29:56,460
was a pic to your point the fact that

754
00:30:01,970 --> 00:29:59,820
this group the fact that you may have a

755
00:30:04,310 --> 00:30:01,980
particular object that's a starburst

756
00:30:05,960 --> 00:30:04,320
galaxy or something like that and if you

757
00:30:07,610 --> 00:30:05,970
go here and you find the spectra then

758
00:30:09,409 --> 00:30:07,620
you can see the other objects like it

759
00:30:11,450 --> 00:30:09,419
you go oh I didn't realize that there

760
00:30:13,580 --> 00:30:11,460
was an observation of my other favorite

761
00:30:15,169 --> 00:30:13,590
off you know object can come ova and

762
00:30:18,139 --> 00:30:15,179
then you can look at that data as well

763
00:30:20,539 --> 00:30:18,149

so that the comfortable groupings are

764
00:30:22,940 --> 00:30:20,549
really really useful when you're trying

765
00:30:25,519 --> 00:30:22,950
to look at a class of object that you're

766
00:30:30,940 --> 00:30:25,529
interested in exactly and so Scott if

767
00:30:34,970 --> 00:30:30,950
you go back to light the samples page um

768
00:30:36,919 --> 00:30:34,980
go let's go to one that has more data

769
00:30:40,399 --> 00:30:36,929
one of the galaxy or quasar once or

770
00:30:43,279 --> 00:30:40,409
white dwarfs if you go back piano lab I

771
00:30:45,740 --> 00:30:43,289
think desert so I'm looking at um there

772
00:30:47,899 --> 00:30:45,750
we are yeah so just scroll down and pick

773
00:30:51,649 --> 00:30:47,909
one that has like a lot of objects in it

774
00:30:54,169 --> 00:30:51,659
all stars for instance um yeah Our Stars

775
00:30:55,399 --> 00:30:54,179
has a lot white chocolate why you are so

776
00:30:56,860 --> 00:30:55,409
nice because they're very bright in the

777
00:30:59,320 --> 00:30:56,870
UV and see a very high

778
00:31:03,790 --> 00:30:59,330
single story is nice um so one of the

779
00:31:06,310 --> 00:31:03,800
nice things about this one is that so

780
00:31:07,720 --> 00:31:06,320
for example um carol is mentioning if

781
00:31:10,540 --> 00:31:07,730
you have your favorite target if you

782
00:31:12,790 --> 00:31:10,550
scroll to the top and you know the name

783
00:31:14,860 --> 00:31:12,800
of the target you're looking for you can

784
00:31:16,780 --> 00:31:14,870
type it into the little search bar so

785
00:31:18,790 --> 00:31:16,790
for example type WD there are a lot of

786
00:31:21,100 --> 00:31:18,800
white dwarfs names that start with WD

787
00:31:29,230 --> 00:31:21,110
and they're all just going to pop up

788
00:31:31,810 --> 00:31:29,240

here sorry sorry um WD 0 um because it's

789
00:31:33,400 --> 00:31:31,820
also searching yeah so here are but you

790
00:31:38,620 --> 00:31:33,410
know a bunch of ones that start like

791
00:31:40,090 --> 00:31:38,630
that um and so now if you click uh you

792
00:31:43,510 --> 00:31:40,100
can also be all these tables are also

793
00:31:47,200 --> 00:31:43,520
sortable so if you click to erase your

794
00:31:51,130 --> 00:31:47,210
search bar this is just an example so

795
00:31:52,930 --> 00:31:51,140
click on number of exposures yep and

796
00:31:55,600 --> 00:31:52,940
click on it again so it's sort of

797
00:31:56,919 --> 00:31:55,610
reverse sort yeah so these first few

798
00:31:58,210 --> 00:31:56,929
ones or ones that we use to calibrate

799
00:32:01,150 --> 00:31:58,220
the instrument is why there's an

800
00:32:04,169 --> 00:32:01,160
insanely large number of exposures but

801
00:32:08,650 --> 00:32:04,179
if you just click on one like maybe they

802
00:32:09,760 --> 00:32:08,660
will be a good one the WD 1654 i'm

803
00:32:11,380 --> 00:32:09,770
pointing at the screen as if you can

804
00:32:16,330 --> 00:32:11,390
tell where I'm pointing down near the

805
00:32:18,610 --> 00:32:16,340
bottom yeah that one it's your telepathy

806
00:32:20,320 --> 00:32:18,620
is pretty good yeah we're cross country

807
00:32:23,770 --> 00:32:20,330
we're getting it going yeah so this is

808
00:32:27,070 --> 00:32:23,780
just an example of if you want to then

809
00:32:31,240 --> 00:32:27,080
see what data exists for this object the

810
00:32:33,130 --> 00:32:31,250
top gives these histograms and I random

811
00:32:35,860 --> 00:32:33,140
example isn't very good give sort of the

812
00:32:37,480 --> 00:32:35,870
demographics of what what configurations

813
00:32:40,440 --> 00:32:37,490

where the instrument was the instrument

814
00:32:44,140 --> 00:32:40,450
in when the different data were taken um

815
00:32:46,320 --> 00:32:44,150
and then as you scroll down the first

816
00:32:49,480 --> 00:32:46,330
thing that shows up is the full

817
00:32:51,400 --> 00:32:49,490
combination of all the spectrum and it

818
00:32:52,870 --> 00:32:51,410
looks very nice and then as you scroll

819
00:32:54,610 --> 00:32:52,880
down which you can see are the

820
00:32:57,610 --> 00:32:54,620
individual exposures which will look a

821
00:32:59,260 --> 00:32:57,620
little bit right here but then the idea

822
00:33:01,299 --> 00:32:59,270
is that once they were combined very

823
00:33:07,060 --> 00:33:01,309
there's a lot more single there that can

824
00:33:08,800 --> 00:33:07,070
be used for science okay well so I got a

825
00:33:10,210 --> 00:33:08,810
comment here from the nebulous mistress

826
00:33:10,630 --> 00:33:10,220
which brings up the next point I want to

827
00:33:13,030 --> 00:33:10,640
break

828
00:33:15,550 --> 00:33:13,040
bring up and I'm assuming it so she says

829
00:33:18,820 --> 00:33:15,560
man i wish this database was online when

830
00:33:21,580 --> 00:33:18,830
i wrote my thesis hayes hope to hear

831
00:33:22,810 --> 00:33:21,590
that so let me add so let me tell this

832
00:33:24,580 --> 00:33:22,820
talk about that a little bit are you

833
00:33:26,770 --> 00:33:24,590
hoping and one of the reed what about

834
00:33:29,140 --> 00:33:26,780
new astronomers coming up with these

835
00:33:31,300 --> 00:33:29,150
tools are they do you think in a better

836
00:33:34,180 --> 00:33:31,310
position to ask science questions of

837
00:33:35,500 --> 00:33:34,190
this data then you guys Lucas jason said

838
00:33:36,910 --> 00:33:35,510

something earlier about we go to the

839
00:33:39,010 --> 00:33:36,920
library and get just to pay a bunch of

840
00:33:41,380 --> 00:33:39,020
pages in a book and you're expected to

841
00:33:43,990 --> 00:33:41,390
sort through them yourself now I did my

842
00:33:46,900 --> 00:33:44,000
thesis in the very late 90s in the early

843
00:33:48,820 --> 00:33:46,910
aughts and we had you know massed in

844
00:33:50,680 --> 00:33:48,830
those days you went you basically got

845
00:33:52,480 --> 00:33:50,690
one object at a time so the library

846
00:33:53,770 --> 00:33:52,490
analogy you checked out one book at a

847
00:33:56,380 --> 00:33:53,780
time and took it home and you wait and

848
00:33:58,150 --> 00:33:56,390
check out another one and and and

849
00:34:00,040 --> 00:33:58,160
remember it was in the forum where the

850
00:34:02,260 --> 00:34:00,050
book wasn't bound it was just a set of

851
00:34:04,690 --> 00:34:02,270
pages right because it was we didn't

852
00:34:07,420 --> 00:34:04,700
combine the exposures into a single

853
00:34:11,470 --> 00:34:07,430
spectrum for each target so you got one

854
00:34:14,649 --> 00:34:11,480
pile of pages at a time now we're in a

855
00:34:16,090 --> 00:34:14,659
situation where we hope that the users

856
00:34:17,980 --> 00:34:16,100
can go to the library and just get the

857
00:34:19,030 --> 00:34:17,990
pile of books they want and go off and

858
00:34:20,800 --> 00:34:19,040
do the research you know they're not

859
