

National Aeronautics and Space Administration



ASTEROID INITIATIVE IDEA SYNTHESIS

Crowd Sourcing & Citizen Science

www.nasa.gov/asteroidworkshop



Join the discussion and send questions to:
[#AsteroidGC](https://twitter.com/AsteroidGC)



1
00:00:27,349 --> 00:00:25,189
all right folks welcome to the afternoon

2
00:00:29,990 --> 00:00:27,359
session of the asteroid initiative

3
00:00:31,750 --> 00:00:30,000
synthesis workshop on crowdsourcing and

4
00:00:33,430 --> 00:00:31,760
citizen science

5
00:00:36,150 --> 00:00:33,440
for the next few hours we'll be hearing

6
00:00:39,350 --> 00:00:36,160
from folks that submitted ideas to the

7
00:00:41,430 --> 00:00:39,360
asteroid initiative rfi pertaining to

8
00:00:43,430 --> 00:00:41,440
how we might use citizen science and

9
00:00:44,790 --> 00:00:43,440
crowdsourcing to

10
00:00:46,310 --> 00:00:44,800
help us to

11
00:00:47,590 --> 00:00:46,320
find all asteroid threats to human

12
00:00:49,670 --> 00:00:47,600
populations and know what to do about

13
00:00:51,430 --> 00:00:49,680

them the grand challenge topic so i have

14

00:00:52,869 --> 00:00:51,440

a few introductory slides uh to walk

15

00:00:54,549 --> 00:00:52,879

through and then we'll go ahead and turn

16

00:00:55,430 --> 00:00:54,559

it over to the presenters

17

00:00:59,830 --> 00:00:55,440

um

18

00:01:01,349 --> 00:00:59,840

most of which are joining us through uh

19

00:01:03,590 --> 00:01:01,359

adobe connect so they'll be joining us

20

00:01:06,230 --> 00:01:03,600

virtually but they will be available for

21

00:01:07,910 --> 00:01:06,240

10 minutes right after their uh their

22

00:01:09,990 --> 00:01:07,920

discussions for q a and they will be

23

00:01:11,750 --> 00:01:10,000

calling back in at the end for the group

24

00:01:13,670 --> 00:01:11,760

discussion so that they're part of our

25

00:01:15,190 --> 00:01:13,680

our brainstorm at the end of the

26

00:01:17,990 --> 00:01:15,200

discussion as well

27

00:01:19,510 --> 00:01:18,000

uh to give a little context to what this

28

00:01:21,749 --> 00:01:19,520

session um

29

00:01:23,270 --> 00:01:21,759

this session is specifically focusing on

30

00:01:25,270 --> 00:01:23,280

uh for this particular session we're

31

00:01:28,070 --> 00:01:25,280

focusing on the asteroid grand challenge

32

00:01:29,910 --> 00:01:28,080

portion of the asteroid initiative so

33

00:01:31,510 --> 00:01:29,920

that is the challenge statement is to

34

00:01:33,270 --> 00:01:31,520

find all asteroid threats to human

35

00:01:34,149 --> 00:01:33,280

populations and know what to do about

36

00:01:36,550 --> 00:01:34,159

them

37

00:01:39,109 --> 00:01:36,560

it is the definition of grand

38

00:01:41,109 --> 00:01:39,119

in many ways as folks in this room very

39

00:01:44,069 --> 00:01:41,119

well know and folks watching

40

00:01:46,630 --> 00:01:44,079

from home also very well know

41

00:01:48,870 --> 00:01:46,640

this fits in the broader asteroid

42

00:01:50,469 --> 00:01:48,880

initiative as one of the two parts of

43

00:01:51,990 --> 00:01:50,479

that effort

44

00:01:53,350 --> 00:01:52,000

as you know there's both the asteroid

45

00:01:54,870 --> 00:01:53,360

mission

46

00:01:56,469 --> 00:01:54,880

discussion that's going on at this

47

00:01:58,230 --> 00:01:56,479

initiative workshop

48

00:02:00,950 --> 00:01:58,240

as well as the asteroid grand challenge

49

00:02:02,630 --> 00:02:00,960

discussions going on at this workshop

50

00:02:04,469 --> 00:02:02,640

there are two sessions that are

51
00:02:05,990 --> 00:02:04,479
specifically devoted to grand challenge

52
00:02:07,670 --> 00:02:06,000
discussions this is one of them the

53
00:02:09,589 --> 00:02:07,680
other is next generation engagement

54
00:02:11,110 --> 00:02:09,599
that's going to be happening tomorrow

55
00:02:13,750 --> 00:02:11,120
morning um

56
00:02:15,589 --> 00:02:13,760
you can see in this uh in this visual

57
00:02:19,350 --> 00:02:15,599
representation of where the overlaps of

58
00:02:21,430 --> 00:02:19,360
these two efforts occur that the the

59
00:02:22,390 --> 00:02:21,440
principles the spirit of the asteroid

60
00:02:25,030 --> 00:02:22,400
initiative

61
00:02:27,030 --> 00:02:25,040
is in many ways that the

62
00:02:29,750 --> 00:02:27,040
that there are participatory engagement

63
00:02:31,589 --> 00:02:29,760

opportunities throughout both of these

64

00:02:34,309 --> 00:02:31,599

activities so it's not just in the grand

65

00:02:36,150 --> 00:02:34,319

challenge that we're looking to engage

66

00:02:38,630 --> 00:02:36,160

non-traditional partners and seek

67

00:02:40,309 --> 00:02:38,640

innovative methods to try to um approach

68

00:02:41,750 --> 00:02:40,319

the goals of that particular activity

69

00:02:44,229 --> 00:02:41,760

they're also seeking to do that on the

70

00:02:46,790 --> 00:02:44,239

mission side of the house as well and so

71

00:02:49,270 --> 00:02:46,800

we just came this morning from a great

72

00:02:51,190 --> 00:02:49,280

partnership and participatory engagement

73

00:02:53,110 --> 00:02:51,200

session at which

74

00:02:55,270 --> 00:02:53,120

jason and the folks in attendance

75

00:02:57,030 --> 00:02:55,280

explored how partnership as a whole

76

00:02:58,390 --> 00:02:57,040

might be able to

77

00:03:00,229 --> 00:02:58,400

assist in both of the elements of the

78

00:03:03,270 --> 00:03:00,239

asteroid initiative and there was plenty

79

00:03:05,110 --> 00:03:03,280

of discussion in that session about how

80

00:03:06,149 --> 00:03:05,120

whether or not participatory engagement

81

00:03:07,589 --> 00:03:06,159

meant

82

00:03:09,270 --> 00:03:07,599

public outreach

83

00:03:11,110 --> 00:03:09,280

if it meant education

84

00:03:12,630 --> 00:03:11,120

if it meant educating people about the

85

00:03:14,229 --> 00:03:12,640

real risks

86

00:03:16,070 --> 00:03:14,239

if it meant a two-way dialogue about

87

00:03:18,309 --> 00:03:16,080

policy priorities what did that mean

88

00:03:20,470 --> 00:03:18,319

what does participatory engagement mean

89

00:03:23,190 --> 00:03:20,480

or does it mean actually engaging

90

00:03:25,670 --> 00:03:23,200

individuals in the meaningful work of

91

00:03:27,350 --> 00:03:25,680

actually accomplishing the goal to find

92

00:03:28,710 --> 00:03:27,360

all asteroid threats to human

93

00:03:30,149 --> 00:03:28,720

populations and know what to do about

94

00:03:31,589 --> 00:03:30,159

them and

95

00:03:32,869 --> 00:03:31,599

we made sure to note that that's exactly

96

00:03:35,030 --> 00:03:32,879

what we're here in this session to talk

97

00:03:37,270 --> 00:03:35,040

about today we're here to talk about the

98

00:03:39,990 --> 00:03:37,280

meaningful ways in which uh individual

99

00:03:41,990 --> 00:03:40,000

citizens from around the globe um can

100

00:03:43,350 --> 00:03:42,000

participate in the many elements of the

101
00:03:45,509 --> 00:03:43,360
grand challenge

102
00:03:47,270 --> 00:03:45,519
in a meaningful way to help us find

103
00:03:48,550 --> 00:03:47,280
where these threats are and know what to

104
00:03:49,430 --> 00:03:48,560
do about them

105
00:03:51,110 --> 00:03:49,440
so

106
00:03:53,750 --> 00:03:51,120
uh moving

107
00:03:55,830 --> 00:03:53,760
forward um the goals of the session are

108
00:03:56,789 --> 00:03:55,840
to uh begin

109
00:03:59,190 --> 00:03:56,799
uh

110
00:04:00,869 --> 00:03:59,200
the discussion with the global community

111
00:04:02,550 --> 00:04:00,879
about crowdsourcing and citizen science

112
00:04:03,670 --> 00:04:02,560
in general as they relate to this grand

113
00:04:05,270 --> 00:04:03,680

challenge

114

00:04:07,429 --> 00:04:05,280

and also we see this as one of the

115

00:04:09,509 --> 00:04:07,439

initial engagements with this particular

116

00:04:11,670 --> 00:04:09,519

community around

117

00:04:14,949 --> 00:04:11,680

creating a community driven

118

00:04:18,390 --> 00:04:14,959

implementation plan so um at the last uh

119

00:04:20,949 --> 00:04:18,400

asteroid initiative workshop um uh after

120

00:04:22,629 --> 00:04:20,959

the the the event was canceled after the

121

00:04:24,150 --> 00:04:22,639

first day a lot of the asteroid

122

00:04:26,790 --> 00:04:24,160

community stuck around for the second

123

00:04:29,350 --> 00:04:26,800

day and had a lot of great dialogue

124

00:04:31,430 --> 00:04:29,360

amongst themselves and with each other

125

00:04:32,950 --> 00:04:31,440

about what could be done in order to

126

00:04:34,390 --> 00:04:32,960

further the goals associated with the

