
Facebook Live Event
Hubble Messier Catalog
Goddard
SPACE FLIGHT CENTER
NASA

1
00:00:03,660 --> 00:00:06,100
Hey Facebook, we're live from Goddard Space Flight Center.

2
00:00:06,110 --> 00:00:09,180
I'm Erin Kisliuk with the Hubble Space Telescope.

3
00:00:09,180 --> 00:00:12,310
Did you know that this weekend is the peak of the

4
00:00:12,310 --> 00:00:15,420
Orionid meteor shower? So if you go out and look up and happen

5
00:00:15,420 --> 00:00:18,460
to see a few shooting stars, which you're actually seeing is

6
00:00:18,460 --> 00:00:21,560
debris from Halley's Comet.

7
00:00:21,560 --> 00:00:24,590
In the mid 1700's there was an astronomer named Charles Messier

8
00:00:24,590 --> 00:00:27,690
and he studied comets, but sometimes when he'd go out and look

9
00:00:27,690 --> 00:00:30,810
up, he'd catch these fuzzy images

10
00:00:30,810 --> 00:00:33,960
so he decided to categorize them

11
00:00:33,960 --> 00:00:37,020
and make a list so he would never be

12
00:00:37,020 --> 00:00:40,140
distracted by them ever again. Thus began

13
00:00:40,140 --> 00:00:43,200

the Messier Catalog. Hubble just today released it's own

14
00:00:43,200 --> 00:00:45,320
album full of Messier objects

15
00:00:45,320 --> 00:00:47,600
taken by the space telescope and

16
00:00:47,600 --> 00:00:49,640
we're going to talk about them here today with you.

17
00:00:49,640 --> 00:00:51,690
Make sure to send in questions

18
00:00:51,690 --> 00:00:53,770
and we'll answer them at the end of the show.

19
00:00:53,770 --> 00:00:55,810
I'm going to introduce you to some very special guests.

20
00:00:55,810 --> 00:00:57,920
So today we're joined by Michelle Thaller

21
00:00:57,920 --> 00:01:00,020
and Kevin Hartnett and thank you both for being here today.

22
00:01:00,020 --> 00:01:02,180
Hey, it's great to be here.

23
00:01:02,180 --> 00:01:04,260
All right were are going to jump right on into it.

24
00:01:04,260 --> 00:01:07,330
Who is Charles Messier and why is catalog so cool?

25
00:01:07,330 --> 00:01:10,440
Well Erin you just said, Charles Messier was an astronomer who was active

26
00:01:10,440 --> 00:01:13,580
in the late 1700's and he was really interested in finding

27
00:01:13,580 --> 00:01:15,740
comets, he actually found many of them over

28
00:01:15,740 --> 00:01:17,760
the course of his career, but there was some fuzzy

29
00:01:17,760 --> 00:01:19,850
little blobs in the sky that looked like comets

30
00:01:19,850 --> 00:01:21,950
but he could tell that they weren't comets

31
00:01:21,950 --> 00:01:24,040
because the didn't move with respect to the stars.

32
00:01:24,040 --> 00:01:26,160
Comets appear and disappear

33
00:01:26,160 --> 00:01:28,290
and they actually move with respect to the background stars

34
00:01:28,290 --> 00:01:30,330
but these little fuzzy blobs stayed right

35
00:01:30,330 --> 00:01:32,400
where they were. So he made a catalog

36
00:01:32,400 --> 00:01:34,500
of basically things to avoid

37
00:01:34,500 --> 00:01:36,660
that weren't comets and the thing that is a

38
00:01:36,660 --> 00:01:38,780

wonderful irony is what he actually had

39
00:01:38,780 --> 00:01:40,840
discovered were some of the dramatic and beautiful

40
00:01:40,840 --> 00:01:42,890
objects in the entire universe.

41
00:01:42,890 --> 00:01:44,930
He discovered things like dead

42
00:01:44,930 --> 00:01:46,980
stars or stars being born

43
00:01:46,980 --> 00:01:49,080
or what we know now are very distant galaxies.

44
00:01:49,080 --> 00:01:51,140
So in fact Messier found

45
00:01:51,140 --> 00:01:53,250
some of the most fascinating things in the sky.

46
00:01:53,250 --> 00:01:55,390
Yep, what's very

47
00:01:55,390 --> 00:01:57,440
interesting is the first object

48
00:01:57,440 --> 00:01:59,520
that we'll talk about, the Crab Nebula.

49
00:01:59,520 --> 00:02:01,610
He was looking actually for the

50
00:02:01,610 --> 00:02:03,730
return of Halley's Comet himself

51
00:02:03,730 --> 00:02:05,860
which was predicted to show up in the

52
00:02:05,860 --> 00:02:08,020
constellation of Taurus in that period

53
00:02:08,020 --> 00:02:10,080
and so he was scanning to find

54
00:02:10,080 --> 00:02:12,160
Halley's Comet and came across this object

55
00:02:12,160 --> 00:02:13,250
that we're going to talk about.

56
00:02:13,250 --> 00:02:14,290
So the catalog is

57
00:02:14,290 --> 00:02:16,420
numbered basically in the order that Messier

58
00:02:16,420 --> 00:02:18,540
discovered these things. So we are going to

59
00:02:18,540 --> 00:02:20,580
start with M1 and just like Kevin

60
00:02:20,580 --> 00:02:22,700
said, M1 is called the Crab Nebula.

61
00:02:22,700 --> 00:02:24,780
So we actually have a depiction here

62
00:02:24,780 --> 00:02:26,860
of where the Crab Nebula is in the sky

63
00:02:26,860 --> 00:02:28,970

and a little bit of what it looks like.

64
00:02:28,970 --> 00:02:31,090
See it's actually in the constellation

65
00:02:31,090 --> 00:02:33,130
Taurus, it's going to be honing in on that

66
00:02:33,130 --> 00:02:35,190
and as this begins to pan in

67
00:02:35,190 --> 00:02:37,270
look there's a fuzzy little thing there

68
00:02:37,270 --> 00:02:38,370
and that is what he saw and that

69
00:02:38,370 --> 00:02:39,450
what he thought might me a comet.

70
00:02:39,450 --> 00:02:41,550
But as we pan into even more

71
00:02:41,550 --> 00:02:43,680
you see that there is wonderful dramatic

72
00:02:43,680 --> 00:02:45,750
structure and what this turns out to be

73
00:02:45,750 --> 00:02:47,810
is an exploded star.

74
00:02:47,810 --> 00:02:49,870
It's what we call a supernova remnant.

75
00:02:49,870 --> 00:02:51,920
So there was a star long ago

76
00:02:51,920 --> 00:02:53,950
that exploded and actually spread its

77
00:02:53,950 --> 00:02:56,070
material over hundreds and hundreds of light years

78
00:02:56,070 --> 00:02:58,230
and in the middle there is the dead

79
00:02:58,230 --> 00:03:00,270
core of a star call a neutron star.

80
00:03:00,270 --> 00:03:02,340
Neutron stars are amazing

81
00:03:02,340 --> 00:03:04,430
they have the density of Mt. Everest

82
00:03:04,430 --> 00:03:06,520
pushed into every teaspoon full of

83
00:03:06,520 --> 00:03:08,740
material and they rotate hundreds

84
00:03:08,740 --> 00:03:10,880
of times a second and I remember

85
00:03:10,880 --> 00:03:12,940
you knew what year this star exploded.

86
00:03:12,940 --> 00:03:15,000
Yes. So historians

87
00:03:15,000 --> 00:03:17,100
have figured out that this

88
00:03:17,100 --> 00:03:19,200

is associated with

89
00:03:19,200 --> 00:03:21,300
the Chinese sighting

90
00:03:21,300 --> 00:03:23,460
of a guest star. they called it

91
00:03:23,460 --> 00:03:25,520
that was visible, so bright

92
00:03:25,520 --> 00:03:27,590
it could be seen during the day time and

93
00:03:27,590 --> 00:03:29,660
that was 1054 A.D.

94
00:03:29,660 --> 00:03:31,710
So we are very sure when this star actually exploded.

95
00:03:31,710 --> 00:03:33,760
Now Kevin is an amazing

96
00:03:33,760 --> 00:03:35,900
amateur astronomer, he actually takes pictures

97
00:03:35,900 --> 00:03:37,960
of these objects with his own telescope

98
00:03:37,960 --> 00:03:40,020
so should we go to some of the images that you

99
00:03:40,020 --> 00:03:42,110
taken yourself?

100
00:03:42,110 --> 00:03:44,170
Sure why not. In this case

101
00:03:44,170 --> 00:03:46,280
I don't have one of M1

102
00:03:46,280 --> 00:03:48,380
we'll see others but I wanted to show you

103
00:03:48,380 --> 00:03:50,420
both this chart and where M1

104
00:03:50,420 --> 00:03:52,480
can be found. Do you see

105
00:03:52,480 --> 00:03:54,550
the constellation of

106
00:03:54,550 --> 00:03:56,620
Taurus here?

107
00:03:56,620 --> 00:03:58,710
This little cluster of stars

108
00:03:58,710 --> 00:04:00,800
called the Hyades is V shaped

109
00:04:00,800 --> 00:04:02,920
and it marks the horns

110
00:04:02,920 --> 00:04:05,090
of the bull of Taurus.

111
00:04:05,090 --> 00:04:07,150
He's up and to the right of Orion.

112
00:04:07,150 --> 00:04:09,230
Very easily spotted in the winter sky

113
00:04:09,230 --> 00:04:11,320

and you take the

114
00:04:11,320 --> 00:04:13,410
lower horn and look at it

115
00:04:13,410 --> 00:04:15,550
with a telescope and your

116
00:04:15,550 --> 00:04:17,690
sure to find M1

117
00:04:17,690 --> 00:04:19,760
if you sweep around the field

118
00:04:19,760 --> 00:04:21,810
of view with that

119
00:04:21,810 --> 00:04:23,910
star in it because it's very close

120
00:04:23,910 --> 00:04:26,020
to that star named

121
00:04:26,020 --> 00:04:28,140
Zata Tauri.

122
00:04:28,140 --> 00:04:30,230
I want you to

123
00:04:30,230 --> 00:04:32,240
know that in the Hubble catalog

124
00:04:32,240 --> 00:04:34,320
that's been released

125
00:04:34,320 --> 00:04:36,360
we have a star chart like this

126
00:04:36,360 --> 00:04:38,460
for every Messier that's in the catalog.

127
00:04:38,460 --> 00:04:40,600
Even if you don't know

128
00:04:40,600 --> 00:04:42,730
anything about the Messier objects

129
00:04:42,730 --> 00:04:44,780
you'll know basically where to find them in the sky.

130
00:04:44,780 --> 00:04:47,820
What season to look for them in

131
00:04:47,820 --> 00:04:50,900
what constellation they're in and

132
00:04:50,900 --> 00:04:54,010
we also tell you in the album what

133
00:04:54,010 --> 00:04:57,140
telescope is a good one to look for this

134
00:04:57,140 --> 00:05:00,230
object and what time of the month

135
00:05:00,230 --> 00:05:02,290
or what month of the year you should be looking for it.

136
00:05:02,290 --> 00:05:04,370
So keeping with the theme of

137
00:05:04,370 --> 00:05:06,380
dead stars there's another one of my

138
00:05:06,380 --> 00:05:08,440

Messier objects, it's one of my favorites

139
00:05:08,440 --> 00:05:10,580
it's called the Ring Nebula. So we talked about M1

140
00:05:10,580 --> 00:05:12,730
being the first one, this is all the way M57

141
00:05:12,730 --> 00:05:14,770
Now the Ring Nebula is in the

142
00:05:14,770 --> 00:05:16,850
constellation Lyra and this is

143
00:05:16,850 --> 00:05:18,900
actually different, sort of dead star.

144
00:05:18,900 --> 00:05:20,990
The first on exploded violently

145
00:05:20,990 --> 00:05:23,090
in a super nova, this star is

146
00:05:23,090 --> 00:05:25,240
basically, generally unraveling itself

147
00:05:25,240 --> 00:05:27,300
into space. It was a star that was

148
00:05:27,300 --> 00:05:29,370
more about the mass the of sun

149
00:05:29,370 --> 00:05:31,440
it's dying and losing shells of gas

150
00:05:31,440 --> 00:05:33,520
around it. In the middle there's the

151
00:05:33,520 --> 00:05:35,620
remnant of this tiny little star,

152
00:05:35,620 --> 00:05:37,750
which is cooling off and basically dying.

153
00:05:37,750 --> 00:05:39,850
The Ring Nebula is a beautiful object

154
00:05:39,850 --> 00:05:41,900
and you can see some of the complexity

155
00:05:41,900 --> 00:05:43,940
that the Hubble Space Telescope discovered

156
00:05:43,940 --> 00:05:45,970
when it took many different visuals of

157
00:05:45,970 --> 00:05:48,080
this Ring Nebula.

