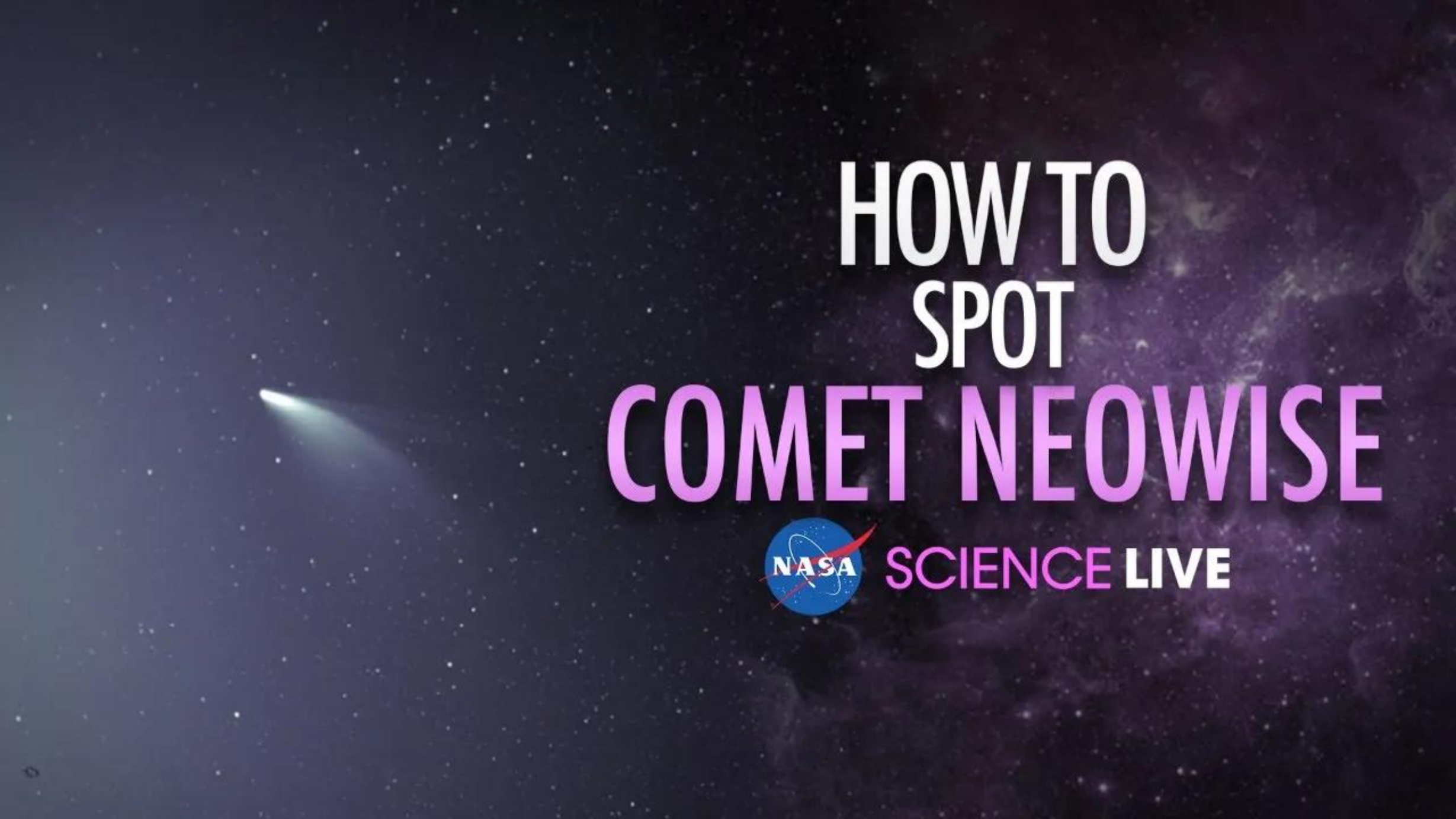
HOW TO
SPOT
COMET NEOWISE
NASA
SCIENCE LIVE

1
00:00:00,730 --> 00:00:08,950
[Music]