127

00:04:36,710 --> 00:04:34,400

grand challenge

128

00:04:38,390 --> 00:04:36,720

by the community as well as what nasa

129

00:04:40,790 --> 00:04:38,400

really needs to do from the community's

130

00:04:42,070 --> 00:04:40,800

perspective and um i understand was a

131

00:04:43,990 --> 00:04:42,080

very rich discussion and there were a

132

00:04:45,830 --> 00:04:44,000

lot of great connections formed and a

133

00:04:47,749 --> 00:04:45,840

lot of really good energy

134

00:04:49,830 --> 00:04:47,759

as a result of those discussions and we

135

00:04:52,310 --> 00:04:49,840

see all of these discussions as being

136

00:04:53,990 --> 00:04:52,320

part of an intelligent way that we're

137

00:04:55,590 --> 00:04:54,000

trying to

138

00:04:56,870 --> 00:04:55,600

architect a series of interactions so

139

00:04:59,110 --> 00:04:56,880

that we're doing this together as a

140

00:05:00,310 --> 00:04:59,120

community this is not something nasa is

141

00:05:02,230 --> 00:05:00,320

doing this is something that we're

142

00:05:03,270 --> 00:05:02,240

seeking to do together

143

00:05:06,070 --> 00:05:03,280

and we want to make sure that the

144

00:05:08,710 --> 00:05:06,080

implementation plan is crafted in in

145

00:05:10,629 --> 00:05:08,720

that spirit and in that way so today is

146

00:05:13,029 --> 00:05:10,639

just one of those discussions it's a

147

00:05:15,110 --> 00:05:13,039

continuation of the discussion from

148

00:05:17,029 --> 00:05:15,120

september but it's also the beginning of

149

00:05:18,390 --> 00:05:17,039

a set of discussions that jason is

150

00:05:19,670 --> 00:05:18,400

leading as the

151
00:05:21,590 --> 00:05:19,680
asteroid grand challenge program

152
00:05:23,110 --> 00:05:21,600
executive for the agency

153
00:05:24,710 --> 00:05:23,120
in the years to come

154
00:05:26,390 --> 00:05:24,720
so we see this as a beginning this

155
00:05:27,909 --> 00:05:26,400
session is largely a continuation of the

156
00:05:29,590 --> 00:05:27,919
beginning

157
00:05:31,990 --> 00:05:29,600
we also hope to spend some time

158
00:05:33,270 --> 00:05:32,000
discussing overlaps and energy synergies

159
00:05:35,990 --> 00:05:33,280
between some of the ideas that are going

160
00:05:38,550 --> 00:05:36,000
to be independently presented today

161
00:05:40,150 --> 00:05:38,560
and also we hope that this can spur the

162
00:05:41,670 --> 00:05:40,160
ideas presented today might spur

163
00:05:44,070 --> 00:05:41,680

additional ideas from the folks

164

00:05:46,150 --> 00:05:44,080

participating both in the room and um

165

00:05:47,909 --> 00:05:46,160

virtually about other ways in which

166

00:05:50,950 --> 00:05:47,919

citizen science and crowdsourcing might

167

00:05:52,950 --> 00:05:50,960

be applied to the grand challenge

168

00:05:55,110 --> 00:05:52,960

um one other thing that we would like to

169

00:05:56,790 --> 00:05:55,120

encourage you guys to

170

00:05:57,749 --> 00:05:56,800

do today

171

00:05:59,270 --> 00:05:57,759

and i'll come back to working

172

00:06:01,350 --> 00:05:59,280

definitions you'll see

173

00:06:02,390 --> 00:06:01,360

there on the wiki you'll see a link to a

174

00:06:05,430 --> 00:06:02,400

wiki

175

00:06:09,350 --> 00:06:07,270

what we've started in the spirit of

176

00:06:11,110 --> 00:06:09,360

information sharing and in the spirit of

177

00:06:13,110 --> 00:06:11,120

continual learning and creating

178

00:06:15,189 --> 00:06:13,120

knowledge as we go is we've started a

179

00:06:16,629 --> 00:06:15,199

wiki with a lot of the things we already

180

00:06:17,830 --> 00:06:16,639

know about citizen science and

181

00:06:19,430 --> 00:06:17,840

crowdsourcing

182

00:06:21,749 --> 00:06:19,440

related to the grand challenge and we're

183

00:06:24,309 --> 00:06:21,759

building on that document through these

184

00:06:27,749 --> 00:06:24,319

series of discussions so any of you here

185

00:06:29,909 --> 00:06:27,759

today and watching from home can request

186

00:06:32,390 --> 00:06:29,919

access now to this wiki it is something

187

00:06:35,029 --> 00:06:32,400

you have to request status to um and

188

00:06:36,230 --> 00:06:35,039

jason here has it has the email up so he

189

00:06:37,990 --> 00:06:36,240

can request you right away so you can

190

00:06:39,749 --> 00:06:38,000

start contributing um we know there's

191

00:06:42,790 --> 00:06:39,759

already folks that are lined up to take

192

00:06:45,350 --> 00:06:42,800

notes um from today in that wiki area

193

00:06:47,749 --> 00:06:45,360

but um it's also a great place to see

194

00:06:50,070 --> 00:06:47,759

kind of the baseline of knowledge that

195

00:06:51,189 --> 00:06:50,080

um we've started to to capture as well

196

00:06:52,550 --> 00:06:51,199

in this area of citizen science and

197

00:06:55,270 --> 00:06:52,560

crowdsourcing if you want to participate

198

00:06:57,350 --> 00:06:55,280

there and of course also feel free to

199

00:06:58,790 --> 00:06:57,360

tweet questions to us and and comments

200

00:07:00,870 --> 00:06:58,800

in live live

201
00:07:03,990 --> 00:07:00,880
live tweet this whole session through um

202
00:07:08,870 --> 00:07:04,000
using the asteroid gc gc standing for

203
00:07:11,430 --> 00:07:08,880
grand challenge asteroid gc hashtag

204
00:07:13,110 --> 00:07:11,440
as far as working definitions go

205
00:07:14,710 --> 00:07:13,120
there's a lot of this kind of an eye

206
00:07:18,390 --> 00:07:14,720
chart apologize there's a lot of words

207
00:07:21,270 --> 00:07:18,400
on this slide but wanted to try to

208
00:07:24,790 --> 00:07:21,280
set the stage for what we mean by

209
00:07:27,189 --> 00:07:24,800
citizen science crowdsourcing and crowd

210
00:07:28,309 --> 00:07:27,199
source science which are kind of three

211
00:07:32,070 --> 00:07:28,319
different

212
00:07:33,830 --> 00:07:32,080
concepts so citizen science you'll hear

213
00:07:36,550 --> 00:07:33,840

of a lot of different citizen science

214

00:07:38,790 --> 00:07:36,560

activities that have today that um have

215

00:07:40,710 --> 00:07:38,800

already occurred um and we'll get some

216

00:07:43,670 --> 00:07:40,720

great lessons learned

217

00:07:46,790 --> 00:07:43,680

from them um but this is largely a

218

00:07:50,469 --> 00:07:48,309

scientific research can actually be

219

00:07:52,869 --> 00:07:50,479

furthered by citizen contributions to

220

00:07:55,589 --> 00:07:52,879

that research and also individual

221

00:07:57,270 --> 00:07:55,599

agendas for research can be done based

222

00:07:58,950 --> 00:07:57,280

on an empowered individual to be able to

223

00:08:00,629 --> 00:07:58,960

do science and contribute to science on

224

00:08:01,909 --> 00:08:00,639

their own and so you see a lot of

225

00:08:03,909 --> 00:08:01,919

citizen science and like the bird

226

00:08:05,510 --> 00:08:03,919

watching community you see it in

227

00:08:07,270 --> 00:08:05,520

environmental local environmental

228

00:08:10,230 --> 00:08:07,280

advocacy there's this group called

229

00:08:11,990 --> 00:08:10,240

public lab that they actually distribute

230

00:08:13,589 --> 00:08:12,000

low-cost sensors for people to be able

231

00:08:15,029 --> 00:08:13,599

to take measurements

232

00:08:18,070 --> 00:08:15,039

in their community in their local

233

00:08:19,909 --> 00:08:18,080

community and take that data

234

00:08:22,230 --> 00:08:19,919

and make scientific conclusions from it

235

00:08:24,629 --> 00:08:22,240

that can help to inform them advocating

236

00:08:26,390 --> 00:08:24,639

locally for environmental justice and so

237

00:08:28,710 --> 00:08:26,400

that is an interesting example of

238

00:08:30,070 --> 00:08:28,720

citizen science where where the citizen

239

00:08:32,389 --> 00:08:30,080

is the scientist

240

00:08:34,149 --> 00:08:32,399

um crowdsourcing

241

00:08:35,509 --> 00:08:34,159

is a different flavor here it's a

242

00:08:38,469 --> 00:08:35,519

process where

243

00:08:40,070 --> 00:08:38,479

the sum of the whole is is or that that

244

00:08:42,230 --> 00:08:40,080

the sum of the parts is greater than the

245

00:08:44,070 --> 00:08:42,240

whole so you're actually able to to

246

00:08:46,790 --> 00:08:44,080

contribute a lot through individual

247

00:08:48,550 --> 00:08:46,800

contributions to a broader task we do

248

00:08:50,150 --> 00:08:48,560

this at nasa through some sort of

249

00:08:52,630 --> 00:08:50,160

sometimes through challenges like what

250

00:08:55,350 --> 00:08:52,640

we do on the nasa tournament lab in the

