
EXIT
NASA
Dwayne
Brown
NEOWISE
In Search of Asteroids
NASA
Kennedy Space Center
Question from Center

1
00:00:12,549 --> 00:00:10,390
good afternoon my name is dwane brown

2
00:00:14,709 --> 00:00:12,559
with the office of communications and

3
00:00:17,349 --> 00:00:14,719
welcome to nasa headquarters

4
00:00:18,630 --> 00:00:17,359
today nasa reveals near-earth asteroid

5
00:00:21,189 --> 00:00:18,640
findings

6
00:00:23,830 --> 00:00:21,199
and implications for future research

7
00:00:27,910 --> 00:00:23,840
from the agency's near-earth object

8
00:00:30,310 --> 00:00:27,920
wide field infrared survey explore

9
00:00:32,069 --> 00:00:30,320
in short kneel-wise

10
00:00:34,470 --> 00:00:32,079
today's

11
00:00:38,229 --> 00:00:34,480
information and graphics can be obtained

12
00:00:41,430 --> 00:00:39,350
wise

13
00:00:43,510 --> 00:00:41,440

we will have brief presentations from

14
00:00:44,630 --> 00:00:43,520
our presenters then open it up for

15
00:00:47,670 --> 00:00:44,640
questions

16
00:00:49,910 --> 00:00:47,680
at our nasa centers and the phone bridge

17
00:00:51,189 --> 00:00:49,920
before we get started let me introduce

18
00:00:52,709 --> 00:00:51,199
you to today's

19
00:00:54,470 --> 00:00:52,719
speakers

20
00:00:56,310 --> 00:00:54,480
first up

21
00:00:58,630 --> 00:00:56,320
lynley johnson

22
00:01:03,750 --> 00:00:58,640
neo program executive

23
00:01:08,390 --> 00:01:05,270
amy meinzer

24
00:01:10,630 --> 00:01:08,400
neowise principal investigator

25
00:01:15,510 --> 00:01:10,640
nasa's jet propulsion laboratory

26
00:01:17,910 --> 00:01:16,870
tim sparr

27
00:01:20,870 --> 00:01:17,920
director

28
00:01:23,590 --> 00:01:20,880
minor planet center smithsonian

29
00:01:27,429 --> 00:01:23,600
astrophysical observatory cambridge

30
00:01:32,630 --> 00:01:30,310
and lucy mcfadden scientist

31
00:01:35,109 --> 00:01:32,640
nasa's goddard space flight center in

32
00:01:38,230 --> 00:01:35,119
greenbelt maryland and with that

33
00:01:39,830 --> 00:01:38,240
i'll toss it to lindley to start us off

34
00:01:41,429 --> 00:01:39,840
thanks

35
00:01:42,950 --> 00:01:41,439
thank you all for tuning in to hear

36
00:01:44,950 --> 00:01:42,960
about our progress with the near-earth

37
00:01:46,870 --> 00:01:44,960
object observation program

38
00:01:48,230 --> 00:01:46,880

we're here today to provide an update of

39
00:01:50,950 --> 00:01:48,240
our understanding of the near-earth

40
00:01:53,590 --> 00:01:50,960
asteroid population and announce uh

41
00:01:55,190 --> 00:01:53,600
achievement of some significant goals

42
00:01:56,550 --> 00:01:55,200
in finding our nearest neighbors in the

43
00:01:58,550 --> 00:01:56,560
solar system

44
00:02:00,310 --> 00:01:58,560
over the past 12 years

45
00:02:02,550 --> 00:02:00,320
our work to find near-earth asteroids

46
00:02:05,109 --> 00:02:02,560
has largely been done by several

47
00:02:08,469 --> 00:02:05,119
ground-based observatory teams but in

48
00:02:10,389 --> 00:02:08,479
2010 nasa augmented those efforts by

49
00:02:11,990 --> 00:02:10,399
enhancement of the ground processing of

50
00:02:14,630 --> 00:02:12,000
the data being returned by the wide

51
00:02:17,270 --> 00:02:14,640
field infrared survey explorer

52
00:02:19,350 --> 00:02:17,280
this enhancement project called neowise

53
00:02:21,030 --> 00:02:19,360
processed all the sky images sent back

54
00:02:23,110 --> 00:02:21,040
from wise to detect objects moving

55
00:02:25,270 --> 00:02:23,120
across the sky background those objects

56
00:02:26,949 --> 00:02:25,280
that would be in our solar system

57
00:02:29,110 --> 00:02:26,959
this was mainly done to find near-earth

58
00:02:30,790 --> 00:02:29,120
asteroids and comets but a great many

59
00:02:33,190 --> 00:02:30,800
main build asteroids and other objects

60
00:02:35,670 --> 00:02:33,200
in the solar system were also found

61
00:02:37,509 --> 00:02:35,680
the year of wise observation also led to

62
00:02:40,229 --> 00:02:37,519
two very significant findings for the

63
00:02:42,470 --> 00:02:40,239

near-earth object observation business

64
00:02:44,229 --> 00:02:42,480
the neo-wise project has confirmed

65
00:02:45,350 --> 00:02:44,239
completion of the original goal set with

66
00:02:48,390 --> 00:02:45,360
congress

67
00:02:50,309 --> 00:02:48,400
back in 1998 of our program

68
00:02:52,229 --> 00:02:50,319
which was defined 90 percent of the one

69
00:02:53,910 --> 00:02:52,239
kilometer and larger near-earth

70
00:02:55,990 --> 00:02:53,920
asteroids

71
00:02:58,630 --> 00:02:56,000
the second significant finding is the

72
00:03:00,869 --> 00:02:58,640
population of medium-sized near-earth

73
00:03:03,110 --> 00:03:00,879
asteroids those between 100 meters and

74
00:03:04,869 --> 00:03:03,120
one kilometer in size is probably

75
00:03:06,149 --> 00:03:04,879
somewhat less than we were estimating

76
00:03:08,630 --> 00:03:06,159
before

77
00:03:10,710 --> 00:03:08,640
so if i could have the first graphic up

78
00:03:13,030 --> 00:03:10,720
uh this is an animated view of our solar

79
00:03:14,949 --> 00:03:13,040
system looking down from the sun

80
00:03:16,710 --> 00:03:14,959
with the inner planets uh orbits

81
00:03:19,589 --> 00:03:16,720
depicted in circles

82
00:03:21,830 --> 00:03:19,599
uh mercury venus earth and mars is the

83
00:03:24,149 --> 00:03:21,840
outer uh ring

84
00:03:25,830 --> 00:03:24,159
i have to point out that this uh diagram

85
00:03:27,270 --> 00:03:25,840
the sizes of these objects is not to

86
00:03:29,509 --> 00:03:27,280
scale if it were

87
00:03:31,110 --> 00:03:29,519
even the planets would be

88
00:03:32,789 --> 00:03:31,120

so small that you couldn't really see

89
00:03:34,710 --> 00:03:32,799
them

90
00:03:36,789 --> 00:03:34,720
so if we could have the uh

91
00:03:38,789 --> 00:03:36,799
animation in motion now all the small

92
00:03:43,190 --> 00:03:38,799
red dots seemingly swirling about like

93
00:03:48,789 --> 00:03:46,710
are shown in the in the red those that

94
00:03:50,869 --> 00:03:48,799
we previously knew about

95
00:03:53,589 --> 00:03:50,879
are now shown in yellow or maybe orange

96
00:03:56,869 --> 00:03:53,599
in some screens those that were detected

97
00:03:58,550 --> 00:03:56,879
by the neowise project are now in blue

98
00:04:09,350 --> 00:03:58,560
and the new objects that were detected

99
00:04:15,350 --> 00:04:12,229
from this sample that the wise

100
00:04:17,189 --> 00:04:15,360
neo-wise project was able to find

101
00:04:19,430 --> 00:04:17,199
we've projected a more accurate model of

102
00:04:21,509 --> 00:04:19,440
the overall population that is over 40

103
00:04:23,430 --> 00:04:21,519
less in numbers which we now compare

104
00:04:25,270 --> 00:04:23,440
here with the old model

105
00:04:28,230 --> 00:04:25,280
of the estimated population so you can

106
00:04:30,390 --> 00:04:28,240
see considerably less numbers

107
00:04:31,909 --> 00:04:30,400
so if this new bottle holds up it will

108
00:04:33,670 --> 00:04:31,919
mean the number of hundred meter and

109
00:04:35,909 --> 00:04:33,680