00:34:23,050 --> 00:34:20,810
they're not having to wade through the

860
00:34:25,419 --> 00:34:23,060
card catalog and figure anybody remember

861
00:34:27,250 --> 00:34:25,429
what card catalog is yeah I mean a way

862
00:34:29,710 --> 00:34:27,260
through the catalog and figure out you

863
00:34:31,270 --> 00:34:29,720

know it's sort of like you know the old

864
00:34:34,659 --> 00:34:31,280
days you if you don't watch ghostbusters

865
00:34:36,880 --> 00:34:34,669
the opening scene right haha it's like

866
00:34:38,409 --> 00:34:36,890
us know that he always managed to make

867
00:34:40,899 --> 00:34:38,419
me feel old in these things why do you

868
00:34:43,570 --> 00:34:40,909
always just cuz it's like if you are

869
00:34:45,909 --> 00:34:43,580
needed to know the name where you run in

870
00:34:48,149 --> 00:34:45,919
yeah and now you can go and you just say

871
00:34:51,850 --> 00:34:48,159
give me all the books you have on

872
00:34:54,520 --> 00:34:51,860
ectoplasm and there is okay but to be

873
00:34:57,640 --> 00:34:54,530
fair back in the day there weren't that

874
00:34:59,410 --> 00:34:57,650
many books to look at okay we were

875
00:35:02,200 --> 00:34:59,420
looking in cuneiform to be fair you'll

876
00:35:03,880 --> 00:35:02,210
have to know their names and know where

877
00:35:05,740 --> 00:35:03,890
to find them and then once you do have

878
00:35:08,280 --> 00:35:05,750
the data you had to spend all of your

879
00:35:10,420 --> 00:35:08,290
time reinventing the same data reduction

880
00:35:12,610 --> 00:35:10,430
techniques that everybody else was

881
00:35:15,310 --> 00:35:12,620
spending our time ya doing and to be

882
00:35:17,860 --> 00:35:15,320
fair you still can download even from

883
00:35:20,880 --> 00:35:17,870
these portals or all the individual

884
00:35:23,400 --> 00:35:20,890
exposures and if what you really

885
00:35:26,190 --> 00:35:23,410
I do is combine them in some way that's

886
00:35:28,349 --> 00:35:26,200
specific to you that's not the choices

887
00:35:30,870 --> 00:35:28,359
that we did you can still do that you

888
00:35:32,819 --> 00:35:30,880

can stop for most science purposes time

889
00:35:35,299 --> 00:35:32,829
is better spent actually doing science

890
00:35:38,099 --> 00:35:35,309
on the reduced to data rather than

891
00:35:41,490 --> 00:35:38,109
trying to figure out the data's phone

892
00:35:43,470 --> 00:35:41,500
number and how to dial it ok well the

893
00:35:44,839 --> 00:35:43,480
Venice library analogy still has legs

894
00:35:48,059 --> 00:35:44,849
but I'm going to use it one more time

895
00:35:51,390 --> 00:35:48,069
wait when you're using a bubble like

896
00:35:53,069 --> 00:35:51,400
like me or Molly or John you might have

897
00:35:54,299 --> 00:35:53,079
created a few data sets and you're

898
00:35:55,680 --> 00:35:54,309
interested in going to get your data

899
00:35:58,079 --> 00:35:55,690
sets out of the archive that's like you

900
00:35:59,970 --> 00:35:58,089
go check out a book you wrote right but

901
00:36:01,440 --> 00:35:59,980
you also when you write that paper or do

902
00:36:03,029 --> 00:36:01,450
a research project you'd like to read

903
00:36:05,190 --> 00:36:03,039
the same the books that everybody else

904
00:36:06,930 --> 00:36:05,200
wrote on that topic and the reason this

905
00:36:08,940 --> 00:36:06,940
is really really enabling is that it

906
00:36:11,670 --> 00:36:08,950
makes it very very easy for you to go

907
00:36:13,620 --> 00:36:11,680
and quickly grab your data plus every

908
00:36:15,450 --> 00:36:13,630
other kind of data every other data set

909
00:36:18,210 --> 00:36:15,460
on that same kind of object that

910
00:36:20,099 --> 00:36:18,220
everybody else is created so you get the

911
00:36:22,259 --> 00:36:20,109
force multiplier effect of having all of

912
00:36:23,549 --> 00:36:22,269
it in one place well that brings up the

913
00:36:25,170 --> 00:36:23,559

next question I wanted to ask both of

914
00:36:26,640 --> 00:36:25,180
you so that's perfect point to make

915
00:36:28,200 --> 00:36:26,650
right this moment Jason because this is

916
00:36:30,480 --> 00:36:28,210
for all of you and Carol you can even

917
00:36:32,249 --> 00:36:30,490
client chime in if you'd like to but

918
00:36:33,749 --> 00:36:32,259
this day and in this day and age you see

919
00:36:35,430 --> 00:36:33,759
a lot of papers being published a lot of

920
00:36:36,839 --> 00:36:35,440
science being done on the data and

921
00:36:38,910 --> 00:36:36,849
they're saying from the data I have

922
00:36:41,910 --> 00:36:38,920
asked this question and reached this

923
00:36:44,400 --> 00:36:41,920
conclusion and it's important now isn't

924
00:36:46,859 --> 00:36:44,410
it in in science especially using these

925
00:36:49,319 --> 00:36:46,869
archives and using the data that is now

926
00:36:52,499 --> 00:36:49,329
we're calling big data to be able to

927
00:36:55,890 --> 00:36:52,509
reproduce those results effectively and

928
00:36:57,480 --> 00:36:55,900
so does an archive like this lets you do

929
00:36:59,279 --> 00:36:57,490
that better if I read a paper let's say

930
00:37:00,779 --> 00:36:59,289
Jason puts out a paper using this data

931
00:37:03,269 --> 00:37:00,789
and i want to say well i'm not sure he's

932
00:37:06,059 --> 00:37:03,279
right let me try it myself and see if i

933
00:37:07,559 --> 00:37:06,069
can get the same answer this helps it a

934
00:37:09,359 --> 00:37:07,569
lot more than say back in the day when

935
00:37:11,549 --> 00:37:09,369
you only have the card catalog right so

936
00:37:15,509 --> 00:37:11,559
way back in the day when when these

937
00:37:17,880 --> 00:37:15,519
these people were children I was working

938
00:37:19,740 --> 00:37:17,890

on on cluster star clusters and in

939
00:37:22,740 --> 00:37:19,750
particular globular clusters and there

940
00:37:25,650 --> 00:37:22,750
was a discrepancy and a number of people

941
00:37:29,160 --> 00:37:25,660
were researching the chemistry of those

942
00:37:30,960 --> 00:37:29,170
clusters using spectra and so but in

943
00:37:33,210 --> 00:37:30,970
those days and age you went and you've

944
00:37:34,740 --> 00:37:33,220
got the spectra and it was your data and

945
00:37:37,140 --> 00:37:34,750
so we had a

946
00:37:39,630 --> 00:37:37,150
conference where everybody come by

947
00:37:41,400 --> 00:37:39,640
agreed to exchange the data store they

948
00:37:43,200 --> 00:37:41,410
had to format the data and they sent

949
00:37:45,510 --> 00:37:43,210
tapes back and forth and all this stuff

950
00:37:47,490 --> 00:37:45,520
and then and then everybody would

951
00:37:49,320 --> 00:37:47,500
analyze each other's data that those

952
00:37:51,270 --> 00:37:49,330
days are over you just go get the data

953
00:37:53,250 --> 00:37:51,280
and you analyze it you say well why did

954
00:37:56,160 --> 00:37:53,260
this person get this and will my

955
00:37:59,520 --> 00:37:56,170
algorithm work the same way so I get

956
00:38:01,530 --> 00:37:59,530
Jason spectra and I use my model or

957
00:38:03,570 --> 00:38:01,540
whatever and then I say oh this is how

958
00:38:05,220 --> 00:38:03,580
it's different so this this really

959
00:38:09,150 --> 00:38:05,230
chained and you get those answers very

960
00:38:10,710 --> 00:38:09,160
quickly and so it doesn't take like a

961
00:38:12,570 --> 00:38:10,720
year do you have to have another

962
00:38:15,330 --> 00:38:12,580
conference a year later oh we all did

963
00:38:16,650 --> 00:38:15,340

you know it was painful good i would say

964
00:38:19,020 --> 00:38:16,660
that des archives have really

965