251
00:08:56,630 --> 00:08:55,360
innovation pavilion but also

252
00:09:00,310 --> 00:08:56,640
there's a lot of instances where

253
00:09:01,509 --> 00:09:00,320
crowdsourcing projects can involve

254
00:09:03,829 --> 00:09:01,519
individuals

255
00:09:05,190 --> 00:09:03,839
doing a bunch of mouse clicks like on

256
00:09:06,550 --> 00:09:05,200
xuniverse

257
00:09:08,070 --> 00:09:06,560
individuals doing a bunch of mouse

258
00:09:10,470 --> 00:09:08,080
clicks to identify whether or not that

259
00:09:12,470 --> 00:09:10,480
galaxy might be a spiral galaxy or it

260
00:09:15,269 --> 00:09:12,480
might be a different type of galaxy they

261
00:09:16,470 --> 00:09:15,279
help to characterize with the human eye

262
00:09:18,470 --> 00:09:16,480
and go through a lot more data a lot

263
00:09:20,389 --> 00:09:18,480

quicker than we might be able to

264

00:09:21,350 --> 00:09:20,399

normally in normal course of business so

265

00:09:22,949 --> 00:09:21,360

that would be an example of

266

00:09:25,190 --> 00:09:22,959

crowdsourcing

267

00:09:27,430 --> 00:09:25,200

and crowdsource science tends to be an

268

00:09:28,870 --> 00:09:27,440

activity where um

269

00:09:31,030 --> 00:09:28,880

you're crowdsourcing but for the purpose

270

00:09:32,710 --> 00:09:31,040

of science it's not necessarily

271

00:09:34,470 --> 00:09:32,720

individuals doing science on their own

272

00:09:36,230 --> 00:09:34,480

it's individuals contributing

273

00:09:37,829 --> 00:09:36,240

microtasking to broader science so

274

00:09:39,350 --> 00:09:37,839

there's slightly different

275

00:09:41,750 --> 00:09:39,360

different

276

00:09:43,030 --> 00:09:41,760

ways of looking at that the whole scope

277

00:09:44,790 --> 00:09:43,040

of ideas that we're going to be looking

278

00:09:45,829 --> 00:09:44,800

at today

279

00:09:47,110 --> 00:09:45,839

um

280

00:09:48,389 --> 00:09:47,120

after all the presenters share their

281

00:09:49,829 --> 00:09:48,399

ideas we'll have some time for interim

282

00:09:51,670 --> 00:09:49,839

discussion at the end where i hope that

283

00:09:54,150 --> 00:09:51,680

we'll talk about

284

00:09:56,070 --> 00:09:54,160

some synthesis across the ideas uh gaps

285

00:09:58,550 --> 00:09:56,080

that still exist kind of use those

286

00:10:00,310 --> 00:09:58,560

initial ideas as a as a

287

00:10:02,630 --> 00:10:00,320

a point to um

288

00:10:05,269 --> 00:10:02,640

to kick off from for other ideation

289

00:10:07,670 --> 00:10:05,279

so with that being said um we'll go

290

00:10:09,190 --> 00:10:07,680

ahead and transition to

291

00:10:11,670 --> 00:10:09,200

uh carl

292

00:10:13,750 --> 00:10:11,680

from the university of arizona

293

00:10:16,389 --> 00:10:13,760

and i forgot to introduce myself so i'll

294

00:10:18,389 --> 00:10:16,399

do that real quick um i'm jen gastetic

295

00:10:19,590 --> 00:10:18,399

i'm the prizes and challenges program

296

00:10:21,829 --> 00:10:19,600

executive in the office of the chief

297

00:10:25,110 --> 00:10:21,839

technologist at nasa headquarters and in

298

00:10:26,949 --> 00:10:25,120

that capacity i i lead the advocacy

299

00:10:29,910 --> 00:10:26,959

policy and strategy for the agency's

300

00:10:33,829 --> 00:10:29,920

prize and challenge um programs and then

301
00:10:36,470 --> 00:10:33,839
to my left is i am jason kessler i am

302
00:10:37,829 --> 00:10:36,480
the program exec for the asteroid grand

303
00:10:39,750 --> 00:10:37,839
challenge

304
00:10:41,910 --> 00:10:39,760
also based at headquarters in the office

305
00:10:43,430 --> 00:10:41,920
of the chief technologist

306
00:10:45,509 --> 00:10:43,440
so now you know us

307
00:10:46,949 --> 00:10:45,519
and go ahead and transfer it now over to

308
00:10:49,190 --> 00:10:46,959
carl who's going to tell us about space

309
00:10:51,269 --> 00:10:49,200
watch and the osiris-rex target asteroid

310
00:10:53,509 --> 00:10:51,279
citizen science programs

311
00:10:54,870 --> 00:10:53,519
okay thanks jen and jason

312
00:10:56,790 --> 00:10:54,880
i'm going to be talking about a few

313
00:10:57,990 --> 00:10:56,800

citizen science projects that we've been

314

00:10:59,990 --> 00:10:58,000

conducting at the university of

315

00:11:01,670 --> 00:11:00,000

arizona's lunar and planetary laboratory

316

00:11:03,829 --> 00:11:01,680

that are directly related to near earth

317

00:11:05,269 --> 00:11:03,839

asteroid research and i'd like to also

318

00:11:07,110 --> 00:11:05,279

acknowledge um

319

00:11:08,949 --> 00:11:07,120

rob bob mcmillan who's the head of space

320

00:11:09,750 --> 00:11:08,959

watch and tim swindle who's the director

321

00:11:10,870 --> 00:11:09,760

of the

322

00:11:13,829 --> 00:11:10,880

lpl

323

00:11:15,350 --> 00:11:13,839

helping with this presentation

324

00:11:17,350 --> 00:11:15,360

lpl has

325

00:11:19,670 --> 00:11:17,360

mainly been uh at the forefront of

326

00:11:21,350 --> 00:11:19,680

asteroid research since the 1960s a lot

327

00:11:22,949 --> 00:11:21,360

of pioneering work on asteroid

328

00:11:25,430 --> 00:11:22,959

photometry whether it's light curve

329

00:11:28,389 --> 00:11:25,440

photometry phase function photometry

330

00:11:30,310 --> 00:11:28,399

even uh colors for taxonomy were not

331

00:11:31,509 --> 00:11:30,320

only uh conducted there but were

332

00:11:32,790 --> 00:11:31,519

developed at

333

00:11:34,470 --> 00:11:32,800

lpl

334

00:11:36,150 --> 00:11:34,480

we were the first organization with the

335

00:11:39,030 --> 00:11:36,160

space watch program to discover

336

00:11:40,389 --> 00:11:39,040

asteroids routinely with a ccd camera

337

00:11:42,630 --> 00:11:40,399

before that everything was done with

338

00:11:45,030 --> 00:11:42,640

photographic plates

339

00:11:47,590 --> 00:11:45,040

first place to discover small neos on

340

00:11:49,350 --> 00:11:47,600

the order of 10 meters or smaller

341

00:11:50,870 --> 00:11:49,360

and the catalina sky survey which is

342

00:11:52,870 --> 00:11:50,880

another near earth asteroid survey

343

00:11:54,870 --> 00:11:52,880

similar space watch has basically been

344

00:11:56,790 --> 00:11:54,880

the most effective and productive near

345

00:11:59,509 --> 00:11:56,800

earth asteroids survey of more or less

346

00:12:01,190 --> 00:11:59,519

the past 10 years and in fact the only

347

00:12:03,269 --> 00:12:01,200

asteroid survey that's ever discovered

348

00:12:06,150 --> 00:12:03,279

an asteroid before it hit the earth the

349

00:12:09,590 --> 00:12:06,160

one that 2008 tc3 that hit the sudan

350

00:12:13,590 --> 00:12:11,430

so lpl has been involved in three

351

00:12:15,190 --> 00:12:13,600

projects one project which is currently

352

00:12:17,030 --> 00:12:15,200

being developed right now is a

353

00:12:18,710 --> 00:12:17,040

collaboration between the catalina sky

354

00:12:20,150 --> 00:12:18,720

survey and planetary resources and

355

00:12:21,430 --> 00:12:20,160

that's something crystal wiki will

356

00:12:23,190 --> 00:12:21,440

actually talk about

357

00:12:25,350 --> 00:12:23,200

later on during this session so i'll

358

00:12:27,910 --> 00:12:25,360

concentrate on a past project which is

359

00:12:30,150 --> 00:12:27,920

the space watch fast moving object

360

00:12:32,470 --> 00:12:30,160

program as well as the osiris-rex target

361

00:12:34,389 --> 00:12:32,480

asteroid characterization project

362

00:12:37,670 --> 00:12:34,399

now as i said before space watch was a

363

00:12:39,670 --> 00:12:37,680

group that used ccd cameras to discover

364

00:12:41,030 --> 00:12:39,680

un previously unknown

365

00:12:43,750 --> 00:12:41,040

asteroids whether they were near earth

366

00:12:45,910 --> 00:12:43,760

asteroids whether they were main belt

367

00:12:48,949 --> 00:12:45,920

type of belt objects even comets

368

00:12:50,790 --> 00:12:48,959

it was conducted between 2003 and 2006

369

00:12:53,110 --> 00:12:50,800

it was made possible to grant from the

370

00:12:55,030 --> 00:12:53,120

paul g allen charitable foundation

371

00:12:57,269 --> 00:12:55,040

and really what they were trying to do

372

00:12:59,110 --> 00:12:57,279

is make up for the fact that most of the

373

00:13:00,870 --> 00:12:59,120

current asteroid surveys are very

374

00:13:03,030 --> 00:13:00,880

inefficient at discovering objects that

375

00:13:04,470 --> 00:13:03,040

are moving extremely fast

376

00:13:06,310 --> 00:13:04,480

mostly when you discover asteroids they

377

00:13:08,470 --> 00:13:06,320

just look like stars that move over the