2
00:00:14,390 --> 00:00:11,749
hello and welcome to a special episode

3
00:00:16,150 --> 00:00:14,400
of nasa science live i'm your host joy

4
00:00:19,029 --> 00:00:16,160
ung and i'm so glad you're joining us

5
00:00:21,029 --> 00:00:19,039
today to talk about comet neowise

6
00:00:23,349 --> 00:00:21,039
as you might have heard in the news this

7
00:00:25,429 --> 00:00:23,359
three mile wide comet is parting through

8
00:00:26,950 --> 00:00:25,439
the night sky this month and you'll be

9
00:00:29,109 --> 00:00:26,960
able to look up and see it with

10
00:00:31,509 --> 00:00:29,119
binoculars telescopes and if you're

11
00:00:33,430 --> 00:00:31,519
lucky even the naked eye

12
00:00:36,229 --> 00:00:33,440
last weekend i managed to see it around

13
00:00:38,069 --> 00:00:36,239

4am in the chesapeake bay in maryland

14
00:00:40,389 --> 00:00:38,079
and it was stunning but if you're more

15
00:00:42,310 --> 00:00:40,399
from night owl starting from this week

16
00:00:45,190 --> 00:00:42,320
you get a chance to see in the evenings

17
00:00:46,869 --> 00:00:45,200
just after sunset on social media we

18
00:00:48,869 --> 00:00:46,879
asked you to submit some of your own

19
00:00:51,029 --> 00:00:48,879
photos and we received some amazing

20
00:00:53,750 --> 00:00:51,039
images so keep an eye out because we'll

21
00:00:55,910 --> 00:00:53,760
be featuring them throughout the show

22
00:00:57,750 --> 00:00:55,920
comet neowise was first discovered in

23
00:01:00,470 --> 00:00:57,760
march of this year and it's been putting

24
00:01:03,670 --> 00:01:00,480
on a grand show for comet comet watches

25
00:01:05,750 --> 00:01:03,680
at dawn and now at dusk it's covered in

26
00:01:09,510 --> 00:01:05,760
soot left over from the formation of our

27
00:01:11,990 --> 00:01:09,520
solar system about 4.6 billion years ago

28
00:01:14,149 --> 00:01:12,000
and as comets orbit close to the sun

29
00:01:17,190 --> 00:01:14,159
they heat up and spew gases and dust in

30
00:01:19,190 --> 00:01:17,200
a glowing head and this material is what

31
00:01:21,109 --> 00:01:19,200
forms the tail that you see stretching

32
00:01:22,870 --> 00:01:21,119
across the sky

33
00:01:25,510 --> 00:01:22,880
observers all over the world are hoping

34
00:01:28,149 --> 00:01:25,520
to capture a glimpse of comet neo-eyes

35
00:01:29,990 --> 00:01:28,159
and today we have two nasa experts here

36
00:01:32,230 --> 00:01:30,000
to answer some key questions about this

37
00:01:33,749 --> 00:01:32,240
fascinating celestial object

38
00:01:36,230 --> 00:01:33,759

please send your questions using the

39
00:01:37,510 --> 00:01:36,240
hashtag asknasa or by writing in the

40
00:01:38,950 --> 00:01:37,520
comment box wherever you're watching

41
00:01:40,630 --> 00:01:38,960
this today

42
00:01:43,069 --> 00:01:40,640
so let's get started

43
00:01:45,429 --> 00:01:43,079
i'm joined by emily kramer who's the

44
00:01:48,469 --> 00:01:45,439
co-investigator on the near-wise science

45
00:01:50,469 --> 00:01:48,479
team and joe masero nearwise deputy

46
00:01:52,710 --> 00:01:50,479
principal investigator from nasa's jet

47
00:01:55,030 --> 00:01:52,720
propulsion laboratory thank you both so

48
00:01:57,429 --> 00:01:55,040
much for joining us thanks for having us

49
00:01:59,190 --> 00:01:57,439
great to be here

50
00:02:01,670 --> 00:01:59,200
so we're all really excited about the

51
00:02:02,550 --> 00:02:01,680
opportunity to see comet nearwise in the

52
00:02:04,550 --> 00:02:02,560
sky

53
00:02:08,790 --> 00:02:04,560
but i'm curious what is the difference

54
00:02:11,750 --> 00:02:08,800
between a comet and an asteroid

55
00:02:14,229 --> 00:02:11,760
sure that's a great question so comets

56
00:02:15,670 --> 00:02:14,239
and asteroids are both objects in our

57
00:02:18,949 --> 00:02:15,680
solar system

58
00:02:22,630 --> 00:02:18,959
that uh orbit through the uh different

59
00:02:24,869 --> 00:02:22,640
areas the asteroids are mostly between

60
00:02:27,190 --> 00:02:24,879
uh mars and jupiter and the comets tend

61
00:02:29,510 --> 00:02:27,200
to be in a much wider area they're also

62
00:02:31,750 --> 00:02:29,520
tend to be very different in composition

63
00:02:34,949 --> 00:02:31,760

the asteroids are mostly rocky and the

64
00:02:38,150 --> 00:02:34,959
comets are what we might call icy mud

65
00:02:40,630 --> 00:02:38,160
balls so a combination of volatiles such

66
00:02:44,710 --> 00:02:40,640
as water ice carbon dioxide and carbon

67
00:02:49,190 --> 00:02:47,110
so how was comet neowize first

68
00:02:51,589 --> 00:02:49,200
discovered

69
00:02:54,470 --> 00:02:51,599
so comet neowise was first picked up by

70
00:02:56,309 --> 00:02:54,480
the neo-y survey at the end of march so

71
00:02:58,070 --> 00:02:56,319
neowise is an acronym that stands for

72
00:03:00,309 --> 00:02:58,080
the near-earth object wide field

73
00:03:02,309 --> 00:03:00,319
infrared survey explorer and this is an

74
00:03:04,229 --> 00:03:02,319
infrared space telescope orbiting the

75
00:03:06,710 --> 00:03:04,239
earth in the low earth orbit constantly

76
00:03:08,229 --> 00:03:06,720
scanning the sky in the thermal infrared

77
00:03:09,830 --> 00:03:08,239
looking for asteroids and comets that

78
00:03:11,990 --> 00:03:09,840
come close to the earth

79
00:03:13,110 --> 00:03:12,000
and so this comet was first picked up at

80
00:03:15,270 --> 00:03:13,120
the end of march as part of our

81
00:03:17,030 --> 00:03:15,280
automated processing and so as the data

82
00:03:18,790 --> 00:03:17,040
came in it goes through an automated

83
00:03:20,790 --> 00:03:18,800
system that tries to identify moving

84
00:03:23,030 --> 00:03:20,800
objects and sends it to our team to

85
00:03:24,470 --> 00:03:23,040
review and so as part of that review we

86
00:03:26,550 --> 00:03:24,480
were looking at and said hey

87
00:03:29,430 --> 00:03:26,560
this looks like a comet we can see a

88
00:03:31,110 --> 00:03:29,440

clear fuzzy cloud around it and so we

89
00:03:32,869 --> 00:03:31,120
reported that to the minor plan center

90
00:03:34,710 --> 00:03:32,879
saying here's a new object and it looks

91
00:03:35,990 --> 00:03:34,720
to be cometary now right after we

92
00:03:37,990 --> 00:03:36,000
discovered it we saw that it was going

93
00:03:39,670 --> 00:03:38,000
to have a close pass with the sun around

94
00:03:41,830 --> 00:03:39,680
july 3rd and that there was a chance

95
00:03:43,430 --> 00:03:41,840
that it could become very bright and so

96