158
00:05:48,080 --> 00:05:50,190
The thing that I really love about the Ring Nebula

159
00:05:50,190 --> 00:05:52,230
is it's not very easy to see

160
00:05:52,230 --> 00:05:54,390
in a telescope, you have to use a special technique

161
00:05:54,390 --> 00:05:56,420
to see it, so tell us a bit about your

162
00:05:56,420 --> 00:05:58,520
observation and how you see an object

163
00:05:58,520 --> 00:05:59,610

like this.

164
00:05:59,610 --> 00:06:01,710
Ok, sure be happy to.

165
00:06:01,710 --> 00:06:03,840
It's one of my favorites, it's a great

166
00:06:03,840 --> 00:06:06,000
summer favorite for amateur astronomer

167
00:06:06,000 --> 00:06:08,040
it's high in the sky and it's

168
00:06:08,040 --> 00:06:10,120
fairly easy to locate

169
00:06:10,120 --> 00:06:12,220
in the constellation of Lyra

170
00:06:12,220 --> 00:06:14,340
but as Michelle said

171
00:06:14,340 --> 00:06:16,470
it's small and a little bit hard to find

172
00:06:16,470 --> 00:06:18,630
and when you a

173
00:06:18,630 --> 00:06:20,690
put in an eye piece that has more

174
00:06:20,690 --> 00:06:22,760
magnification it dims

175
00:06:22,760 --> 00:06:25,850
It gets a little

176
00:06:25,850 --> 00:06:27,970
tricky to see especially the hole that's in

177
00:06:27,970 --> 00:06:30,110
the center.

178
00:06:30,110 --> 00:06:32,160
What you have to do and this a trick

179
00:06:32,160 --> 00:06:34,220
that we amateurs use

180
00:06:34,220 --> 00:06:36,290
is look to the side of the object

181
00:06:36,290 --> 00:06:38,380
because the edge of your eye

182
00:06:38,380 --> 00:06:40,500
is more sensitive to light then

183
00:06:40,500 --> 00:06:42,620
the center is, oddly enough.

184
00:06:42,620 --> 00:06:44,790
You have rods and cones in your eye

185
00:06:44,790 --> 00:06:46,850
and the rods are along

186
00:06:46,850 --> 00:06:48,960
the edge so at night

187
00:06:48,960 --> 00:06:51,000
your peripheral

188
00:06:51,000 --> 00:06:53,090

vision is better then your

189
00:06:53,090 --> 00:06:55,240
center vision and you can see things

190
00:06:55,240 --> 00:06:57,370
that move, so as a trick

191
00:06:57,370 --> 00:06:59,410
we get the object

192
00:06:59,410 --> 00:07:01,480
in the telescope and then

193
00:07:01,480 --> 00:07:03,590
look to the side of the object

194
00:07:03,590 --> 00:07:05,720
and wiggle the telescope a little bit

195
00:07:05,720 --> 00:07:07,870
and you can see it better when you do that.

196
00:07:07,870 --> 00:07:09,940
Especially the hole

197
00:07:09,940 --> 00:07:12,010
in the middle, it looks like a big smoke ring

198
00:07:12,010 --> 00:07:14,080
in sky when you use

199
00:07:14,080 --> 00:07:16,110
those tricks. Now you won't see the center

200
00:07:16,110 --> 00:07:18,170
star because that's pretty faint and

201
00:07:18,170 --> 00:07:20,210
although I took this

202
00:07:20,210 --> 00:07:22,340
photo with just a

203
00:07:22,340 --> 00:07:24,380
general DSLR and

204
00:07:24,380 --> 00:07:26,440
modest telescope

205
00:07:26,440 --> 00:07:28,520
the camera is more sensitive then your

206
00:07:28,520 --> 00:07:30,590
eye and so it can pick up on this star.

207
00:07:30,590 --> 00:07:32,720
You'd need probably

208
00:07:32,720 --> 00:07:34,840
a 14" telescope

209
00:07:34,840 --> 00:07:37,000
to see that star.

210
00:07:37,000 --> 00:07:39,060
So we are going from the theme of dead stars to something now

211
00:07:39,060 --> 00:07:41,110
very different and that is the birth of stars.

212
00:07:41,110 --> 00:07:43,210
Messier discovered things that represent all

213
00:07:43,210 --> 00:07:45,440

the different fazes of the life cycles of stars.

214
00:07:45,440 --> 00:07:48,580
So we're going to start talking about young stars.

215
00:07:48,580 --> 00:07:50,630
Yeah, while we walk over to talk about

216
00:07:50,630 --> 00:07:52,710
the young stars over here, I wanted to remind

217
00:07:52,710 --> 00:07:54,840
everybody to continue to send in questions

218
00:07:54,840 --> 00:07:56,960
we are really great ones.

219
00:07:56,960 --> 00:07:59,100
Were still here at Goddard Space Flight Center talking about

220
00:07:59,100 --> 00:08:01,120
Hubble Messier catalog

221
00:08:01,120 --> 00:08:03,180
and now we're going to be talking about young stars

222
00:08:03,180 --> 00:08:05,240
so take it away, I'll get out of your way.

223
00:08:05,240 --> 00:08:07,330
Well that's right, these are stars that are being born.

224
00:08:07,330 --> 00:08:09,400
The next object we're going to talk about is one of my

225
00:08:09,400 --> 00:08:11,510
favorites in the sky, it's like an old friend

226
00:08:11,510 --> 00:08:13,630
returning every time the fall sky rolls around.

227
00:08:13,630 --> 00:08:15,680
And that's M42, this is the

228
00:08:15,680 --> 00:08:17,760
Orion Nebula and as you can see in this

229
00:08:17,760 --> 00:08:19,790
wonderful animation with the Orion Nebula

230
00:08:19,790 --> 00:08:21,810
really is, is a giant

231
00:08:21,810 --> 00:08:23,890
cloud of dust and gas

232
00:08:23,890 --> 00:08:26,010
and inside it there are stars

233
00:08:26,010 --> 00:08:28,140
forming that are lighting us this cloud.

234
00:08:28,140 --> 00:08:30,180
There are 4 very bright

235
00:08:30,180 --> 00:08:32,220
stars at the very heart of the nebula called

236
00:08:32,220 --> 00:08:34,330
the Trapezium Cluster and these stars

237
00:08:34,330 --> 00:08:36,410
are larger then the Sun.

238
00:08:36,410 --> 00:08:38,430

More massive then the Sun and brighter

239
00:08:38,430 --> 00:08:40,600
and the light from them is lighting up the whole area

240
00:08:40,600 --> 00:08:42,680
that we know of as the Orion Nebula.

241
00:08:42,680 --> 00:08:44,720
To me this is one of the most beautiful images ever taken

242
00:08:44,720 --> 00:08:46,780
by Hubble. It's not only beautiful

243
00:08:46,780 --> 00:08:48,870
but it's very dramatic when you think about

244
00:08:48,870 --> 00:08:50,920
this is a cloud of dust and gas

245
00:08:50,920 --> 00:08:53,030
many, many hundreds of light years across

246
00:08:53,030 --> 00:08:55,080
and inside it there are

247
00:08:55,080 --> 00:08:57,260
dozens, if not hundreds of new stars

248
00:08:57,260 --> 00:08:59,310
forming right now.

249
00:08:59,310 --> 00:09:01,390
So this is a beautiful object and I have to say the image

250
00:09:01,390 --> 00:09:03,430
you took of this is spectacular.

251
00:09:03,430 --> 00:09:05,530
I mean you are an amazing astro-photographer.

252
00:09:05,530 --> 00:09:07,590
Let's take a look at what you got with this on.

253
00:09:07,590 --> 00:09:09,760
Well it is one of one of my

254
00:09:09,760 --> 00:09:11,810
better efforts, but they are all work

255
00:09:11,810 --> 00:09:13,820
and I want to really communicate

256
00:09:13,820 --> 00:09:16,900
that taking pictures

257
00:09:16,900 --> 00:09:19,990
is another aspect of astronomy that is

258
00:09:19,990 --> 00:09:22,000
enjoyable and has it's technical challenges

259
00:09:22,000 --> 00:09:24,140
but I've spent most of my life

260
00:09:24,140 --> 00:09:26,280
observing these things with binoculars or a telescope

261
00:09:26,280 --> 00:09:28,320
and it's as much fun

262
00:09:28,320 --> 00:09:30,380
it's probably more fun then

263
00:09:30,380 --> 00:09:32,440

trying to take pictures of them which is just hard.

264
00:09:32,440 --> 00:09:34,540
So here you see

265
00:09:34,540 --> 00:09:36,670
an image

266
00:09:36,670 --> 00:09:38,780
of Orion Nebula

267
00:09:38,780 --> 00:09:40,860
and I want to point out the contrast between this one

268
00:09:40,860 --> 00:09:42,910
and this one. It took Hubble

269
00:09:42,910 --> 00:09:44,960
about 500

270
00:09:44,960 --> 00:09:46,990
different pointing's

271
00:09:46,990 --> 00:09:49,050
mosaics stitched together to form

272
00:09:49,050 --> 00:09:51,110
this image because Hubble

273
00:09:51,110 --> 00:09:53,140
zooms in and has such

274
00:09:53,140 --> 00:09:55,210
high magnification, it zooms in to

275
00:09:55,210 --> 00:09:57,320
a smaller part of the

276
00:09:57,320 --> 00:09:59,400
object, this could all fit

277
00:09:59,400 --> 00:10:01,500
in the field of view of my telescope.

278
00:10:01,500 --> 00:10:03,610
When you are looking at this object

279
00:10:03,610 --> 00:10:05,760
just with a telescope

280
00:10:05,760 --> 00:10:07,780
and not worried about taking pictures

281
00:10:07,780 --> 00:10:09,940
you want to look for it beneath the 3

282
00:10:09,940 --> 00:10:11,980
stars that form Orion's belt

283
00:10:11,980 --> 00:10:14,110
the sheath for his sword

284
00:10:14,110 --> 00:10:16,200
if you will, right in that

285
00:10:16,200 --> 00:10:18,330
area from a dark spot

286
00:10:18,330 --> 00:10:20,380
you can see a faint cloud

287
00:10:20,380 --> 00:10:22,400
and put a telescope on it

288
00:10:22,400 --> 00:10:24,440

and you can see, right there

289
00:10:24,440 --> 00:10:26,480
is an image of where

290
00:10:26,480 --> 00:10:28,540
M42 is.

291
00:10:28,540 --> 00:10:30,630
Again, this is on our website

292
00:10:30,630 --> 00:10:32,720
so you can find

293
00:10:32,720 --> 00:10:34,900
these for all the Messier objects there.

294
00:10:34,900 --> 00:10:36,940
But you put a telescope

295
00:10:36,940 --> 00:10:38,980
on it and you can see this trapezium

296
00:10:38,980 --> 00:10:41,060
4 little stars in a

297
00:10:41,060 --> 00:10:43,130
trapezoid shape and

298
00:10:43,130 --> 00:10:45,230
enjoy the dark and light bands

299
00:10:45,230 --> 00:10:47,340
of this nebula. It's truly spectacular.

300
00:10:47,340 --> 00:10:49,530
Messier found a number of examples

301
00:10:49,530 --> 00:10:51,600
of young stars, in the case of the Orion

302
00:10:51,600 --> 00:10:53,660
Nebula the stars are still forming

303
00:10:53,660 --> 00:10:55,770
in this cloud of dust and gas

304
00:10:55,770 --> 00:10:57,870
but then there are other stars that are a little farther long

305
00:10:57,870 --> 00:11:00,020
that have moved out of the clouds they

306
00:11:00,020 --> 00:11:02,180
were born in. In many cases

307
00:11:02,180 --> 00:11:04,220
just the radiation and also the particle winds

308
00:11:04,220 --> 00:11:06,270
coming off these birth young stars

309
00:11:06,270 --> 00:11:08,340
blows away the cloud and so the next

310
00:11:08,340 --> 00:11:10,450
thing we are going to is an example of a young

311
00:11:10,450 --> 00:11:12,580
cluster of stars, stars that

312
00:11:12,580 --> 00:11:14,750
all formed probably in the least tens of millions of years.

313
00:11:14,750 --> 00:11:16,790

Doesn't sound very you to us but

314
00:11:16,790 --> 00:11:18,850
for stars that they are and this is a

315
00:11:18,850 --> 00:11:20,880
cluster called the Pleiades and the Pleiades

316
00:11:20,880 --> 00:11:22,970
is a wonderful thing to see to see in the

317
00:11:22,970 --> 00:11:25,090
autumn and winter sky it's always

318
00:11:25,090 --> 00:11:27,250
wonderful for me that wonderful, beautiful

319
00:11:27,250 --> 00:11:29,270
autumn sky is rolling around.

320
00:11:29,270 --> 00:11:31,350
These images look very different, so here's

321
00:11:31,350 --> 00:11:33,440
image that you took of this young cluster of stars

322
00:11:33,440 --> 00:11:35,520
and in fact the Hubble image

323
00:11:35,520 --> 00:11:37,630
has so much resolution

324
00:11:37,630 --> 00:11:39,660
and so much focus that it's only a tiny

325
00:11:39,660 --> 00:11:41,810
part of your image here. Right.