00:38:20,700 --> 00:38:19,030
strengthened the overall ethic of

966
00:38:23,850 --> 00:38:20,710
reproducibility which is an important

967
00:38:26,660 --> 00:38:23,860
part absolutely no comparability about

968
00:38:28,920 --> 00:38:26,670
different people analyze information

969
00:38:31,890 --> 00:38:28,930
over after which we shouldn't overlook

970
00:38:35,070 --> 00:38:31,900
is that these these these data are from

971
00:38:38,490 --> 00:38:35,080
missions that that the public paid for

972
00:38:40,980 --> 00:38:38,500
so you know we need to make sure that

973
00:38:43,980 --> 00:38:40,990
whatever we're generating is accessible

974
00:38:45,870 --> 00:38:43,990
and intelligible and useful because it

975
00:38:47,490 --> 00:38:45,880
really belongs just like Hubble itself

976
00:38:49,730 --> 00:38:47,500
it all had eight applause all of us and

977
00:38:52,500 --> 00:38:49,740
one of the things about these different

978
00:38:54,360 --> 00:38:52,510
samples that we've put together that you

979
00:38:58,640 --> 00:38:54,370
know has been fascinating just for us

980
00:39:00,450 --> 00:38:58,650
going through and I'm sure certain

981
00:39:02,130 --> 00:39:00,460
members of the public with certain

982
00:39:06,060 --> 00:39:02,140
dispositions but also find fascinating

983
00:39:08,820 --> 00:39:06,070
to go through is you know I had never

984
00:39:12,540 --> 00:39:08,830
seen a UV spectrum of a supernova before

985
00:39:14,340 --> 00:39:12,550
and now I can just go to the Superdome a

986
00:39:16,800 --> 00:39:14,350
sample and click through if you like wow

987
00:39:22,140 --> 00:39:16,810
what's going on there and look at that

988
00:39:23,490 --> 00:39:22,150

and um you know I have gotten a lot

989
00:39:25,170 --> 00:39:23,500
better because I've just been looking or

990
00:39:27,270 --> 00:39:25,180
I don't work on white horse I can now

991
00:39:29,850 --> 00:39:27,280
kind of go through white dwarfs and be

992
00:39:32,190 --> 00:39:29,860
like oh you look really like you've just

993
00:39:33,660 --> 00:39:32,200
got hydrogen home oh you you look like

994
00:39:36,180 --> 00:39:33,670
you've got some metal line absorption

995
00:39:38,820 --> 00:39:36,190
that's interesting like I you it's just

996
00:39:40,110 --> 00:39:38,830
once you have the full database that you

997
00:39:42,720 --> 00:39:40,120
can go through instead of just

998
00:39:44,880 --> 00:39:42,730
individual objects there's just a lot of

999
00:39:47,100 --> 00:39:44,890
fascinating stuff that you can just kind

1000
00:39:48,329 --> 00:39:47,110
of pick up by I ok now here but here's

1001
00:39:50,069 --> 00:39:48,339
what worries me about this and

1002
00:39:52,109 --> 00:39:50,079
it's not just about this archive but all

1003
00:39:54,239 --> 00:39:52,119
archives where you're getting already

1004
00:39:57,539 --> 00:39:54,249
analyzed or processed data in some way

1005
00:40:00,029 --> 00:39:57,549
are we introducing biases and are we how

1006
00:40:02,749 --> 00:40:00,039
careful are we that we are that

1007
00:40:05,160 --> 00:40:02,759
everybody is starting with and the right

1008
00:40:06,690 --> 00:40:05,170
foundation to ask their questions

1009
00:40:08,999 --> 00:40:06,700
because what worries me is if somebody

1010
00:40:10,979 --> 00:40:09,009
gets a wrong processing step line and

1011
00:40:13,049 --> 00:40:10,989
everybody's paper is based on this let

1012
00:40:15,059 --> 00:40:13,059
down the road how susceptible or a week

1013
00:40:17,640 --> 00:40:15,069

to that that was a big concern of ours

1014
00:40:20,039 --> 00:40:17,650
because we are we are all users of this

1015
00:40:22,890 --> 00:40:20,049
kind of stuff ourselves and we know how

1016
00:40:24,690 --> 00:40:22,900
difficult it can be to perform those

1017
00:40:27,440 --> 00:40:24,700
reduction steps to get the analysis

1018
00:40:29,339 --> 00:40:27,450
right we also know that different

1019
00:40:30,870 --> 00:40:29,349
scientists who've been trained to do

1020
00:40:33,509 --> 00:40:30,880
this kind of thing make different

1021
00:40:35,009 --> 00:40:33,519
judgments a lot of the steps you do come

1022
00:40:37,380 --> 00:40:35,019
down to judgment calls about whether

1023
00:40:39,029 --> 00:40:37,390
you're willing to do this or that step

1024
00:40:41,759 --> 00:40:39,039
which may be computationally intensive

1025
00:40:43,950 --> 00:40:41,769
you know there's never a single unique

1026
00:40:45,450 --> 00:40:43,960
answer for every step in the process so

1027
00:40:46,890 --> 00:40:45,460
you have to when you're doing it for

1028
00:40:48,749 --> 00:40:46,900
yourself you have to make choices and

1029
00:40:51,059 --> 00:40:48,759
you're doing it for everybody like we

1030
00:40:52,469 --> 00:40:51,069
did you have to often you have to make

1031
00:40:53,880 --> 00:40:52,479
those same choices so we actually

1032
00:40:56,670 --> 00:40:53,890
brought in a group of experts from

1033
00:40:59,670 --> 00:40:56,680
outside the Institute side Space

1034
00:41:01,499 --> 00:40:59,680
Telescope and some people from inside we

1035
00:41:04,920 --> 00:41:01,509
all got together over a period of a few

1036
00:41:07,440 --> 00:41:04,930
months and these are some of the best

1037
00:41:09,150 --> 00:41:07,450
people yeah you can you could you could

1038
00:41:10,890 --> 00:41:09,160

possibly get whoever done spectroscopy

1039
00:41:12,870 --> 00:41:10,900
including people have been doing it you

1040
00:41:14,819 --> 00:41:12,880
know for the entire lifetime with Hubble

1041
00:41:16,559 --> 00:41:14,829
and even before that entire lifetime me

1042
00:41:18,989 --> 00:41:16,569
and then we here we got it we got them

1043
00:41:21,420 --> 00:41:18,999
together we talked about how to make

1044
00:41:24,089 --> 00:41:21,430
these choices and we tried we know we

1045
00:41:25,890 --> 00:41:24,099
can't produce data sets that are going

1046
00:41:29,249 --> 00:41:25,900
to be perfect for every purpose it's

1047
00:41:31,620 --> 00:41:29,259
just not possible but we know we can

1048
00:41:34,410 --> 00:41:31,630
write we thought and we turned up to be

1049
00:41:35,609 --> 00:41:34,420
right that we could produce data sets

1050
00:41:37,259 --> 00:41:35,619
that would be you know ninety percent

1051
00:41:39,509 --> 00:41:37,269
useful to ninety percent of the science

1052
00:41:42,329 --> 00:41:39,519
cases by making the broadest possible

1053
00:41:44,519 --> 00:41:42,339
set of choices and as we go along one of

1054
00:41:46,170 --> 00:41:44,529
the reasons where we've kind of arranged

1055
00:41:47,999 --> 00:41:46,180
things this way we have an email address

1056
00:41:50,130 --> 00:41:48,009
for people to send us feedback if

1057
00:41:52,890 --> 00:41:50,140
website we're doing this hangout we want

1058
00:41:54,900 --> 00:41:52,900
people to tell us what the data could do

1059
00:41:57,089 --> 00:41:54,910
for them that it's not doing and then

1060
00:41:58,559 --> 00:41:57,099
over time the Institute will continue to

1061
00:42:02,160 --> 00:41:58,569
support this and it will evolve and

1062
00:42:04,470 --> 00:42:02,170
we're hoping to make it even more useful

1063
00:42:06,150 --> 00:42:04,480

in in that way so you know Tony you're

1064
00:42:07,470 --> 00:42:06,160
okay Bo but wait a minute that that

1065
00:42:09,870 --> 00:42:07,480
that's that bothers me a little bit

1066
00:42:11,400 --> 00:42:09,880
Jason only because how can i if I call

1067
00:42:13,410 --> 00:42:11,410
you and tell you well the datas I'm not

1068
00:42:16,140 --> 00:42:13,420
you're not what you're not saying I hope

1069
00:42:17,550 --> 00:42:16,150