00:03:45,110 --> 00:03:43,440
we were really crossing our fingers and

97
00:03:48,309 --> 00:03:45,120
we got really lucky that it turned out

98
00:03:50,309 --> 00:03:48,319
to be a spectacular sight

99
00:03:52,550 --> 00:03:50,319
yeah it's really really stunning

100
00:03:54,869 --> 00:03:52,560
so why is it named

101
00:03:56,789 --> 00:03:54,879
um near-wise

102
00:03:58,470 --> 00:03:56,799
so this is a tradition in astronomy that

103
00:03:59,990 --> 00:03:58,480
goes back centuries

104
00:04:02,229 --> 00:04:00,000
comets are typically named after their

105
00:04:03,830 --> 00:04:02,239
discoverer and or the first person who

106
00:04:06,070 --> 00:04:03,840
reported it in the journals or the

107
00:04:07,910 --> 00:04:06,080
letters to their colleagues

108
00:04:09,190 --> 00:04:07,920
now that most of the discoveries of

109
00:04:11,270 --> 00:04:09,200
asteroids and comments are done by

110
00:04:13,190 --> 00:04:11,280
surveys the rules have been that if it's

111
00:04:15,350 --> 00:04:13,200
found by the automatic processing of the

112
00:04:17,270 --> 00:04:15,360
survey it's named after the survey and

113
00:04:20,870 --> 00:04:17,280

so because our survey is named eois the

114
00:04:25,430 --> 00:04:22,710
and is there anything that makes this

115
00:04:27,749 --> 00:04:25,440
comment unique

116
00:04:30,310 --> 00:04:27,759
well the fact that we can see it is

117
00:04:32,310 --> 00:04:30,320
really what makes it unique um

118
00:04:34,070 --> 00:04:32,320
it's quite rare for a comet to be bright

119
00:04:36,629 --> 00:04:34,080
enough that we can see it with the naked

120
00:04:38,150 --> 00:04:36,639
eye or even with just binoculars uh the

121
00:04:41,189 --> 00:04:38,160
last time we had a comet that was this

122
00:04:43,830 --> 00:04:41,199
bright was common hill bop back in 1995

123
00:04:46,070 --> 00:04:43,840
and 1996 so it's been quite a while and

124
00:04:48,790 --> 00:04:46,080
it's exciting to be able to see this one

125
00:04:50,790 --> 00:04:48,800
in in this way now

126
00:04:52,950 --> 00:04:50,800
and why is it that we can see comet near

127
00:04:54,950 --> 00:04:52,960
eyes now i understand at the end of the

128
00:04:57,189 --> 00:04:54,960
month it's going to disappear and not be

129
00:05:00,550 --> 00:04:57,199
seen for six thousand eight hundred

130
00:05:03,029 --> 00:05:00,560
years so why is that so

131
00:05:05,430 --> 00:05:03,039
right so as i said this when it came by

132
00:05:07,510 --> 00:05:05,440
the close pass of the sun in july july

133
00:05:10,230 --> 00:05:07,520
third um that's when it gets the hottest

134
00:05:12,230 --> 00:05:10,240
and so the sun bakes off these ices that

135
00:05:14,070 --> 00:05:12,240
emily spoke about and turns them into a

136
00:05:15,430 --> 00:05:14,080
gas that makes this cloud this beautiful

137
00:05:17,110 --> 00:05:15,440
tail that we see and that's a

138
00:05:19,350 --> 00:05:17,120

combination of the melting gases and the

139
00:05:21,830 --> 00:05:19,360
dust that's kicked off by it and so

140
00:05:23,350 --> 00:05:21,840
whether you can see a comet or not and

141
00:05:25,270 --> 00:05:23,360
how bright it appears is all a function

142
00:05:27,590 --> 00:05:25,280
of geometry where is the earth where is

143
00:05:29,830 --> 00:05:27,600
the sun where is the comet and so if all

144
00:05:31,430 --> 00:05:29,840
of the things line up just right then

145
00:05:33,350 --> 00:05:31,440
this comet is reflecting enough of the

146
00:05:37,350 --> 00:05:33,360
sun's light to get to us to appear to be

147
00:05:41,590 --> 00:05:39,270
and we've had a few nasa satellites that

148
00:05:43,430 --> 00:05:41,600
have captured the comet in its images um

149
00:05:45,670 --> 00:05:43,440
what can we learn from comets using

150
00:05:49,749 --> 00:05:45,680
satellites

151
00:05:51,909 --> 00:05:49,759
some really interesting information that

152
00:05:54,230 --> 00:05:51,919
we're not able to get from the ground

153
00:05:55,990 --> 00:05:54,240
for example with the neo-y spacecraft

154
00:05:58,550 --> 00:05:56,000
the one that we use to discover this

155
00:06:00,629 --> 00:05:58,560
comet we're able to detect carbon

156
00:06:02,150 --> 00:06:00,639
monoxide and carbon dioxide which is

157
00:06:04,870 --> 00:06:02,160
difficult to see from the ground due to

158
00:06:05,990 --> 00:06:04,880
earth's atmosphere so we're able to get

159
00:06:08,790 --> 00:06:06,000
some information that we wouldn't be

160
00:06:11,670 --> 00:06:08,800
able to do otherwise additionally with

161
00:06:14,230 --> 00:06:11,680
uh with other spacecraft such as hubble

162
00:06:17,110 --> 00:06:14,240
space telescope for example or

163
00:06:19,430 --> 00:06:17,120

soho or a few others we're able to see

164
00:06:21,510 --> 00:06:19,440
the comet without the earth's atmosphere

165
00:06:25,350 --> 00:06:21,520
obscuring it allowing us to get a much

166
00:06:27,270 --> 00:06:25,360
more detailed picture of what's going on

167
00:06:29,510 --> 00:06:27,280
well that's really interesting um let's

168
00:06:32,150 --> 00:06:29,520
go ahead and answer some questions from

169
00:06:34,070 --> 00:06:32,160
ask nasa remember please don't hesitate

170
00:06:35,430 --> 00:06:34,080
to send us your questions by writing in

171
00:06:37,830 --> 00:06:35,440
the comment box wherever you're watching

172
00:06:39,430 --> 00:06:37,840
this or by using the hashtag asksmaster

173
00:06:41,350 --> 00:06:39,440
on social media

174
00:06:44,469 --> 00:06:41,360
so one question we've been getting from

175
00:06:47,430 --> 00:06:44,479
a lot of you is how do i capture

176
00:06:49,350 --> 00:06:47,440
comment neowise in photos well nasa's

177
00:06:51,909 --> 00:06:49,360
social media specialist bill dunford

178
00:06:54,629 --> 00:06:51,919
captured some photos last weekend and

179
00:06:56,390 --> 00:06:54,639
has shared a few of his tips

180
00:06:59,270 --> 00:06:56,400
hi i'm bill dunphy from nasa's jet

181
00:07:02,390 --> 00:06:59,280
propulsion laboratory in my spare time i

182
00:07:04,629 --> 00:07:02,400
love to take pictures of the night sky

183
00:07:08,070 --> 00:07:04,639
i do this using a camera mounted to a

184
00:07:10,070 --> 00:07:08,080
tripod and in manual mode so that i can

185
00:07:11,749 --> 00:07:10,080
set the camera to leave the shutter open

186
00:07:15,110 --> 00:07:11,759
for several seconds

187
00:07:17,029 --> 00:07:15,120
to let in lots of light

188
00:07:18,629 --> 00:07:17,039

recently i captured these images of