326
00:11:41,810 --> 00:11:43,940
So compare the Hubble image that we have here

327
00:11:43,940 --> 00:11:46,030
with what you were able to see with the Pleiades.

328
00:11:46,030 --> 00:11:48,110
So it's a very tiny portion, the Pleiades

329
00:11:48,110 --> 00:11:50,230
is a naked eye object

330
00:11:50,230 --> 00:11:52,360
and it's somewhat

331
00:11:52,360 --> 00:11:54,400
like 3 or 4 times

332
00:11:54,400 --> 00:11:56,470
the size of the full moon.

333
00:11:56,470 --> 00:11:58,520
It's very big on the sky.

334
00:11:58,520 --> 00:12:00,630
This image

335
00:12:00,630 --> 00:12:02,770
taken by Hubble

336
00:12:02,770 --> 00:12:04,830
of part of the gas and dust

337
00:12:04,830 --> 00:12:07,000
surrounding these stars

338
00:12:07,000 --> 00:12:09,130

is right in between this bright star

339
00:12:09,130 --> 00:12:11,220
called Merope and these two little stars

340
00:12:11,220 --> 00:12:13,310
next to it, so it's a very

341
00:12:13,310 --> 00:12:15,370
tiny portion of

342
00:12:15,370 --> 00:12:17,520
the actual Pleiades.

343
00:12:17,520 --> 00:12:19,570
Pleiades is also known as the

344
00:12:19,570 --> 00:12:21,620
Seven Sisters, a lot of people mistake it for

345
00:12:21,620 --> 00:12:23,690
the Little Dipper, cause it has this

346
00:12:23,690 --> 00:12:25,800
dipper shape.

347
00:12:25,800 --> 00:12:27,860
With your eye you really only see six, there's

348
00:12:27,860 --> 00:12:29,920
this legend of the

349
00:12:29,920 --> 00:12:31,970
missing Pleiad because you don't see

350
00:12:31,970 --> 00:12:34,030
seven but this

351
00:12:34,030 --> 00:12:36,100
cluster is also know in Japan

352
00:12:36,100 --> 00:12:38,170
as Subaru so when you look at the

353
00:12:38,170 --> 00:12:40,260
logo on the back of a Subaru

354
00:12:40,260 --> 00:12:42,350
you're looking at this star pattern, most people

355
00:12:42,350 --> 00:12:44,450
don't know that.

356
00:12:44,450 --> 00:12:46,610
It's a very, very beautiful cluster

357
00:12:46,610 --> 00:12:48,660
and best appreciated

358
00:12:48,660 --> 00:12:50,710
in binoculars or a small telescope

359
00:12:50,710 --> 00:12:52,750
where you can see just

360
00:12:52,750 --> 00:12:54,820
these diamonds

361
00:12:54,820 --> 00:12:56,960
on a black background.

362
00:12:56,960 --> 00:12:59,110
So we're talking about families of stars

363
00:12:59,110 --> 00:13:01,170

and the type of cluster that the Pleiades

364
00:13:01,170 --> 00:13:03,230
is something called an open cluster

365
00:13:03,230 --> 00:13:05,320
these are stars that form relatively close to each other

366
00:13:05,320 --> 00:13:07,410
in one of these big clouds

367
00:13:07,410 --> 00:13:09,510
but the sun was probably in a cluster like this billions

368
00:13:09,510 --> 00:13:11,630
of years ago, but over that time

369
00:13:11,630 --> 00:13:13,790
we've been around the galaxy so many times

370
00:13:13,790 --> 00:13:15,870
that just the gravitational interaction between

371
00:13:15,870 --> 00:13:17,940
the stars have peeled off all the other

372
00:13:17,940 --> 00:13:20,020
members of our star cluster, we don't really know

373
00:13:20,020 --> 00:13:22,180
where in the sky our brother and sister

374
00:13:22,180 --> 00:13:24,300
stars are. So an open cluster

375
00:13:24,300 --> 00:13:26,350
is a family of stars that all formed together

376
00:13:26,350 --> 00:13:28,380
and we're go over and talk a bit more

377
00:13:28,380 --> 00:13:30,490
about some different families of stars now.

378
00:13:30,490 --> 00:13:32,600
Yeah, once again while we're walking

379
00:13:32,600 --> 00:13:34,720
over, I just want to remind everyone to keep

380
00:13:34,720 --> 00:13:36,780
sending in your questions. I'm getting some really

381
00:13:36,780 --> 00:13:38,930
really great ones.

382
00:13:38,930 --> 00:13:40,980
We are here at Goddard Space Flight Center talking about

383
00:13:40,980 --> 00:13:43,070
Hubble's Messier catalog so continue

384
00:13:43,070 --> 00:13:45,150
sending in your question and I'll let you guys talk

385
00:13:45,150 --> 00:13:47,240
about clusters.

386
00:13:47,240 --> 00:13:49,360
Here's another example of an open cluster

387
00:13:49,360 --> 00:13:51,530
this is M11 Wild Duck Cluster.

388
00:13:51,530 --> 00:13:53,600

Open clusters are

389
00:13:53,600 --> 00:13:55,640
stars that form together relatively

390
00:13:55,640 --> 00:13:57,680
recently in the last millions or tens of millions

391
00:13:57,680 --> 00:13:59,800
of years and are slowly peeling apart

392
00:13:59,800 --> 00:14:01,830
over time so this is another one that

393
00:14:01,830 --> 00:14:03,980
you have a very different image

394
00:14:03,980 --> 00:14:06,140
Hubble is taking sort of picture here of the heart

395
00:14:06,140 --> 00:14:08,190
of this cluster and you have picture of the larger

396
00:14:08,190 --> 00:14:10,320
cluster so people can see that.

397
00:14:10,320 --> 00:14:12,450
Right, neither one looks much like a wild duck, do they?

398
00:14:12,450 --> 00:14:14,580
If you had a small

399
00:14:14,580 --> 00:14:16,620
telescope or a pair of binoculars

400
00:14:16,620 --> 00:14:18,630
and looked at this object which is in the summer

401
00:14:18,630 --> 00:14:20,670
sky in the Milky Way

402
00:14:20,670 --> 00:14:22,700
you'll see a V-shaped

403
00:14:22,700 --> 00:14:24,800
grouping of stars

404
00:14:24,800 --> 00:14:26,900
the brighter stars are V-shaped and

405
00:14:26,900 --> 00:14:29,060
reminded the early observers

406
00:14:29,060 --> 00:14:31,120
of a flight of ducks or geese that

407
00:14:31,120 --> 00:14:33,170
are characteristically flying in a V.

408
00:14:33,170 --> 00:14:35,250
When I look at this

409
00:14:35,250 --> 00:14:37,340
and this is one of my favorites too

410
00:14:37,340 --> 00:14:39,430
you notice right away and so did

411
00:14:39,430 --> 00:14:41,460
Messier, he wrote in his catalog

412
00:14:41,460 --> 00:14:43,580
about this that

413
00:14:43,580 --> 00:14:45,590

there is a very bright star

414
00:14:45,590 --> 00:14:47,640
in the center of the cluster.

415
00:14:47,640 --> 00:14:49,710
Hard to make out here because

416
00:14:49,710 --> 00:14:51,790
it just gets lost with all the others.

417
00:14:51,790 --> 00:14:53,920
It's very, very noticeable.

418
00:14:53,920 --> 00:14:55,960
When you look at it in a telescope

419
00:14:55,960 --> 00:14:57,980
this amazing

420
00:14:57,980 --> 00:15:00,020
grouping of stars

421
00:15:00,020 --> 00:15:02,040
and this one bright one

422
00:15:02,040 --> 00:15:04,090
in the middle. Now I found this

423
00:15:04,090 --> 00:15:06,160
cluster is particularly

424
00:15:06,160 --> 00:15:08,240
fun to look at

425
00:15:08,240 --> 00:15:10,340
in higher magnification

426
00:15:10,340 --> 00:15:12,350
and I like to use a zoom eye piece

427
00:15:12,350 --> 00:15:14,490
so I look at it

428
00:15:14,490 --> 00:15:16,650
at low magnification

429
00:15:16,650 --> 00:15:18,710
and the stars are really tight

430
00:15:18,710 --> 00:15:20,780
and then as you twist the eye

431
00:15:20,780 --> 00:15:22,820
piece it zooms in

432
00:15:22,820 --> 00:15:24,930
and you see hundreds more.

433
00:15:24,930 --> 00:15:27,050
It's a remarkable beautiful

434
00:15:27,050 --> 00:15:29,180
open cluster

435
00:15:29,180 --> 00:15:31,260
and there is

436
00:15:31,260 --> 00:15:33,310
something like, oh gee

437
00:15:33,310 --> 00:15:35,390
hundred of stars in the cluster.

438
00:15:35,390 --> 00:15:37,540

That's right an open cluster can have

439
00:15:37,540 --> 00:15:39,680
dozens or hundreds of stars but

440
00:15:39,680 --> 00:15:41,740
there are much larger star cluster as well.

441
00:15:41,740 --> 00:15:43,800
Certainly the largest ones that are in our own

442
00:15:43,800 --> 00:15:45,880
galaxy, the Milky Way, are called the globular clusters.

443
00:15:45,880 --> 00:15:48,050
We have an absolutely spectacular

444
00:15:48,050 --> 00:15:50,160
picture of a globular cluster here.

445
00:15:50,160 --> 00:15:52,190
This is the globular cluster M15

446
00:15:52,190 --> 00:15:54,230
the 15th thing on the list of things that where not comets.

447
00:15:54,230 --> 00:15:56,280
This is actually a cluster of

448
00:15:56,280 --> 00:15:58,340
stars that contains millions of stars.

449
00:15:58,340 --> 00:16:00,400
Now, astronomers believe

450
00:16:00,400 --> 00:16:02,490
that globular clusters are ancient clusters

451
00:16:02,490 --> 00:16:04,550
they probably formed very early on

452
00:16:04,550 --> 00:16:06,670
in the lifetime of our galaxy

453
00:16:06,670 --> 00:16:08,810
and if you think about the Milky Way galaxy

454
00:16:08,810 --> 00:16:10,850
we live in a spiral galaxy that is kind of shaped like a Frisbee.

455
00:16:10,850 --> 00:16:12,900
It's a disk of stars and gas

456
00:16:12,900 --> 00:16:14,950
and dust, but the globular clusters

457
00:16:14,950 --> 00:16:17,050
orbit around the entire

458
00:16:17,050 --> 00:16:19,150
galaxy almost like a swarm

459
00:16:19,150 --> 00:16:21,220
of angry bees. They are going all

460
00:16:21,220 --> 00:16:23,410
different directions around the Milky Way.

461
00:16:23,410 --> 00:16:25,460
In fact globular clusters were one of the

462
00:16:25,460 --> 00:16:27,550
first ways that we discovered our

463
00:16:27,550 --> 00:16:29,560

own place in the Milky Way.

464
00:16:29,560 --> 00:16:31,620
It turns out we are nowhere near the center

465
00:16:31,620 --> 00:16:33,730
of the Milky Way, we live out in the suburbs

466
00:16:33,730 --> 00:16:35,880
about three quarters of the way out into the disk

467
00:16:35,880 --> 00:16:37,940
from the center. So that's a long way from

468
00:16:37,940 --> 00:16:39,980
the middle of the galaxy.

469
00:16:39,980 --> 00:16:42,040
And all these globular clusters orbit around the center

470
00:16:42,040 --> 00:16:44,090
of mass of our galaxy.

471
00:16:44,090 --> 00:16:46,170
Astronomer along time ago realized

472
00:16:46,170 --> 00:16:48,290
that most of the globular clusters were

473
00:16:48,290 --> 00:16:50,310
in one half of the sky

474
00:16:50,310 --> 00:16:52,470
fewer on the other half of the sky and that's

475
00:16:52,470 --> 00:16:54,530
cause we were looking from a vantage point of being very

476
00:16:54,530 --> 00:16:56,560
far out from the center of the galaxy.

477
00:16:56,560 --> 00:16:58,650
When ever I see globular clusters

478
00:16:58,650 --> 00:17:00,750
I really aware of the

479
00:17:00,750 --> 00:17:02,880
place, the roll that they had in

480
00:17:02,880 --> 00:17:05,020
giving us a map as to where we are in the galaxy.

481
00:17:05,020 --> 00:17:07,070
As really good

482
00:17:07,070 --> 00:17:09,120
thing that we're not on a planet inside

483
00:17:09,120 --> 00:17:11,210
a globular cluster cause we wouldn't

484
00:17:11,210 --> 00:17:13,460
see much of the sky at all right?

485
00:17:13,460 --> 00:17:15,600
It would be like daytime all the time.

486
00:17:15,600 --> 00:17:17,660
Just look at all of those stars packed into

487
00:17:17,660 --> 00:17:19,730
that little area.

488
00:17:19,730 --> 00:17:21,820

Yes so it's very good for observing that we are

489
00:17:21,820 --> 00:17:23,940
where are.

490
00:17:23,940 --> 00:17:26,070
See you have another great image here.