is that while the data is not doing what

1070
00:42:19,320 --> 00:42:17,560
it needs to be doing for me I need you

1071
00:42:20,670 --> 00:42:19,330
to change it I mean isn't it this is

1072
00:42:23,850 --> 00:42:20,680
objective thing these are measurements

1073
00:42:26,490 --> 00:42:23,860
that were taken I want to serve oh well

1074
00:42:29,370 --> 00:42:26,500
so to rephrase your question if you know

1075
00:42:32,850 --> 00:42:29,380
we get an email that's saying oh it

1076
00:42:35,550 --> 00:42:32,860
looks like you know you've got some

1077
00:42:37,860 --> 00:42:35,560
weird you know error property is

1078
00:42:39,630 --> 00:42:37,870
happening when you're combining the edge

1079
00:42:41,910 --> 00:42:39,640
of this one segment with the edge of

1080
00:42:43,530 --> 00:42:41,920
this other segments and let me show you

1081
00:42:45,000 --> 00:42:43,540
this example case where something's

1082
00:42:47,520 --> 00:42:45,010
clearly don't clearly going we were like

1083
00:42:50,220 --> 00:42:47,530
oh okay we need to look at that that

1084
00:42:53,010 --> 00:42:50,230
didn't show up in our tests it you know

1085
00:42:55,050 --> 00:42:53,020
okay um but at some point there is an

1086
00:42:57,390 --> 00:42:55,060
objective high weight low fish the

1087
00:42:59,040 --> 00:42:57,400
question that I had kept asking when we

1088
00:43:00,570 --> 00:42:59,050

were trying to decide okay are we ready

1089
00:43:02,100 --> 00:43:00,580
to release this product the question

1090
00:43:04,140 --> 00:43:02,110
that I kept asking Jason and other

1091
00:43:06,210 --> 00:43:04,150
people the team is you know well you

1092
00:43:08,430 --> 00:43:06,220
know we know that there are always ways

1093
00:43:10,650 --> 00:43:08,440
to improve the data product and the

1094
00:43:12,150 --> 00:43:10,660
question was well you know you're

1095
00:43:14,820 --> 00:43:12,160
someone who does spectroscopy for a

1096
00:43:16,680 --> 00:43:14,830
living would you use this site you know

1097
00:43:18,720 --> 00:43:16,690
do you use this data product to be your

1098
00:43:22,560 --> 00:43:18,730
own science and once the answer was well

1099
00:43:25,110 --> 00:43:22,570
yeah that's when we were like okay we're

1100
00:43:28,610 --> 00:43:25,120
not and and I also want to point

1101
00:43:31,350 --> 00:43:28,620
something out there are other notable

1102
00:43:34,380 --> 00:43:31,360
fields of science not all but there are

1103
00:43:36,480 --> 00:43:34,390
some where the research is done behind

1104
00:43:38,880 --> 00:43:36,490
closed doors and paid for by commercial

1105
00:43:42,720 --> 00:43:38,890
companies and you don't get to see the

1106
00:43:44,970 --> 00:43:42,730
data this is a completely open class you

1107
00:43:47,190 --> 00:43:44,980
can look at the data reduction code you

1108
00:43:49,740 --> 00:43:47,200
can modify the data reduction code you

1109
00:43:51,420 --> 00:43:49,750
can start from Ground Zero and get every

1110
00:43:54,800 --> 00:43:51,430
little bit that came down from the

1111
00:43:58,350 --> 00:43:54,810
telescope you can it's a good points or

1112
00:44:00,690 --> 00:43:58,360
integrate a complete open process it's

1113
00:44:02,790 --> 00:44:00,700

open source there till we see every step

1114
00:44:03,870 --> 00:44:02,800
that was taken not just oh you're just

1115
00:44:05,400 --> 00:44:03,880
gonna take it because this is what we're

1116
00:44:08,040 --> 00:44:05,410
getting it and the way that we're

1117
00:44:11,040 --> 00:44:08,050
delivering these data is the individual

1118
00:44:13,470 --> 00:44:11,050
exposures that went into the final

1119
00:44:16,350 --> 00:44:13,480
edition that we're delivering are

1120
00:44:16,590 --> 00:44:16,360
delivered along with that co edition so

1121
00:44:19,740 --> 00:44:16,600
you

1122
00:44:21,930 --> 00:44:19,750
look at the final project can be like

1123
00:44:23,220 --> 00:44:21,940
yeah okay that makes sense or but that's

1124
00:44:25,080 --> 00:44:23,230
where I was hoping to get to because

1125
00:44:27,720 --> 00:44:25,090
there is some there's some check or some

1126
00:44:30,390 --> 00:44:27,730
objective storing let me reassure you

1127
00:44:32,730 --> 00:44:30,400
that although astronomers are not the

1128
00:44:35,820 --> 00:44:32,740
dominant science in this country we are

1129
00:44:37,920 --> 00:44:35,830
filled with skeptics and you know and

1130
00:44:40,050 --> 00:44:37,930
our colleagues are skeptics and they

1131
00:44:43,320 --> 00:44:40,060
will go through all this and reassure

1132
00:44:45,480 --> 00:44:43,330
themselves that that the data is correct

1133
00:44:47,700 --> 00:44:45,490
which is not like astronomers like oh

1134
00:44:50,520 --> 00:44:47,710
yay Jason and reduced my data for me so

1135
00:44:52,770 --> 00:44:50,530
I'll just use that you know we're more

1136
00:44:55,680 --> 00:44:52,780
community of skeptics we've been showing

1137
00:44:58,460 --> 00:44:55,690
and demonstrating these data products to

1138
00:45:01,110 --> 00:44:58,470

our colleagues and other astronomers

1139
00:45:03,270 --> 00:45:01,120
since the SS mean the American National

1140
00:45:05,220 --> 00:45:03,280
slightly meeting January and I've had a

1141
00:45:07,980 --> 00:45:05,230
couple people tell me that based on what

1142
00:45:09,690 --> 00:45:07,990
they've seen it doesn't meet their very

1143
00:45:11,760 --> 00:45:09,700
very strict requirements for this or

1144
00:45:13,230 --> 00:45:11,770
that reason and I say well sorry but

1145
00:45:15,570 --> 00:45:13,240
we'll try to you know we can try to

1146
00:45:17,430 --> 00:45:15,580
incorporate that in the future but I've

1147
00:45:18,990 --> 00:45:17,440
had you know 20 times as many people

1148
00:45:20,430 --> 00:45:19,000
tell me boy you just saved me a year's

1149
00:45:22,530 --> 00:45:20,440
worth of effort trolling the earth and

1150
00:45:24,060 --> 00:45:22,540
adding all this stuff over I wish I had

1151
00:45:26,730 --> 00:45:24,070
this when I was bred or my favorite

1152
00:45:33,000 --> 00:45:26,740
responses oh my grad students be really

1153
00:45:35,010 --> 00:45:33,010
upset just yeah yeah I'm very I'm very

1154
00:45:36,690 --> 00:45:35,020
impressed by the searchability of this

1155
00:45:38,160 --> 00:45:36,700
data set and how you can look at a

1156
00:45:40,410 --> 00:45:38,170
variety of different objects and things

1157
00:45:42,900 --> 00:45:40,420
you get you have made it I think is a is

1158
00:45:46,020 --> 00:45:42,910
extremely easy to ask science questions

1159
00:45:48,540 --> 00:45:46,030
of this data will vanderheide up hi woh

1160
00:45:51,120 --> 00:45:48,550
tis good to see you again is asking he's

1161
00:45:53,940 --> 00:45:51,130
from well I shouldn't say is the entire

1162
00:45:56,310 --> 00:45:53,950
library accessible for non-us citizens

1163
00:45:58,560 --> 00:45:56,320

because i'd like to have NASA benefits

1164
00:46:01,230 --> 00:45:58,570
tags for it yeah yeah just click on that

1165
00:46:03,030 --> 00:46:01,240
download all the data link and later a

1166
00:46:05,820 --> 00:46:03,040
little bit yeah so anybody in the world

1167
00:46:08,070 --> 00:46:05,830
can get access to act yes and wealth of

1168
00:46:15,710 --> 00:46:08,080
fury there from Europe or Canada it's

1169
00:46:18,000 --> 00:46:15,720
not text can anyone pick up a good point

1170
00:46:20,940 --> 00:46:18,010
melissa is a collaboration with you

1171
00:46:24,090 --> 00:46:20,950
hello that's right that's right okay

1172
00:46:25,770 --> 00:46:24,100
well that's very good and so the I want

1173
00:46:27,810 --> 00:46:25,780