189
00:07:21,510 --> 00:07:18,639
comet neowise

190
00:07:23,670 --> 00:07:21,520
on a clear morning at about 4 30 a.m i

191
00:07:25,350 --> 00:07:23,680
went to a location far from city lights

192
00:07:27,589 --> 00:07:25,360
that had a good view of the northeast

193
00:07:29,990 --> 00:07:27,599
horizon

194
00:07:32,150 --> 00:07:30,000
i could see the comet with the naked eye

195
00:07:34,870 --> 00:07:32,160
so i zoomed in on it and exposed each

196
00:07:36,950 --> 00:07:34,880
shot for about 4 seconds

197
00:07:39,670 --> 00:07:36,960
i also did a little post processing

198
00:07:41,189 --> 00:07:39,680
using photo editing software here's an

199
00:07:44,070 --> 00:07:41,199
original photo straight out of the

200
00:07:46,230 --> 00:07:44,080
camera i was able to brighten it a bit

201
00:07:48,150 --> 00:07:46,240
draw out the vibrancy of the colors and

202
00:07:49,990 --> 00:07:48,160
clean up some noise

203
00:07:52,070 --> 00:07:50,000
the end result was close to how the

204
00:07:54,070 --> 00:07:52,080
scene looked in person which i have to

205
00:07:55,990 --> 00:07:54,080
tell you is beautiful

206
00:07:58,309 --> 00:07:56,000
so i really hope you get a chance to see

207
00:08:04,390 --> 00:07:58,319
comet neowise and all of the other

208
00:08:09,589 --> 00:08:06,150
so we have another question from social

209
00:08:11,830 --> 00:08:09,599
media twitter user fran asks will the

210
00:08:14,309 --> 00:08:11,840
comet keep moving higher away from the

211
00:08:16,869 --> 00:08:14,319
horizon every night will eventually be

212
00:08:19,350 --> 00:08:16,879
over my head and can i see it any time

213
00:08:21,189 --> 00:08:19,360

after dark

214
00:08:23,189 --> 00:08:21,199
so right now it's moving from the

215
00:08:25,110 --> 00:08:23,199
morning sky as you heard into the

216
00:08:27,670 --> 00:08:25,120
evening sky so it will be coming up in

217
00:08:30,070 --> 00:08:27,680
the evening sky as this next week or two

218
00:08:31,749 --> 00:08:30,080
go on but it's going to be moving

219
00:08:33,909 --> 00:08:31,759
further from the sun at the same time

220
00:08:36,310 --> 00:08:33,919
and so there's a chance that it could be

221
00:08:38,709 --> 00:08:36,320
getting fainter or if there's extra

222
00:08:40,790 --> 00:08:38,719
activity it could be getting brighter so

223
00:08:42,389 --> 00:08:40,800
we really don't know what the brightness

224
00:08:44,550 --> 00:08:42,399
change will be over time but it's

225
00:08:46,310 --> 00:08:44,560
certainly going to be in the after about

226
00:08:48,870 --> 00:08:46,320
a month from now going to be getting

227
00:08:53,590 --> 00:08:48,880
much fainter rapidly um it won't be over

228
00:08:58,870 --> 00:08:57,190
okay um and twitter user batswan asks

229
00:09:01,110 --> 00:08:58,880
now that the comet is more visible in

230
00:09:03,910 --> 00:09:01,120
the evening will it no longer be visible

231
00:09:09,110 --> 00:09:06,829
yeah so as joe was saying

232
00:09:11,590 --> 00:09:09,120
oh this is the difficult part about

233
00:09:14,630 --> 00:09:11,600
doing this remotely uh so as joe was

234
00:09:17,030 --> 00:09:14,640
saying as the the comet moves its

235
00:09:20,150 --> 00:09:17,040
position in the solar system due to the

236
00:09:22,470 --> 00:09:20,160
geometry we'll only be able to see it in

237
00:09:24,550 --> 00:09:22,480
the evening from uh

238
00:09:26,630 --> 00:09:24,560

after a few days from now you can see

239
00:09:27,750 --> 00:09:26,640
from this picture here how it'll move in

240
00:09:34,310 --> 00:09:27,760
the sky

241
00:09:39,750 --> 00:09:37,350
fantastic so twitter user andrew fontura

242
00:09:42,790 --> 00:09:39,760
asks how fast is comet near-wise

243
00:09:44,470 --> 00:09:42,800
traveling through space

244
00:09:46,949 --> 00:09:44,480
so as emily mentioned before comets

245
00:09:49,030 --> 00:09:46,959
follow these very elliptical orbits and

246
00:09:50,949 --> 00:09:49,040
so when it's farthest from the sun comet

247
00:09:53,110 --> 00:09:50,959
eos is almost at a standstill with

248
00:09:55,030 --> 00:09:53,120
respect to the sun but as it fell down

249
00:09:57,190 --> 00:09:55,040
the sun's gravity well it's sped up and

250
00:09:59,110 --> 00:09:57,200
so right now it's moving at around 40

251
00:10:01,670 --> 00:09:59,120
miles every second this is about twice

252
00:10:03,269 --> 00:10:01,680
as fast as earth speed around the sun

253
00:10:05,030 --> 00:10:03,279
and so as it goes farther from the sun

254
00:10:09,190 --> 00:10:05,040
it'll be slowing down as it climbs back

255
00:10:14,710 --> 00:10:11,750
okay so rishikesh kankel from twitter

256
00:10:19,670 --> 00:10:14,720
asks what is comet neowise's tail made

257
00:10:20,870 --> 00:10:19,680
of or how much water is in the comets

258
00:10:23,190 --> 00:10:20,880
right so

259
00:10:25,750 --> 00:10:23,200
comet there's actually usually you see

260
00:10:28,310 --> 00:10:25,760
two different comet tails you can see

261
00:10:31,670 --> 00:10:28,320
the broad dust tail which kind of has

262
00:10:34,310 --> 00:10:31,680
this pale yellowish gray color and then

263
00:10:37,910 --> 00:10:34,320

frequently you will also see the ion

264
00:10:40,550 --> 00:10:37,920
tail which is made of ionized gases so

265
00:10:43,269 --> 00:10:40,560
both of these are come from the comet's

266
00:10:45,430 --> 00:10:43,279
nucleus that are lifted off as the comet

267
00:10:46,630 --> 00:10:45,440
gets closer to the sun

268
00:10:48,310 --> 00:10:46,640
and because they have different

269
00:10:49,990 --> 00:10:48,320
compositions they just react a little

270
00:10:51,190 --> 00:10:50,000
differently to

271
00:10:54,949 --> 00:10:51,200
the

272
00:10:57,190 --> 00:10:54,959
solar radiation pressure that is to say

273
00:10:58,069 --> 00:10:57,200
the uh

274
00:10:59,590 --> 00:10:58,079
the

275
00:11:00,949 --> 00:10:59,600
sun's uh

276
00:11:03,829 --> 00:11:00,959
how the sun interacts with these

277
00:11:06,949 --> 00:11:03,839
particles so the the two different kinds

278
00:11:08,949 --> 00:11:06,959
of particles tend to get spread out so

279
00:11:10,949 --> 00:11:08,959
the other question uh the other part of

280
00:11:13,269 --> 00:11:10,959
the question was about the how much

281
00:11:16,310 --> 00:11:13,279
water is in a comet so

282
00:11:19,190 --> 00:11:16,320
uh this comet is about um three miles

283
00:11:21,750 --> 00:11:19,200
across and most comets on average are

284
00:11:23,350 --> 00:11:21,760