491
00:17:26,070 --> 00:17:28,100
Yeah, this image is fun

492
00:17:28,100 --> 00:17:30,150
because I took it two nights ago, right?

493
00:17:32,220 --> 00:17:34,290
I took it with a very small telescope.

494
00:17:36,410 --> 00:17:38,530
It's in the constellation

495
00:17:38,530 --> 00:17:40,650
of Pegasus.

496
00:17:40,650 --> 00:17:42,820
The flying horse, which if you go out

497
00:17:42,820 --> 00:17:44,920
in tonight
in tonight's sky

498
00:17:44,920 --> 00:17:47,030
it will appear as a square

499
00:17:47,030 --> 00:17:49,120
they call the square

500
00:17:49,120 --> 00:17:51,280
Pegasus, very prominent square

501
00:17:51,280 --> 00:17:53,400
in the sky and I like to

502
00:17:53,400 --> 00:17:55,440
consider it like a baseball diamond.

503
00:17:55,440 --> 00:17:57,520
Cause it's oriented that way.

504
00:17:57,520 --> 00:17:59,620
This object is located

505
00:17:59,620 --> 00:18:01,710
off first base

506
00:18:01,710 --> 00:18:03,860
and there is a

507
00:18:03,860 --> 00:18:06,040
L-shaped string of stars

508
00:18:06,040 --> 00:18:08,120
is right at the tip of the L.

509
00:18:08,120 --> 00:18:10,130
It's very easy to find. Right there. There you go.

510
00:18:10,130 --> 00:18:12,250
So we've been talking about families

511
00:18:12,250 --> 00:18:14,360
of stars, the star clusters and in fact

512
00:18:14,360 --> 00:18:16,480
the largest families of stars in the universe

513

00:18:16,480 --> 00:18:18,520
are the galaxies.

514
00:18:18,520 --> 00:18:20,590
These are families of stars that include hundreds

515
00:18:20,590 --> 00:18:22,670
of billions of stars.

516
00:18:22,670 --> 00:18:24,740
So let's talk a bit about some of the galaxies

517
00:18:24,740 --> 00:18:25,860
that we are looking at.

518
00:18:25,860 --> 00:18:27,960
While we walk over to the biggest

519
00:18:27,960 --> 00:18:30,130
screen in the room, we'll talk about the biggest objects, right?

520
00:18:30,130 --> 00:18:32,180
I just want to remind everybody

521
00:18:32,180 --> 00:18:34,350
once again we're here at Goddard.

522
00:18:34,350 --> 00:18:36,440
We're talking about Hubble's Messier objects

523
00:18:36,440 --> 00:18:38,540
and please continue to send in your questions,

524
00:18:38,540 --> 00:18:41,670
we've got a ton of good ones and I'll let you talk about galaxies.

525
00:18:41,670 --> 00:18:44,720
Sounds good, yes, right.

526
00:18:44,720 --> 00:18:46,790
We're going to end with looking at some of these beautiful

527
00:18:46,790 --> 00:18:48,870
spiral galaxies and the first one we are looking at

528
00:18:48,870 --> 00:18:50,970
is something the Whirlpool galaxy which is know

529
00:18:50,970 --> 00:18:53,030
as M51 and the

530
00:18:53,030 --> 00:18:55,150
Whirlpool galaxy is a spiral galaxy

531
00:18:55,150 --> 00:18:57,210
about half the size of our own Milky Way

532
00:18:57,210 --> 00:18:59,280
and is at a distance of about

533
00:18:59,280 --> 00:19:01,360
23 million light years away.

534
00:19:01,360 --> 00:19:03,440
You can see here in this beautiful

535
00:19:03,440 --> 00:19:05,530
Hubble image the detail on the spiral

536
00:19:05,530 --> 00:19:07,650
arms of this galaxy.

537
00:19:07,650 --> 00:19:09,780
The dark areas are actually lanes of gas

538

00:19:09,780 --> 00:19:11,820
and dust where new stars are forming

539
00:19:11,820 --> 00:19:13,920
inside that right now. In fact,

540
00:19:13,920 --> 00:19:16,000
when ever you see red areas along the spiral

541
00:19:16,000 --> 00:19:18,110
arm, that's active star formation.

542
00:19:18,110 --> 00:19:20,260
That's where young stars are still embedded

543
00:19:20,260 --> 00:19:22,260
in the dust and they are lighting up the

544
00:19:22,260 --> 00:19:24,310
dust and making glow red.

545
00:19:24,310 --> 00:19:26,340
It is an absolutely beautiful spiral.

546
00:19:26,340 --> 00:19:28,370
The thing that is amazing about

547
00:19:28,370 --> 00:19:30,490
this, is looks quite different

548
00:19:30,490 --> 00:19:32,530
through a telescope and some people might be

549
00:19:32,530 --> 00:19:34,640
disappointed but I still think it's a wonder thing to look at.

550
00:19:34,640 --> 00:19:36,800
So tell us a bit about what it's like to observe

551
00:19:36,800 --> 00:19:38,840
a beautiful galaxy like this.

552
00:19:38,840 --> 00:19:40,900
I tell you, it's fun

553
00:19:40,900 --> 00:19:42,970
to glimpse these things

554
00:19:42,970 --> 00:19:45,030
even if you're not seeing them particularly

555
00:19:45,030 --> 00:19:47,140
clearly in the night sky.

556
00:19:47,140 --> 00:19:49,270
There's a

557
00:19:49,270 --> 00:19:51,440
connection with the universe

558
00:19:51,440 --> 00:19:53,500
by looking at the light of

559
00:19:53,500 --> 00:19:55,560
these things with your own eye.

560
00:19:55,560 --> 00:19:58,660
Just like Messier would have

561
00:19:58,660 --> 00:20:01,760
seen this, it was a smudge but know you know

562
00:20:01,760 --> 00:20:04,870
what it really is and that's electrifying.

563

00:20:04,870 --> 00:20:08,070
If you're, at night, searching for these

564
00:20:08,070 --> 00:20:11,140
things with your telescope and finding

565
00:20:11,140 --> 00:20:14,220
it and realizing what you're seeing

566
00:20:14,220 --> 00:20:17,360
there is nothing really quite like it.

567
00:20:17,360 --> 00:20:20,420
Messier would not have seen the spiral arms

568
00:20:20,420 --> 00:20:23,480
because you need a large a telescope

569
00:20:23,480 --> 00:20:26,550
to do that and his telescopes where not

570
00:20:26,550 --> 00:20:28,630
very good, they weren't even made of glass.

571
00:20:28,630 --> 00:20:30,730
The ones that we use now

572
00:20:30,730 --> 00:20:32,790
with mirrors, the mirrors were made out of metal

573
00:20:32,790 --> 00:20:34,830
back then and we've

574
00:20:34,830 --> 00:20:36,860
looked at these globular clusters

575
00:20:36,860 --> 00:20:38,920
in M15

576
00:20:38,920 --> 00:20:41,000
Messier noted he didn't see one

577
00:20:41,000 --> 00:20:43,070
star in that globular cluster

578
00:20:43,070 --> 00:20:45,170
that we now know has

579
00:20:45,170 --> 00:20:47,420
millions of stars.

580
00:20:47,420 --> 00:20:50,470
So his view was very very different.

581
00:20:50,470 --> 00:20:53,510
This is an image I took, it took about 4 hours

582
00:20:53,510 --> 00:20:55,570
to layup that image. In a second

583
00:20:55,570 --> 00:20:57,650
I'll show you what one little frame looked like.

584
00:20:57,650 --> 00:20:59,740
But this object was

585
00:20:59,740 --> 00:21:01,860
not seen by Messier

586
00:21:01,860 --> 00:21:03,990
at the time, it's a neighboring galaxy.

587
00:21:03,990 --> 00:21:06,040
He only saw the very

588

00:21:06,040 --> 00:21:08,070
core of this and it looked like a little blob.

589
00:21:08,070 --> 00:21:10,130
So the thing is

590
00:21:10,130 --> 00:21:12,200
even if your telescope image

591
00:21:12,200 --> 00:21:14,310
doesn't look like this, it's still wonderful

592
00:21:14,310 --> 00:21:16,390
to think the lights your looking, even when you see a little

593
00:21:16,390 --> 00:21:18,520
smudge on the sky, in this case it's

594
00:21:18,520 --> 00:21:20,570
23 millions years old.

595
00:21:20,570 --> 00:21:22,630
23 million light years away, means the light

596
00:21:22,630 --> 00:21:24,710
took that long to get to us so when you see

597
00:21:24,710 --> 00:21:26,830
this beautiful as just a smudge

598
00:21:26,830 --> 00:21:28,950
in the sky, that light left long before

599
00:21:28,950 --> 00:21:31,100
there were humans on the earth.

600
00:21:31,100 --> 00:21:33,160
You mention you were going to show us

601
00:21:33,160 --> 00:21:35,250
so this is what you'd see through even a large telescope.

602
00:21:35,250 --> 00:21:37,340
Yeah, this was taken through a 8" diameter

603
00:21:37,340 --> 00:21:39,420
telescope and it took

604
00:21:39,420 --> 00:21:41,460
I'm trying to remember now, about 3 minutes

605
00:21:41,460 --> 00:21:43,480
or 4 minutes to layup this particular

606
00:21:43,480 --> 00:21:45,560
image and you see you get

607
00:21:45,560 --> 00:21:47,600
all the light pollution

608
00:21:47,600 --> 00:21:49,630
right? The sky glow in the back

609
00:21:49,630 --> 00:21:51,670
too. The trick

610
00:21:51,670 --> 00:21:53,760
that amateurs use

611
00:21:53,760 --> 00:21:55,840
is to stack

612
00:21:55,840 --> 00:21:57,930
all these up, line them up

613

00:21:57,930 --> 00:22:00,040
and so I took, what ever, 4 hours

614
00:22:00,040 --> 00:22:02,220
of 3 minute exposures

615
00:22:02,220 --> 00:22:04,290
and you can get software free off the web

616
00:22:04,290 --> 00:22:06,370
now to align them all and stack

617
00:22:06,370 --> 00:22:08,450
them up and you learn some about processing.

618
00:22:08,450 --> 00:22:10,550
Honestly,

619
00:22:10,550 --> 00:22:12,660
although I don't want you to think

620
00:22:12,660 --> 00:22:14,660
that your going to see these marvelous images,

621
00:22:14,660 --> 00:22:16,700
the pictures

622
00:22:16,700 --> 00:22:18,760
from Hubble or even my telescope

623
00:22:18,760 --> 00:22:20,810
by looking through the eye piece.

624
00:22:20,810 --> 00:22:22,890
It is encouraging

625
00:22:22,890 --> 00:22:25,000
or it should be encouraging you that, I've only been

626
00:22:25,000 --> 00:22:27,130
at astro-photography for maybe 4 years

627
00:22:27,130 --> 00:22:29,290
with a digital camera

628
00:22:29,290 --> 00:22:31,330
and so you can learn very quickly with a lot of

629
00:22:31,330 --> 00:22:33,390
resources on the web but

630
00:22:33,390 --> 00:22:35,490
start with the Hubble site.

631
00:22:35,490 --> 00:22:37,590
You can find out where the Messier's

632
00:22:37,590 --> 00:22:39,630
are in the sky

633
00:22:39,630 --> 00:22:41,790
and what instrument to use

634
00:22:41,790 --> 00:22:43,840
look at them and once you get more

635
00:22:43,840 --> 00:22:45,900
familiar with the sky, like I've done over many

636
00:22:45,900 --> 00:22:47,980
years then dabble in astro-photography.

637
00:22:47,980 --> 00:22:50,070
So we are going to wrap up our

638

00:22:50,070 --> 00:22:52,140
catalog of the Messier objects

639
00:22:52,140 --> 00:22:54,280
with one of the most beautiful things in the sky called

640
00:22:54,280 --> 00:22:56,380
the Andromeda galaxy, this is M31

641
00:22:56,380 --> 00:22:59,450
and I have to say Kevin this your image.

642
00:22:59,450 --> 00:23:02,530
This is absolutely spectacular. The Andromeda

643
00:23:02,530 --> 00:23:05,740
galaxy is a galaxy very much like the Milky Way

644
00:23:05,740 --> 00:23:07,790
it's a distance of a little bit more then 2 million light years away.

645
00:23:07,790 --> 00:23:09,880
The thing that is amazing about the Andromeda

646
00:23:09,880 --> 00:23:11,910
galaxy is that edge to edge this

647
00:23:11,910 --> 00:23:13,930
is as large on the sky as

648
00:23:13,930 --> 00:23:15,970
three full moons.

649
00:23:15,970 --> 00:23:18,020
Think about lining full moon up

650
00:23:18,020 --> 00:23:20,140
across that galaxy.