larger near-earth asteroids yet to be

110
00:04:37,189 --> 00:04:35,919
found is somewhat less but even this new

111
00:04:39,350 --> 00:04:37,199
population

112
00:04:41,110 --> 00:04:39,360
there are over fifteen thousand objects

113
00:04:42,790 --> 00:04:41,120

still to be found

114
00:04:44,950 --> 00:04:42,800
it will take more capable systems and

115
00:04:47,030 --> 00:04:44,960
several more years of survey efforts

116
00:04:48,469 --> 00:04:47,040
to find these relatively small and dim

117
00:04:50,230 --> 00:04:48,479
objects it's something like trying to

118
00:04:51,430 --> 00:04:50,240
detect a candle at the distance of the

119
00:04:53,590 --> 00:04:51,440
moon

120
00:04:56,150 --> 00:04:53,600
to tell us more about the neowise

121
00:04:57,909 --> 00:04:56,160
project as our principal investigator dr

122
00:04:59,749 --> 00:04:57,919
amy manger

123
00:05:01,909 --> 00:04:59,759
well thanks lindley and thanks all of

124
00:05:03,670 --> 00:05:01,919
you for tuning in this afternoon uh it's

125
00:05:05,029 --> 00:05:03,680
great to be here wise was a very short

126
00:05:07,590 --> 00:05:05,039
mission and we're very happy to have

127
00:05:09,430 --> 00:05:07,600
these results to present so quickly

128
00:05:11,430 --> 00:05:09,440
so as lindley mentioned we find that

129
00:05:13,350 --> 00:05:11,440
there are fewer near-earth asteroids out

130
00:05:15,990 --> 00:05:13,360
there however it's very important to

131
00:05:17,510 --> 00:05:16,000
note that fewer does not mean none

132
00:05:19,110 --> 00:05:17,520
and there are still tens of thousands

133
00:05:20,550 --> 00:05:19,120
that are out there that we need to find

134
00:05:22,230 --> 00:05:20,560
that are left

135
00:05:24,070 --> 00:05:22,240
as one of my colleagues at the jet

136
00:05:26,150 --> 00:05:24,080
propulsion laboratory likes to say the

137
00:05:28,469 --> 00:05:26,160
best three ways of dealing with the

138
00:05:30,710 --> 00:05:28,479

potential of an asteroid impact are to

139
00:05:31,909 --> 00:05:30,720
find them early find them early and find

140
00:05:33,670 --> 00:05:31,919
them early

141
00:05:35,430 --> 00:05:33,680
if you can find near-earth asteroids

142
00:05:37,670 --> 00:05:35,440
when they're far away it would take far

143
00:05:39,830 --> 00:05:37,680
less energy to mitigate a potentially

144
00:05:41,670 --> 00:05:39,840
threatening object so this is why we

145
00:05:45,350 --> 00:05:41,680
carry out surveys like the ones that

146
00:05:47,749 --> 00:05:45,360
lindley has described and like neowise

147
00:05:49,430 --> 00:05:47,759
so one of the characteristics of neowise

148
00:05:51,749 --> 00:05:49,440
is that it really was a fairly small

149
00:05:53,510 --> 00:05:51,759
telescope in a low earth orbit in fact

150
00:05:55,110 --> 00:05:53,520
the telescope would kind of fit under

151
00:05:57,350 --> 00:05:55,120
your arm like this so it's not

152
00:05:59,590 --> 00:05:57,360
particularly large but by virtue of

153
00:06:01,029 --> 00:05:59,600
being in space and operating at infrared

154
00:06:02,629 --> 00:06:01,039
wavelengths it's a very powerful

155
00:06:05,350 --> 00:06:02,639
telescope and it turns out to be very

156
00:06:07,110 --> 00:06:05,360
good at finding asteroids and comets

157
00:06:09,189 --> 00:06:07,120
now if you go to the first animation

158
00:06:11,110 --> 00:06:09,199
here you can see a little representation

159
00:06:13,510 --> 00:06:11,120
of what wise looks like going around the

160
00:06:15,909 --> 00:06:13,520
earth it's always pointing outward from

161
00:06:18,070 --> 00:06:15,919
the earth surveying the whole sky and as

162
00:06:19,830 --> 00:06:18,080
the earth goes around the sun

163
00:06:21,749 --> 00:06:19,840

this allows the telescope to very

164
00:06:23,510 --> 00:06:21,759
quickly and efficiently carry out a

165
00:06:25,350 --> 00:06:23,520
survey of the whole sky

166
00:06:26,950 --> 00:06:25,360
and in fact it was so fast we were able

167
00:06:29,510 --> 00:06:26,960
to survey the whole sky twice in

168
00:06:30,550 --> 00:06:29,520
infrared wavelengths in only one year

169
00:06:32,390 --> 00:06:30,560
and you can see here a little

170
00:06:34,309 --> 00:06:32,400
representation of the difference between

171
00:06:37,189 --> 00:06:34,319
visible light and the infrared light

172
00:06:38,710 --> 00:06:37,199
that wise was able to see

173
00:06:41,430 --> 00:06:38,720
so this was a very efficient and

174
00:06:42,950 --> 00:06:41,440
effective way of surveying the sky and

175
00:06:44,710 --> 00:06:42,960
the original purpose of the mission was

176
00:06:46,309 --> 00:06:44,720
actually to study cool stars in very

177
00:06:48,469 --> 00:06:46,319
distant galaxies and it's doing a great

178
00:06:51,029 --> 00:06:48,479
job of that however it turns out to also

179
00:06:52,870 --> 00:06:51,039
be very good at detecting asteroids

180
00:06:53,749 --> 00:06:52,880
this is because it's using infrared

181
00:06:55,510 --> 00:06:53,759
light

182
00:06:57,830 --> 00:06:55,520
if we look at the next slide here we can

183
00:07:00,870 --> 00:06:57,840
see two asteroids we can see a close-up

184
00:07:03,270 --> 00:07:00,880
of them one is very bright and kind of

185
00:07:05,990 --> 00:07:03,280
shiny more reflective and the other one

186
00:07:07,589 --> 00:07:06,000
is very dark like a piece of charcoal or

187
00:07:09,670 --> 00:07:07,599
barbecue so at the bottom of your

188
00:07:12,070 --> 00:07:09,680

barbecue they're both the same size

189
00:07:13,749 --> 00:07:12,080
however now when we're close up to these

190
00:07:16,230 --> 00:07:13,759
asteroids you can actually see that

191
00:07:17,990 --> 00:07:16,240
they're the same size but the problem is

192
00:07:20,390 --> 00:07:18,000
most of the time we're not close up to

193
00:07:22,870 --> 00:07:20,400
the asteroids if we roll the animation

194
00:07:24,469 --> 00:07:22,880
we can start to see what happens next

195
00:07:26,309 --> 00:07:24,479
when we're close up it's easy to get a

196
00:07:28,070 --> 00:07:26,319
very good estimate of their sizes but

197
00:07:29,830 --> 00:07:28,080
now imagine that they're far away and

198
00:07:32,550 --> 00:07:29,840
we're observing them through a very

199
00:07:34,230 --> 00:07:32,560
distant telescope if even at the even if

200
00:07:36,629 --> 00:07:34,240
they're at the same distance to this

201
00:07:38,870 --> 00:07:36,639
visible light telescope the one that is

202
00:07:40,390 --> 00:07:38,880
brighter is going to appear brighter to

203
00:07:42,710 --> 00:07:40,400
the visible light telescope and the one

204
00:07:44,550 --> 00:07:42,720
that's darker looks fainter

205
00:07:46,710 --> 00:07:44,560
however if we can look with an infrared

206
00:07:48,550 --> 00:07:46,720
telescope what we're seeing now is

207
00:07:50,629 --> 00:07:48,560
actually heat that's being emitted from

208
00:07:53,029 --> 00:07:50,639
the objects and so to the infrared

209
00:07:55,110 --> 00:07:53,039
telescope they look the same brightness

210
00:07:58,150 --> 00:07:55,120
and from that we're able to determine

211