378

00:13:10,230 --> 00:13:08,480

course of half an hour or so but if an

379

00:13:11,750 --> 00:13:10,240

object is extremely close and even

380

00:13:13,509 --> 00:13:11,760

though this is actually a

381

00:13:14,870 --> 00:13:13,519

meteor in this picture

382

00:13:16,230 --> 00:13:14,880

the asteroid will appear as a giant

383

00:13:18,550 --> 00:13:16,240

streak

384

00:13:20,310 --> 00:13:18,560

and the software has always been very

385

00:13:22,470 --> 00:13:20,320

inefficient at detecting those streaks

386

00:13:25,590 --> 00:13:22,480

and also one problem is there's a lot of

387

00:13:26,949 --> 00:13:25,600

man-made artificial debris in orbit so

388

00:13:28,470 --> 00:13:26,959

if you followed all of these streaks

389

00:13:29,670 --> 00:13:28,480

you'd be wasting a lot of your time

390

00:13:31,750 --> 00:13:29,680

following stuff that turned out not to

391

00:13:33,670 --> 00:13:31,760

be an earth asteroid but the thinking

392

00:13:36,230 --> 00:13:33,680

was as they were taking their data if

393

00:13:37,509 --> 00:13:36,240

they made their data available online in

394

00:13:39,750 --> 00:13:37,519

real time

395

00:13:41,509 --> 00:13:39,760

amateurs could log in and could pick up

396

00:13:43,509 --> 00:13:41,519

streaks that would be otherwise missed

397

00:13:44,710 --> 00:13:43,519

by the software

398

00:13:46,629 --> 00:13:44,720

and it turned out to be extremely

399

00:13:48,629 --> 00:13:46,639

successful they had over 300 volunteers

400

00:13:50,150 --> 00:13:48,639

over the lifetime of the program

401
00:13:52,470 --> 00:13:50,160
on an average clear night they had about

402
00:13:54,470 --> 00:13:52,480
35 to 40 people with volunteers would

403
00:13:57,430 --> 00:13:54,480
log in and review images

404
00:13:59,030 --> 00:13:57,440
it produced 43 confirmed discoveries

405
00:14:00,389 --> 00:13:59,040
as well as recoveries of previously

406
00:14:01,750 --> 00:14:00,399
known objects some of them were

407
00:14:04,470 --> 00:14:01,760
artificial satellites and there were a

408
00:14:06,150 --> 00:14:04,480
few that unfortunately got away

409
00:14:08,069 --> 00:14:06,160
and most of the objects they found one

410
00:14:09,670 --> 00:14:08,079
was as big as one kilometer and some

411
00:14:11,430 --> 00:14:09,680
were down to tens of meters and they

412
00:14:13,430 --> 00:14:11,440
moved about two to sixteen degrees per

413
00:14:15,350 --> 00:14:13,440

day and most of them were

414

00:14:16,870 --> 00:14:15,360

faster than eight degrees per day so

415

00:14:20,310 --> 00:14:16,880

we're finding a lot of small fast

416

00:14:23,110 --> 00:14:20,320

objects the software otherwise missed

417

00:14:25,750 --> 00:14:23,120

there were some hard lessons learned

418

00:14:27,750 --> 00:14:25,760

remember this is 2003 2004 is that kit

419

00:14:29,990 --> 00:14:27,760

peak bandwidth was an issue so

420

00:14:31,110 --> 00:14:30,000

unfortunately the volunteers weren't

421

00:14:33,590 --> 00:14:31,120

looking at

422

00:14:35,030 --> 00:14:33,600

the real raw fits data as it came off

423

00:14:37,189 --> 00:14:35,040

the telescope they were looking at

424

00:14:39,430 --> 00:14:37,199

compressed jpeg images if you know

425

00:14:40,949 --> 00:14:39,440

anything about jpeg images they don't do

426

00:14:43,990 --> 00:14:40,959

a great job with

427

00:14:45,509 --> 00:14:44,000

linear features streaks so quite often

428

00:14:47,030 --> 00:14:45,519

you know the amateurs at home would say

429

00:14:49,110 --> 00:14:47,040

hey i got a streak

430

00:14:51,189 --> 00:14:49,120

that the observer knew right away wasn't

431

00:14:52,790 --> 00:14:51,199

this it wasn't an asteroid but the

432

00:14:54,069 --> 00:14:52,800

observer at home had no way of knowing

433

00:14:55,750 --> 00:14:54,079

that

434

00:14:57,670 --> 00:14:55,760

they did have a good mentoring program

435

00:14:59,269 --> 00:14:57,680

with online interactive training that

436

00:15:01,110 --> 00:14:59,279

everyone had to take

437

00:15:03,189 --> 00:15:01,120

but they found with time as more and

438

00:15:05,990 --> 00:15:03,199

more people signed up people just

439

00:15:07,350 --> 00:15:06,000

weren't paying attention to the training

440

00:15:08,790 --> 00:15:07,360

and because there's a lot of things that

441

00:15:10,870 --> 00:15:08,800

mimic streaks in the sky there's

442

00:15:12,550 --> 00:15:10,880

diffraction spikes off stars there's

443

00:15:13,910 --> 00:15:12,560

galaxies there's a lot of other things

444

00:15:15,350 --> 00:15:13,920

going on there

445

00:15:17,350 --> 00:15:15,360

and so it ended up being where they were

446

00:15:19,990 --> 00:15:17,360

getting a thousand false alarms for

447

00:15:22,069 --> 00:15:20,000

every real detection

448

00:15:24,550 --> 00:15:22,079

and unlike most crowd sourcing like the

449

00:15:25,829 --> 00:15:24,560

z universe that jen mentioned where you

450

00:15:27,990 --> 00:15:25,839

could have people log in look at the

451
00:15:29,910 --> 00:15:28,000
same galaxy and over the course of weeks

452
00:15:31,269 --> 00:15:29,920
or months the signal and noise will rise

453
00:15:33,350 --> 00:15:31,279
up and you go yes that's definitely

454
00:15:35,670 --> 00:15:33,360
elliptical galaxy

455
00:15:37,670 --> 00:15:35,680
these objects you had they basically had

456
00:15:39,030 --> 00:15:37,680
to be discovered in real time you

457
00:15:40,389 --> 00:15:39,040
couldn't wait

458
00:15:41,829 --> 00:15:40,399
a week you couldn't even wait a day

459
00:15:44,310 --> 00:15:41,839
because the object so close to the earth

460
00:15:45,749 --> 00:15:44,320
it zoomed past and would be lost forever

461
00:15:47,110 --> 00:15:45,759
shouldn't say forever but lost for a

462
00:15:49,509 --> 00:15:47,120
long time

463
00:15:51,030 --> 00:15:49,519

and so you had to react to every object

464

00:15:52,790 --> 00:15:51,040

that was being flagged and when you have

465

00:15:54,470 --> 00:15:52,800

a thousand false detections going back

466

00:15:55,990 --> 00:15:54,480

to the observer who's at the telescope

467

00:15:57,829 --> 00:15:56,000

who has to now keep up with this stuff

468

00:15:59,350 --> 00:15:57,839

it became a really burdensome and after

469

00:16:00,870 --> 00:15:59,360

a while it ultimately required three

470

00:16:02,949 --> 00:16:00,880

full-time people working eight hours a

471

00:16:04,790 --> 00:16:02,959

day on the program and the project kind

472

00:16:07,269 --> 00:16:04,800

of collapsed under its own weight

473

00:16:09,110 --> 00:16:07,279

so actual discovery especially a very

474

00:16:11,269 --> 00:16:09,120

close small object especially the ones

475

00:16:13,350 --> 00:16:11,279

that arm is interested in

476
00:16:15,189 --> 00:16:13,360
you can't really crowd source

477
00:16:16,710 --> 00:16:15,199
you can citizen science it but you can't

478
00:16:18,389 --> 00:16:16,720
crowdsource which means stuff has to be

479
00:16:20,310 --> 00:16:18,399
done in near real time

480
00:16:23,990 --> 00:16:20,320
and you have to find a way to get that

481
00:16:28,069 --> 00:16:25,829
now the project i'm currently involved

482
00:16:29,749 --> 00:16:28,079
in at the osiris-rex mission which by

483
00:16:31,509 --> 00:16:29,759
the way is a nasa funded new frontiers

484
00:16:33,829 --> 00:16:31,519
mission run out of the university of

485
00:16:35,990 --> 00:16:33,839
arizona with significant with also with

486
00:16:37,269 --> 00:16:36,000
a lockheed martin and goddard space

487
00:16:39,910 --> 00:16:37,279
flight center as well as significant

488
00:16:41,910 --> 00:16:39,920

contributions from canada and other

489

00:16:44,150 --> 00:16:41,920

scientists around the world will launch

490

00:16:46,870 --> 00:16:44,160

in 2016 go to a near earth asteroid

491

00:16:49,030 --> 00:16:46,880

named bennu around the 2018-2020 time

492

00:16:51,990 --> 00:16:49,040

frame pick up samples from the surface

493

00:16:54,389 --> 00:16:52,000

and return them back to earth in 2023

494

00:16:57,269 --> 00:16:54,399

and one thing we wanted to do was find

495

00:16:58,949 --> 00:16:57,279

out how could the average amateur help

496

00:17:01,030 --> 00:16:58,959

increase our knowledge of the near earth

497

00:17:02,470 --> 00:17:01,040

asteroid population and in particular

498

00:17:04,870 --> 00:17:02,480

those objects

499

00:17:07,429 --> 00:17:04,880

that are good destinations for future

500

00:17:09,990 --> 00:17:07,439

robotic or human missions basically

501
00:17:11,350 --> 00:17:10,000