651
00:23:20,140 --> 00:23:22,270
At night when this thing is up, there's this

652
00:23:22,270 --> 00:23:24,320
giant galaxy actually covering a fairly large

653
00:23:24,320 --> 00:23:26,380
part of our sky but the reason we don't see

654
00:23:26,380 --> 00:23:28,440
it's very faint and in fact

655
00:23:28,440 --> 00:23:30,490
Messier could only see the very very central

656
00:23:30,490 --> 00:23:32,540
part of the galaxy but this other objects

657
00:23:32,540 --> 00:23:35,710
in here as well that Messier saw

658
00:23:35,710 --> 00:23:38,760
in this gorgeous image that you took. Tell us about that.

659
00:23:38,760 --> 00:23:41,810
Wouldn't we all had eyes to see this

660
00:23:41,810 --> 00:23:44,880
thing in the sky hanging

661
00:23:44,880 --> 00:23:47,960
there in the autumn sky as big

662
00:23:47,960 --> 00:23:51,060
as 6 full moons across, right?

663

00:23:51,060 --> 00:23:54,100
It's just an amazingly big object.

664
00:23:54,100 --> 00:23:57,250
It's faint because it's a long way away.

665
00:23:57,250 --> 00:24:00,320
So when you look at this in a telescope

666
00:24:00,320 --> 00:24:03,380
or with binoculars, in fact you can see this object

667
00:24:03,380 --> 00:24:06,480
with the naked eye from a dark place.

668
00:24:06,480 --> 00:24:09,620
You're really only seeing the very bright core

669
00:24:09,620 --> 00:24:12,750
but that is what you'll see in a scope

670
00:24:12,750 --> 00:24:15,810
or binoculars. Very fun to see.

671
00:24:15,810 --> 00:24:18,880
I remember dragging my whole family when I was maybe 15

672
00:24:18,880 --> 00:24:21,980
and it was in the winter and

673
00:24:21,980 --> 00:24:25,100
I said, now that I found you have to see it so

674
00:24:25,100 --> 00:24:28,230
it was like 20 degrees out, drag all my sisters out

675
00:24:28,230 --> 00:24:31,290
to see this thing because it's just

676
00:24:31,290 --> 00:24:34,340
it's a classic. It's very spectacular.

677
00:24:34,340 --> 00:24:37,360
This object, Messier also found probably within

678
00:24:37,360 --> 00:24:40,470
the same night that he looked at M31.

679
00:24:40,470 --> 00:24:43,520
This is called M32.

680
00:24:43,520 --> 00:24:46,660
Again, very easy to see because it's so close to N31

681
00:24:46,660 --> 00:24:49,700
and it looks like a slightly out of focus star.

682
00:24:49,700 --> 00:24:52,740
Little harder to see is this on down here

683
00:24:52,740 --> 00:24:55,770
a companion galaxy, now known as

684
00:24:55,770 --> 00:24:58,890
M110 you have to use that

685
00:24:58,890 --> 00:25:01,930
little trick I mention earlier, looking to the

686
00:25:01,930 --> 00:25:05,090
side of M110 to see it more clearly. I like to

687
00:25:05,090 --> 00:25:08,180
take people out and show them Andromeda

688

00:25:08,180 --> 00:25:11,230
through the telescope, it's very easy to see this

689
00:25:11,230 --> 00:25:14,340
little harder to see this and they have to really work to see

690
00:25:14,340 --> 00:25:17,490
M110 so it's a great learning experience.

691
00:25:17,490 --> 00:25:19,550
Going to the Hubble image of Andromeda,

692
00:25:19,550 --> 00:25:21,630
this is something that is kind of mind blowing.

693
00:25:21,630 --> 00:25:23,690
Hubble is so powerful that it can see the individual

694
00:25:23,690 --> 00:25:25,790
stars in this galaxy

695
00:25:25,790 --> 00:25:27,880
2 million light years away.

696
00:25:27,880 --> 00:25:29,950
Now this galaxy contains hundreds of

697
00:25:29,950 --> 00:25:32,100
billions of stars and when you look

698
00:25:32,100 --> 00:25:34,150
this image there is kind of graininess to the image

699
00:25:34,150 --> 00:25:36,230
and that is real. These are all individual

700
00:25:36,230 --> 00:25:38,300
stars that Hubble can pick out.

701
00:25:38,300 --> 00:25:40,410
Now the amazing thing, it Hubble over

702
00:25:40,410 --> 00:25:42,520
400 pointing's to stitch

703
00:25:42,520 --> 00:25:44,670
together this giant mosaic of Andromeda

704
00:25:44,670 --> 00:25:46,680
and in fact Hubble only had the time

705
00:25:46,680 --> 00:25:48,760
to image about 1/3 of the galaxy.

706
00:25:48,760 --> 00:25:50,840
So think about that. More then

707
00:25:50,840 --> 00:25:52,910
400 Hubble images all put together in a

708
00:25:52,910 --> 00:25:55,010
mosaic to cover just about 1/3

709
00:25:55,010 --> 00:25:57,130
of the Andromeda galaxy.

710
00:25:57,130 --> 00:25:59,200
That's amazing thing to see and an

711
00:25:59,200 --> 00:26:01,270
incredible Messier object.

712
00:26:01,270 --> 00:26:03,330
Hopefully in talking about these wonderful

713

00:26:03,330 --> 00:26:05,420
objects you can see in the sky, things like

714
00:26:05,420 --> 00:26:07,460
dead stars, stars being born,

715
00:26:07,460 --> 00:26:09,720
galaxy, star clusters. You might want to

716
00:26:09,720 --> 00:26:11,800
go out and look at them yourself and this is

717
00:26:11,800 --> 00:26:13,860
where Kevin is the expert and he's going to talk to you

718
00:26:13,860 --> 00:26:15,910
a bit about what you can do, to go out

719
00:26:15,910 --> 00:26:18,010
and make your own Messier catalog.

720
00:26:18,010 --> 00:26:20,110
So you brought some telescopes here so let's go

721
00:26:20,110 --> 00:26:22,270
over here and take a look at this.

722
00:26:24,420 --> 00:26:26,450
So I should probably start here.

723
00:26:26,450 --> 00:26:28,510
Because

724
00:26:28,510 --> 00:26:30,570
from a dark sky

725
00:26:30,570 --> 00:26:32,660
you can see

726
00:26:32,660 --> 00:26:34,760
most of the Messier

727
00:26:34,760 --> 00:26:36,900
objects with a good pair of binoculars.

728
00:26:36,900 --> 00:26:38,940
From the Washington, DC

729
00:26:38,940 --> 00:26:40,970
area maybe a

730
00:26:40,970 --> 00:26:43,050
quarter of them but if you're out

731
00:26:43,050 --> 00:26:45,140
in a dark spot you can see

732
00:26:45,140 --> 00:26:47,250
many of these so get yourself

733
00:26:47,250 --> 00:26:49,380
a star chart like this

734
00:26:49,380 --> 00:26:51,470
and find

735
00:26:51,470 --> 00:26:53,500
them or use the star charts that

736
00:26:53,500 --> 00:26:55,580
are on the Hubble

737
00:26:55,580 --> 00:26:57,740
site and you'll

738

00:26:57,740 --> 00:26:59,850
know where to look.

739
00:26:59,850 --> 00:27:01,890
It's good to use a set of

740
00:27:01,890 --> 00:27:04,060
binoculars at night that's,

741
00:27:04,060 --> 00:27:06,130
one like this.

742
00:27:06,130 --> 00:27:08,190
This is a 10x50

743
00:27:08,190 --> 00:27:10,230
10 is the magnification

744
00:27:10,230 --> 00:27:12,330
50 is the size and milometer

745
00:27:12,330 --> 00:27:14,380
of the glass up front.

746
00:27:14,380 --> 00:27:16,550
Most of us have 7x35 at home they're

747
00:27:16,550 --> 00:27:18,580
great for terrestrial viewing,

748
00:27:18,580 --> 00:27:20,670
looking at things in the yard

749
00:27:20,670 --> 00:27:22,720
or what ever.

750
00:27:22,720 --> 00:27:24,820
But you want a little more power and you want to

751
00:27:24,820 --> 00:27:26,920
gather more light because the stars are faint.

752
00:27:26,920 --> 00:27:29,040
You want this

753
00:27:29,040 --> 00:27:32,270
lens to be as big as you can hold
lens to be as big as you can hold steady.

754
00:27:32,270 --> 00:27:35,340
That's the other caveat, right?

755
00:27:35,340 --> 00:27:37,380
So if you get to heavy of a binocular you can't hold it steady

756
00:27:37,380 --> 00:27:39,490
and you won't get a very good view.

757
00:27:39,490 --> 00:27:41,620
So just 2 other representitives

758
00:27:41,620 --> 00:27:43,660
scopes you might

759
00:27:43,660 --> 00:27:45,710
be fascinated to know that the

760
00:27:45,710 --> 00:27:47,750
beautiful that I took

761
00:27:47,750 --> 00:27:50,830
and the one of the Pleiades was taken with

762
00:27:50,830 --> 00:27:53,890
almost exactly this size, it wasn't this particular one

763
00:27:53,890 --> 00:27:55,990
but I had it mounted on the back

764
00:27:55,990 --> 00:27:58,120
of a larger scope and more

765
00:27:58,120 --> 00:28:00,170
expensive mount that was tracking the star

766
00:28:00,170 --> 00:28:02,220
cause again I had to layup these time

767
00:28:02,220 --> 00:28:04,290
exposures. But you can enjoy

768
00:28:04,290 --> 00:28:06,450
the Pleiades and the Orion

769
00:28:06,450 --> 00:28:09,580
nebula and M31

770
00:28:09,580 --> 00:28:12,710
all as beautiful objects in a scope this size.

771
00:28:12,710 --> 00:28:15,780
Our website says

772
00:28:15,780 --> 00:28:18,860
for each individual object it's best seen or

773
00:28:18,860 --> 00:28:21,940
can be see with a large, medium, or small

774
00:28:21,940 --> 00:28:25,050
telescope. This is what we mean by small.

775
00:28:25,050 --> 00:28:28,190

Up to 3 or 4 inches.

776
00:28:28,190 --> 00:28:30,220
Medium would be more in the class of a 6

777
00:28:30,220 --> 00:28:32,280
to 10 inch diameter telescope.

778
00:28:32,280 --> 00:28:34,360
The size of the

779
00:28:34,360 --> 00:28:36,440
lens again is

780
00:28:36,440 --> 00:28:38,530
the size of the

781
00:28:38,530 --> 00:28:40,650
it's what collecting

782
00:28:40,650 --> 00:28:42,830
the light so think of it as you eyeball.

783
00:28:42,830 --> 00:28:44,920
Imagine your eyeball being 8

784
00:28:44,920 --> 00:28:46,960
inches wide, you'd collect a lot more light.

785
00:28:46,960 --> 00:28:49,000
Then larger scopes,

786
00:28:49,000 --> 00:28:51,120
we didn't have room on set to bring it in here,

787
00:28:51,120 --> 00:28:54,260
can be 10, 12, 16

788
00:28:54,260 --> 00:28:56,330
some amateurs have 20 inch telescopes,

789
00:28:56,330 --> 00:28:58,370
great big things. But the get

790
00:28:58,370 --> 00:29:00,500
obviously difficult to move around.

791
00:29:00,500 --> 00:29:02,610
So

792
00:29:02,610 --> 00:29:04,640
each has their own price range

793
00:29:04,640 --> 00:29:06,760
and pros and cons

794
00:29:06,760 --> 00:29:08,910
read up on a web site that describes

795
00:29:08,910 --> 00:29:10,970
telescopes before buying one and really I

796
00:29:10,970 --> 00:29:13,040
recommend learning your constellations,

797
00:29:13,040 --> 00:29:15,090
finding Messier objects

798
00:29:15,090 --> 00:29:17,150
with a binocular and then

799
00:29:17,150 --> 00:29:19,260
stepping up as your interest continues.

800
00:29:19,260 --> 00:29:21,400

Here's a zoom eye piece

801
00:29:21,400 --> 00:29:23,440
that I was mentioning before

802
00:29:23,440 --> 00:29:25,480
so you just twist it and it

803
00:29:25,480 --> 00:29:27,530
magnifies so you don't have to keep

804
00:29:27,530 --> 00:29:29,630
reaching for different eye pieces.

805
00:29:29,630 --> 00:29:31,720
If you do want to do that

806
00:29:31,720 --> 00:29:33,750
there are many different types

807
00:29:33,750 --> 00:29:35,910
and

808
00:29:35,910 --> 00:29:37,950
it just makes it easier, I find it easier

809
00:29:37,950 --> 00:29:40,000
to just zoom in. Interesting

810
00:29:40,000 --> 00:29:42,060
Charles Messier, he

811
00:29:42,060 --> 00:29:44,170
looked through about every telescope he could get his

812
00:29:44,170 --> 00:29:46,260
hands on and

813
00:29:46,260 --> 00:29:48,390
they were very good

814
00:29:48,390 --> 00:29:50,470
and they didn't have eye pieces

815
00:29:50,470 --> 00:29:52,550
The eye piece they had weren't

816
00:29:52,550 --> 00:29:54,580
replaceable, I should say

817
00:29:54,580 --> 00:29:56,650
they were a fixed magnification.

818
00:29:56,650 --> 00:29:58,770
Interesting different.