00:07:59,909 --> 00:07:58,160
their sizes the other benefit of this is

212
00:08:02,150 --> 00:07:59,919
it means that infrared telescopes are

213
00:08:04,790 --> 00:08:02,160

less intrinsically biased against

214
00:08:06,309 --> 00:08:04,800
finding small dark near-earth asteroids

215
00:08:07,990 --> 00:08:06,319
and this gives us a better

216
00:08:10,629 --> 00:08:08,000
representative sample of the true

217
00:08:12,070 --> 00:08:10,639
population so with neowise we didn't go

218
00:08:13,589 --> 00:08:12,080
out and find every single asteroid

219
00:08:16,150 --> 00:08:13,599
that's out there but we got a good

220
00:08:17,270 --> 00:08:16,160
representative sample kind of like doing

221
00:08:19,670 --> 00:08:17,280
a census

222
00:08:20,790 --> 00:08:19,680
where you take a poll of a small subset

223
00:08:23,350 --> 00:08:20,800
of people that you think is

224
00:08:24,869 --> 00:08:23,360
representative of what everybody thinks

225
00:08:27,430 --> 00:08:24,879
and so that's what we've been able to do

226
00:08:28,950 --> 00:08:27,440
with neowise if we go to our next chart

227
00:08:30,150 --> 00:08:28,960
we can see how these results have

228
00:08:32,149 --> 00:08:30,160
applied

229
00:08:33,990 --> 00:08:32,159
if we look at the very largest asteroids

230
00:08:35,670 --> 00:08:34,000
these are one kilometer and larger

231
00:08:37,269 --> 00:08:35,680
objects so these are the the planet

232
00:08:38,630 --> 00:08:37,279
busters these are the things that are

233
00:08:40,949 --> 00:08:38,640
like the one that is thought to have

234
00:08:42,870 --> 00:08:40,959
caused the extinction of the dinosaurs

235
00:08:44,230 --> 00:08:42,880
the good news here is that with neowise

236
00:08:46,310 --> 00:08:44,240
we've been able to confirm that the

237
00:08:48,389 --> 00:08:46,320
worldwide community of astronomers both

238
00:08:51,269 --> 00:08:48,399

amateur and professional all over the

239
00:08:52,829 --> 00:08:51,279
place have now found more than 90

240
00:08:55,110 --> 00:08:52,839
percent of all of these really big

241
00:08:56,630 --> 00:08:55,120
asteroids and that's represented as the

242
00:08:57,910 --> 00:08:56,640
filled in asteroids the ones that look

243
00:08:59,750 --> 00:08:57,920
sort of tan

244
00:09:03,030 --> 00:08:59,760
we believe that there are something like

245
00:09:04,790 --> 00:09:03,040
981 in the total population

246
00:09:06,710 --> 00:09:04,800
and this is very close to the original

247
00:09:08,550 --> 00:09:06,720
estimate of about a thousand objects

248
00:09:10,389 --> 00:09:08,560
that's what you see in the blue outline

249
00:09:11,829 --> 00:09:10,399
right there the green outline represents

250
00:09:13,829 --> 00:09:11,839
the the difference in our prediction

251
00:09:15,750 --> 00:09:13,839
with neo-wise so we're saying the total

252
00:09:17,990 --> 00:09:15,760
number is about the same but the the new

253
00:09:19,590 --> 00:09:18,000
thing here is that we can now confirm

254
00:09:21,829 --> 00:09:19,600
that we have met the so-called space

255
00:09:24,070 --> 00:09:21,839
guard goal of finding 90 percent of all

256
00:09:25,190 --> 00:09:24,080
the one kilometer asteroids so we know

257
00:09:27,350 --> 00:09:25,200
where they are

258
00:09:29,590 --> 00:09:27,360
and by virtue of the fact that we know

259
00:09:31,829 --> 00:09:29,600
these objects and we know their orbits

260
00:09:34,070 --> 00:09:31,839
we can predict that they are no longer

261
00:09:35,910 --> 00:09:34,080
uh hazardous to earth in the sense that

262
00:09:37,750 --> 00:09:35,920
we can follow them and we know that

263
00:09:39,509 --> 00:09:37,760

there are none that pose any imminent

264
00:09:41,269 --> 00:09:39,519
risk of an impact

265
00:09:43,269 --> 00:09:41,279
if we look at smaller sizes with the

266
00:09:45,350 --> 00:09:43,279
neowise data if we go to the next line

267
00:09:47,030 --> 00:09:45,360
in the chart you can start to see the

268
00:09:49,030 --> 00:09:47,040
differences in the previous prediction

269
00:09:50,870 --> 00:09:49,040
of the population versus our prediction

270
00:09:53,590 --> 00:09:50,880
of the population the previous

271
00:09:55,430 --> 00:09:53,600
prediction is shown as the blue outlines

272
00:09:57,269 --> 00:09:55,440
and our prediction is shown as the green

273
00:09:58,630 --> 00:09:57,279
outlines and again you can see that the

274
00:10:00,389 --> 00:09:58,640
the fraction of objects that have

275
00:10:02,550 --> 00:10:00,399
already been discovered are shown as

276
00:10:05,430 --> 00:10:02,560
filled in and going to still smaller

277
00:10:06,790 --> 00:10:05,440
sizes we can see another layer of this

278
00:10:08,630 --> 00:10:06,800
so if we could have the next layer in

279
00:10:10,150 --> 00:10:08,640
the chart you can see that now the

280
00:10:12,630 --> 00:10:10,160
prediction is showing that there are

281
00:10:15,269 --> 00:10:12,640
somewhat less but we've also found

282
00:10:17,110 --> 00:10:15,279
proportionally less of these objects

283
00:10:18,949 --> 00:10:17,120
so there are still many remaining to be

284
00:10:20,870 --> 00:10:18,959
found and if we go to the next layer you

285
00:10:22,870 --> 00:10:20,880
can see that this continues

286
00:10:25,269 --> 00:10:22,880
so if we go to the final layer of the

287
00:10:28,069 --> 00:10:25,279
chart for objects that are smaller than

288
00:10:30,389 --> 00:10:28,079

about 100 meters the neowise survey is

289
00:10:32,310 --> 00:10:30,399
not really able to comment because we

290
00:10:33,750 --> 00:10:32,320
just didn't see very many objects that

291
00:10:35,670 --> 00:10:33,760
are that small so we're not able to

292
00:10:37,110 --> 00:10:35,680
comment however previous studies

293
00:10:38,790 --> 00:10:37,120
indicate that there may be as many as

294
00:10:40,870 --> 00:10:38,800
about a million or so of these very

295
00:10:42,870 --> 00:10:40,880
small asteroids but

296
00:10:45,110 --> 00:10:42,880
even so if we sum up and look at all of

297
00:10:47,350 --> 00:10:45,120
these things everything between a

298
00:10:49,110 --> 00:10:47,360
hundred meters and a thousand meters one

299
00:10:51,030 --> 00:10:49,120
kilometer we believe that there's

300
00:10:53,350 --> 00:10:51,040
something like nineteen thousand five

301
00:10:55,590 --> 00:10:53,360
hundred predicted to exist in the total

302
00:10:57,509 --> 00:10:55,600
population compared to a previous

303
00:10:59,430 --> 00:10:57,519
estimate of about thirty five thousand

304
00:11:01,110 --> 00:10:59,440
so there are fewer however it's

305
00:11:04,069 --> 00:11:01,120
important to note that we've only found

306
00:11:05,509 --> 00:11:04,079
a fairly small fraction of these to date

307
00:11:07,670 --> 00:11:05,519
okay so

308
00:11:09,910 --> 00:11:07,680
to give us a little bit more information

309
00:11:12,470 --> 00:11:09,920
about infrared and the value of these

310
00:11:14,470 --> 00:11:12,480
surveys is tim sparr dr tim sparr is the

311
00:11:16,069 --> 00:11:14,480
director of the minor planet center in

312
00:11:18,150 --> 00:11:16,079