objects are in orbit similar to earth

502
00:17:13,189 --> 00:17:11,360
now yeah if we all had an eight meter

503
00:17:15,669 --> 00:17:13,199
telescope in our backyard

504
00:17:17,189 --> 00:17:15,679
with a spectrograph and a ccd and

505
00:17:18,470 --> 00:17:17,199
thermal imaging camera we could learn

506
00:17:20,390 --> 00:17:18,480
all we wanted to learn about these

507
00:17:21,829 --> 00:17:20,400
objects but unfortunately it's hard to

508
00:17:23,590 --> 00:17:21,839
get time on those big telescopes they're

509
00:17:25,110 --> 00:17:23,600
far and few between and

510
00:17:26,710 --> 00:17:25,120
surprise surprise

511
00:17:29,750 --> 00:17:26,720
most astronomers don't care about

512
00:17:31,190 --> 00:17:29,760
asteroids only a select few do

513
00:17:33,669 --> 00:17:31,200

so the thinking was how could the

514

00:17:36,390 --> 00:17:33,679

average amateur say with a c8 in their

515

00:17:39,029 --> 00:17:36,400

backyard and a reasonably inexpensive

516

00:17:40,390 --> 00:17:39,039

ccd camera how could they tell us more

517

00:17:41,830 --> 00:17:40,400

about these objects that we could

518

00:17:44,070 --> 00:17:41,840

otherwise learn

519

00:17:46,070 --> 00:17:44,080

with the larger telescopes

520

00:17:47,430 --> 00:17:46,080

and it turns out there is one thing you

521

00:17:49,350 --> 00:17:47,440

can do

522

00:17:51,430 --> 00:17:49,360

and that is observe the asteroid do

523

00:17:55,029 --> 00:17:51,440

photometry at what we call different

524

00:17:57,990 --> 00:17:55,039

phase angles now phase angle is the sun

525

00:18:00,070 --> 00:17:58,000

asteroid observer angle okay

526

00:18:01,669 --> 00:18:00,080

if you think of the moon zero degrees

527

00:18:03,830 --> 00:18:01,679

phase angles full moon you're seeing the

528

00:18:06,470 --> 00:18:03,840

entire face illuminated 90 degrees is

529

00:18:08,070 --> 00:18:06,480

half moon 180 degrees is new moon

530

00:18:09,830 --> 00:18:08,080

basically

531

00:18:11,510 --> 00:18:09,840

and you get a slope and this is actual

532

00:18:13,270 --> 00:18:11,520

data taken with the target asteroids

533

00:18:16,230 --> 00:18:13,280

project most of this is from patrick

534

00:18:18,549 --> 00:18:16,240

wiggins who's an amateur nasa ambassador

535

00:18:20,789 --> 00:18:18,559

up in the utah area

536

00:18:22,470 --> 00:18:20,799

and the slope of this line is directly

537

00:18:24,310 --> 00:18:22,480

correlated with the albedo of the

538

00:18:26,150 --> 00:18:24,320

asteroid

539

00:18:27,270 --> 00:18:26,160

so by having this slope you have the

540

00:18:29,190 --> 00:18:27,280

albedo

541

00:18:30,710 --> 00:18:29,200

if you fit a model function you get the

542

00:18:32,549 --> 00:18:30,720

absolute magnitude which is how bright

543

00:18:35,190 --> 00:18:32,559

the asteroid would be at 0 degrees phase

544

00:18:36,870 --> 00:18:35,200

angle and 1au from the earth and sun so

545

00:18:38,549 --> 00:18:36,880

you normalize it

546

00:18:40,070 --> 00:18:38,559

these two parameters together you get

547

00:18:41,990 --> 00:18:40,080

the size

548

00:18:44,789 --> 00:18:42,000

if you observe in different colors like

549

00:18:47,270 --> 00:18:44,799

the traditional bvri or the new sloan

550

00:18:48,870 --> 00:18:47,280

filters that astronomers use nowadays

551

00:18:50,710 --> 00:18:48,880

you get the color of the object and

552

00:18:52,630 --> 00:18:50,720

that's a direct i shouldn't say direct

553

00:18:53,990 --> 00:18:52,640

but a pretty good correlation between

554

00:18:56,390 --> 00:18:54,000

the colors of the object and its

555

00:18:57,990 --> 00:18:56,400

taxonomy whether it's carbonaceous

556

00:19:01,430 --> 00:18:58,000

whether it's a piece of vesta whether

557

00:19:02,789 --> 00:19:01,440

it's an ordinary quadratic material

558

00:19:04,870 --> 00:19:02,799

and the nice thing about this is you

559

00:19:06,870 --> 00:19:04,880

don't need high precision photometry

560

00:19:08,549 --> 00:19:06,880

which you do need for say light curves

561

00:19:10,150 --> 00:19:08,559

where you probably need

562

00:19:13,190 --> 00:19:10,160

a couple percent photometry to really

563

00:19:14,950 --> 00:19:13,200

get a good light curve here 10 20 30 40

564

00:19:16,789 --> 00:19:14,960

percent as long as enough people are

565

00:19:18,950 --> 00:19:16,799

observing over enough phase angles you

566

00:19:20,549 --> 00:19:18,960

can beat down the noise so you really

567

00:19:22,710 --> 00:19:20,559

can't differentiate between dark

568

00:19:25,350 --> 00:19:22,720

asteroids and light asteroids what their

569

00:19:27,190 --> 00:19:25,360

sizes are and what their taxonomic

570

00:19:28,630 --> 00:19:27,200

compositions are

571

00:19:30,230 --> 00:19:28,640

and for light curves if they get bright

572

00:19:31,830 --> 00:19:30,240

enough we ask people to do light curves

573

00:19:33,430 --> 00:19:31,840

and of course i help out by going to the

574

00:19:35,669 --> 00:19:33,440

bigger telescopes and kind of fill in

575

00:19:37,190 --> 00:19:35,679

the gaps when the object's too faint or

576

00:19:38,470 --> 00:19:37,200

get you know spectroscopy and stuff like

577

00:19:40,710 --> 00:19:38,480

that so it really is a collaborative

578

00:19:42,549 --> 00:19:40,720

effort

579

00:19:45,350 --> 00:19:42,559

now some of the lessons learned first

580

00:19:46,549 --> 00:19:45,360

one get the word out advertise advertise

581

00:19:48,150 --> 00:19:46,559

advertise

582

00:19:49,830 --> 00:19:48,160

i mean basically there's a market out

583

00:19:51,029 --> 00:19:49,840

there and they're amateur astronomers

584

00:19:54,630 --> 00:19:51,039

who have

585

00:19:56,390 --> 00:19:54,640

telescopes with ccDs and they're just

586

00:19:58,390 --> 00:19:56,400

looking for something to do

587

00:20:00,390 --> 00:19:58,400

so go out to the astronomy magazines go

588

00:20:03,510 --> 00:20:00,400

to the astronomers astrology uh

589

00:20:05,350 --> 00:20:03,520

astronomy societies and advertise

590

00:20:06,789 --> 00:20:05,360

make strong partnerships

591

00:20:07,990 --> 00:20:06,799

and we have partnerships with a bunch of

592

00:20:09,190 --> 00:20:08,000

different groups so i'll provide

593

00:20:11,110 --> 00:20:09,200

services

594

00:20:13,029 --> 00:20:11,120

an important one is peter lake here who

595

00:20:14,630 --> 00:20:13,039

works for itelescope.net

596

00:20:16,710 --> 00:20:14,640

peter lake got uh

597

00:20:19,909 --> 00:20:16,720

interested in citizen science because he

598

00:20:21,110 --> 00:20:19,919

was part of the space watch fmo program

599

00:20:23,710 --> 00:20:21,120

it inspired him to go out and buy a

600

00:20:25,750 --> 00:20:23,720

telescope which he then made part of the

601
00:20:27,750 --> 00:20:25,760
itelscope.net network

602
00:20:29,270 --> 00:20:27,760
and is now doing target asteroids stuff

603
00:20:30,549 --> 00:20:29,280
and has actually been working classrooms

604
00:20:32,390 --> 00:20:30,559
with students from australia and i've

605
00:20:35,990 --> 00:20:32,400
had multiple times where i've actually

606
00:20:39,830 --> 00:20:37,909
neo character rate characterization

607
00:20:42,789 --> 00:20:39,840
requires a worldwide solution we have

608
00:20:45,110 --> 00:20:42,799
184 partners from 28 american states and

609
00:20:46,789 --> 00:20:45,120
30 countries but all around the world

610
00:20:48,789 --> 00:20:46,799
but you notice there are some regions

611
00:20:50,950 --> 00:20:48,799
that are lacking and a lot of this i

612
00:20:52,630 --> 00:20:50,960
believe is a language barrier

613
00:20:54,870 --> 00:20:52,640

you know we do a really good job of

614

00:20:56,470 --> 00:20:54,880

producing english material

615

00:20:57,590 --> 00:20:56,480

pretty good job at producing spanish

616

00:20:59,590 --> 00:20:57,600

material

617

00:21:01,669 --> 00:20:59,600

but there's a lot of observers in russia

618

00:21:04,070 --> 00:21:01,679

china of course is up and coming japan

619

00:21:05,909 --> 00:21:04,080

has always had astronomers but a lot of

620

00:21:08,710 --> 00:21:05,919

them actually don't cross into the

621

00:21:09,909 --> 00:21:08,720

english speaking astronomy societies

622

00:21:11,350 --> 00:21:09,919

they have their own and that's some

623

00:21:13,110 --> 00:21:11,360

place we need to go to

624

00:21:14,950 --> 00:21:13,120

the middle east is developing a vibrant

625

00:21:17,110 --> 00:21:14,960

middle class there's amateurs now coming

626

00:21:18,390 --> 00:21:17,120