about half water and half dust and so i

285
00:11:25,670 --> 00:11:23,360
actually did a little quick back of the

286
00:11:27,350 --> 00:11:25,680
envelope calculation on an actual

287
00:11:29,030 --> 00:11:27,360
envelope uh

288
00:11:30,389 --> 00:11:29,040

as you can see right here this is

289
00:11:32,790 --> 00:11:30,399
actually how a lot of scientists do

290
00:11:35,430 --> 00:11:32,800
these calculations a lot of times and my

291
00:11:38,069 --> 00:11:35,440
quick calculation is it's probably about

292
00:11:41,350 --> 00:11:38,079
13 million olympic swimming pools worth

293
00:11:44,630 --> 00:11:41,360
of water so that's a lot of water

294
00:11:46,949 --> 00:11:44,640
wow that's that is a lot of water

295
00:11:50,629 --> 00:11:46,959
oh thank you for doing that calculation

296
00:11:53,430 --> 00:11:50,639
um so palak on youtube asked how fast

297
00:11:56,389 --> 00:11:53,440
would the comet be seen um moving with

298
00:11:57,990 --> 00:11:56,399
to the human eye

299
00:12:00,310 --> 00:11:58,000
you can't really see it with the human

300
00:12:01,350 --> 00:12:00,320
eye although you might notice it moving

301
00:12:03,030 --> 00:12:01,360
a little bit with respect to the

302
00:12:04,790 --> 00:12:03,040
background stars if for instance you

303
00:12:06,790 --> 00:12:04,800
have a camera on a tripod and you're

304
00:12:08,470 --> 00:12:06,800
taking images over time

305
00:12:10,470 --> 00:12:08,480
but you know on minute to minute it's

306
00:12:12,870 --> 00:12:10,480
not moving very fast if you take two

307
00:12:14,629 --> 00:12:12,880
images night to night you will see it

308
00:12:16,870 --> 00:12:14,639
distinctly moving against the background

309
00:12:21,750 --> 00:12:16,880
frame of the stars so you can you can

310
00:12:27,190 --> 00:12:24,790
fantastic uh so we have another question

311
00:12:30,949 --> 00:12:27,200
from twitter daryl leslie asked will i

312
00:12:35,430 --> 00:12:33,190
yeah you should be able to see it from

313
00:12:37,670 --> 00:12:35,440

most places in the northern hemisphere

314
00:12:38,949 --> 00:12:37,680
so long as you have a reasonably dark

315
00:12:41,110 --> 00:12:38,959
sky

316
00:12:43,110 --> 00:12:41,120
and have a clear view of the

317
00:12:44,790 --> 00:12:43,120
northwestern horizon

318
00:12:46,389 --> 00:12:44,800
now i know that some folks in the

319
00:12:49,110 --> 00:12:46,399
northern hemisphere especially those

320
00:12:49,829 --> 00:12:49,120
particularly far north are in

321
00:12:52,949 --> 00:12:49,839
the

322
00:12:54,389 --> 00:12:52,959
and if you're particularly far north you

323
00:12:56,550 --> 00:12:54,399
don't get a lot of dark time so that

324
00:12:57,750 --> 00:12:56,560
might make it a little more challenging

325
00:12:59,430 --> 00:12:57,760
but uh

326
00:13:05,269 --> 00:12:59,440
i would say still try to go for it it'd

327
00:13:10,550 --> 00:13:07,829
okay so we have another question um saga

328
00:13:14,310 --> 00:13:10,560
gautam from twitter they ask how is

329
00:13:18,790 --> 00:13:16,389
uh sure yeah i'll take that one so

330
00:13:21,190 --> 00:13:18,800
comets were formed in the very early

331
00:13:23,509 --> 00:13:21,200
days of our solar system back when

332
00:13:26,470 --> 00:13:23,519
everything was just this big

333
00:13:27,990 --> 00:13:26,480
disk of gas and dust and we didn't have

334
00:13:30,790 --> 00:13:28,000
even have the planets or anything for

335
00:13:32,310 --> 00:13:30,800
them so you had the star our protostar

336
00:13:34,629 --> 00:13:32,320
early sun in the middle and then just

337
00:13:35,750 --> 00:13:34,639
this big gas uh

338
00:13:38,069 --> 00:13:35,760

disk of

339
00:13:40,310 --> 00:13:38,079
gas and dust and then things started

340
00:13:42,389 --> 00:13:40,320
collecting into these uh into what

341
00:13:44,949 --> 00:13:42,399
eventually became the comets in the

342
00:13:47,670 --> 00:13:44,959
asteroids and the planets and the

343
00:13:50,150 --> 00:13:47,680
asteroids tended to stay mostly in these

344
00:13:52,790 --> 00:13:50,160
middle of the solar system whereas most

345
00:13:54,470 --> 00:13:52,800
of the comets tend to get flung far away

346
00:13:56,790 --> 00:13:54,480
and so they've been in what we like to

347
00:13:58,870 --> 00:13:56,800
call cold storage for most of the age of

348
00:14:02,230 --> 00:13:58,880
the solar system and that's why they're

349
00:14:03,350 --> 00:14:02,240
able to have these ices on onboard which

350
00:14:05,350 --> 00:14:03,360
helped to

351
00:14:08,949 --> 00:14:05,360
form these dramatic tales as we see with

352
00:14:12,790 --> 00:14:10,790
so the number one question we're getting

353
00:14:15,590 --> 00:14:12,800
from social media is

354
00:14:17,509 --> 00:14:15,600
can i see it from my parts of the world

355
00:14:19,269 --> 00:14:17,519
and can you explain where comet

356
00:14:22,389 --> 00:14:19,279
near-wise is visible

357
00:14:24,069 --> 00:14:22,399
across the globe right now

358
00:14:26,550 --> 00:14:24,079
so yeah as emily mentioned if you're in

359
00:14:28,629 --> 00:14:26,560
the northern hemisphere you can see it

360
00:14:30,790 --> 00:14:28,639
uh as the next couple days progress will

361
00:14:32,710 --> 00:14:30,800
be getting higher in the evening sky so

362
00:14:34,150 --> 00:14:32,720
you're going to want to look northwest

363
00:14:35,990 --> 00:14:34,160

right under the big dipper so as this

364
00:14:38,710 --> 00:14:36,000
graphic shows you can see where the

365
00:14:39,990 --> 00:14:38,720
comet was a few days ago with respect to

366
00:14:42,230 --> 00:14:40,000
the the

367
00:14:44,790 --> 00:14:42,240
dipper in the big dipper to the bucket

368
00:14:46,230 --> 00:14:44,800
um so that will be moving up and in this

369
00:14:48,069 --> 00:14:46,240
image to the left a little bit so

370
00:14:50,389 --> 00:14:48,079
getting more underneath the big dipper

371
00:14:52,949 --> 00:14:50,399
um what you want to do is go out right

372
00:14:55,430 --> 00:14:52,959
around the time that the first stars

373
00:14:56,949 --> 00:14:55,440
start to show up and so you're not going

374
00:14:58,949 --> 00:14:56,959
to see it before that it's probably

375
00:15:00,790 --> 00:14:58,959
about as bright as some of the stars in

376
00:15:02,949 --> 00:15:00,800
the big dipper so

377
00:15:05,670 --> 00:15:02,959
find out what time your local sunset is

378
00:15:07,670 --> 00:15:05,680
go out about 45 minutes after that

379
00:15:08,710 --> 00:15:07,680
and wait until the first star starts to