massachusetts

313
00:11:19,269 --> 00:11:18,160

uh thanks for the lead in amy

314
00:11:21,829 --> 00:11:19,279
um

315
00:11:24,150 --> 00:11:21,839
the job of the minor planet center is to

316
00:11:25,750 --> 00:11:24,160
collect all of the asteroid data that's

317
00:11:27,829 --> 00:11:25,760
taken worldwide

318
00:11:29,750 --> 00:11:27,839
and so we're in a position where we

319
00:11:31,910 --> 00:11:29,760
interact with all the other asteroid

320
00:11:33,750 --> 00:11:31,920
astronomers we collect positional data

321
00:11:36,470 --> 00:11:33,760
we distribute the orbits

322
00:11:38,150 --> 00:11:36,480
and one of the things that we do is to

323
00:11:41,350 --> 00:11:38,160
try to discriminate between near-earth

324
00:11:42,630 --> 00:11:41,360
asteroids and the main belt asteroids

325
00:11:44,389 --> 00:11:42,640
and

326
00:11:47,190 --> 00:11:44,399
from this perspective from my

327
00:11:48,630 --> 00:11:47,200
perspective at the mpc uh the neo-wise

328
00:11:49,990 --> 00:11:48,640
mission is the most important project in

329
00:11:51,590 --> 00:11:50,000
my career

330
00:11:53,829 --> 00:11:51,600
and the real punchline of this is that

331
00:11:55,509 --> 00:11:53,839
they observed the size they were able to

332
00:11:57,110 --> 00:11:55,519
determine the size of every object that

333
00:11:59,190 --> 00:11:57,120
they observed

334
00:12:01,990 --> 00:11:59,200
in addition when i combined the

335
00:12:03,430 --> 00:12:02,000
positional information that they gave us

336
00:12:05,030 --> 00:12:03,440
with that from the other surveys that

337
00:12:07,350 --> 00:12:05,040
lindley described

338
00:12:09,190 --> 00:12:07,360

they were able to produce a very good

339
00:12:10,470 --> 00:12:09,200
orbit model for all of the objects and

340
00:12:12,150 --> 00:12:10,480
not just the near-earth objects i'm

341
00:12:16,470 --> 00:12:12,160
talking about the main belt asteroids

342
00:12:21,269 --> 00:12:19,750
neo-wise observed actually 25 percent of

343
00:12:22,870 --> 00:12:21,279
the entire known

344
00:12:25,670 --> 00:12:22,880
asteroid population so that was

345
00:12:27,110 --> 00:12:25,680
something like 150 000

346
00:12:28,870 --> 00:12:27,120
objects

347
00:12:30,230 --> 00:12:28,880
and

348
00:12:31,670 --> 00:12:30,240
because they could again because they

349
00:12:32,949 --> 00:12:31,680
could determine the size of all of these

350
00:12:35,110 --> 00:12:32,959
objects we were able to put together a

351
00:12:37,110 --> 00:12:35,120
really good model

352
00:12:38,949 --> 00:12:37,120
and it's important to know that this was

353
00:12:40,870 --> 00:12:38,959
something that was it was a contributory

354
00:12:42,710 --> 00:12:40,880
effect this fit in perfectly with the

355
00:12:44,150 --> 00:12:42,720
other surveys that are already there it

356
00:12:45,670 --> 00:12:44,160
looked at a different wavelength and a

357
00:12:47,590 --> 00:12:45,680
different area of the sky so everything

358
00:12:50,069 --> 00:12:47,600
fit together very well

359
00:12:52,870 --> 00:12:50,079
now to give a little idea of the census

360
00:12:54,470 --> 00:12:52,880
we've got a video here

361
00:12:55,430 --> 00:12:54,480
and all right go ahead and start that

362
00:12:58,069 --> 00:12:55,440
please

363
00:13:00,629 --> 00:12:58,079

this each little dot again not to scale

364
00:13:03,829 --> 00:13:00,639
is an asteroid that was observed by the

365
00:13:06,069 --> 00:13:03,839
wise the neowise program in the center

366
00:13:07,590 --> 00:13:06,079
you have the sun and the outer orbit

367
00:13:09,910 --> 00:13:07,600
there is the orbit of jupiter and if you

368
00:13:11,590 --> 00:13:09,920
give that just a good look you can see

369
00:13:13,670 --> 00:13:11,600
the sampling

370
00:13:15,509 --> 00:13:13,680
of all the different populations of main

371
00:13:17,350 --> 00:13:15,519
belt asteroids there's objects out by

372
00:13:18,949 --> 00:13:17,360
jupiter and there's a whole bunch of

373
00:13:20,710 --> 00:13:18,959
objects in there

374
00:13:23,670 --> 00:13:20,720
near the earth so that's the near-earth

375
00:13:26,550 --> 00:13:23,680
asteroid population and this is showing

376
00:13:28,550 --> 00:13:26,560
just over one year how powerful this

377
00:13:31,190 --> 00:13:28,560
program was observed a quarter of the

378
00:13:39,189 --> 00:13:31,200
known population and censused a good

379
00:13:44,230 --> 00:13:40,389
so

380
00:13:46,710 --> 00:13:44,240
information on

381
00:13:48,069 --> 00:13:46,720
how the spacecraft works in terms of

382
00:13:49,910 --> 00:13:48,079
determining the sizes and we want to

383
00:13:52,550 --> 00:13:49,920
make sure we get this through so

384
00:13:54,629 --> 00:13:52,560
the next picture that we have here

385
00:13:56,550 --> 00:13:54,639
is a visible light image this would be

386
00:13:58,629 --> 00:13:56,560
what you would see

387
00:14:00,790 --> 00:13:58,639
go ahead cue that one up all right that

388
00:14:02,230 --> 00:14:00,800

would be what you would see from

389
00:14:03,990 --> 00:14:02,240
a visible light telescope like the

390
00:14:05,350 --> 00:14:04,000
existing surveys that we have so you see

391
00:14:06,470 --> 00:14:05,360
three asteroids that look similar

392
00:14:08,069 --> 00:14:06,480
brightness

393
00:14:09,990 --> 00:14:08,079
now we can go to the next iteration

394
00:14:12,710 --> 00:14:10,000
please so on the left hand side we have

395
00:14:14,150 --> 00:14:12,720
a small reflective object and on the

396
00:14:16,310 --> 00:14:14,160
right hand side we have a large dark

397
00:14:19,030 --> 00:14:16,320
object and again we as we heard before

398
00:14:21,350 --> 00:14:19,040
those will look the same in the visible

399
00:14:22,470 --> 00:14:21,360
light now if i could have the last slide

400
00:14:24,310 --> 00:14:22,480
please

401
00:14:25,829 --> 00:14:24,320
this is the real key

402
00:14:28,470 --> 00:14:25,839
in the infrared light we get a

403
00:14:29,910 --> 00:14:28,480
discrimination in the size from neo-wise

404
00:14:31,590 --> 00:14:29,920
and so on the left-hand side the

405
00:14:34,069 --> 00:14:31,600
smallest object

406
00:14:35,829 --> 00:14:34,079
actually looks to be the dimmest and the

407
00:14:37,910 --> 00:14:35,839
neo-wise images and the right-hand side

408
00:14:39,670 --> 00:14:37,920
the largest object looks to be the

409
00:14:41,670 --> 00:14:39,680
brightest

410
00:14:43,030 --> 00:14:41,680
this is really the most important part

411
00:14:45,750 --> 00:14:43,040
of it if you think of trying to do a

412
00:14:47,509 --> 00:14:45,760
census you need to know the actual

413
00:14:50,230 --> 00:14:47,519

physical characteristics of the object

414
00:14:52,389 --> 00:14:50,240
and this is what we get from neowise we

415
00:14:54,230 --> 00:14:52,399
got the actual sizes and as we take a

416
00:14:55,990 --> 00:14:54,240
fraction of the population we can extend

417
00:14:57,990 --> 00:14:56,000
that knowing the size and the orbit

418
00:14:59,829 --> 00:14:58,000
characteristics to the whole asteroid

419
00:15:01,590 --> 00:14:59,839