to talk a little bit about well first of

1174
00:46:29,550 --> 00:46:27,820
all let me ask you Molly and Jason have

1175
00:46:30,540 --> 00:46:29,560
I have you shown everything you wanted

1176
00:46:31,680 --> 00:46:30,550
to see is or something

1177
00:46:33,150 --> 00:46:31,690
that we should be showing that we have

1178
00:46:36,030 --> 00:46:33,160
it yet we had a couple of interesting

1179
00:46:37,710 --> 00:46:36,040
little eyes nuggets that yeah thought

1180
00:46:39,810 --> 00:46:37,720
we'd mentioned because it shows you go

1181
00:46:44,150 --> 00:46:39,820
ahead things that people discover with

1182
00:46:47,850 --> 00:46:44,160
this these data sets like these um so

1183
00:46:51,870 --> 00:46:47,860
Scott I guess plot the samp the that

1184
00:46:54,810 --> 00:46:51,880
mean welcome page which one you want to

1185
00:46:56,340 --> 00:46:54,820
shippers well I there was a some nice

1186
00:47:00,660 --> 00:46:56,350
graphics on the black backgrounds that

1187
00:47:02,970 --> 00:47:00,670
yeah it showed the I think so which said

1188
00:47:05,580 --> 00:47:02,980

am I going off of well when I sent you

1189
00:47:07,410 --> 00:47:05,590
the last time that the Black slides with

1190
00:47:08,580 --> 00:47:07,420
them oh yeah yeah yeah I'll just run

1191
00:47:09,540 --> 00:47:08,590
through those real quick just to show

1192
00:47:11,640 --> 00:47:09,550
you what kinds of things we're talking

1193
00:47:13,230 --> 00:47:11,650
about and while those are being brought

1194
00:47:14,340 --> 00:47:13,240
up one of the we're talking about open

1195
00:47:15,630 --> 00:47:14,350
data and one of the things that we've

1196
00:47:18,830 --> 00:47:15,640
done with archives one of the things

1197
00:47:21,600 --> 00:47:18,840
we're really hoping will happen with uh

1198
00:47:25,020 --> 00:47:21,610
making this archive both publicly

1199
00:47:28,260 --> 00:47:25,030
available and easily searchable is the

1200
00:47:30,600 --> 00:47:28,270
real power is when people propose to

1201
00:47:32,190 --> 00:47:30,610
take observations with Hubble you know

1202
00:47:33,870 --> 00:47:32,200
they had their science question that

1203
00:47:36,570 --> 00:47:33,880
they want to ask of the data they're

1204
00:47:38,490 --> 00:47:36,580
getting uh but a lot of different sized

1205
00:47:41,880 --> 00:47:38,500
questions can be asked and answered with

1206
00:47:47,220 --> 00:47:41,890
the data so what's really going to come

1207
00:47:50,070 --> 00:47:47,230
out of this archival data is questions

1208
00:47:51,990 --> 00:47:50,080
and answers that the people who

1209
00:47:54,210 --> 00:47:52,000
originally proposed those observations

1210
00:47:56,880 --> 00:47:54,220
never even thought to ask in the first

1211
00:48:00,150 --> 00:47:56,890
place that if the data we're just

1212
00:48:05,400 --> 00:48:00,160
sitting in some drawer somewhere that's

1213
00:48:07,350 --> 00:48:05,410

right ok so the Scott brought up a nice

1214
00:48:14,280 --> 00:48:07,360
graphic I wanted to just show a couple

1215
00:48:15,810 --> 00:48:14,290
of things which are the you know sort of

1216
00:48:19,080 --> 00:48:15,820
some science highlights for what you can

1217
00:48:22,020 --> 00:48:19,090
get out of this stuff one of the things

1218
00:48:24,780 --> 00:48:22,030
that people can do with with Hubble this

1219
00:48:26,640 --> 00:48:24,790
is actually with the this particular

1220
00:48:29,850 --> 00:48:26,650
observations with this instrument not

1221
00:48:33,210 --> 00:48:29,860
cost but it's the same idea there's this

1222
00:48:36,300 --> 00:48:33,220
planet which is a natural like planet an

1223
00:48:39,390 --> 00:48:36,310
ice giant orbiting a star called GJ 436

1224
00:48:41,460 --> 00:48:39,400
and the planet is close to its star that

1225
00:48:43,260 --> 00:48:41,470
the radiation from the star is actually

1226
00:48:44,370 --> 00:48:43,270
evaporating the atmosphere of the planet

1227
00:48:46,559 --> 00:48:44,380
boiling it away

1228
00:48:48,029 --> 00:48:46,569
and over time you know hundreds of

1229
00:48:49,859 --> 00:48:48,039
millions or maybe billions of years the

1230
00:48:51,509 --> 00:48:49,869
plan is just completely dissipate and

1231
00:48:54,569 --> 00:48:51,519
you might be left with just the rocky

1232
00:48:56,220 --> 00:48:54,579
core and if you take a spectrum of that

1233
00:48:58,400 --> 00:48:56,230
planet you can actually see the

1234
00:49:00,980 --> 00:48:58,410
signature of the hydrogen and the oxygen

1235
00:49:03,539 --> 00:49:00,990
boiling off the atmosphere of the planet

1236
00:49:05,819 --> 00:49:03,549
with Hubble data so that you know the

1237
00:49:07,769 --> 00:49:05,829
fact that there are planets being

1238
00:49:10,049 --> 00:49:07,779

destroyed by their host stars was a real

1239
00:49:11,609 --> 00:49:10,059
discovery of Hubble's and this was the

1240
00:49:12,900 --> 00:49:11,619
observation that did it and that you

1241
00:49:14,400 --> 00:49:12,910
would have met you would have noticed

1242
00:49:16,470 --> 00:49:14,410
any other way would you really oh

1243
00:49:19,579 --> 00:49:16,480
absolutely not you can't Anna to take

1244
00:49:21,839 --> 00:49:19,589
pictures of that that planet and that

1245
00:49:24,180 --> 00:49:21,849
star all day and you would never see

1246
00:49:25,529 --> 00:49:24,190
this because on the one number one the

1247
00:49:27,749 --> 00:49:25,539
planets too close to the star to

1248
00:49:28,980 --> 00:49:27,759
actually separate them and number two is

1249
00:49:31,019 --> 00:49:28,990
you wouldn't be able to see the fact

1250
00:49:32,609 --> 00:49:31,029
that the gases coming off the planet

1251
00:49:34,859 --> 00:49:32,619
have a velocity as they come off the

1252
00:49:37,380 --> 00:49:34,869
planet as they boil off you can only

1253
00:49:40,499 --> 00:49:37,390
measure those velocities and the content

1254
00:49:43,019 --> 00:49:40,509
of that stuff that's boiling off with a

1255
00:49:46,380 --> 00:49:43,029
with a spectrum in the ultraviolet so

1256
00:49:51,349 --> 00:49:46,390
cool observation and then if you go to

1257
00:49:54,269 --> 00:49:51,359
the next slide in that set this one is

1258
00:49:55,920 --> 00:49:54,279
really cool and I got an issue a

1259
00:49:58,970 --> 00:49:55,930
disclaimer I'm actually on the paper

1260
00:50:01,890 --> 00:49:58,980
Andrew had a whole thing about it yeah

1261
00:50:03,900 --> 00:50:01,900
our friend Andrew Fox who did right yeah

1262
00:50:05,400 --> 00:50:03,910
so Andy Fox is an astronomer here at

1263
00:50:06,870 --> 00:50:05,410

Space Telescope and actually he was

1264
00:50:10,349 --> 00:50:06,880
involved with the group of us that put

1265
00:50:11,549 --> 00:50:10,359
this archive together in addition to

1266
00:50:12,779 --> 00:50:11,559
leading up this area of science so

1267
00:50:14,999 --> 00:50:12,789
there's these things called the Fermi

1268
00:50:17,609 --> 00:50:15,009
bubbles these are very high energetic

1269
00:50:18,930 --> 00:50:17,619
that observed in gamma rays these

1270
00:50:20,609 --> 00:50:18,940
bubbles that come up out of the Milky

1271
00:50:23,970 --> 00:50:20,619
Way galaxy and it's thought that these

1272
00:50:26,130 --> 00:50:23,980
were created by ejecta from the

1273
00:50:28,049 --> 00:50:26,140
supermassive black hole that lives in

1274
00:50:30,720 --> 00:50:28,059
the center of the Milky Way so what Andy

1275
00:50:33,210 --> 00:50:30,730
did was to take the gamma-ray maps that

1276
00:50:35,880 --> 00:50:33,220
was produced by NASA's Fermi satellite

1277
00:50:38,009 --> 00:50:35,890
and then use Hubble's costs instrument

1278
00:50:39,990 --> 00:50:38,019