380
00:15:12,069 --> 00:15:08,720
appear and that's when you should start

381
00:15:14,389 --> 00:15:12,079
looking with your binoculars

382
00:15:16,710 --> 00:15:14,399
okay so is it visible from the southern

383
00:15:21,189 --> 00:15:16,720
hemisphere at all

384
00:15:24,790 --> 00:15:23,269
that's a shame

385
00:15:27,430 --> 00:15:24,800
um so how

386
00:15:29,829 --> 00:15:27,440
did on twitter ask um what is the

387
00:15:31,509 --> 00:15:29,839
diameter of comet neowise is it an

388
00:15:33,749 --> 00:15:31,519

interest and is it an interstellar

389
00:15:37,509 --> 00:15:33,759
object

390
00:15:43,350 --> 00:15:40,069
so from our additional data with the

391
00:15:45,030 --> 00:15:43,360
neoi spacecraft we're able to make a

392
00:15:47,110 --> 00:15:45,040
preliminary measurement of the size and

393
00:15:49,509 --> 00:15:47,120
nucleus we found out it's about

394
00:15:52,230 --> 00:15:49,519
three miles across or five kilometers

395
00:15:55,269 --> 00:15:52,240
for free for the other folks who might

396
00:15:57,189 --> 00:15:55,279
use uh the metric system uh

397
00:15:59,829 --> 00:15:57,199
and this one we know it's not an

398
00:16:03,030 --> 00:15:59,839
interstellar object uh by watching its

399
00:16:05,829 --> 00:16:03,040
motion we can see that it's bound to the

400
00:16:08,230 --> 00:16:05,839
sun's gravity so it's coming in very

401
00:16:09,829 --> 00:16:08,240
rapidly and then it's gonna go far back

402
00:16:11,910 --> 00:16:09,839
out again and then but then it should

403
00:16:16,230 --> 00:16:11,920
come back in again in about six thousand

404
00:16:23,269 --> 00:16:20,069
fantastic so uh twitter user aloose

405
00:16:26,230 --> 00:16:23,279
okeezy asks please um i'd like to know

406
00:16:28,069 --> 00:16:26,240
if comets have regular orbits and i'd

407
00:16:30,310 --> 00:16:28,079
also like to know if the formation of

408
00:16:33,350 --> 00:16:30,320
comet tails leads to the reduction in

409
00:16:35,269 --> 00:16:33,360
mass of the comets and if their mass is

410
00:16:38,470 --> 00:16:35,279
replenished by when their orbit is

411
00:16:41,030 --> 00:16:38,480
farther away from the sun

412
00:16:42,790 --> 00:16:41,040
so yes comets do have regular orbits uh

413
00:16:44,870 --> 00:16:42,800

this one is on an elliptical orbit it's

414
00:16:46,230 --> 00:16:44,880
a very stretched out ellipse but it's

415
00:16:50,069 --> 00:16:46,240
still in the lips and so it will go

416
00:16:51,910 --> 00:16:50,079
around the sun every 7 000 years or so

417
00:16:53,749 --> 00:16:51,920
and each time it does it loses some of

418
00:16:55,189 --> 00:16:53,759
its mass now there's nothing out there

419
00:16:57,269 --> 00:16:55,199
right now to replenish it all of the

420
00:16:59,189 --> 00:16:57,279
gases and dust that emily talked about

421
00:17:00,550 --> 00:16:59,199
that were there when it formed are no

422
00:17:02,629 --> 00:17:00,560
longer there they've been blown out by

423
00:17:05,029 --> 00:17:02,639
the sun's solar wind over the last

424
00:17:07,270 --> 00:17:05,039
billions of years and so it's constantly

425
00:17:09,110 --> 00:17:07,280
losing mass not replenishing it and so

426
00:17:11,029 --> 00:17:09,120
each time it goes by it will lose a

427
00:17:14,470 --> 00:17:11,039
little bit more until one day it just

428
00:17:14,480 --> 00:17:19,829
and how long does that process take

429
00:17:24,150 --> 00:17:23,029
um that process oh go on emily yeah no

430
00:17:26,549 --> 00:17:24,160
go ahead

431
00:17:28,549 --> 00:17:26,559
okay uh that process can it depends on

432
00:17:30,950 --> 00:17:28,559
the comet some comets lose mass very

433
00:17:32,710 --> 00:17:30,960
quickly if their surface is if this is

434
00:17:34,310 --> 00:17:32,720
their first time in the solar system and

435
00:17:35,990 --> 00:17:34,320
there's not much in the way and there's

436
00:17:37,909 --> 00:17:36,000
a lot of ice on the surface it can lose

437
00:17:40,549 --> 00:17:37,919
that material very quickly

438
00:17:42,630 --> 00:17:40,559

as the comet gets older the ice has been

439
00:17:44,549 --> 00:17:42,640
blown off and the dust has remained and

440
00:17:46,710 --> 00:17:44,559
it gets this crust basically that

441
00:17:48,310 --> 00:17:46,720
shields it and so comets each time they

442
00:17:50,150 --> 00:17:48,320
come by will are expected to get a

443
00:17:51,750 --> 00:17:50,160
little bit weaker a little bit less

444
00:17:54,470 --> 00:17:51,760
powerful in terms of the amount of

445
00:17:56,710 --> 00:17:54,480
material being shed off and so they

446
00:17:58,789 --> 00:17:56,720
might still have ice of surface after we

447
00:18:00,549 --> 00:17:58,799
call them dead comets it's just that

448
00:18:02,390 --> 00:18:00,559
there's a thick layer of rubble that

449
00:18:06,549 --> 00:18:02,400
protects them protects them from the

450
00:18:10,390 --> 00:18:09,430
so uh kate staples from twitter um they

451
00:18:12,150 --> 00:18:10,400
asked

452
00:18:14,710 --> 00:18:12,160
why is there a public conference about

453
00:18:17,430 --> 00:18:14,720
neowise tomorrow where the nasa defense

454
00:18:22,070 --> 00:18:17,440
officers i find it all very sudden what

455
00:18:25,270 --> 00:18:24,150
i'm going to let joe take this one

456
00:18:27,270 --> 00:18:25,280
okay

457
00:18:29,510 --> 00:18:27,280
um there is no risk to the planet from

458
00:18:31,350 --> 00:18:29,520
this the this object is nearly

459
00:18:33,110 --> 00:18:31,360
three-quarters of an astronomical unit

460
00:18:34,470 --> 00:18:33,120
away from us right now that's the one

461
00:18:36,549 --> 00:18:34,480
astronomical unit is the distance from

462
00:18:37,990 --> 00:18:36,559
the earth to the sun so this is very far

463
00:18:39,990 --> 00:18:38,000

away from us and it's not coming

464
00:18:41,430 --> 00:18:40,000
anywhere near us so there is no threat

465
00:18:43,029 --> 00:18:41,440
the reason that the planetary defense

466
00:18:45,029 --> 00:18:43,039
coordination office is having a press

467
00:18:47,510 --> 00:18:45,039
conference i believe right after this is

468
00:18:49,750 --> 00:18:47,520
because neowise is under the umbrella of

469
00:18:51,270 --> 00:18:49,760
the planetary defense office and so this

470
00:18:52,950 --> 00:18:51,280
is one of our goals is to search for

471
00:18:54,789 --> 00:18:52,960
hazardous asteroids when we do that we

472
00:18:56,710 --> 00:18:54,799
find all kinds of great other things

473
00:18:58,789 --> 00:18:56,720