population and that to me is why it was

420
00:15:03,350 --> 00:15:01,600
so important

421
00:15:05,509 --> 00:15:03,360
now i would like to hand things over to

422
00:15:07,430 --> 00:15:05,519
dr lucy mcfadden to drill down into some

423
00:15:09,030 --> 00:15:07,440
of the other aspects of the project and

424
00:15:10,470 --> 00:15:09,040
other nasa missions

425
00:15:12,310 --> 00:15:10,480
thank you tim

426
00:15:14,550 --> 00:15:12,320
first of all i find it really exciting

427
00:15:16,230 --> 00:15:14,560
that scientists continue to find things

428
00:15:18,629 --> 00:15:16,240
in the solar system

429
00:15:20,230 --> 00:15:18,639
bodies in orbit around the sun and

430
00:15:21,590 --> 00:15:20,240
objects that are close to our our

431
00:15:23,350 --> 00:15:21,600
backyard

432
00:15:25,430 --> 00:15:23,360
in the near-earth space

433
00:15:27,990 --> 00:15:25,440
i want to congratulate the team for your

434
00:15:29,189 --> 00:15:28,000
successes and i know from experience

435
00:15:31,430 --> 00:15:29,199
that it

436
00:15:34,310 --> 00:15:31,440
that in order to conduct a survey and to

437
00:15:36,629 --> 00:15:34,320
locate and discover new bodies in

438
00:15:39,670 --> 00:15:36,639

from spacecraft missions requires a lot

439
00:15:42,870 --> 00:15:39,680
of planning a lot of ingenuity

440
00:15:45,670 --> 00:15:42,880
huge amounts of computing power and then

441
00:15:47,509 --> 00:15:45,680
hours and hours months of discussions

442
00:15:49,990 --> 00:15:47,519
with colleagues and pouring over the

443
00:15:51,829 --> 00:15:50,000
data to validate the results so i want

444
00:15:53,670 --> 00:15:51,839
to congratulate you all it was a big

445
00:15:54,470 --> 00:15:53,680
team effort that you should all be proud

446
00:15:57,110 --> 00:15:54,480
of

447
00:15:59,269 --> 00:15:57,120
there are 28 co-authors on the papers

448
00:16:01,110 --> 00:15:59,279
that are to be published and each one of

449
00:16:04,230 --> 00:16:01,120
them has had a critical role in the

450
00:16:06,389 --> 00:16:04,240
success of the of the project

451
00:16:08,870 --> 00:16:06,399
additionally it's terrific to have a

452
00:16:10,710 --> 00:16:08,880
satellite that that can

453
00:16:13,749 --> 00:16:10,720
reach the greatest depths of the

454
00:16:16,069 --> 00:16:13,759
universe and also find things right here

455
00:16:18,470 --> 00:16:16,079
close to home

456
00:16:20,550 --> 00:16:18,480
um can i see the have the first slide

457
00:16:23,030 --> 00:16:20,560
here again we like we like looking at

458
00:16:25,110 --> 00:16:23,040
the bird's eye view of our solar system

459
00:16:27,189 --> 00:16:25,120
with the with the uh

460
00:16:29,430 --> 00:16:27,199
the circles or actually ellipses

461
00:16:32,389 --> 00:16:29,440
representing the paths of the planets

462
00:16:34,470 --> 00:16:32,399
and the white dots representing the uh

463
00:16:37,030 --> 00:16:34,480

the the asteroids

464
00:16:38,870 --> 00:16:37,040
um they're minor planets we we consider

465
00:16:41,269 --> 00:16:38,880
the minor planets because of their small

466
00:16:43,670 --> 00:16:41,279
size and it's really fun to welcome the

467
00:16:45,670 --> 00:16:43,680
the new asteroids into our consciousness

468
00:16:48,069 --> 00:16:45,680
of the solar system

469
00:16:49,990 --> 00:16:48,079
another concept that i marvel at is that

470
00:16:51,749 --> 00:16:50,000
their presence their mere presence

471
00:16:54,230 --> 00:16:51,759
reveals the past

472
00:16:57,350 --> 00:16:54,240
when the solar system was forming solids

473
00:16:58,550 --> 00:16:57,360
condensed from the rotating disk of gas

474
00:17:01,269 --> 00:16:58,560
and dust

475
00:17:03,189 --> 00:17:01,279
and and planets grew some of them to

476
00:17:05,429 --> 00:17:03,199
hundreds of kilometers

477
00:17:07,110 --> 00:17:05,439
um and they weren't they

478
00:17:09,189 --> 00:17:07,120
their growth was stopped by the

479
00:17:11,669 --> 00:17:09,199
formation of the larger planets the

480
00:17:13,429 --> 00:17:11,679
major planets that that are

481
00:17:16,870 --> 00:17:13,439
tens of thousands to hundreds of

482
00:17:19,669 --> 00:17:16,880
thousands of kilometers in diameter

483
00:17:23,029 --> 00:17:19,679
so in the asteroid population we see

484
00:17:24,949 --> 00:17:23,039
both early planets that grew to

485
00:17:27,110 --> 00:17:24,959
what i call a small size hundreds of

486
00:17:29,669 --> 00:17:27,120
kilometers but also

487
00:17:31,590 --> 00:17:29,679
um the remnants of larger planets that

488
00:17:34,789 --> 00:17:31,600

were broken up from collisions in the

489
00:17:35,990 --> 00:17:34,799
solar system and and the challenge is to

490
00:17:38,310 --> 00:17:36,000
determine

491
00:17:39,909 --> 00:17:38,320
which asteroids are which and what the

492
00:17:42,310 --> 00:17:39,919
time scale is

493
00:17:43,830 --> 00:17:42,320
what happened when

494
00:17:46,390 --> 00:17:43,840
so um

495
00:17:49,110 --> 00:17:46,400
next slide please to to complement the

496
00:17:51,190 --> 00:17:49,120
surveys what the surveys tell us is what

497
00:17:53,430 --> 00:17:51,200
the big population is give us the big

498
00:17:55,830 --> 00:17:53,440
picture they also allow us to decide

499
00:17:57,350 --> 00:17:55,840
which ones to go study up close with

500
00:17:59,990 --> 00:17:57,360
robotic missions

501
00:18:02,070 --> 00:18:00,000
so here we have about nine asteroids

502
00:18:04,150 --> 00:18:02,080
that have been studied with

503
00:18:05,430 --> 00:18:04,160
robotic spacecraft missions in the past

504
00:18:07,909 --> 00:18:05,440
20 years

505
00:18:08,950 --> 00:18:07,919
um we've we've covered a wide range of

506
00:18:11,110 --> 00:18:08,960
sizes

507
00:18:13,190 --> 00:18:11,120
um and asteroids from different parts of

508
00:18:15,350 --> 00:18:13,200
the whole asteroid belt as as well as

509
00:18:16,310 --> 00:18:15,360
some in near earth space

510
00:18:18,470 --> 00:18:16,320
um

511
00:18:20,789 --> 00:18:18,480
what i'd like to point out here the

512
00:18:22,789 --> 00:18:20,799
obvious one the biggest one here is

513
00:18:25,430 --> 00:18:22,799

asteroid 4 vesta

514
00:18:27,270 --> 00:18:25,440
which which has a spacecraft in orbit

515
00:18:29,909 --> 00:18:27,280
about it today

516
00:18:31,270 --> 00:18:29,919
orbiting for for the next nine months

517
00:18:32,070 --> 00:18:31,280
and and

518
00:18:34,630 --> 00:18:32,080
getting

519
00:18:36,549 --> 00:18:34,640
revealing this body as a as a world of

520
00:18:39,029 --> 00:18:36,559
its own looking at the surface

521
00:18:40,950 --> 00:18:39,039
properties determining its composition

522
00:18:43,430 --> 00:18:40,960
and determining the processes that hit

523
00:18:44,950 --> 00:18:43,440
it and you can see by looking at the

524
00:18:46,870 --> 00:18:44,960
surface that they're craters on the

525
00:18:48,230 --> 00:18:46,880
surface and that tells us that there

526
00:18:51,350 --> 00:18:48,240
were collisions

527
00:18:54,070 --> 00:18:51,360
bodies collided with the planet with i'm

528
00:18:56,630 --> 00:18:54,080