the spectrograph to look for the gas

1279
00:50:44,339 --> 00:50:40,000
that's associated with this gamma-ray

1280
00:50:46,079 --> 00:50:44,349
emission what we didn't know was whether

1281
00:50:48,329 --> 00:50:46,089
whatever event it was from the

1282
00:50:51,059 --> 00:50:48,339
supermassive black hole only generated

1283
00:50:52,620 --> 00:50:51,069
this gamma-ray emission or whether it

1284
00:50:55,049 --> 00:50:52,630
would actually driven you know get a

1285
00:50:57,089 --> 00:50:55,059
bubble of gas up out of the disk and

1286
00:50:57,870 --> 00:50:57,099
into this bubble shape and when you

1287
00:50:59,910 --> 00:50:57,880
observe

1288
00:51:01,050 --> 00:50:59,920

objects on the other side of the bubble

1289
00:51:04,890 --> 00:51:01,060
from where the Sun is you can actually

1290
00:51:06,420 --> 00:51:04,900
see that gas flow and in the same way as

1291
00:51:08,250 --> 00:51:06,430
I mentioned for the exoplanet just now

1292
00:51:10,770 --> 00:51:08,260
you can only measure the gas velocities

1293
00:51:15,420 --> 00:51:10,780
with the technique that they ain t used

1294
00:51:17,370 --> 00:51:15,430
so the data that was used to produce

1295
00:51:18,780 --> 00:51:17,380
these measurements and that some of the

1296
00:51:21,810 --> 00:51:18,790
data you're seeing these little squiggly

1297
00:51:24,660 --> 00:51:21,820
lines here in this graphic are in our

1298
00:51:26,910 --> 00:51:24,670
spectroscopic legacy archive andy's data

1299
00:51:29,610 --> 00:51:26,920
and a bunch of data like it are sitting

1300
00:51:34,410 --> 00:51:29,620
right there you can go and get it it's

1301
00:51:37,050 --> 00:51:34,420
also decidedly American hahaha yeah

1302
00:51:39,210 --> 00:51:37,060
that's all I'm gonna beat friend water

1303
00:51:41,610 --> 00:51:39,220
French or French yes it could be it some

1304
00:51:42,870 --> 00:51:41,620
kind of accidental yeah so the the joke

1305
00:51:47,070 --> 00:51:42,880
there you say it's French or American

1306
00:51:49,680 --> 00:51:47,080
headies English but I'll see a Union

1307
00:51:53,160 --> 00:51:49,690
Jack there yeah the reason is that the

1308
00:51:55,140 --> 00:51:53,170
reason is that the on the on the side

1309
00:51:56,490 --> 00:51:55,150
facing us the side facing the Sun which

1310
00:51:58,620 --> 00:51:56,500
is the right side here in the graphic

1311
00:52:01,020 --> 00:51:58,630
that absorption is blue shifted it's

1312
00:52:03,540 --> 00:52:01,030
moving towards us and the Doppler effect

1313
00:52:05,460 --> 00:52:03,550

causes it as it's moving toward us to

1314
00:52:07,530 --> 00:52:05,470
look to move to slightly shorter

1315
00:52:09,360 --> 00:52:07,540
wavelengths and on the other side where

1316
00:52:11,670 --> 00:52:09,370
the gas is moving away it's sort of in

1317
00:52:14,070 --> 00:52:11,680
this flow which is moving like that up

1318
00:52:15,630 --> 00:52:14,080
out of the center the on the other side

1319
00:52:17,310 --> 00:52:15,640
it's red shifted because the velocity is

1320
00:52:18,960 --> 00:52:17,320
moving it away from us and its

1321
00:52:21,540 --> 00:52:18,970
wavelength hits a little longer so in

1322
00:52:23,070 --> 00:52:21,550
the spectral trace down there the red

1323
00:52:26,880 --> 00:52:23,080
stuff corresponds with the red stuff in

1324
00:52:29,640 --> 00:52:26,890
the blue stuff this stuff and again at

1325
00:52:32,010 --> 00:52:29,650
velocity those kinematics you would

1326
00:52:35,730 --> 00:52:32,020
never know if you didn't have a spectrum

1327
00:52:38,310 --> 00:52:35,740
if you just take a picture okay did you

1328
00:52:39,270 --> 00:52:38,320
have it yeah so that shows the value of

1329
00:52:40,530 --> 00:52:39,280
some of the things you're getting out of

1330
00:52:43,740 --> 00:52:40,540
here did you have another use case there

1331
00:52:45,330 --> 00:52:43,750
Jason I don't okay so well guys wanna

1332
00:52:47,160 --> 00:52:45,340
make sure you got to you got to show the

1333
00:52:48,660 --> 00:52:47,170
ones you were thinking of because I now

1334
00:52:50,580 --> 00:52:48,670
I'd like to get you guys to comment on

1335
00:52:52,500 --> 00:52:50,590
something that I've been thinking about

1336
00:52:54,740 --> 00:52:52,510
quite a bit with these archives and that

1337
00:52:57,450 --> 00:52:54,750
is these for a long time we thought that

1338
00:52:58,620 --> 00:52:57,460

and I know that this isn't exactly big

1339
00:53:00,870 --> 00:52:58,630
data because you can get the whole thing

1340
00:53:03,630 --> 00:53:00,880
to fit on a thumb drive and that's not

1341
00:53:06,360 --> 00:53:03,640
exactly big data but this idea that the

1342
00:53:09,090 --> 00:53:06,370
data are becoming presentable in ways

1343
00:53:10,770 --> 00:53:09,100
that are very interesting to not to not

1344
00:53:11,340 --> 00:53:10,780
just scientist but in ways that we

1345
00:53:13,860 --> 00:53:11,350
probably

1346
00:53:15,120 --> 00:53:13,870
might not have thought to look at these

1347
00:53:16,200 --> 00:53:15,130
data before I like to get you guys to

1348
00:53:18,390 --> 00:53:16,210
comment a little bit about the

1349
00:53:19,800 --> 00:53:18,400
importance of there were there was a

1350
00:53:21,180 --> 00:53:19,810
there was a movement in the past I don't

1351
00:53:22,680 --> 00:53:21,190
even know what happened to it I having

1352
00:53:24,720 --> 00:53:22,690
something called a virtual Observatory

1353
00:53:26,040 --> 00:53:24,730
where lots of different data archives

1354
00:53:27,660 --> 00:53:26,050
plugged into it and you could ask

1355
00:53:29,490 --> 00:53:27,670
science questions of the virtual

1356
00:53:30,960 --> 00:53:29,500
observatory I think those have kind of

1357
00:53:34,200 --> 00:53:30,970
gone away a little bit in favor of these

1358
00:53:38,120 --> 00:53:34,210
individual ones but do you think no this

1359
00:53:41,130 --> 00:53:38,130
is the feud you girls meant to ask I

1360
00:53:45,270 --> 00:53:41,140
don't agree with you but go ahead what

1361
00:53:49,890 --> 00:53:45,280
about what what I said yes I don't agree

1362
00:53:52,920 --> 00:53:49,900
with your premise yeah didn't stop my

1363
00:53:55,410 --> 00:53:52,930

premise yet observatories went away

1364
00:53:58,110 --> 00:53:55,420
that's not true but go ahead all right

1365
00:54:04,250 --> 00:53:58,120
well I think even the ones that I knew

1366
00:54:08,910 --> 00:54:04,260
it you know even here they don't go away

1367
00:54:09,930 --> 00:54:08,920
then how important do you think and I

1368
00:54:12,390 --> 00:54:09,940
like to get your comments and thoughts

1369
00:54:14,520 --> 00:54:12,400
on this are these archives are to

1370
00:54:15,810 --> 00:54:14,530
answering not just the science questions

1371
00:54:18,210 --> 00:54:15,820
you know about that you set out to

1372
00:54:19,860 --> 00:54:18,220
answer but maybe even think about those

1373
00:54:22,560 --> 00:54:19,870
things you hadn't thought to answer do

1374
00:54:24,510 --> 00:54:22,570
these visualization tools you think have

1375
00:54:25,410 --> 00:54:24,520
a bright or are they how important do

1376
00:54:28,590 --> 00:54:25,420
you think they're going to be the future

1377
00:54:30,180 --> 00:54:28,600
scientists going forward and maybe Molly

1378
00:54:33,510 --> 00:54:30,190
you could start commenting and I'll just

1379
00:54:36,540 --> 00:54:33,520
go down the row um I'm not gonna dive

1380
00:54:37,890 --> 00:54:36,550
into the whole virtual observatory okay

1381
00:54:40,650 --> 00:54:37,900
I don't want to get booked into the debt

1382
00:54:44,010 --> 00:54:40,660
I died what I meant to say was I'll