like comet neo-wise but because this is

474
00:19:00,549 --> 00:18:58,799
the office that is uh

475
00:19:02,470 --> 00:19:00,559
basically allowing neowise to operate

476
00:19:03,909 --> 00:19:02,480
and giving us our guidance they're the

477
00:19:05,830 --> 00:19:03,919
ones who are going to be uh talking

478
00:19:11,110 --> 00:19:05,840
about what we found and all the cool

479
00:19:15,430 --> 00:19:12,710
so there's another question on twitter

480
00:19:17,669 --> 00:19:15,440
from ange and they asked are there any

481
00:19:19,750 --> 00:19:17,679
chances of neo-eyes becoming a great

482
00:19:24,710 --> 00:19:19,760
comet and turning it exceptionally

483
00:19:28,870 --> 00:19:26,950
uh comments are notoriously hard to

484
00:19:31,350 --> 00:19:28,880
predict in terms of how bright they'll

485
00:19:33,830 --> 00:19:31,360
be and uh even for comments that we've

486
00:19:35,750 --> 00:19:33,840
seen before this is a real challenge but

487
00:19:37,430 --> 00:19:35,760
for comet neowise with it's the first

488
00:19:39,909 --> 00:19:37,440

time that we're seeing it we don't

489
00:19:42,150 --> 00:19:39,919
really know for sure um

490
00:19:43,990 --> 00:19:42,160
because it's already past the

491
00:19:45,270 --> 00:19:44,000
its closest point to the sun so that's

492
00:19:47,350 --> 00:19:45,280
it's already past the point where it's

493
00:19:49,590 --> 00:19:47,360
gotten the most heat it's unlikely to

494
00:19:52,950 --> 00:19:49,600
become tremendously much brighter than

495
00:19:55,430 --> 00:19:52,960
it is but comets surprise us so i would

496
00:19:57,029 --> 00:19:55,440
say keep keep a lookout and

497
00:19:58,710 --> 00:19:57,039
you know who knows we might see it

498
00:20:00,870 --> 00:19:58,720
become a great comment

499
00:20:02,310 --> 00:20:00,880
but it might just fade away that's the

500
00:20:03,669 --> 00:20:02,320
that's one of the exciting things about

501
00:20:05,669 --> 00:20:03,679
studying comments is that you never

502
00:20:07,190 --> 00:20:05,679
really know

503
00:20:08,870 --> 00:20:07,200
and we're all exploring this together

504
00:20:12,310 --> 00:20:08,880
right now

505
00:20:17,750 --> 00:20:15,190
um so terry on facebook they asked why

506
00:20:20,149 --> 00:20:17,760
are there two or even three towels with

507
00:20:22,950 --> 00:20:20,159
comets

508
00:20:25,590 --> 00:20:22,960
yeah so as i had explained before comet

509
00:20:30,230 --> 00:20:25,600
tails are made up of dust

510
00:20:32,390 --> 00:20:30,240
and uh ions and i ionize gases so that

511
00:20:34,950 --> 00:20:32,400
broad tail that you see is the dust and

512
00:20:36,870 --> 00:20:34,960
it interacts with the sun's solar wind a

513
00:20:38,789 --> 00:20:36,880

little differently than the ionized gas

514
00:20:41,510 --> 00:20:38,799
is and sometimes you even have the third

515
00:20:42,549 --> 00:20:41,520
tail is which is uh the sodium tail in

516
00:20:44,310 --> 00:20:42,559
very

517
00:20:46,310 --> 00:20:44,320
rare cases where

518
00:20:48,390 --> 00:20:46,320
you have a particularly bright comet

519
00:20:50,950 --> 00:20:48,400
that's having a lot of activity having a

520
00:20:53,430 --> 00:20:50,960
lot of dust and gas come off the surface

521
00:20:55,990 --> 00:20:53,440
most of the time the comments we see are

522
00:20:58,310 --> 00:20:56,000
too far or too fat to actually see that

523
00:21:03,909 --> 00:20:58,320
third tail so it's very exciting when we

524
00:21:09,750 --> 00:21:06,230
so we have a couple of questions about

525
00:21:11,110 --> 00:21:09,760
um when was the last time comic neowise

526
00:21:12,870 --> 00:21:11,120
appeared

527
00:21:14,870 --> 00:21:12,880
or is this the first time it's visited

528
00:21:17,669 --> 00:21:14,880
us

529
00:21:19,909 --> 00:21:17,679
so its orbital period right now from our

530
00:21:23,190 --> 00:21:19,919
current measurements is around 6 800

531
00:21:25,750 --> 00:21:23,200
6900 years so that would mean that the

532
00:21:28,870 --> 00:21:25,760
comet was here last about 7 000 years

533
00:21:30,470 --> 00:21:28,880
ago however as the comet is outgassing

534
00:21:32,630 --> 00:21:30,480
as material is being kicked off these

535
00:21:34,630 --> 00:21:32,640
act like thruster jets and so comets

536
00:21:36,789 --> 00:21:34,640
very frequently change their orbits

537
00:21:39,029 --> 00:21:36,799
either subtly or sometimes dramatically

538
00:21:40,549 --> 00:21:39,039

from one pass of the sun to the next so

539
00:21:42,549 --> 00:21:40,559
while we can go backwards in time and

540
00:21:43,750 --> 00:21:42,559
say it was probably here around 7 000

541
00:21:45,430 --> 00:21:43,760
years ago

542
00:21:48,149 --> 00:21:45,440
we're not sure if it's been on this

543
00:21:50,230 --> 00:21:48,159
orbit for many more passes prior to that

544
00:21:52,149 --> 00:21:50,240
or if it had been dramatically changed

545
00:21:57,350 --> 00:21:52,159
for some reason because of the you know

546
00:22:05,029 --> 00:21:59,510
wow and what is the average temperature

547
00:22:08,070 --> 00:22:06,149
uh so

548
00:22:10,470 --> 00:22:08,080
comets are pretty cold

549
00:22:13,669 --> 00:22:10,480
uh compared to uh

550
00:22:15,510 --> 00:22:13,679
what we have here on earth but uh

551
00:22:18,630 --> 00:22:15,520
they're relatively warm compared to the

552
00:22:21,110 --> 00:22:18,640
background of space so uh

553
00:22:22,310 --> 00:22:21,120
let's see for an exact number oh i'm

554
00:22:24,070 --> 00:22:22,320
gonna have to pass it over to joe i'm

555
00:22:26,630 --> 00:22:24,080
not doing these calculations on my head

556
00:22:29,350 --> 00:22:26,640
which is why i had that that envelope

557
00:22:32,149 --> 00:22:29,360
where he did the other calculation

558
00:22:33,830 --> 00:22:32,159
so for for these kind of objects uh the

559
00:22:35,510 --> 00:22:33,840
temperature of the object is really just

560
00:22:36,470 --> 00:22:35,520
a function of how far it is from the sun

561
00:22:38,870 --> 00:22:36,480
because that's where it's getting its

562
00:22:41,270 --> 00:22:38,880
heat from and so because this comet is

563
00:22:42,789 --> 00:22:41,280

passing about the same distance from the

564
00:22:44,470 --> 00:22:42,799
sun as the earth is just in a very

565
00:22:46,149 --> 00:22:44,480
different spot it's going to have about

566
00:22:47,750 --> 00:22:46,159
the same temperature so if you were

567
00:22:49,990 --> 00:22:47,760
standing on the surface it's probably

568
00:22:51,350 --> 00:22:50,000