sorry bodies collided with vesta

529
00:18:59,029 --> 00:18:56,640
and debris was ejected from it

530
00:19:00,870 --> 00:18:59,039
and over tens of millions of years or

531
00:19:03,029 --> 00:19:00,880
maybe longer

532
00:19:06,230 --> 00:19:03,039
objects have been

533
00:19:08,310 --> 00:19:06,240
have found their way through a dance and

534
00:19:10,390 --> 00:19:08,320
if we could go to the next slide through

535
00:19:11,590 --> 00:19:10,400
a dance of gravity and solar system

536
00:19:13,669 --> 00:19:11,600
dynamics

537
00:19:16,470 --> 00:19:13,679
bodies have found their way

538
00:19:19,750 --> 00:19:16,480

into um collision collision course with

539
00:19:22,789 --> 00:19:19,760
the earth and we see these as meteors

540
00:19:25,590 --> 00:19:22,799
mostly fireballs terrific fireballs that

541
00:19:28,630 --> 00:19:25,600
are spectacular um this one was captured

542
00:19:31,029 --> 00:19:28,640
during a football game in 1992

543
00:19:32,630 --> 00:19:31,039
and um it traveled the whole length of

544
00:19:35,669 --> 00:19:32,640
the eastern seaboard

545
00:19:38,470 --> 00:19:35,679
and coincidentally landed in a small

546
00:19:40,870 --> 00:19:38,480
town in the hudson river of upstate new

547
00:19:43,909 --> 00:19:40,880
york where i used to spend my summers

548
00:19:48,230 --> 00:19:43,919
and it landed as a meteorite

549
00:19:49,830 --> 00:19:48,240
so we have um we have in our collection

550
00:19:52,549 --> 00:19:49,840
um

551
00:19:55,909 --> 00:19:52,559
meteorites that have landed on earth

552
00:19:57,669 --> 00:19:55,919
and as an example here we were showing a

553
00:20:01,350 --> 00:19:57,679
picture of myself

554
00:20:03,990 --> 00:20:01,360
on a scientific expedition in 2008

555
00:20:06,549 --> 00:20:04,000
looking for the remnants of an asteroid

556
00:20:09,270 --> 00:20:06,559
that was discovered by astronomers with

557
00:20:11,270 --> 00:20:09,280
their telescope who determined that the

558
00:20:12,710 --> 00:20:11,280
asteroid was going to collide with earth

559
00:20:14,310 --> 00:20:12,720
and it broke up in the earth's

560
00:20:15,590 --> 00:20:14,320
atmosphere just as the peak skill

561
00:20:17,270 --> 00:20:15,600
meteorite did

562
00:20:18,789 --> 00:20:17,280
and through

563
00:20:20,789 --> 00:20:18,799

communications

564
00:20:24,149 --> 00:20:20,799
and precise calculations and

565
00:20:26,630 --> 00:20:24,159
measurements we were able to determine

566
00:20:28,390 --> 00:20:26,640
the location of the meteorite fall and

567
00:20:30,630 --> 00:20:28,400
actually travel with students from

568
00:20:32,870 --> 00:20:30,640
university of khartoum and search for

569
00:20:35,029 --> 00:20:32,880
these meteorites and recover them

570
00:20:37,350 --> 00:20:35,039
so we have these samples here which now

571
00:20:40,470 --> 00:20:37,360
cosmo chemists can study

572
00:20:43,750 --> 00:20:40,480
um in their laboratories and give us yet

573
00:20:45,909 --> 00:20:43,760
more detail on the processes and the

574
00:20:48,070 --> 00:20:45,919
history of of

575
00:20:51,590 --> 00:20:48,080
products and processes in the solar

576
00:20:54,390 --> 00:20:51,600
system so we have so what we can go what

577
00:20:57,510 --> 00:20:54,400
we've done is going from

578
00:20:59,430 --> 00:20:57,520
points of light amidst the infrared glow

579
00:21:01,990 --> 00:20:59,440
of the universe

580
00:21:03,669 --> 00:21:02,000
to rocks from space that tell us about

581
00:21:05,590 --> 00:21:03,679
the solar system's four and a half

582
00:21:07,990 --> 00:21:05,600
billion year existence

583
00:21:10,630 --> 00:21:08,000
and then instead of just being afraid of

584
00:21:12,310 --> 00:21:10,640
of asteroid impact disasters these

585
00:21:13,990 --> 00:21:12,320
objects can teach us

586
00:21:18,630 --> 00:21:14,000
tell us information about the solar

587
00:21:23,830 --> 00:21:21,029
thanks lucy for uh for summing this all

588
00:21:25,270 --> 00:21:23,840

up and just to pull it all together for

589
00:21:27,350 --> 00:21:25,280
what we've learned today from the

590
00:21:29,430 --> 00:21:27,360
neowise project so far

591
00:21:31,190 --> 00:21:29,440
is today we have good news with some

592
00:21:33,510 --> 00:21:31,200
important caveats

593
00:21:35,430 --> 00:21:33,520
so we've learned with neowise that the

594
00:21:36,789 --> 00:21:35,440
worldwide community of astronomers

595
00:21:38,710 --> 00:21:36,799
looking at near-earth asteroids have

596
00:21:40,310 --> 00:21:38,720
found 93 percent

597
00:21:42,549 --> 00:21:40,320
of all the really big near-earth

598
00:21:44,630 --> 00:21:42,559
asteroids that we think are out there

599
00:21:47,909 --> 00:21:44,640
and this is substantially reduced the

600
00:21:50,070 --> 00:21:47,919
risk of of an impact that is not warned

601
00:21:51,590 --> 00:21:50,080
in other words we we know now where most

602
00:21:52,630 --> 00:21:51,600
of them are and where most of them are

603
00:21:54,470 --> 00:21:52,640
going

604
00:21:57,350 --> 00:21:54,480
that really has reduced our risk of an

605
00:21:59,510 --> 00:21:57,360
unwarned impact from a really big one

606
00:22:02,310 --> 00:21:59,520
also we predict that there are somewhat

607
00:22:04,549 --> 00:22:02,320
fewer medium-sized asteroids out there

608
00:22:06,630 --> 00:22:04,559
in the earth space but fewer does not

609
00:22:08,070 --> 00:22:06,640
mean none and there are still tens of

610
00:22:09,270 --> 00:22:08,080
thousands out there that are left to

611
00:22:11,350 --> 00:22:09,280
find

612
00:22:12,710 --> 00:22:11,360
so we still need to keep going on the

613
00:22:14,310 --> 00:22:12,720

survey efforts we have a lot of work

614
00:22:16,070 --> 00:22:14,320
left to do much more research and we

615
00:22:17,990 --> 00:22:16,080
still need to specifically analyze the

616
00:22:19,750 --> 00:22:18,000
subset of near-earth asteroids that get

617
00:22:21,909 --> 00:22:19,760
really close to the earth

618
00:22:23,350 --> 00:22:21,919
but overall at this point our

619
00:22:25,190 --> 00:22:23,360
understanding of the near-earth asteroid

620
00:22:27,990 --> 00:22:25,200
population has been significantly

621
00:22:30,470 --> 00:22:28,000
improved and we believe that the hazard

622
00:22:31,830 --> 00:22:30,480
to the earth may be somewhat less

623
00:22:35,750 --> 00:22:31,840
thank you

624
00:22:37,110 --> 00:22:35,760
going to transition into the question

625
00:22:40,149 --> 00:22:37,120
and answer period we're going to first

626
00:22:41,909 --> 00:22:40,159
start down at the kennedy space center

627
00:22:43,669 --> 00:22:41,919
where we have one question and a

628
00:22:50,870 --> 00:22:43,679
follow-up and then we'll go to the phone

629
00:22:55,990 --> 00:22:53,510
florida today

630
00:22:58,310 --> 00:22:56,000
last april uh the president of the

631
00:23:01,830 --> 00:22:58,320
united states was down here at kennedy

632
00:23:03,990 --> 00:23:01,840
space center and he challenged nasa to

633
00:23:07,029 --> 00:23:04,000
send astronauts to an asteroid by the

634
00:23:09,669 --> 00:23:07,039
year 2025.