819
00:29:58,770 --> 00:30:00,810
Before we go on to some questions from the audience

820
00:30:00,810 --> 00:30:02,940
the question I have for you is how many Messier

821
00:30:02,940 --> 00:30:04,990
objects have you personally seen?

822
00:30:04,990 --> 00:30:07,040
Oh boy! Yeah so.

823
00:30:07,040 --> 00:30:09,120
I've seen just about all of them.

824
00:30:09,120 --> 00:30:11,180
We didn't talk about tonight but there's a

825
00:30:11,180 --> 00:30:13,290

large group of galaxies

826
00:30:13,290 --> 00:30:16,440
in the constellation Coma Berenices

827
00:30:16,440 --> 00:30:19,510
off the tail of Leo and next to Virgo

828
00:30:19,510 --> 00:30:22,570
where there are just

829
00:30:22,570 --> 00:30:24,650
literally scores of galaxies.

830
00:30:24,650 --> 00:30:26,730
Some of them are Messier objects

831
00:30:26,730 --> 00:30:28,770
many of them are not. They didn't make his list.

832
00:30:28,770 --> 00:30:30,880
So I've looked at that cluster

833
00:30:30,880 --> 00:30:33,030
and when you

834
00:30:33,030 --> 00:30:35,080
look through the field of view

835
00:30:35,080 --> 00:30:37,150
you might see 2 or 3 Messier objects

836
00:30:37,150 --> 00:30:39,240
but 2 or 3 that are almost

837
00:30:39,240 --> 00:30:41,320
as bright that he missed somehow.

838
00:30:41,320 --> 00:30:43,450
I've seen

839
00:30:43,450 --> 00:30:45,490
them all, I haven't cataloged

840
00:30:45,490 --> 00:30:47,550
all but I'm starting to do that

841
00:30:47,550 --> 00:30:49,610
now, it kind of a bucket list thing

842
00:30:49,610 --> 00:30:51,650
for me. If you write

843
00:30:51,650 --> 00:30:53,730
down the day, time, and scope

844
00:30:53,730 --> 00:30:55,820
that you used and details

845
00:30:55,820 --> 00:30:57,930
about the sky

846
00:30:57,930 --> 00:30:59,990
and send that log

847
00:30:59,990 --> 00:31:02,000
to the Astronomical League

848
00:31:02,000 --> 00:31:04,060
you can get a certificate.

849
00:31:04,060 --> 00:31:06,110
Which is really cool. Say you've seen all

850
00:31:06,110 --> 00:31:08,170

the Messier objects. So I'm now

851
00:31:08,170 --> 00:31:10,250
logging them all, I've probably seen them all.

852
00:31:10,250 --> 00:31:12,370
But I didn't log them all.

853
00:31:12,370 --> 00:31:14,430
Excellent! Before we go we have some

854
00:31:14,430 --> 00:31:15,450
time for questions.

855
00:31:15,450 --> 00:31:17,600
Yeah, we do and it seems like we have a couple

856
00:31:17,600 --> 00:31:19,640
Messier collection

857
00:31:19,640 --> 00:31:21,690
hopefuls in here.

858
00:31:21,690 --> 00:31:23,760
We have one question asking,

859
00:31:23,760 --> 00:31:25,860
what is the best kind of telescope for

860
00:31:25,860 --> 00:31:27,990
a beginner? While we are over here we might as well

861
00:31:27,990 --> 00:31:30,110
start with the telescope questions, yeah?

862
00:31:30,110 --> 00:31:32,170
The best answer I've heard to that question is

863
00:31:32,170 --> 00:31:34,250
one that you use. OK?

864
00:31:34,250 --> 00:31:36,340
So it can't be to heavy, it can't be

865
00:31:36,340 --> 00:31:38,460
too complicated,

866
00:31:38,460 --> 00:31:40,570
can't be to expensive.

867
00:31:40,570 --> 00:31:42,700
Right? If you're just a beginner.

868
00:31:42,700 --> 00:31:44,760
Because you want to get your feet wet.

869
00:31:44,760 --> 00:31:46,850
Right?

870
00:31:46,850 --> 00:31:48,920
Realize I really can find things.

871
00:31:48,920 --> 00:31:51,020
Enjoy them and then

872
00:31:51,020 --> 00:31:53,160
move up from there.

873
00:31:53,160 --> 00:31:55,190
I find ones that have this

874
00:31:55,190 --> 00:31:57,230
style of mount helpful.

875
00:31:57,230 --> 00:32:00,290

It's called a azimuth and

876
00:32:00,290 --> 00:32:03,340
elevation and so it's very intuitive to just

877
00:32:03,340 --> 00:32:05,440
swing it around and bring it up

878
00:32:05,440 --> 00:32:07,550
and look for your object in the

879
00:32:07,550 --> 00:32:09,670
one of these types of telescopes.

880
00:32:09,670 --> 00:32:11,740
I think this a good choice

881
00:32:11,740 --> 00:32:13,790
not maybe this big but

882
00:32:13,790 --> 00:32:15,870
an azimuth elevation kind of

883
00:32:15,870 --> 00:32:17,940
mount on the telescope.

884
00:32:17,940 --> 00:32:20,040
Then similar we got a different question

885
00:32:20,040 --> 00:32:22,160
from someone else asking, what are the best

886
00:32:22,160 --> 00:32:24,200
kind of binoculars for back yard astronomy?

887
00:32:24,200 --> 00:32:26,260
Yeah, well again a

888
00:32:26,260 --> 00:32:28,340
I would say shoot for something

889
00:32:28,340 --> 00:32:30,380
like a 10x50

890
00:32:30,380 --> 00:32:32,440
like these

891
00:32:32,440 --> 00:32:34,480
and not to heavy.

892
00:32:34,480 --> 00:32:36,570
If you get much heavier then this they

893
00:32:36,570 --> 00:32:38,700
sell stands you can put them on

894
00:32:38,700 --> 00:32:40,790
but you'll want something to steady them.

895
00:32:40,790 --> 00:32:42,850
I think a 10x50 is a

896
00:32:42,850 --> 00:32:44,900
pretty good size for most places.

897
00:32:44,900 --> 00:32:46,970
That's always my problem but I love using binoculars

898
00:32:46,970 --> 00:32:49,090
but it's hard to keep them steady in your hands.

899
00:32:49,090 --> 00:32:51,140
So people have techniques like resting your

900
00:32:51,140 --> 00:32:53,300

elbows on knees

901
00:32:53,300 --> 00:32:55,350
and steadying that way or actually going up against

902
00:32:55,350 --> 00:32:57,400
a wall. That's one of the harder things, learning to

903
00:32:57,400 --> 00:32:59,410
steady the image. Right.

904
00:32:59,410 --> 00:33:01,590
Speaking of images maybe we'll come out here

905
00:33:01,590 --> 00:33:02,680
so we can see some more of these

906
00:33:02,680 --> 00:33:03,780
images in the background

907
00:33:03,780 --> 00:33:04,910
while we take a few more questions.

908
00:33:04,910 --> 00:33:05,950
Watch your step.

909
00:33:05,950 --> 00:33:08,010
Kelly wants to know, what

910
00:33:08,010 --> 00:33:10,060
causes new stars to move

911
00:33:10,060 --> 00:33:12,240
away from the cloud that they were born in?

912
00:33:12,240 --> 00:33:14,370
Well there are a lot of reasons for this.

913
00:33:14,370 --> 00:33:16,500
There an intrinsic movement of the stars.

914
00:33:16,500 --> 00:33:18,560
That when stars form they pick

915
00:33:18,560 --> 00:33:20,620
up angular momentum, they begin to spin

916
00:33:20,620 --> 00:33:22,680
and the clusters of stars spin in different ways too.

917
00:33:22,680 --> 00:33:24,770
Over time this can actually spin some

918
00:33:24,770 --> 00:33:26,890
of the stars out of the cluster entirely.

919
00:33:26,890 --> 00:33:29,000
The other thing to remember is that star clusters

920
00:33:29,000 --> 00:33:31,180
never live just by themselves.

921
00:33:31,180 --> 00:33:33,250
We go around the galaxy.

922
00:33:33,250 --> 00:33:35,310
Right now we actually flying around the center

923
00:33:35,310 --> 00:33:37,400
of the Milky Way galaxy at about a

924
00:33:37,400 --> 00:33:39,420
half a million miles an hour.

925
00:33:39,420 --> 00:33:41,550

Good thing we don't actually feel that.

926
00:33:41,550 --> 00:33:43,600
As the Sun moves around the galaxy it has

927
00:33:43,600 --> 00:33:45,640
very gentle gravitation encounters

928
00:33:45,640 --> 00:33:47,700
with other stars. Over billions

929
00:33:47,700 --> 00:33:49,860
of years, over many passes around

930
00:33:49,860 --> 00:33:52,950
the galaxy, this spreads the cluster out.

931
00:33:52,950 --> 00:33:54,990
We've left probably some of our sister stars

932
00:33:54,990 --> 00:33:57,130
way on the other side of the galaxy.

933
00:33:57,130 --> 00:33:59,200
The star formed right near us but now

934
00:33:59,200 --> 00:34:01,250
it's 100 thousand light years away.

935
00:34:01,250 --> 00:34:03,300
And that's just the regular gravitational attraction

936
00:34:03,300 --> 00:34:05,380
of the different stars as we move through the galaxy.

937
00:34:05,380 --> 00:34:06,920
Great! It seems like these clusters

938
00:34:06,920 --> 00:34:08,970
kind of resonated with people.

939
00:34:08,970 --> 00:34:11,030
Someone else wanted to know,

940
00:34:11,030 --> 00:34:13,110
how far away are stars

941
00:34:13,110 --> 00:34:15,210
in a cluster?

942
00:34:15,210 --> 00:34:17,340
That's an interesting question. I don't have an exact number

943
00:34:17,340 --> 00:34:19,380
for some of the clusters that we've been showing you.

944
00:34:19,380 --> 00:34:21,480
But as Kevin mentioned, if you were in a globular

945
00:34:21,480 --> 00:34:23,530
cluster. If you were in a planet

946
00:34:23,530 --> 00:34:25,630
around a star in the heart of a globular

947
00:34:25,630 --> 00:34:27,680
cluster, the night sky would be

948
00:34:27,680 --> 00:34:29,780
brilliantly bright. So the closest

949
00:34:29,780 --> 00:34:31,900
star to us is about 4 light years away

950
00:34:31,900 --> 00:34:34,080

and in the heart of a globular cluster

951
00:34:34,080 --> 00:34:36,150
it would be a lot closer then that.

952
00:34:36,150 --> 00:34:38,230
I don't have an exact number but I do know

953
00:34:38,230 --> 00:34:40,330
the night sky would look a lot different.

954
00:34:40,330 --> 00:34:42,430
4 light years is a long way.

955
00:34:42,430 --> 00:34:44,570
Right? And so

956
00:34:44,570 --> 00:34:46,610
I've read if

957
00:34:46,610 --> 00:34:48,670
you considered the volume

958
00:34:48,670 --> 00:34:50,730
of sphere

959
00:34:50,730 --> 00:34:52,830
this 4 light years in

960
00:34:52,830 --> 00:34:54,960
radius some of these globular

961
00:34:54,960 --> 00:34:57,100
cluster there could be as many as

962
00:34:57,100 --> 00:34:59,140
10 thousand stars within that

963
00:35:01,200 --> 00:35:03,280
that sphere and so

964
00:35:03,280 --> 00:35:05,310
imagine being on a planet around one of those

965
00:35:07,420 --> 00:35:09,540
it would be just dazzling.

966
00:35:09,540 --> 00:35:11,700
And then another question.

967
00:35:11,700 --> 00:35:13,740
This one looks it's specifically

968
00:35:13,740 --> 00:35:15,800
for Kevin. How do you deal with light pollution?

969
00:35:15,800 --> 00:35:17,880
Yes... Well

970
00:35:17,880 --> 00:35:19,960
I cry a lot I guess is the answer.

971
00:35:19,960 --> 00:35:22,000
[Laughter]

972
00:35:22,000 --> 00:35:24,240
If you have a

973
00:35:24,240 --> 00:35:27,290
portable telescope which some of my are.

974
00:35:27,290 --> 00:35:29,350
You get to a dark spot. In that way

975
00:35:29,350 --> 00:35:31,430

you can just enjoy the night sky and

976
00:35:31,430 --> 00:35:33,540
find things easier.

977
00:35:33,540 --> 00:35:35,630
Taking pictures, see

978
00:35:35,630 --> 00:35:37,740
is one of the strategies that I have

979
00:35:37,740 --> 00:35:39,780
to fight light pollution because

980
00:35:39,780 --> 00:35:41,840
you can play tricks with a digital camera.