out of egypt and turkey and iran so

627

00:21:20,789 --> 00:21:18,400

arabic is starting to become an

628

00:21:25,830 --> 00:21:20,799

important language so we need to start

629

00:21:29,430 --> 00:21:27,750

so to make citizen science more

630

00:21:30,630 --> 00:21:29,440

productive based on our experience of

631

00:21:33,029 --> 00:21:30,640

courses

632

00:21:35,669 --> 00:21:33,039

material non-english languages

633

00:21:38,390 --> 00:21:35,679

produce an online gui where amateurs can

634

00:21:40,470 --> 00:21:38,400

upload their data directly and that gui

635

00:21:42,710 --> 00:21:40,480

can then reduce their data producing

636

00:21:44,470 --> 00:21:42,720

photometry and astrometry in a rigorous

637

00:21:46,390 --> 00:21:44,480

standardized way and then that data

638

00:21:48,870 --> 00:21:46,400

could be fed to programs like us or the

639

00:21:50,390 --> 00:21:48,880

minor planet center

640

00:21:52,070 --> 00:21:50,400

of course work with as many

641

00:21:55,830 --> 00:21:52,080

non-for-profit and non-profit

642

00:22:00,710 --> 00:21:58,070

convince non-asteroid astronomers to try

643

00:22:02,470 --> 00:22:00,720

something different like asteroids

644

00:22:05,029 --> 00:22:02,480

and even though we kind of get this idea

645

00:22:07,830 --> 00:22:05,039

that citizen science is free because the

646

00:22:10,789 --> 00:22:07,840

data is coming free the analysis isn't

647

00:22:13,510 --> 00:22:10,799

you still have a lot of you know person

648

00:22:15,190 --> 00:22:13,520

hours reducing the data

649

00:22:16,870 --> 00:22:15,200

and so we found we need a lot of

650

00:22:18,789 --> 00:22:16,880

different specialties are critical for

651
00:22:20,310 --> 00:22:18,799
success where we need a manager we need

652
00:22:22,470 --> 00:22:20,320
a scientist to handle stuff and then we

653
00:22:24,149 --> 00:22:22,480
need the data reducers so it isn't

654
00:22:25,990 --> 00:22:24,159
necessarily free

655
00:22:27,830 --> 00:22:26,000
and of course citizen science organized

656
00:22:30,070 --> 00:22:27,840
citizen science is not new it's been

657
00:22:32,310 --> 00:22:30,080
going on for over 100 years especially

658
00:22:33,750 --> 00:22:32,320
groups like the you know american

659
00:22:35,750 --> 00:22:33,760
the association of american variable

660
00:22:37,990 --> 00:22:35,760
star observers british astronomical

661
00:22:39,350 --> 00:22:38,000
society so there's a lot of experience

662
00:22:41,750 --> 00:22:39,360
and knowledge out there and we just need

663
00:22:48,230 --> 00:22:41,760

to talk to them

664

00:22:52,630 --> 00:22:50,950

questions from the room go ahead

665

00:22:53,909 --> 00:22:52,640

and we have microphones so since we

666

00:22:55,110 --> 00:22:53,919

don't have a microphone runner we're

667

00:22:56,310 --> 00:22:55,120

going to ask you guys actually in room

668

00:22:57,669 --> 00:22:56,320

to get up and go to a microphone if you

669

00:22:59,909 --> 00:22:57,679

have a question

670

00:23:01,750 --> 00:22:59,919

sorry about that

671

00:23:02,950 --> 00:23:01,760

but for the ustream so everyone else can

672

00:23:05,110 --> 00:23:02,960

hear your voice

673

00:23:06,870 --> 00:23:05,120

the world is waiting

674

00:23:08,789 --> 00:23:06,880

i was just wondering now who is paying

675

00:23:11,029 --> 00:23:08,799

for you said you have to have the staff

676
00:23:13,510 --> 00:23:11,039
you have to have a manager

677
00:23:14,870 --> 00:23:13,520
who is paying for all that in this well

678
00:23:17,029 --> 00:23:14,880
this project it's run out of the

679
00:23:19,430 --> 00:23:17,039
osiris-rex program and it was run out of

680
00:23:20,870 --> 00:23:19,440
our education and public outreach which

681
00:23:23,190 --> 00:23:20,880
is now communications and public

682
00:23:23,990 --> 00:23:23,200
engagement program

683
00:23:25,669 --> 00:23:24,000
but

684
00:23:27,990 --> 00:23:25,679
to be honest it's a lot of volunteer

685
00:23:30,390 --> 00:23:28,000
time on our that we're doing as a

686
00:23:32,230 --> 00:23:30,400
scientist and dolores hill who's working

687
00:23:34,070 --> 00:23:32,240
from the education side so it's

688
00:23:35,990 --> 00:23:34,080

university of arizona

689

00:23:37,830 --> 00:23:36,000

has decided that this is important and

690

00:23:40,549 --> 00:23:37,840

that they're

691

00:23:43,190 --> 00:23:40,559

they're supplying the funds for the

692

00:23:45,029 --> 00:23:43,200

the group to manage this activity yes i

693

00:23:46,630 --> 00:23:45,039

agree

694

00:23:48,070 --> 00:23:46,640

but there are things that unfortunately

695

00:23:50,870 --> 00:23:48,080

we don't have support for like the

696

00:23:52,310 --> 00:23:50,880

upgrades like producing online guise and

697

00:23:54,310 --> 00:23:52,320

stuff which is something that the double

698

00:23:56,470 --> 00:23:54,320

abso does where you can upload you shoot

699

00:23:58,149 --> 00:23:56,480

a variable star you upload your data it

700

00:23:59,510 --> 00:23:58,159

finds which stars are which it tells you

701
00:24:01,110 --> 00:23:59,520
where the variable star is and it does

702
00:24:03,269 --> 00:24:01,120
the photometry for you i mean there's a

703
00:24:04,549 --> 00:24:03,279
little bit of manual interface there but

704
00:24:06,070 --> 00:24:04,559
that's something we would really like

705
00:24:09,430 --> 00:24:06,080
for astronomers and photometry of

706
00:24:13,510 --> 00:24:11,029
other questions do we have any questions

707
00:24:16,390 --> 00:24:13,520
from social media

708
00:24:18,710 --> 00:24:16,400
i have not seen any questions come in on

709
00:24:21,029 --> 00:24:18,720
twitter or streaming okay well i have um

710
00:24:23,909 --> 00:24:21,039
one girl where other folks are thinking

711
00:24:26,230 --> 00:24:23,919
so if today you are redoing um

712
00:24:28,230 --> 00:24:26,240
spacewatch what what type of formats

713
00:24:30,470 --> 00:24:28,240

file formats would be easier for

714

00:24:31,909 --> 00:24:30,480

folks to actually not jpeg for folks to

715

00:24:33,029 --> 00:24:31,919

actually be able to do the work that

716

00:24:34,230 --> 00:24:33,039

you're asking them to do how would you

717

00:24:35,510 --> 00:24:34,240

do it today

718

00:24:38,390 --> 00:24:35,520

today i would actually just give them

719

00:24:40,470 --> 00:24:38,400

access to the raw fits images

720

00:24:41,430 --> 00:24:40,480

nowadays i mean fits browsers are pretty

721

00:24:43,669 --> 00:24:41,440

common

722

00:24:45,269 --> 00:24:43,679

um you know you just and you just give

723

00:24:46,789 --> 00:24:45,279

them the data and let them blink

724

00:24:49,590 --> 00:24:46,799

basically let them use the tools we're

725

00:24:50,789 --> 00:24:49,600

using of course you can simplify it but

726

00:24:52,390 --> 00:24:50,799

basically let them use the tools we're

727

00:24:54,950 --> 00:24:52,400

using

728

00:24:57,110 --> 00:24:54,960

so i'll question you okay go ahead um so

729

00:24:59,669 --> 00:24:57,120

a question came in from ustream any

730

00:25:01,110 --> 00:24:59,679

plans for a training program

731

00:25:02,390 --> 00:25:01,120

yes

732

00:25:05,669 --> 00:25:02,400

in fact

733

00:25:07,350 --> 00:25:05,679

one of the groups if i go back

734

00:25:09,990 --> 00:25:07,360

one of our partners isaac which is the

735

00:25:11,909 --> 00:25:10,000

international astronomy

736

00:25:13,830 --> 00:25:11,919

search collaboration

737

00:25:15,190 --> 00:25:13,840

we actually run a program with them

738

00:25:16,710 --> 00:25:15,200

where right now it's an asteroid

739

00:25:18,390 --> 00:25:16,720

discovery program

740

00:25:20,470 --> 00:25:18,400

where we advertise it in some of the

741

00:25:21,830 --> 00:25:20,480

local some of the astronomy magazines

742

00:25:23,669 --> 00:25:21,840

and some of the astronomy societies and

743

00:25:25,510 --> 00:25:23,679

got 40 people to sign up where they

744

00:25:26,710 --> 00:25:25,520

actually were taught how to discover

745

00:25:28,390 --> 00:25:26,720

asteroids

746

00:25:31,430 --> 00:25:28,400

on data that was taken with a one meter

747

00:25:33,510 --> 00:25:31,440

telescope and the plan is to expand that

748

00:25:35,190 --> 00:25:33,520

to where we'll get data that's taken of

749

00:25:36,390 --> 00:25:35,200

our you know particular near earth

750

00:25:38,789 --> 00:25:36,400

asteroids that require physical

751

00:25:40,630 --> 00:25:38,799

observations and give people not only

752

00:25:42,070 --> 00:25:40,640

the tools and the software but also the