635
00:23:12,789 --> 00:23:09,679
i was wondering if you could um

636
00:23:15,510 --> 00:23:12,799
tell us whether any of the findings uh

637
00:23:16,789 --> 00:23:15,520
that you found in your survey

638
00:23:18,310 --> 00:23:16,799

might uh

639
00:23:21,990 --> 00:23:18,320
produce

640
00:23:24,470 --> 00:23:22,000
targets uh of opportunity for human

641
00:23:26,470 --> 00:23:24,480
exploration

642
00:23:28,230 --> 00:23:26,480
mark that uh thanks for the question

643
00:23:30,710 --> 00:23:28,240
this is lindley

644
00:23:32,070 --> 00:23:30,720
um we're working with the human space

645
00:23:33,110 --> 00:23:32,080
flight folks

646
00:23:41,830 --> 00:23:33,120
in

647
00:23:44,070 --> 00:23:41,840
if there are available targets

648
00:23:45,990 --> 00:23:44,080
this research the work that neowise has

649
00:23:48,470 --> 00:23:46,000
done has allowed us to understand the

650
00:23:51,430 --> 00:23:48,480
population of these objects much more

651
00:23:52,710 --> 00:23:51,440
and to understand uh where we could find

652
00:23:54,230 --> 00:23:52,720
uh more

653
00:23:55,350 --> 00:23:54,240
available targets

654
00:24:05,029 --> 00:23:55,360
uh

655
00:24:08,470 --> 00:24:05,039
to earth are tend to be the smaller ones

656
00:24:09,830 --> 00:24:08,480
in the 100 meter class and as you see

657
00:24:12,390 --> 00:24:09,840
there's a large percentage of the

658
00:24:13,190 --> 00:24:12,400
population still to be found

659
00:24:15,510 --> 00:24:13,200
but

660
00:24:17,750 --> 00:24:15,520
the efforts to date have have shown us

661
00:24:19,430 --> 00:24:17,760
what the population looked like and

662
00:24:21,110 --> 00:24:19,440
where we might

663
00:24:23,110 --> 00:24:21,120

be able to find in the techniques we

664
00:24:25,430 --> 00:24:23,120
need we need to use to find more of

665
00:24:29,350 --> 00:24:25,440
these objects

666
00:24:34,870 --> 00:24:31,590
and just as we follow

667
00:24:35,990 --> 00:24:34,880
could you um tell us in a general

668
00:24:39,029 --> 00:24:36,000
sense for

669
00:24:41,990 --> 00:24:39,039
say my next door neighbor why we would

670
00:24:44,390 --> 00:24:42,000
actually want to send human explorers to

671
00:24:45,590 --> 00:24:44,400
an asteroid

672
00:24:47,430 --> 00:24:45,600
well

673
00:24:50,549 --> 00:24:47,440
exploration of the solar system is uh

674
00:24:53,510 --> 00:24:50,559
one of the goals of uh of nasa uh and

675
00:24:55,269 --> 00:24:53,520
our scientific program uh the human uh

676
00:24:56,950 --> 00:24:55,279
space flight uh is a part of that

677
00:24:59,990 --> 00:24:56,960
exploration

678
00:25:02,630 --> 00:25:00,000
so uh it's it's a natural stepping stone

679
00:25:05,990 --> 00:25:02,640
of our uh exploration uh into the solar

680
00:25:10,310 --> 00:25:08,310
okay we're gonna transition to the phone

681
00:25:11,870 --> 00:25:10,320
lounge now first up

682
00:25:18,149 --> 00:25:11,880
is alan boyle with

683
00:25:22,470 --> 00:25:20,230
thank you i realize you're focusing on

684
00:25:24,310 --> 00:25:22,480
near-earth asteroids today but there's

685
00:25:26,710 --> 00:25:24,320
been so much talk about the potential

686
00:25:30,310 --> 00:25:26,720
for finding a planet x or some sort of

687
00:25:31,830 --> 00:25:30,320
large body through the wise survey can

688
00:25:35,269 --> 00:25:31,840

you comment on

689
00:25:38,149 --> 00:25:35,279
any uh any status on that sort of search

690
00:25:40,070 --> 00:25:38,159
or or maybe even reassure people that

691
00:25:41,269 --> 00:25:40,080
planet x isn't coming to get them next

692
00:25:43,430 --> 00:25:41,279
year

693
00:25:45,590 --> 00:25:43,440
uh yes this is amy meinzer i'm happy to

694
00:25:46,950 --> 00:25:45,600
answer this one their planet x is not

695
00:25:49,510 --> 00:25:46,960
coming to get us

696
00:25:51,430 --> 00:25:49,520
um so but we are looking to see if there

697
00:25:53,110 --> 00:25:51,440
are any other bodies in the outer part

698
00:25:55,590 --> 00:25:53,120
of the solar system with the wise data

699
00:25:57,269 --> 00:25:55,600
this is a very natural project for wise

700
00:25:59,750 --> 00:25:57,279
and so we're still working on it right

701
00:26:01,430 --> 00:25:59,760
now it's we've obviously just returned a

702
00:26:02,789 --> 00:26:01,440
huge amount of data from the telescope

703
00:26:03,990 --> 00:26:02,799
that's going to take us a long time to

704
00:26:05,430 --> 00:26:04,000
sort through

705
00:26:06,870 --> 00:26:05,440
but the initial results are very

706
00:26:08,390 --> 00:26:06,880
promising you may have seen earlier

707
00:26:11,029 --> 00:26:08,400
results where we've discovered a new

708
00:26:12,149 --> 00:26:11,039
class of very cool type of stars with

709
00:26:14,310 --> 00:26:12,159
wise

710
00:26:15,510 --> 00:26:14,320
but the search is still on and we don't

711
00:26:17,110 --> 00:26:15,520
think that there's anything that's

712
00:26:19,190 --> 00:26:17,120
hazardous in the outer solar system we

713
00:26:20,870 --> 00:26:19,200

think that this is just a sort of a if

714
00:26:25,350 --> 00:26:20,880
there is something out there it would be

715
00:26:26,789 --> 00:26:25,360
a large body in a roughly circular orbit

716
00:26:29,830 --> 00:26:26,799
our next caller

717
00:26:33,990 --> 00:26:29,840
denise chow from space.com when you say

718
00:26:38,230 --> 00:26:36,149
yeah the the initial results are very

719
00:26:40,230 --> 00:26:38,240
promising anything else he wanted to say

720
00:26:43,510 --> 00:26:40,240
on that point we've actually been able

721
00:26:45,430 --> 00:26:43,520
to confirm the discovery of 100 new

722
00:26:47,190 --> 00:26:45,440
objects that are these very cool stars

723
00:26:49,990 --> 00:26:47,200
called brown dwarfs

724
00:26:51,510 --> 00:26:50,000
and so that's very similar to what

725
00:26:52,710 --> 00:26:51,520
people are interested in looking for so

726
00:26:54,149 --> 00:26:52,720
we've actually found some of these that

727
00:26:55,909 --> 00:26:54,159
are relatively close to the earth but

728
00:26:57,269 --> 00:26:55,919
none of these are closer at this point

729
00:26:58,470 --> 00:26:57,279
than the nearest star to our solar

730
00:27:02,470 --> 00:26:58,480
system

731
00:27:06,549 --> 00:27:03,669
thank you

732
00:27:10,630 --> 00:27:06,559
okay now we'll go to denise

733
00:27:15,669 --> 00:27:12,789
hi uh denise childspace.com thanks for

734
00:27:17,029 --> 00:27:15,679
taking my question um i was under the

735
00:27:19,909 --> 00:27:17,039
impression but please correct me if i'm

736
00:27:21,990 --> 00:27:19,919
wrong that the um the wise mission was

737
00:27:24,549 --> 00:27:22,000
um officially shut down in february of

738
00:27:26,149 --> 00:27:24,559

2011. um so does that mean that in the

739
00:27:27,830 --> 00:27:26,159
months and years to come it'll be more

740
00:27:29,430 --> 00:27:27,840
of sifting through the survey

741
00:27:32,230 --> 00:27:29,440
information has been collected or is

742
00:27:34,310 --> 00:27:32,240
there a plan to continue with

743
00:27:35,590 --> 00:27:34,320
another mission to take more of these uh

744
00:27:36,310 --> 00:27:35,600
sky surveys

745
00:27:38,389 --> 00:27:36,320
well

746
00:27:39,669 --> 00:27:38,399
uh this is amy and i'll answer this uh

747
00:27:41,909 --> 00:27:39,679
we like to think that the wise

748
00:27:44,470 --> 00:27:41,919
spacecraft having completed its baseline

749
00:27:46,870 --> 00:27:44,480
mission successfully is now in honorable

750
00:27:48,710 --> 00:27:46,880
retirement it's in hibernation mode

751
00:27:50,789 --> 00:27:48,720
having accomplished all of the goals and

752
00:27:51,669 --> 00:27:50,799
then some that were set out for it so

753
00:28:00,230 --> 00:27:51,679
we're

754
00:28:09,269 --> 00:28:01,510
okay

755
00:28:13,990 --> 00:28:11,510
oh sorry uh just the the benefits of

756
00:28:15,909 --> 00:28:14,000
having a manned mission to an asteroid

757
00:28:19,190 --> 00:28:15,919
as opposed to just collecting samples

758
00:28:26,870 --> 00:28:21,029
now could you repeat that again the

759
00:28:30,630 --> 00:28:28,630
oh sorry i was just wondering if you

760
00:28:32,549 --> 00:28:30,640
could explain the benefits of having a

761
00:28:34,070 --> 00:28:32,559
manned mission to an asteroid as opposed

762
00:28:35,350 --> 00:28:34,080
to um collecting samples just

763
00:28:37,190 --> 00:28:35,360

robotically and returning those

764
00:28:39,669 --> 00:28:37,200
terrorists

765
00:28:42,710 --> 00:28:39,679
our take that uh this is lindley again

766
00:28:44,789 --> 00:28:42,720
uh the human space flight they are still

767
00:28:47,110 --> 00:28:44,799
working out the uh

768
00:28:49,350 --> 00:28:47,120
objectives uh and constraints and

769
00:28:51,029 --> 00:28:49,360
requirements of a human spaceflight

770
00:28:54,149 --> 00:28:51,039
mission to an neo

771
00:28:55,669 --> 00:28:54,159
but um we're for robotic mission uh you

772
00:28:58,549 --> 00:28:55,679
have certain capabilities that you're

773
00:29:00,310 --> 00:28:58,559
able to do but uh

774
00:29:03,029 --> 00:29:00,320