981
00:35:41,840 --> 00:35:43,910
Digital camera is very very

982
00:35:43,910 --> 00:35:45,950
sensitive as you've seen in these

983
00:35:45,950 --> 00:35:48,050
images and so

984
00:35:48,050 --> 00:35:50,160
you can play these tricks

985
00:35:50,160 --> 00:35:52,300
about stacking up photos

986
00:35:52,300 --> 00:35:54,340
and processing them and get these

987
00:35:54,340 --> 00:35:56,400
amazing results. I live north

988
00:35:56,400 --> 00:35:58,480
of Washington, DC where it's very

989
00:35:58,480 --> 00:36:00,590
bright and yet

990
00:36:00,590 --> 00:36:02,690
you can play these tricks

991
00:36:02,690 --> 00:36:04,810
with a digital camera.

992
00:36:04,810 --> 00:36:06,880
Some of the same tricks Hubble

993
00:36:06,880 --> 00:36:08,960
plays actually.

994
00:36:08,960 --> 00:36:11,040
Taking an image

995
00:36:11,040 --> 00:36:13,070
and then basically covering

996
00:36:13,070 --> 00:36:15,170
the shutter

997
00:36:15,170 --> 00:36:17,280
and putting up a black

998
00:36:17,280 --> 00:36:19,350
cover on the telescope

999
00:36:19,350 --> 00:36:21,390
and taking another image. You'd say

1000
00:36:21,390 --> 00:36:23,470

why would you do that? You record the

1001
00:36:23,470 --> 00:36:25,540
noise in the camera

1002
00:36:25,540 --> 00:36:27,610
and then there is software

1003
00:36:27,610 --> 00:36:29,710
that you can use to subtract off the noise

1004
00:36:29,710 --> 00:36:31,830
so this is the way to fight light

1005
00:36:31,830 --> 00:36:33,960
pollution. You subtract it off with

1006
00:36:33,960 --> 00:36:36,030
a digital camera. Can't do that with your eye.

1007
00:36:36,030 --> 00:36:38,110
But Hubble plays that same trick.

1008
00:36:38,110 --> 00:36:40,170
Not to fight light pollution so much but

1009
00:36:40,170 --> 00:36:42,290
just to get that noise that is

1010
00:36:42,290 --> 00:36:44,390
inherent in the camera because of it's

1011
00:36:44,390 --> 00:36:46,390
thermal qualities

1012
00:36:46,390 --> 00:36:48,550
and subtract that out.

1013
00:36:48,550 --> 00:36:50,590
It's amazing to me just how much we are missing with

1014
00:36:50,590 --> 00:36:52,670
light pollution. The most beautiful sky I've ever saw

1015
00:36:52,670 --> 00:36:54,750
was when I was in Chile, I was in the

1016
00:36:54,750 --> 00:36:56,850
Atacama desert where there were no lights around at all

1017
00:36:56,850 --> 00:36:59,000
and somebody pointed out that

1018
00:36:59,000 --> 00:37:01,080
the Milky Way was so bright over head

1019
00:37:01,080 --> 00:37:03,110
it was making me cry. It was so beautiful

1020
00:37:03,110 --> 00:37:05,190
I was getting tears in my eyes. I looked down

1021
00:37:05,190 --> 00:37:07,290
at the ground and someone pointed out that I was

1022
00:37:07,290 --> 00:37:09,380
casting a very dim shadow on the ground.

1023
00:37:09,380 --> 00:37:11,520
But there was no moon out that night,

1024
00:37:11,520 --> 00:37:13,680
none of the bright planets were out that night

1025
00:37:13,680 --> 00:37:15,730

I was actually a shadow being cast by the Milk Way.

1026
00:37:15,730 --> 00:37:17,780
That's how bright the Milky Way can get.

1027
00:37:17,780 --> 00:37:19,950
So get yourself

1028
00:37:19,950 --> 00:37:23,080
to a dark sky if you possible can.

1029
00:37:23,080 --> 00:37:25,150
Wow! That's crazy. So we have a question

1030
00:37:25,150 --> 00:37:27,210
about Hubble specifically.

1031
00:37:27,210 --> 00:37:29,290
How does Hubble take so many sharp

1032
00:37:29,290 --> 00:37:31,350
images when it's moving so fast?

1033
00:37:31,350 --> 00:37:33,450
Pointing. I think

1034
00:37:33,450 --> 00:37:35,550
I'll leave this to the Hubble operation manager.

1035
00:37:35,550 --> 00:37:37,690
Absolutely. That's for you Kev. Yes no.

1036
00:37:37,690 --> 00:37:39,700
You don't think about it much

1037
00:37:39,700 --> 00:37:41,760
that would be more of a problem if

1038
00:37:41,760 --> 00:37:43,810
the stars were closer but they're

1039
00:37:43,810 --> 00:37:45,870
so far away that the light

1040
00:37:45,870 --> 00:37:48,080
that's coming anywhere Earth

1041
00:37:48,080 --> 00:37:51,210
is coming in parallel beams.

1042
00:37:51,210 --> 00:37:54,300
And so, yes Hubble is moving around the Earth

1043
00:37:54,300 --> 00:37:57,390
but it's still seeing these

1044
00:37:57,390 --> 00:37:59,410
parallel beams that come from these

1045
00:37:59,410 --> 00:38:01,510
distant stars.

1046
00:38:01,510 --> 00:38:03,540
If an object was closer like

1047
00:38:03,540 --> 00:38:05,660
the moon,

1048
00:38:05,660 --> 00:38:07,720
you don't see many Hubble pictures

1049
00:38:07,720 --> 00:38:09,730
of the moon do you? See,

1050
00:38:09,730 --> 00:38:11,820

Hubble was never designed to look at the moon.

1051
00:38:11,820 --> 00:38:13,890
Now we've

1052
00:38:13,890 --> 00:38:15,930
over the years that Hubble's been operating

1053
00:38:15,930 --> 00:38:18,010
we know have modes that can but they are very

1054
00:38:18,010 --> 00:38:20,120
seldom used because you have a

1055
00:38:20,120 --> 00:38:22,160
what they have a parallax problem.

1056
00:38:22,160 --> 00:38:24,200
The moon is to close

1057
00:38:24,200 --> 00:38:26,250
and Hubble is moving to fast

1058
00:38:26,250 --> 00:38:28,320
that light beams aren't coming to you

1059
00:38:28,320 --> 00:38:30,390
in a parallel fashion.

1060
00:38:30,390 --> 00:38:32,450
And so, the secret is

1061
00:38:32,450 --> 00:38:34,570
the stars are so far way.

1062
00:38:34,570 --> 00:38:36,630
Wow that fascinating.

1063
00:38:36,630 --> 00:38:38,760
Some asked, what is the best

1064
00:38:38,760 --> 00:38:40,810
telescope for astro-photography?

1065
00:38:40,810 --> 00:38:42,850
OK.I don't know how to answer that

1066
00:38:42,850 --> 00:38:44,870
question, that's why I'm asking you.

1067
00:38:44,870 --> 00:38:46,930
[laughter]

1068
00:38:46,930 --> 00:38:48,990
There is different types of targets

1069
00:38:48,990 --> 00:38:51,070
what we've been calling

1070
00:38:51,070 --> 00:38:53,190
these ones would be classified as

1071
00:38:53,190 --> 00:38:55,290
deep space objects

1072
00:38:55,290 --> 00:38:57,350
(DOS's). There's also like the moon

1073
00:38:57,350 --> 00:38:59,400
and planets. You would

1074
00:38:59,400 --> 00:39:01,480
want a different type of telescope

1075
00:39:01,480 --> 00:39:03,540

to do lunar and

1076
00:39:03,540 --> 00:39:05,670
planetary work then you would

1077
00:39:05,670 --> 00:39:07,810
for deep sky objects.

1078
00:39:07,810 --> 00:39:09,840
And so that's part of the answer.

1079
00:39:09,840 --> 00:39:11,880
For deep sky objects I think

1080
00:39:11,880 --> 00:39:13,960
most web sites

1081
00:39:13,960 --> 00:39:16,040
I would go to and people more

1082
00:39:16,040 --> 00:39:18,150
experience then I at this would say

1083
00:39:18,150 --> 00:39:20,300
get medium size

1084
00:39:20,300 --> 00:39:22,350
refracting telescope.

1085
00:39:22,350 --> 00:39:24,400
It's the type that has the lens up front.

1086
00:39:24,400 --> 00:39:26,480
With a

1087
00:39:26,480 --> 00:39:28,540
fairly short focal length

1088
00:39:28,540 --> 00:39:30,650
and that will probably do the best

1089
00:39:30,650 --> 00:39:32,750
for you for these things.

1090
00:39:32,750 --> 00:39:34,800
Lot's of reason why

1091
00:39:34,800 --> 00:39:36,850
those kind of telescope can

1092
00:39:36,850 --> 00:39:38,910
range from the $600 that I bought

1093
00:39:38,910 --> 00:39:40,990
to $6000 so

1094
00:39:40,990 --> 00:39:43,020
you kind of go with your budget too.

1095
00:39:43,020 --> 00:39:45,110
And so much of it appears to be in the way you process the images.

1096
00:39:45,110 --> 00:39:47,160
I mean you image of Andromeda was

1097
00:39:47,160 --> 00:39:49,280
spectacular. I remember when I first saw it

1098
00:39:49,280 --> 00:39:51,460
we were rehearsing for this, I said that was something

1099
00:39:51,460 --> 00:39:53,540
that the Mt Wilson telescope would have taken

1100
00:39:53,540 --> 00:39:55,600

a 100 years ago. That would have been the best

1101
00:39:55,600 --> 00:39:57,680
astronomical image in the world but here you did this out of the

1102
00:39:57,680 --> 00:39:59,790
small scope. Yeah, there it is.

1103
00:39:59,790 --> 00:40:01,930
So that has to do a lot with what you do

1104
00:40:01,930 --> 00:40:03,980
with the imagery afterwards too.

1105
00:40:03,980 --> 00:40:06,050
So true. Yes

1106
00:40:06,050 --> 00:40:08,120
The more you stack the more signals

1107
00:40:08,120 --> 00:40:10,220
noise you get and the more you learn

1108
00:40:10,220 --> 00:40:12,310
about Photoshop and

1109
00:40:12,310 --> 00:40:14,460
these other processing techniques.

1110
00:40:14,460 --> 00:40:16,520
They just

1111
00:40:16,520 --> 00:40:18,580
the better you get at it. I really consider myself

1112
00:40:18,580 --> 00:40:20,660
a baby at it.

1113
00:40:20,660 --> 00:40:22,740
This one again was about a 4 hours exposure.

1114
00:40:24,800 --> 00:40:26,850
Many many times more then

1115
00:40:26,850 --> 00:40:29,000
4 hours in processing.

1116
00:40:29,000 --> 00:40:31,050
And you only have been doing this about 4 years.

1117
00:40:31,050 --> 00:40:33,130
Yep. It's because there's so many resources online.

1118
00:40:33,130 --> 00:40:35,180
We're bringing you the

1119
00:40:35,180 --> 00:40:37,220
Hubble Messier catalog

1120
00:40:37,220 --> 00:40:39,340
online with all its information

1121
00:40:39,340 --> 00:40:41,440
there's lots and lots of helpful

1122
00:40:41,440 --> 00:40:43,480
resources out there about astro-photography.

1123
00:40:43,480 --> 00:40:45,650
The Messier catalog is

1124
00:40:45,650 --> 00:40:47,720
such an inspiration to me, sort of wrapping

1125
00:40:47,720 --> 00:40:49,810

it all up again, we talk about avoiding these things that

1126
00:40:49,810 --> 00:40:51,880
aren't comets but instead

1127
00:40:51,880 --> 00:40:54,020
it turns out to be the catalog of wonders.

1128
00:40:54,020 --> 00:40:56,100
Everything from dead stars to baby stars to

1129
00:40:56,100 --> 00:40:58,140
these vast galaxies that you took a picture of

1130
00:40:58,140 --> 00:41:00,190
well in some strange way we have

1131
00:41:00,190 --> 00:41:02,260
Charles Messier even though

1132
00:41:02,260 --> 00:41:04,350
it wasn't what he was looking for.

1133
00:41:04,350 --> 00:41:06,470
Yes, he found 13

1134
00:41:06,470 --> 00:41:08,620
comets on his own.

1135
00:41:08,620 --> 00:41:10,800
Remarkable for the instruments he had and

1136
00:41:10,800 --> 00:41:11,860
operating from the center of Paris.

1137
00:41:11,860 --> 00:41:12,960
Can you imagine it?

1138
00:41:12,960 --> 00:41:16,060
In an observatory there and he

1139
00:41:16,060 --> 00:41:19,160
co-discovered 7 others with

1140
00:41:19,160 --> 00:41:22,300
his friends. So the man found 20

1141
00:41:22,300 --> 00:41:25,360
comets in his lifetime.

1142
00:41:25,360 --> 00:41:27,420
Very remarkable for the instruments he had

1143
00:41:27,420 --> 00:41:29,510
and the place he was doing it from.

1144
00:41:29,510 --> 00:41:31,600
Try to discover one from the center of Paris right now.

1145
00:41:31,600 --> 00:41:33,730
Pretty hard to do. OK.

1146
00:41:33,730 --> 00:41:35,880
Are you ready for another question? Sure!