1383
00:54:50,180 --> 00:54:44,020
argue with him later yeah what but I'll

1384
00:54:53,490 --> 00:54:50,190
stay X on periscope Carol braids Tony I

1385
00:54:57,710 --> 00:54:53,500
think this I you're gonna start seeing a

1386
00:55:01,530 --> 00:54:57,720
lot more of this idea of being able to

1387
00:55:06,570 --> 00:55:01,540
search by what kinds of targets you're

1388
00:55:09,420 --> 00:55:06,580

interested in um rather than just

1389
00:55:11,520 --> 00:55:09,430
searching by the traditional way would

1390
00:55:17,670 --> 00:55:11,530
be to search by a location on the sky

1391
00:55:19,860 --> 00:55:17,680
and if you're interested in physics in

1392
00:55:23,340 --> 00:55:19,870
what's going on with something

1393
00:55:24,780 --> 00:55:23,350
physically then you know you don't

1394
00:55:28,530 --> 00:55:24,790
really care

1395
00:55:30,720 --> 00:55:28,540
where it is on the sky right even in the

1396
00:55:35,970 --> 00:55:30,730
case of you know this mapping that flows

1397
00:55:37,560 --> 00:55:35,980
out of the Milky Way where a you you

1398
00:55:38,940 --> 00:55:37,570
know really do care to figure out that

1399
00:55:40,470 --> 00:55:38,950
geometry the location of those

1400
00:55:42,870 --> 00:55:40,480
individual objects you're looking at on

1401
00:55:44,490 --> 00:55:42,880
the sky to map the geometry the first

1402
00:55:47,430 --> 00:55:44,500
thing you care about is what those

1403
00:55:49,350 --> 00:55:47,440
objects are and then you care about

1404
00:55:50,910 --> 00:55:49,360
where they are on the sky the first

1405
00:55:52,770 --> 00:55:50,920
thing is well is this object and I be

1406
00:55:57,650 --> 00:55:52,780
able to be useful to answer my science

1407
00:56:00,510 --> 00:55:57,660
question um so I think that that mode of

1408
00:56:03,390 --> 00:56:00,520
interacting with data is going to become

1409
00:56:06,270 --> 00:56:03,400
a lot more common and definitely I think

1410
00:56:11,700 --> 00:56:06,280
that these kinds of archives especially

1411
00:56:14,540 --> 00:56:11,710
um ones that show you that give you data

1412
00:56:19,320 --> 00:56:14,550
that you could use out of the box

1413
00:56:23,640 --> 00:56:19,330

instead of having to just download and

1414
00:56:26,250 --> 00:56:23,650
reproduce all of the data in some

1415
00:56:29,790 --> 00:56:26,260
painstaking way it's definitely going to

1416
00:56:31,290 --> 00:56:29,800
increase the longevity of things okay

1417
00:56:33,330 --> 00:56:31,300
John how about you not here I could talk

1418
00:56:34,560 --> 00:56:33,340
about this yeah y'all want to get to

1419
00:56:36,300 --> 00:56:34,570
John on this okay let's get your

1420
00:56:38,580 --> 00:56:36,310
thoughts on this one well I I have two

1421
00:56:39,930 --> 00:56:38,590
thoughts I mean one of them is is that

1422
00:56:42,270 --> 00:56:39,940
the other really exciting thing about

1423
00:56:43,830 --> 00:56:42,280
this and why it's exciting for me

1424
00:56:46,080 --> 00:56:43,840
because I mix ground and space-based

1425
00:56:48,330 --> 00:56:46,090
astronomy all the time is that I've

1426
00:56:50,280 --> 00:56:48,340
worked on a similar effort with the Keck

1427
00:56:52,560 --> 00:56:50,290
telescope in what we call the Kodiak

1428
00:56:56,250 --> 00:56:52,570
survey to build up a giant public survey

1429
00:56:58,200 --> 00:56:56,260
Kodiak with a Q with a que yeah but

1430
00:57:04,080 --> 00:56:58,210
spelled a queue at the end right and

1431
00:57:06,330 --> 00:57:04,090
it's it fits it well but the purpose of

1432
00:57:08,790 --> 00:57:06,340
that is to is to bring as much pet data

1433
00:57:10,200 --> 00:57:08,800
to public as well but what's going to be

1434
00:57:12,240 --> 00:57:10,210
really exciting is where these two

1435
00:57:14,040 --> 00:57:12,250
things overlap in the sense that there

1436
00:57:16,410 --> 00:57:14,050
is going to be a significant parameter

1437
00:57:18,570 --> 00:57:16,420
space from from the Hubble spectroscopic

1438
00:57:21,240 --> 00:57:18,580

archives and the ground-based by

1439
00:57:22,920 --> 00:57:21,250
spectroscopic archives where as long as

1440
00:57:25,770 --> 00:57:22,930
you know and in many ways Kodiaks

1441
00:57:28,170 --> 00:57:25,780
searchability was inspired by mast and

1442
00:57:30,600 --> 00:57:28,180
then archives like this what to try to

1443
00:57:33,090 --> 00:57:30,610
give as much discovery space to people

1444
00:57:34,770 --> 00:57:33,100
who haven't thought explicitly about the

1445
00:57:36,810 --> 00:57:34,780
nitty-gritty details of data reduction

1446
00:57:37,410 --> 00:57:36,820
in this than the other thing and so I'm

1447
00:57:39,089 --> 00:57:37,420
really

1448
00:57:41,490 --> 00:57:39,099
cited about seeing how these things

1449
00:57:42,930 --> 00:57:41,500
might overlap the other point that I was

1450
00:57:44,819 --> 00:57:42,940
going to make real quickly is that and

1451
00:57:46,740 --> 00:57:44,829
not to sound like a downer but we're not

1452
00:57:51,470 --> 00:57:46,750
going to have a UV spectrograph in space

1453
00:57:53,910 --> 00:57:51,480
forever and the you know the the great

1454
00:57:55,319 --> 00:57:53,920
opportunities afforded by archives which

1455
00:57:59,789 --> 00:57:55,329
have given a lot of thought to things

1456
00:58:01,890 --> 00:57:59,799
like this it's really helpful continuing

1457
00:58:03,990 --> 00:58:01,900
and continuing our ability to do UV

1458
00:58:05,339 --> 00:58:04,000
space astronomy that's true God we

1459
00:58:07,589 --> 00:58:05,349
brought that point up in many hangouts

1460
00:58:09,359 --> 00:58:07,599
word in all the one game in town and I

1461
00:58:11,309 --> 00:58:09,369
think graduate students will be trained

1462
00:58:14,190 --> 00:58:11,319
on archives like this because they won't

1463
00:58:16,260 --> 00:58:14,200

have new native Nick like this for at

1464
00:58:17,819 --> 00:58:16,270
least four at least for a while boy for

1465
00:58:19,620 --> 00:58:17,829
educational use as well this will be

1466
00:58:21,450 --> 00:58:19,630
amazing resource for people Jason can I

1467
00:58:24,900 --> 00:58:21,460
get your thoughts on that well yeah it's

1468
00:58:27,450 --> 00:58:24,910
funny so a couple things uh the the

1469
00:58:31,410 --> 00:58:27,460
Kodiak project is a perfect example of

1470
00:58:34,079 --> 00:58:31,420
what you the power of unleashing data

1471
00:58:35,760 --> 00:58:34,089
and unlocking it taking out taking it

1472
00:58:37,109 --> 00:58:35,770
out of the individual astronomers desk

1473
00:58:39,270 --> 00:58:37,119
drawer and putting it in the public

1474
00:58:42,270 --> 00:58:39,280
domain the Kinect project the Keck

1475
00:58:44,309 --> 00:58:42,280
telescope in Hawaii organized by private

1476
00:58:46,799 --> 00:58:44,319
universities they never were obliged by

1477
00:58:48,930 --> 00:58:46,809
law to release their data until NASA

1478
00:58:50,160 --> 00:58:48,940
made and do it now you're starting to

1479
00:58:51,569 --> 00:58:50,170
see more and more of a kept a to come

1480
00:58:53,370 --> 00:58:51,579
out in public and people are using it

1481
00:58:55,500 --> 00:58:53,380
you're seeing that publication rates and

1482
00:58:57,599 --> 00:58:55,510
the impact of that data finally come out

1483
00:59:00,839 --> 00:58:57,609
the other thing is a story I heard

1484
00:59:03,180 --> 00:59:00,849
recently uh you know we all know that

1485
00:59:04,770 --> 00:59:03,190
back in the medieval times the reason

1486
00:59:06,660 --> 00:59:04,780
all the Greek and Roman manuscript

1487
00:59:09,089 --> 00:59:06,670
survived was that the monks were copying