753

00:25:43,750 --> 00:25:42,080

training and how to actually reduce

754

00:25:45,110 --> 00:25:43,760

their own data

755

00:25:46,870 --> 00:25:45,120

and of course if you join the target

756

00:25:49,590 --> 00:25:46,880

asteroid program

757

00:25:53,909 --> 00:25:51,110

right here

758

00:25:55,110 --> 00:25:53,919

we will mentor you

759

00:25:56,950 --> 00:25:55,120

we have no problem helping i mean we

760

00:25:58,470 --> 00:25:56,960

know most people you know this is their

761

00:26:01,830 --> 00:25:58,480

first time and we all have to learn at

762

00:26:05,110 --> 00:26:01,840

some point so we have no problem helping

763

00:26:07,029 --> 00:26:05,120

a follow-up question uh real quickly

764

00:26:21,269 --> 00:26:07,039

the

765

00:26:23,510 --> 00:26:21,279

joining late

766

00:26:24,950 --> 00:26:23,520

didn't seem to follow the training got

767

00:26:26,390 --> 00:26:24,960

it for some reason i don't know if it's

768

00:26:27,990 --> 00:26:26,400

because the really interested people

769

00:26:30,230 --> 00:26:28,000

joined up first and then there was a

770

00:26:32,390 --> 00:26:30,240

different subset of people joining up

771

00:26:35,669 --> 00:26:32,400

later or they saw discoveries being made

772

00:26:37,750 --> 00:26:35,679

so they jumped in so is there a way to

773

00:26:39,350 --> 00:26:37,760

pull that apart and as you're talking

774

00:26:41,510 --> 00:26:39,360

about adding training or making it

775

00:26:43,269 --> 00:26:41,520

available so that that doesn't get

776

00:26:45,110 --> 00:26:43,279

repeated or to

777

00:26:46,950 --> 00:26:45,120

prevent that from happening again i mean

778

00:26:48,630 --> 00:26:46,960

one thing you might have to do is

779

00:26:50,390 --> 00:26:48,640

have a test

780

00:26:52,310 --> 00:26:50,400

where you throw up stuff and you go okay

781

00:26:53,750 --> 00:26:52,320

here's 20 objects which ones are the

782

00:26:56,149 --> 00:26:53,760

real options you know which one are the

783

00:26:58,070 --> 00:26:56,159

real asteroids and the ones who pass

784

00:27:01,269 --> 00:26:58,080

move on and the ones that don't practice

785

00:27:04,870 --> 00:27:03,269

turk approach so amazon does that and

786

00:27:06,070 --> 00:27:04,880

we'll take two more questions steve and

787

00:27:06,950 --> 00:27:06,080

then we'll take a second question from

788

00:27:08,390 --> 00:27:06,960

the room and then we'll move on to the

789

00:27:10,230 --> 00:27:08,400

next piece and at the end we'll have

790

00:27:12,390 --> 00:27:10,240

discussion at the end if you guys want

791

00:27:13,830 --> 00:27:12,400

to um put those questions down we can

792

00:27:15,510 --> 00:27:13,840

make sure to have that conversation but

793

00:27:17,110 --> 00:27:15,520

the talk that krista wiki is giving

794

00:27:18,470 --> 00:27:17,120

later on in the session will actually

795

00:27:19,990 --> 00:27:18,480

address

796

00:27:22,310 --> 00:27:20,000

basically looking at the same problem

797

00:27:24,870 --> 00:27:22,320

the space watch had using crowdsourcing

798

00:27:27,430 --> 00:27:24,880

from a different angle

799

00:27:30,470 --> 00:27:27,440

yeah i just wanted to extend on the what

800

00:27:32,310 --> 00:27:30,480

worked and didn't work uh

801
00:27:33,830 --> 00:27:32,320
is there any sort of curation of the

802
00:27:35,990 --> 00:27:33,840
community that you're doing right like

803
00:27:37,510 --> 00:27:36,000
do you run little sprints for

804
00:27:39,190 --> 00:27:37,520
for you know tonight we're doing a

805
00:27:41,269 --> 00:27:39,200
contest to see who can

806
00:27:42,549 --> 00:27:41,279
find the most or

807
00:27:44,149 --> 00:27:42,559
there's a lot in the model of

808
00:27:47,110 --> 00:27:44,159
crowdsourcing that seems

809
00:27:49,510 --> 00:27:47,120
that we can apply to this to really a

810
00:27:51,510 --> 00:27:49,520
increase your crowd from tens to

811
00:27:53,350 --> 00:27:51,520
hundreds and thousands and

812
00:27:55,110 --> 00:27:53,360
two to increase the training right

813
00:27:56,950 --> 00:27:55,120

there's just some best practices i think

814

00:27:58,310 --> 00:27:56,960

in community curation that could start

815

00:27:59,350 --> 00:27:58,320

to happen in some of these various

816

00:28:00,710 --> 00:27:59,360

communities

817

00:28:02,549 --> 00:28:00,720

yeah and that's kind of what's going on

818

00:28:04,149 --> 00:28:02,559

when isaac's running their campaigns

819

00:28:05,830 --> 00:28:04,159

their discovery campaigns they break

820

00:28:07,909 --> 00:28:05,840

everyone up into uh

821

00:28:09,669 --> 00:28:07,919

three-person groups right and though

822

00:28:11,590 --> 00:28:09,679

there's no money being won they kind of

823

00:28:14,070 --> 00:28:11,600

compete against each other sure and

824

00:28:17,269 --> 00:28:14,080

there's a lot that's about

825

00:28:19,510 --> 00:28:17,279

prize levels or or even just uh

826

00:28:21,029 --> 00:28:19,520

little metals and whatnot that you get

827

00:28:23,269 --> 00:28:21,039

that that are being used in a lot of

828

00:28:25,269 --> 00:28:23,279

other communities that might be a nice

829

00:28:27,750 --> 00:28:25,279

model but the thing that really helps is

830

00:28:29,430 --> 00:28:27,760

just interacting with the volunteers i

831

00:28:30,789 --> 00:28:29,440

mean let them know their data is

832

00:28:32,630 --> 00:28:30,799

appreciated

833

00:28:34,070 --> 00:28:32,640

tell them you know what to observe

834

00:28:35,669 --> 00:28:34,080

tell them that their data was good which

835

00:28:37,430 --> 00:28:35,679

it usually is and if it's not you tell

836

00:28:39,029 --> 00:28:37,440

them how to improve it but

837

00:28:43,909 --> 00:28:39,039

basically let them know their data is

838

00:28:48,950 --> 00:28:45,350

i know um

839

00:28:51,430 --> 00:28:48,960

see some hackers use online gaming to

840

00:28:54,149 --> 00:28:51,440

try and get around the to teach their

841

00:28:55,990 --> 00:28:54,159

ais how to get around security protocols

842

00:28:58,870 --> 00:28:56,000

because is it possible to use a similar

843

00:29:00,710 --> 00:28:58,880

tactic to teach the ais how to better uh

844

00:29:01,990 --> 00:29:00,720

better recognize the faster moving

845

00:29:03,350 --> 00:29:02,000

objects

846

00:29:05,029 --> 00:29:03,360

yes

847

00:29:06,470 --> 00:29:05,039

and in fact i think crystal wiki's stuff

848

00:29:07,830 --> 00:29:06,480

will go into a little more detail on the

849

00:29:08,950 --> 00:29:07,840

project that is a little more along

850

00:29:09,830 --> 00:29:08,960

those lines

851
00:29:15,830 --> 00:29:09,840
right

852
00:29:19,909 --> 00:29:18,149
and we should have tim on the phone tim

853
00:29:21,029 --> 00:29:19,919
can you hear us

854
00:29:21,909 --> 00:29:21,039
i can hear you

855
00:29:24,230 --> 00:29:21,919
about me

856
00:29:25,750 --> 00:29:24,240
yeah you're a little muffled um so if

857
00:29:28,310 --> 00:29:25,760
you're on speakerphone take yourself off

858
00:29:30,389 --> 00:29:28,320
a speakerphone but we can hear you

859
00:29:31,909 --> 00:29:30,399
all right

860
00:29:34,070 --> 00:29:31,919
how's that

861
00:29:36,149 --> 00:29:34,080
it's great all right so we're gonna just

862
00:29:38,710 --> 00:29:36,159
go ahead and put up your um uh

863
00:29:41,909 --> 00:29:38,720

presentation we can see you now

864

00:29:43,750 --> 00:29:41,919

you can go ahead and get started tim

865

00:29:45,909 --> 00:29:43,760

all right well the working on

866

00:29:50,470 --> 00:29:45,919

i'm not saying it's a way to change the

867

00:29:57,750 --> 00:29:50,480

slides here let's take that move here

868

00:30:01,590 --> 00:29:59,350

survey telescope

869

00:30:03,990 --> 00:30:01,600

and i'm going to be sketching an idea

870

00:30:06,149 --> 00:30:04,000

with actually very similar goals to the

871

00:30:07,190 --> 00:30:06,159

project that you just heard about from

872

00:30:09,590 --> 00:30:07,200

carl

873

00:30:12,950 --> 00:30:09,600

but as you'll see it's uh it's

874

00:30:13,830 --> 00:30:12,960

considerably further in the future

875

00:30:17,029 --> 00:30:13,840

so

876

00:30:19,350 --> 00:30:17,039

i want to begin with a quick overview of

877

00:30:20,389 --> 00:30:19,360

lsst itself

878

00:30:23,190 --> 00:30:20,399

um

879

00:30:25,510 --> 00:30:23,200

it is a large synoptic survey telescope

880

00:30:29,269 --> 00:30:25,520

it's going to be based in chile

881

00:30:30,470 --> 00:30:29,279

and the notion is that it's a telescope

882