1147
00:41:35,880 --> 00:41:37,930
Alahondra wants to know what are your favorite

1148
00:41:37,930 --> 00:41:39,950
locations for stargazing? I guess I can ask both

1149
00:41:39,950 --> 00:41:42,030
of you that question.

1150
00:41:42,030 --> 00:41:44,110

Well I just mention the Atacama Desert but that's kind

1151
00:41:44,110 --> 00:41:46,220
hard to get to. So it is

1152
00:41:46,220 --> 00:41:48,360
amazing to me how much you actually

1153
00:41:48,360 --> 00:41:50,420
can see from a relatively dark back yard.

1154
00:41:50,420 --> 00:41:52,480
If you can get yourself to a nice clear

1155
00:41:52,480 --> 00:41:54,540
horizon. I've seen comets

1156
00:41:54,540 --> 00:41:56,620
through small binoculars.

1157
00:41:56,620 --> 00:41:58,710
I've seen small telescopes where you can see the rings

1158
00:41:58,710 --> 00:42:00,830
of Saturn. Saturn in particular

1159
00:42:00,830 --> 00:42:02,990
is an object a lot closer to us

1160
00:42:02,990 --> 00:42:05,050
then the Messier objects are but

1161
00:42:05,050 --> 00:42:07,110
this is one of the things where if you're a little disappointed

1162
00:42:07,110 --> 00:42:09,210
by the Andromeda galaxy just being a smudge.

1163
00:42:09,210 --> 00:42:11,300
When you see Saturn and it's rings

1164
00:42:11,300 --> 00:42:13,420
right there in front of you and the moons of Saturn

1165
00:42:13,420 --> 00:42:15,570
as well, that's something that just floored

1166
00:42:15,570 --> 00:42:17,630
me the first time I saw it. It looked like somebody

1167
00:42:17,630 --> 00:42:19,700
had taken a picture of Saturn from a textbook and

1168
00:42:19,700 --> 00:42:21,760
just kind of pasted on the end of the telescope.

1169
00:42:21,760 --> 00:42:23,890
So some of these objects are very easy to

1170
00:42:23,890 --> 00:42:25,950
see, they are very bright

1171
00:42:25,950 --> 00:42:28,090
don't need a dark sky to see them.

1172
00:42:28,090 --> 00:42:30,130
Yeah that's right.

1173
00:42:30,130 --> 00:42:32,190
The moon and planets

1174
00:42:32,190 --> 00:42:34,220
in even a very modest size scope

1175
00:42:34,220 --> 00:42:36,330

can be a

1176
00:42:36,330 --> 00:42:39,360
unforgettable

1177
00:42:39,360 --> 00:42:41,490
experience.

1178
00:42:41,490 --> 00:42:43,660
As you mentioned, seeing the rings of Saturn

1179
00:42:43,660 --> 00:42:45,710
I've been at so many

1180
00:42:45,710 --> 00:42:47,760
star parties, we call them, we have telescopes

1181
00:42:47,760 --> 00:42:49,850
out and have fun with

1182
00:42:49,850 --> 00:42:51,940
the heavens.

1183
00:42:51,940 --> 00:42:54,060
It's so fun to see people

1184
00:42:54,060 --> 00:42:56,230
see the moon or the planets

1185
00:42:56,230 --> 00:42:58,360
Saturn or Jupiter with it's

1186
00:42:58,360 --> 00:43:01,380
moons and bands for the first time.

1187
00:43:01,380 --> 00:43:03,380
They never forget it. I never forget it.

1188
00:43:03,380 --> 00:43:05,490
That's what got me into astronomy

1189
00:43:05,490 --> 00:43:07,600
many, many years ago

1190
00:43:07,600 --> 00:43:09,740
seeing Saturn

1191
00:43:09,740 --> 00:43:11,800
there is connection with the universe

1192
00:43:11,800 --> 00:43:13,870
that you feel and it's really

1193
00:43:13,870 --> 00:43:15,940
unforgettable. Where would I go

1194
00:43:15,940 --> 00:43:18,040
around here? I have a brother-in-law

1195
00:43:18,040 --> 00:43:20,150
that lives down in Virginia in the mountains

1196
00:43:20,150 --> 00:43:22,290
and so that's a good spot to go

1197
00:43:22,290 --> 00:43:24,330
and the eastern shore is pretty

1198
00:43:24,330 --> 00:43:26,370
good dark spot with nice horizons.

1199
00:43:26,370 --> 00:43:28,420
So you can see things

1200
00:43:28,420 --> 00:43:30,510

from horizon to horizon

1201
00:43:30,510 --> 00:43:32,560
but if I were going to pay money and go some

1202
00:43:32,560 --> 00:43:34,660
place it would probably Chile or someplace like that

1203
00:43:34,660 --> 00:43:36,840
or Hawaii

1204
00:43:36,840 --> 00:43:39,910
to have, be on top of a mountain

1205
00:43:39,910 --> 00:43:42,950
where all the other great telescopes are

1206
00:43:42,950 --> 00:43:44,020
and observe from there.

1207
00:43:44,020 --> 00:43:45,200
One thing I have to say is take advantage of

1208
00:43:45,200 --> 00:43:47,320
your local amateur astronomy societies.

1209
00:43:47,320 --> 00:43:49,380
Because pretty much where ever you are in the US

1210
00:43:49,380 --> 00:43:51,430
there is local club where if don't know what

1211
00:43:51,430 --> 00:43:52,480
sort of telescope you'd like

1212
00:43:52,480 --> 00:43:53,570
or you don't know how to use a telescope

1213
00:43:53,570 --> 00:43:55,600
if you don't where the nearest dark sky

1214
00:43:55,600 --> 00:43:57,710
areas are around you. Your local astronomy

1215
00:43:57,710 --> 00:43:59,840
club will know these things. And they are an

1216
00:43:59,840 --> 00:44:02,010
incredible resource. As a professional

1217
00:44:02,010 --> 00:44:04,070
astronomer I would go to these large

1218
00:44:04,070 --> 00:44:06,140
observatories and people would type coordinates

1219
00:44:06,140 --> 00:44:08,230
in the computers and I would make my observations

1220
00:44:08,230 --> 00:44:10,350
I often feel that the amateur astronomy

1221
00:44:10,350 --> 00:44:12,650
community are the real astronomers.

1222
00:44:12,650 --> 00:44:13,710
They're the people who really know the sky

1223
00:44:13,710 --> 00:44:14,750
like the back of their hand.

1224
00:44:14,750 --> 00:44:15,800
Right.

1225
00:44:15,800 --> 00:44:17,900

1226
00:44:17,900 --> 00:44:19,990
groups will also

1227
00:44:19,990 --> 00:44:22,100
love to show you telescopes

1228
00:44:22,100 --> 00:44:24,250
and so you can try

1229
00:44:24,250 --> 00:44:26,320
before you buy. If you

1230
00:44:26,320 --> 00:44:28,370
go to a club and that's

1231
00:44:28,370 --> 00:44:29,410
also helpful.

1232
00:44:29,410 --> 00:44:30,510
Great!

1233
00:44:30,510 --> 00:44:31,640
It's kind of like asking someone about

1234
00:44:31,640 --> 00:44:32,760
their job,

1235
00:44:32,760 --> 00:44:33,920
asking someone about their telescope

1236
00:44:33,920 --> 00:44:34,970
they can talk for days.

1237
00:44:34,970 --> 00:44:37,010
So unfortunately we only have time for

1238
00:44:37,010 --> 00:44:39,110
one more question.

1239
00:44:39,110 --> 00:44:41,200
We're going to keep answering some of your questions on

1240
00:44:41,200 --> 00:44:43,370
Facebook as they are coming in later on but

1241
00:44:43,370 --> 00:44:45,540
unfortunately we only have so much camera time so.

1242
00:44:45,540 --> 00:44:47,600
One more question.

1243
00:44:47,600 --> 00:44:49,670
What is your favorite object you've view

1244
00:44:49,670 --> 00:44:51,740
through a telescope?

1245
00:44:51,740 --> 00:44:53,860
Awe, it's like choosing between your children.

1246
00:44:53,860 --> 00:44:55,910
Oh wow. OK so I guess.

1247
00:44:55,910 --> 00:44:57,960
We just mentioned Saturn

1248
00:44:57,960 --> 00:45:00,100
so I think that actually is my favorite.

1249
00:45:00,100 --> 00:45:02,180
In the southern sky

1250
00:45:02,180 --> 00:45:04,280

there is something called the Carina nebula

1251
00:45:04,280 --> 00:45:06,400
and the Carina nebula is an area where

1252
00:45:06,400 --> 00:45:08,520
can see star birth and star death

1253
00:45:08,520 --> 00:45:10,660
all happening at once. There are young

1254
00:45:10,660 --> 00:45:12,720
clusters of stars, then there's a star called

1255
00:45:12,720 --> 00:45:14,790
Eta Carinae which is very close

1256
00:45:14,790 --> 00:45:16,840
we think to blowing itself up in a supernova

1257
00:45:16,840 --> 00:45:18,950
explosion. This part of the sky

1258
00:45:18,950 --> 00:45:21,090
has these vast bands of

1259
00:45:21,090 --> 00:45:23,270
dark dust and bright gas

1260
00:45:23,270 --> 00:45:24,310
and I have to say

1261
00:45:24,310 --> 00:45:25,360
those are some of the things that I've

1262
00:45:25,360 --> 00:45:26,420
seen with my own eyes

1263
00:45:26,420 --> 00:45:27,540
when I was living in the southern hemisphere

1264
00:45:27,540 --> 00:45:29,790
that just blew me away.

1265
00:45:29,790 --> 00:45:30,930
I mean this is probably the closest thing

1266
00:45:30,930 --> 00:45:31,990
I've seen with my

1267
00:45:31,990 --> 00:45:33,100
naked eyes looking through a telescope

1268
00:45:33,100 --> 00:45:35,180
that looked like a Hubble image.

1269
00:45:35,180 --> 00:45:37,270
Eda Carinae would have to be one of my favorites.

1270
00:45:37,270 --> 00:45:39,300
Yeah and for me

1271
00:45:39,300 --> 00:45:41,410
It is like deciding between

1272
00:45:41,410 --> 00:45:43,560
your children I guess.

1273
00:45:43,560 --> 00:45:45,590
I really love to look

1274
00:45:45,590 --> 00:45:47,630
visually at M11

1275
00:45:47,630 --> 00:45:49,690

that Wild Duck cluster.

1276
00:45:49,690 --> 00:45:51,780
Because when you first look at it in the scope

1277
00:45:51,780 --> 00:45:53,880
you can

1278
00:45:53,880 --> 00:45:55,930
imagine how Messier

1279
00:45:55,930 --> 00:45:58,090
didn't see any stars in, they're very

1280
00:45:58,090 --> 00:46:00,130
very close and yet you

1281
00:46:00,130 --> 00:46:02,180
zoom in and

1282
00:46:02,180 --> 00:46:04,260
it's almost like the

1283
00:46:04,260 --> 00:46:06,460
fly through that we saw.

1284
00:46:06,460 --> 00:46:09,580
It turns into something else.

1285
00:46:09,580 --> 00:46:12,630
And it's in the heart of the Milky Way where

1286
00:46:12,630 --> 00:46:14,710
it's surrounded by hundreds and hundreds stars

1287
00:46:14,710 --> 00:46:16,790
to begin with and so it's just

1288
00:46:16,790 --> 00:46:18,900
it's

1289
00:46:18,900 --> 00:46:20,990
I don't know how to describe it.

1290
00:46:20,990 --> 00:46:23,140
It's just beautiful. I could look at it

1291
00:46:23,140 --> 00:46:24,310
a long time.

1292
00:46:24,310 --> 00:46:25,370
If we don't know how to

1293
00:46:25,370 --> 00:46:26,450
describe it, you need to try it yourself.

1294
00:46:26,450 --> 00:46:27,550
That's right.

1295
00:46:27,550 --> 00:46:28,630
So get out there and

1296
00:46:28,630 --> 00:46:30,760
find the Messier catalog yourself

1297
00:46:30,760 --> 00:46:32,900
and enjoy the absolutely

1298
00:46:32,900 --> 00:46:34,990
beautiful that the Hubble Space Telescope

1299
00:46:34,990 --> 00:46:35,590
has made of these objects.

1300
00:46:35,590 --> 00:46:36,760

Absolutely, like they said

1301
00:46:36,760 --> 00:46:38,810
if you want more we've got

1302
00:46:38,810 --> 00:46:40,860
the catalog up on our web site at

1303
00:46:40,860 --> 00:46:41,920
nasa.gov/hubble and if you want

1304
00:46:41,920 --> 00:46:43,000
to know anything about Hubble

1305
00:46:43,000 --> 00:46:44,010
at anytime you can follow

1306
00:46:44,010 --> 00:46:45,160
us on twitter

1307
00:46:45,160 --> 00:46:46,310
@nasahubble

1308
00:46:46,310 --> 00:46:48,460
Thank you both so so much for being

1309
00:46:48,460 --> 00:46:50,540
here and thank you all for tuning into us