1488
00:59:11,250 --> 00:59:09,099

them right what I don't have first-hand

1489
00:59:13,950 --> 00:59:11,260
experience but do you know why they had

1490
00:59:15,690 --> 00:59:13,960
to copy them it wasn't that they wanted

1491
00:59:18,660 --> 00:59:15,700
to read more copies it was that the

1492
00:59:20,549 --> 00:59:18,670
copies sitting on the shelf had a finite

1493
00:59:24,089 --> 00:59:20,559
lifetime because they literally the

1494
00:59:26,220 --> 00:59:24,099
bookworms would eat them so if Iran even

1495
00:59:27,990 --> 00:59:26,230
if you didn't want to sim simma Nate the

1496
00:59:30,359 --> 00:59:28,000
manuscript and pass the information

1497
00:59:32,670 --> 00:59:30,369
around you still had to make sure that

1498
00:59:34,950 --> 00:59:32,680
it stayed alive by copying the version

1499
00:59:37,049 --> 00:59:34,960
that you had in your monastery because

1500
00:59:39,660 --> 00:59:37,059
otherwise it would get eaten by worms so

1501
00:59:41,309 --> 00:59:39,670
what we're in in that same way what

1502
00:59:45,210 --> 00:59:41,319
we're doing here is keeping a database

1503
00:59:47,039 --> 00:59:45,220
alive we're making sure you know through

1504
00:59:48,770 --> 00:59:47,049
our own intellects and through the work

1505
00:59:50,850 --> 00:59:48,780
of our IT people in the whole process

1506
00:59:54,150 --> 00:59:50,860
making sure that that data

1507
00:59:57,360 --> 00:59:54,160
Days alive and available you know you're

1508
01:00:00,000 --> 00:59:57,370
not going to be able to read a CD in 15

1509
01:00:01,980 --> 01:00:00,010
years already my kids who is four and

1510
01:00:04,080 --> 01:00:01,990
eight they don't know what a wild record

1511
01:00:05,580 --> 01:00:04,090
is oh yeah well we've all yes anybody

1512
01:00:08,400 --> 01:00:05,590
who's had a floppy disk and had to make

1513
01:00:11,550 --> 01:00:08,410

it go to see each other's and then they

1514
01:00:14,010 --> 01:00:11,560
will know he is right you can't rely on

1515
01:00:15,480 --> 01:00:14,020
the physical medium so we're you know

1516
01:00:17,700 --> 01:00:15,490
it's our job here at Space Telescope to

1517
01:00:20,070 --> 01:00:17,710
make sure that the data itself is the

1518
01:00:21,900 --> 01:00:20,080
thing we're trying to preserve stays in

1519
01:00:23,610 --> 01:00:21,910
the form that's usable through the

1520
01:00:25,080 --> 01:00:23,620
decades eventually as O'Meara says

1521
01:00:25,920 --> 01:00:25,090
Hubble isn't going to last forever but

1522
01:00:27,960 --> 01:00:25,930
eventually we're going to have a

1523
01:00:29,700 --> 01:00:27,970
telescope that's much bigger a lot of us

1524
01:00:33,240 --> 01:00:29,710
are working on a 10 or 12 your space

1525
01:00:35,430 --> 01:00:33,250
telescope jwst and we will definitely

1526
01:00:37,320 --> 01:00:35,440
absolutely want to reabsorb of the stuff

1527
01:00:38,880 --> 01:00:37,330
that Hubble's looked at and we'll want

1528
01:00:40,230 --> 01:00:38,890
to go back and compare new results with

1529
01:00:42,660 --> 01:00:40,240
those future observatories to what

1530
01:00:44,580 --> 01:00:42,670
Hubble saw 20 30 years before we have to

1531
01:00:46,110 --> 01:00:44,590
have these archives in place and they

1532
01:00:48,480 --> 01:00:46,120
have to still be intelligible readable

1533
01:00:49,710 --> 01:00:48,490
to us for that to work so there's a

1534
01:00:52,290 --> 01:00:49,720
really strong reason why we're keeping

1535
01:00:54,180 --> 01:00:52,300
these things away from the bookworms and

1536
01:00:55,890 --> 01:00:54,190
broadway to be put back on just that

1537
01:00:58,170 --> 01:00:55,900
last point for two seconds real fast

1538
01:00:59,670 --> 01:00:58,180

because we are with with the remaining

1539
01:01:01,320 --> 01:00:59,680
years of Hubble that we have every

1540
01:01:04,140 --> 01:01:01,330
second is precious and so the other

1541
01:01:06,060 --> 01:01:04,150
thing that this archive does is it helps

1542
01:01:08,010 --> 01:01:06,070
inform the last set of proposals that

1543
01:01:09,930 --> 01:01:08,020
will be made on Hubble's Mesa that were

1544
01:01:11,790 --> 01:01:09,940
not made wasting time and be so that we

1545
01:01:14,430 --> 01:01:11,800
really are getting the best photons down

1546
01:01:17,160 --> 01:01:14,440
the bucket and in archives like this are

1547
01:01:18,320 --> 01:01:17,170
crucial for things yes and I you guys

1548
01:01:20,580 --> 01:01:18,330
are raising a lot of really interesting

1549
01:01:22,500 --> 01:01:20,590
topics that I'd like to get into not not

1550
01:01:24,000 --> 01:01:22,510
just the educational aspects of what

1551
01:01:25,470 --> 01:01:24,010
these archives can we can bring but also

1552
01:01:27,660 --> 01:01:25,480
the fact that what Jason brought up the

1553
01:01:28,980 --> 01:01:27,670
the perpetuating of the data set the

1554
01:01:30,930 --> 01:01:28,990
saving of them to make sure we don't

1555
01:01:33,540 --> 01:01:30,940
lose any of this stuff as well as making

1556
01:01:35,700 --> 01:01:33,550
as John points out more efficient use of

1557
01:01:36,720 --> 01:01:35,710
the tools that we do have already and we

1558
01:01:38,310 --> 01:01:36,730
don't read OOP we don't duplicate

1559
01:01:40,440 --> 01:01:38,320
efforts so these are all excellent

1560
01:01:42,210 --> 01:01:40,450
points and big data oh my gosh that's

1561
01:01:44,310 --> 01:01:42,220
like 10 hangouts all in all right there

1562
01:01:46,080 --> 01:01:44,320
so we do really go into a lot of this

1563
01:01:47,640 --> 01:01:46,090

stuff's but but I hope you guys got a

1564
01:01:49,680 --> 01:01:47,650
good introduction into this new

1565
01:01:51,000 --> 01:01:49,690
structural archive that's out available

1566
01:01:52,890 --> 01:01:51,010
on mass now I want to thank Molly

1567
01:01:54,000 --> 01:01:52,900
people's Jason Tomlinson and John

1568
01:01:56,280 --> 01:01:54,010
O'Meara for telling us a little bit

1569
01:01:58,740 --> 01:01:56,290
about it go visit go ask your questions

1570
01:02:01,200 --> 01:01:58,750
go explore it's there for you it's wide

1571
01:02:02,820 --> 01:02:01,210
open and ready to go and I am excited

1572
01:02:04,260 --> 01:02:02,830
for this hopefully we'll see a lot of

1573
01:02:06,060 --> 01:02:04,270
really cool new sign

1574
01:02:08,070 --> 01:02:06,070
coming out of it and I even wanted to

1575
01:02:10,800 --> 01:02:08,080
talk about citizen science impact but we

1576
01:02:12,450 --> 01:02:10,810
just didn't have time so anyway many

1577
01:02:14,880 --> 01:02:12,460
turn it all into an art project you know

1578
01:02:20,940 --> 01:02:14,890
yeah exactly is a little heavy there's a

1579
01:02:23,160 --> 01:02:20,950
lot of major oh we're doing that okay

1580
01:02:24,420 --> 01:02:23,170
okay guys well thank you all for I guess

1581
01:02:26,220 --> 01:02:24,430
we have to stop it there I did see one

1582
01:02:28,200 --> 01:02:26,230
quick comment from from Twitter from

1583
01:02:30,660 --> 01:02:28,210
days off 77 who's talking about a great

1584
01:02:33,990 --> 01:02:30,670
library from HST what a great tool the

1585
01:02:36,480 --> 01:02:34,000
Hubble legacy offside archive please

1586
01:02:37,770 --> 01:02:36,490
guys go explore this is your data set so

1587
01:02:39,150 --> 01:02:37,780
we hope you guys can get a lot of good

1588
01:02:41,100 --> 01:02:39,160

use out of it the astronomers I'm sure

1589
01:02:42,660 --> 01:02:41,110
well and we look forward to see what

1590
01:02:43,920 --> 01:02:42,670
comes out of it on behalf of carol

1591
01:02:46,160 --> 01:02:43,930
christian and scott lewis i want to