close to room temperature but as emily

569
00:22:53,270 --> 00:22:51,360
mentioned as it goes further out it's

570
00:22:55,270 --> 00:22:53,280
going to cool off and drop dramatically

571
00:22:57,110 --> 00:22:55,280
and so it's going to get down to liquid

572
00:22:59,270 --> 00:22:57,120
nitrogen temperatures and liquid helium

573
00:23:01,510 --> 00:22:59,280
temperatures before it goes out into its

574
00:23:06,549 --> 00:23:01,520
cold storage which is only a few degrees

575
00:23:11,430 --> 00:23:08,230
and um you said that they can change

576
00:23:13,190 --> 00:23:11,440
trajectory but when comets lose mass do

577
00:23:17,909 --> 00:23:13,200
their orbits change and that's a

578
00:23:21,270 --> 00:23:17,919
question from kamehameha on periscope

579
00:23:23,830 --> 00:23:21,280
uh yes absolutely the orbits can change

580
00:23:26,470 --> 00:23:23,840
um it depends on where the thruster is

581
00:23:27,909 --> 00:23:26,480
coming out from uh comets we thought of

582
00:23:29,909 --> 00:23:27,919
them originally as snowballs that were

583
00:23:32,630 --> 00:23:29,919
just losing mass everywhere but from the

584
00:23:35,029 --> 00:23:32,640
rosetta mission to uh 67p triumph

585
00:23:37,029 --> 00:23:35,039
gerasimenko we saw that it actually came

586
00:23:39,190 --> 00:23:37,039
out in these very narrow jets from

587
00:23:41,029 --> 00:23:39,200
certain parts on the comet surface and

588
00:23:42,390 --> 00:23:41,039

so each of those jets can cause a little

589
00:23:43,750 --> 00:23:42,400
push and it can either change how the

590
00:23:45,830 --> 00:23:43,760
comet spins

591
00:23:47,750 --> 00:23:45,840
or it can change the comet's entire

592
00:23:49,350 --> 00:23:47,760
orbit around the sun and it all depends

593
00:23:53,830 --> 00:23:49,360
on where that jet is and where it is

594
00:23:59,029 --> 00:23:56,789
and so samir on facebook they asked is

595
00:24:00,789 --> 00:23:59,039
this comet disintegrating as seen in

596
00:24:03,990 --> 00:24:00,799
some of the recent photos taken by

597
00:24:10,070 --> 00:24:06,710
uh yeah sure so i took a look at a few

598
00:24:11,590 --> 00:24:10,080
of those from a couple days ago and uh

599
00:24:13,590 --> 00:24:11,600
what i think we're actually seeing in

600
00:24:15,590 --> 00:24:13,600
those images is not necessarily the

601
00:24:16,950 --> 00:24:15,600
comment breaking up but actually a

602
00:24:20,070 --> 00:24:16,960
jitter in

603
00:24:21,990 --> 00:24:20,080
the way the camera is set up so if you

604
00:24:23,909 --> 00:24:22,000
have a camera that's very stable you'll

605
00:24:25,909 --> 00:24:23,919
get a nice clear picture of the comet

606
00:24:28,070 --> 00:24:25,919
but if it shakes a little as you're

607
00:24:30,390 --> 00:24:28,080
taking the image it'll look like the

608
00:24:32,230 --> 00:24:30,400
comet is breaking up or splitting up and

609
00:24:34,950 --> 00:24:32,240
this is actually a really common thing

610
00:24:36,070 --> 00:24:34,960
that even professional astronomers have

611
00:24:39,430 --> 00:24:36,080
to deal with

612
00:24:41,990 --> 00:24:39,440
so if you see a little uh bit of jitter

613
00:24:43,990 --> 00:24:42,000

in your objects or in the images that's

614
00:24:45,990 --> 00:24:44,000
pretty normal uh that doesn't mean the

615
00:24:47,669 --> 00:24:46,000
comet's breaking up that just means that

616
00:24:50,149 --> 00:24:47,679
you might need to try to secure your

617
00:24:51,669 --> 00:24:50,159
your uh camera a little bit more tightly

618
00:24:55,269 --> 00:24:51,679
before trying to take another long

619
00:24:58,870 --> 00:24:56,950
we're getting some great um questions

620
00:25:01,269 --> 00:24:58,880
from social media so we have holland

621
00:25:03,590 --> 00:25:01,279
lilly on periscope they asked what does

622
00:25:07,350 --> 00:25:03,600
the color of neowise's gas plume tell us

623
00:25:12,149 --> 00:25:09,590
emily you can take this one

624
00:25:14,630 --> 00:25:12,159
sure yeah so the

625
00:25:17,110 --> 00:25:14,640
uh we can use what are called spectra to

626
00:25:18,870 --> 00:25:17,120
help us understand the composition of

627
00:25:20,390 --> 00:25:18,880
these comets without even having to go

628
00:25:22,549 --> 00:25:20,400
there which is i i think is really

629
00:25:24,070 --> 00:25:22,559
fascinating just by the basically by the

630
00:25:26,830 --> 00:25:24,080
color of the light we can tell what it's

631
00:25:28,710 --> 00:25:26,840
made of without we'd have to touch it uh

632
00:25:31,190 --> 00:25:28,720
so we

633
00:25:34,149 --> 00:25:31,200
what we know from uh comets is that

634
00:25:37,110 --> 00:25:34,159
generally these ion tails are made of uh

635
00:25:40,549 --> 00:25:37,120
hydrogen cyanide uh

636
00:25:43,510 --> 00:25:40,559
and a few other what we call uh

637
00:25:45,750 --> 00:25:43,520
carbon bearing molecules um

638
00:25:47,269 --> 00:25:45,760

and so yeah hydrogen cyanide tends to be

639
00:25:49,029 --> 00:25:47,279
one of the biggest ones so you wouldn't

640
00:25:50,870 --> 00:25:49,039
want to breathe it in if

641
00:25:54,549 --> 00:25:50,880
if you're standing on the comet as joe

642
00:25:58,710 --> 00:25:56,630
well we have learned a lot about comet

643
00:26:00,630 --> 00:25:58,720
nearwise today emily and joe thank you

644
00:26:01,830 --> 00:26:00,640
so much for joining us

645
00:26:04,870 --> 00:26:01,840
you're very welcome it's been a long

646
00:26:07,269 --> 00:26:04,880
time yeah a lot of fun

647
00:26:08,870 --> 00:26:07,279
and thank you for joining us from home

648
00:26:10,710 --> 00:26:08,880
if you want to learn more or take a

649
00:26:12,669 --> 00:26:10,720
closer look at viewing tips of comet

650
00:26:14,390 --> 00:26:12,679
neowise visit

651
00:26:16,470 --> 00:26:14,400
go.nasa.gov

652
00:26:18,070 --> 00:26:16,480
spot comment nearwise

653
00:26:20,070 --> 00:26:18,080
so we're going to end this episode with

654
00:26:22,390 --> 00:26:20,080
a fun video that has all you need to

655
00:26:25,669 --> 00:26:22,400
know about near-earth objects and nasa's

656
00:26:30,940 --> 00:26:25,679
mission to find a track and monitor them

657
00:28:40,630 --> 00:26:42,610
[Music]

658
00:28:45,269 --> 00:28:42,710
not special there's thousands of people

659
00:28:46,549 --> 00:28:45,279
out here that have thousands of jobs

660
00:28:47,909 --> 00:28:46,559
you know and each one's equally

661
00:28:49,830 --> 00:28:47,919
important

662
00:28:52,310 --> 00:28:49,840
the only unique thing about us is we