since those have to be programmed ahead

775
00:29:04,630 --> 00:29:03,039
of time and

776
00:29:06,870 --> 00:29:04,640
has to be all planned out and thought

777
00:29:08,950 --> 00:29:06,880
out ahead of time to to get the robot to

778
00:29:11,510 --> 00:29:08,960
do what you needed to do

779
00:29:12,950 --> 00:29:11,520
there are some limitations to to robotic

780
00:29:15,669 --> 00:29:12,960
sample collection

781
00:29:17,990 --> 00:29:15,679
uh one of the big advantages of humans

782
00:29:21,669 --> 00:29:18,000
is they're able to think on the fly

783
00:29:24,070 --> 00:29:21,679
and adapt quite quickly uh given

784
00:29:26,389 --> 00:29:24,080
some basic capabilities so that would

785
00:29:29,590 --> 00:29:26,399
certainly be one advantage

786
00:29:31,029 --> 00:29:29,600
of a human exploration of an asteroid to

787
00:29:33,669 --> 00:29:31,039
be able to

788
00:29:37,029 --> 00:29:35,350

think of

789
00:29:39,029 --> 00:29:37,039
different

790
00:29:42,149 --> 00:29:39,039
things to be done while you're at the

791
00:29:44,950 --> 00:29:42,159
asteroid look in different places for

792
00:29:47,029 --> 00:29:44,960
samples to be to be returned of course

793
00:29:48,710 --> 00:29:47,039
one of the biggest

794
00:29:50,389 --> 00:29:48,720
science objectives of a human

795
00:29:53,269 --> 00:29:50,399
exploration to an asteroid would be to

796
00:30:05,590 --> 00:29:53,279
bring back samples

797
00:30:05,600 --> 00:30:12,470
okay go ahead she's coming right now

798
00:30:17,590 --> 00:30:15,350
new estimate of roughly 19 000 mid-sized

799
00:30:19,430 --> 00:30:17,600
near-earth asteroids

800
00:30:22,789 --> 00:30:19,440
the majority of those have not been

801
00:30:25,190 --> 00:30:22,799
discovered and i'm wondering what um

802
00:30:27,190 --> 00:30:25,200
missions or projects are underway to

803
00:30:29,190 --> 00:30:27,200
discover those and i also wondered if

804
00:30:30,950 --> 00:30:29,200
you could characterize the damage to our

805
00:30:34,710 --> 00:30:30,960
planet that would occur if one of those

806
00:30:36,789 --> 00:30:34,720
mid-sized objects struck the earth

807
00:30:39,110 --> 00:30:36,799
i guess i'll take that uh again this is

808
00:30:41,269 --> 00:30:39,120
uh this is lindley uh your first

809
00:30:43,190 --> 00:30:41,279
question is about uh the ongoing efforts

810
00:30:45,430 --> 00:30:43,200
uh what are we continuing to do uh we

811
00:30:47,909 --> 00:30:45,440
continue to run uh uh several

812
00:30:49,990 --> 00:30:47,919
ground-based teams uh that have been in

813
00:30:51,990 --> 00:30:50,000

operation for several years and have

814
00:30:54,310 --> 00:30:52,000
actually found the majority

815
00:30:57,350 --> 00:30:54,320
of the known objects

816
00:30:58,870 --> 00:30:57,360
those projects continue we are looking

817
00:31:01,750 --> 00:30:58,880
at uh

818
00:31:04,630 --> 00:31:01,760
increased more capabilities

819
00:31:06,950 --> 00:31:04,640
the neo-wise mission kind of gave us a

820
00:31:10,310 --> 00:31:06,960
prototype of

821
00:31:12,230 --> 00:31:10,320
a space-based mission that we might look

822
00:31:13,990 --> 00:31:12,240
at for the future but we have to examine

823
00:31:15,269 --> 00:31:14,000
the cost and benefit of doing it from

824
00:31:17,350 --> 00:31:15,279
space

825
00:31:19,350 --> 00:31:17,360
in the infrared versus

826
00:31:21,190 --> 00:31:19,360
ground-based observatory larger

827
00:31:25,269 --> 00:31:21,200
ground-based observatories

828
00:31:28,389 --> 00:31:25,279
um so there's there's actually a whole

829
00:31:31,750 --> 00:31:28,399
spectrum of capabilities to be looked at

830
00:31:32,950 --> 00:31:31,760
it it's really it's not one system to do

831
00:31:34,630 --> 00:31:32,960
it it's a

832
00:31:37,190 --> 00:31:34,640
complement of both ground and

833
00:31:39,029 --> 00:31:37,200
space-based systems which would probably

834
00:31:40,149 --> 00:31:39,039
be the best

835
00:31:43,269 --> 00:31:40,159
to

836
00:31:45,110 --> 00:31:43,279
recover the entire population of these

837
00:31:46,549 --> 00:31:45,120
objects

838
00:31:51,029 --> 00:31:46,559

uh and i've forgotten your second

839
00:31:53,669 --> 00:31:51,830
oh

840
00:31:55,509 --> 00:31:53,679
uh thanks amy um

841
00:31:58,070 --> 00:31:55,519
uh you wanted uh some idea what the

842
00:32:01,269 --> 00:31:58,080
damage of say a hundred meter uh uh

843
00:32:03,269 --> 00:32:01,279
asteroid if it were to impact the earth

844
00:32:04,789 --> 00:32:03,279
because of the orbital dynamics the

845
00:32:07,029 --> 00:32:04,799
relative uh

846
00:32:07,830 --> 00:32:07,039
speed at which these objects uh hit the

847
00:32:12,230 --> 00:32:07,840
earth

848
00:32:14,149 --> 00:32:12,240
uh would be on on the order of uh

849
00:32:16,470 --> 00:32:14,159
tens of uh

850
00:32:19,190 --> 00:32:16,480
miles per second so that's a lot of

851
00:32:19,990 --> 00:32:19,200
energy to be dissipated in an instance

852
00:32:21,350 --> 00:32:20,000
so

853
00:32:22,870 --> 00:32:21,360
uh

854
00:32:24,870 --> 00:32:22,880
it is quite

855
00:32:25,909 --> 00:32:24,880
a large

856
00:32:27,990 --> 00:32:25,919
area

857
00:32:30,070 --> 00:32:28,000
that would be damaged by the impact of

858
00:32:32,950 --> 00:32:30,080
100 meter object something on the order

859
00:32:33,750 --> 00:32:32,960
of a metropolitan area

860
00:32:35,909 --> 00:32:33,760
if

861
00:32:38,470 --> 00:32:35,919
say for instance one were to hit in the

862
00:32:39,830 --> 00:32:38,480
middle of the dc area it would pretty

863
00:32:42,149 --> 00:32:39,840

much

864
00:32:45,190 --> 00:32:42,159
devastate the entire area within the

865
00:32:49,269 --> 00:32:47,110
this is tim's bar i'd like to make one

866
00:32:51,110 --> 00:32:49,279
general comment on the existing

867
00:32:54,630 --> 00:32:51,120
excuse me the existing

868
00:32:57,909 --> 00:32:54,640
search teams they're finding roughly 500

869
00:33:00,149 --> 00:32:57,919
objects larger than 100 meters per year

870
00:33:02,310 --> 00:33:00,159
and so it's a little bit slow going but

871
00:33:04,310 --> 00:33:02,320
the existing assets are capable of

872
00:33:07,350 --> 00:33:04,320
certainly doing a good job with this

873
00:33:08,389 --> 00:33:07,360
certainly given enough years

874
00:33:10,710 --> 00:33:08,399
they will

875
00:33:13,190 --> 00:33:10,720
eventually recover the

876
00:33:16,630 --> 00:33:13,200
population but it uh it will be several

877
00:33:19,350 --> 00:33:16,640
decades with just existing assets

878
00:33:20,950 --> 00:33:19,360
okay we uh have one final question i

879
00:33:23,029 --> 00:33:20,960
think this is a good wrap up this is for

880
00:33:24,710 --> 00:33:23,039
amy for one of the dot coms with all

881
00:33:28,950 --> 00:33:24,720
this uh data

882
00:33:32,389 --> 00:33:30,389
one of the most exciting things about

883
00:33:34,630 --> 00:33:32,399
having uh data from a spacecraft

884
00:33:36,149 --> 00:33:34,640
likewise and the neowise project is that

885
00:33:38,389 --> 00:33:36,159
uh there's just so many different things

886
00:33:40,310 --> 00:33:38,399
you can do with it one of the things

887
00:33:42,149 --> 00:33:40,320
we're very interested in studying is the

888
00:33:44,230 --> 00:33:42,159

subset of near-earth asteroids that are

889
00:33:45,269 --> 00:33:44,240
considered potentially hazardous meaning

890
00:33:46,710 --> 00:33:45,279
that they have

891
00:33:47,990 --> 00:33:46,720
orbits that take them very close to the

892
00:33:49,590 --> 00:33:48,000
earth we're going to be looking at those

893
00:33:50,710 --> 00:33:49,600
in greater detail

894
00:33:52,389 --> 00:33:50,720
we're also going to be studying

895
00:33:54,389 --> 00:33:52,399
asteroids between the main in the main

896
00:33:56,149 --> 00:33:54,399
belt between mars and jupiter

897
00:33:57,909 --> 00:33:56,159
and so we've just got a lot of good

898
00:33:59,990 --> 00:33:57,919
things left to do and it's going to keep

899
00:34:02,470 --> 00:34:00,000
us busy for a long time

900
00:34:04,470 --> 00:34:02,480
if i might add to that this uh

901
00:34:06,549 --> 00:34:04,480
subset of the population that amy talks

902
00:34:08,950 --> 00:34:06,559
about those that are have closest

903
00:34:10,470 --> 00:34:08,960
encounters with earth that's also the

904
00:34:12,790 --> 00:34:10,480
population of objects which will make

905
00:34:14,149 --> 00:34:12,800
the base best human space flight targets

906
00:34:16,230 --> 00:34:14,159
so there are

907
00:34:21,510 --> 00:34:16,240
a particular interest for not just a

908
00:34:23,909 --> 00:34:21,520
hazard but for exploration destinations

909
00:34:25,589 --> 00:34:23,919
okay that's going to wrap up here and i

910
00:34:27,589 --> 00:34:25,599
would like to remind folks that go to

911
00:34:30,069 --> 00:34:27,599
www.nasa.gov

912
00:34:32,149 --> 00:34:30,079
wise for the information presented today

913
00:34:34,149 --> 00:34:32,159

also our participants are available for

914
00:34:37,750 --> 00:34:34,159
follow-up interviews just contact my