00:30:38,870 --> 00:30:30,480

which

883

00:30:40,950 --> 00:30:38,880

it scans the entire visible sky

884

00:30:43,750 --> 00:30:40,960

every night that it can

885

00:30:45,750 --> 00:30:43,760

so the telescope

886

00:30:48,950 --> 00:30:45,760

as you'll see here

887

00:30:50,470 --> 00:30:48,960

it's pretty big it's got an 8.4 meter

888

00:30:52,630 --> 00:30:50,480

primary

889

00:30:53,669 --> 00:30:52,640

the thing that's unusual about it is

890

00:30:55,510 --> 00:30:53,679

that

891

00:30:58,070 --> 00:30:55,520

in conjunction with this very large

892

00:31:00,070 --> 00:30:58,080

primary it also has a huge field of view

893

00:31:01,430 --> 00:31:00,080

for a telescope like this so three and a

894

00:31:03,350 --> 00:31:01,440

half degrees

895

00:31:05,269 --> 00:31:03,360

diameter

896

00:31:09,029 --> 00:31:05,279

and this it has a single instrument

897

00:31:12,389 --> 00:31:09,039

which is a 3.2 billion pixel camera

898

00:31:13,509 --> 00:31:12,399

and it takes images very fast it takes

899

00:31:16,230 --> 00:31:13,519

um

900

00:31:18,710 --> 00:31:16,240

pairs of 15 second exposures as quickly

901
00:31:21,990 --> 00:31:18,720
as it can which means that

902
00:31:24,389 --> 00:31:22,000
it moves on to the next field about

903
00:31:27,430 --> 00:31:24,399
every 40 seconds

904
00:31:30,310 --> 00:31:27,440
and it comes back and

905
00:31:32,630 --> 00:31:30,320
covers the same bit of sky

906
00:31:35,590 --> 00:31:32,640
sort of every couple of nights

907
00:31:36,870 --> 00:31:35,600
so it just operates this way it scans

908
00:31:40,789 --> 00:31:36,880
the sky

909
00:31:43,110 --> 00:31:40,799
continuously eventually for 10 years

910
00:31:44,630 --> 00:31:43,120
so part of the project which you'll as

911
00:31:47,509 --> 00:31:44,640
you'll see

912
00:31:49,590 --> 00:31:47,519
in a few minutes is that

913
00:31:51,909 --> 00:31:49,600

it processes the data

914

00:31:53,190 --> 00:31:51,919

and serves it both the scientists and

915

00:31:57,269 --> 00:31:53,200

the public

916

00:32:01,430 --> 00:31:57,279

and the data that it produces um covers

917

00:32:07,350 --> 00:32:05,350

it sends out alerts on

918

00:32:09,350 --> 00:32:07,360

events we'll call them which means

919

00:32:10,950 --> 00:32:09,360

essentially anything that changes on the

920

00:32:14,070 --> 00:32:10,960

sky this could be

921

00:32:16,470 --> 00:32:14,080

a variable star changing in magnitude it

922

00:32:19,190 --> 00:32:16,480

could be the appearance of an asteroid

923

00:32:21,590 --> 00:32:19,200

and a field that we don't know about

924

00:32:23,269 --> 00:32:21,600

it could be a supernova many other

925

00:32:25,590 --> 00:32:23,279

things so it sends these out with very

926
00:32:27,430 --> 00:32:25,600
short latency for

927
00:32:29,509 --> 00:32:27,440
purposes of follow-up

928
00:32:31,669 --> 00:32:29,519
so within 60 seconds of something like

929
00:32:33,909 --> 00:32:31,679
this being detected it stands out as a

930
00:32:35,590 --> 00:32:33,919
vo event and goes out over there over

931
00:32:38,710 --> 00:32:35,600
the network

932
00:32:42,389 --> 00:32:38,720
and then there is a very extensive

933
00:32:44,549 --> 00:32:42,399
database catalog of all the objects

934
00:32:47,509 --> 00:32:44,559
that it finds on the skies and what

935
00:32:50,389 --> 00:32:47,519
their properties are so they've seen

936
00:32:52,230 --> 00:32:50,399
magnitude shapes in the case of galaxies

937
00:32:54,870 --> 00:32:52,240
light curves

938
00:32:57,990 --> 00:32:54,880

um and then of course there are the

939

00:33:02,230 --> 00:32:59,750

so one thing about

940

00:33:04,470 --> 00:33:02,240

the lfst is that education and public

941

00:33:06,310 --> 00:33:04,480

outreach epo is an integral part of the

942

00:33:07,669 --> 00:33:06,320

project so it has been from the

943

00:33:09,430 --> 00:33:07,679

beginning

944

00:33:11,830 --> 00:33:09,440

and

945

00:33:15,590 --> 00:33:11,840

so my role in the project at this point

946

00:33:19,269 --> 00:33:15,600

is to be the kind of science guide for

947

00:33:21,110 --> 00:33:19,279

uh what epo is is going to do

948

00:33:24,310 --> 00:33:21,120

so the office key

949

00:33:26,310 --> 00:33:24,320

is we hope just on the threshold of

950

00:33:29,029 --> 00:33:26,320

beginning construction it's in this

951

00:33:31,350 --> 00:33:29,039

year's uh president's budget

952

00:33:34,470 --> 00:33:31,360

we all know that that's a bit short of a

953

00:33:36,310 --> 00:33:34,480

guarantee of beginning construction but

954

00:33:39,830 --> 00:33:36,320

there you go

955

00:33:43,269 --> 00:33:39,840

so if things go as we hope they will

956

00:33:46,070 --> 00:33:43,279

science operations will begin in 2022 so

957

00:33:52,230 --> 00:33:46,080

we have some time to uh to get all this

958

00:33:56,950 --> 00:33:54,549

so i've touched on this a little bit

959

00:33:59,269 --> 00:33:56,960

already but i'll just emphasize that the

960

00:34:01,509 --> 00:33:59,279

lsst is a different kind of telescope

961

00:34:02,710 --> 00:34:01,519

than you have probably in captured

962

00:34:05,110 --> 00:34:02,720

before

963

00:34:07,990 --> 00:34:05,120

um it really is an integrated survey

964

00:34:10,629 --> 00:34:08,000

system rather than just a telescope so

965

00:34:13,109 --> 00:34:10,639

the observatory the telescope the camera

966

00:34:15,109 --> 00:34:13,119

the data management system are all built

967

00:34:17,030 --> 00:34:15,119

to work together and are built really

968

00:34:19,349 --> 00:34:17,040

for a single purpose to support this

969

00:34:22,230 --> 00:34:19,359

lsst survey

970

00:34:24,389 --> 00:34:22,240

and i should say that the survey itself

971

00:34:27,750 --> 00:34:24,399

is designed to support many many

972

00:34:30,389 --> 00:34:27,760

different science uh cases so

973

00:34:32,389 --> 00:34:30,399

dark energy

974

00:34:34,069 --> 00:34:32,399

galactic astronomy

975

00:34:37,030 --> 00:34:34,079

there's there's a large number and of

976
00:34:39,030 --> 00:34:37,040
course um solar system science which is

977
00:34:41,510 --> 00:34:39,040
our interest here

978
00:34:44,550 --> 00:34:41,520
so unlike the usual telescope there's no

979
00:34:46,470 --> 00:34:44,560
pi mode there's no proposal there's no

980
00:34:48,550 --> 00:34:46,480
getting time and going for the telescope

981
00:34:50,629 --> 00:34:48,560
the thing is just the machine which runs

982
00:34:54,230 --> 00:34:50,639
and produces data

983
00:34:56,149 --> 00:34:54,240
so from the perspective of the

984
00:34:58,230 --> 00:34:56,159
normal user

985
00:35:00,630 --> 00:34:58,240
you don't really use the telescope to

986
00:35:03,349 --> 00:35:00,640
use the database

987
00:35:06,150 --> 00:35:03,359
and this is this is of course the spirit

988
00:35:07,030 --> 00:35:06,160

that the storm survey has

989

00:35:12,310 --> 00:35:07,040

has

990

00:35:16,710 --> 00:35:14,230

okay so i think uh you've got the

991

00:35:21,910 --> 00:35:16,720

message that lsst really is the database

992

00:35:26,790 --> 00:35:24,630

so we see citizen science

993

00:35:29,510 --> 00:35:26,800

and possibly thinking back to jen's

994

00:35:31,190 --> 00:35:29,520

definitions and her intro

995

00:35:34,069 --> 00:35:31,200

this definitely

996

00:35:36,310 --> 00:35:34,079

should include crowdsourcing uh as well

997

00:35:38,950 --> 00:35:36,320

as citizen science but we see both these

998

00:35:40,790 --> 00:35:38,960

things as being integral to the overall

999

00:35:42,790 --> 00:35:40,800

process of

1000

00:35:44,870 --> 00:35:42,800

how lsst works

1001
00:35:47,670 --> 00:35:44,880
so here's a cartoon that kind of shows

1002
00:35:49,990 --> 00:35:47,680
you how this uh how this goes

1003
00:35:53,430 --> 00:35:50,000
um if you think of this as the stream of

1004
00:35:56,390 --> 00:35:53,440
all the data being collected by lsst

1005
00:35:59,109 --> 00:35:56,400
uh you can say that there's some large

1006
00:36:01,589 --> 00:35:59,119
fraction of the data which is basically

1007
00:36:03,430 --> 00:36:01,599
understood so you know it's from such a

1008
00:36:04,870 --> 00:36:03,440
variable going up and down we know what

1009
00:36:07,190 --> 00:36:04,880
that is

1010
00:36:09,270 --> 00:36:07,200
but there also are

1011
00:36:11,270 --> 00:36:09,280
aspects of the data and i would very

1012
00:36:13,670 --> 00:36:11,280
much include

1013
00:36:15,670 --> 00:36:13,680

asteroid observations here

1014

00:36:18,069 --> 00:36:15,680

as things that while they may be

1015

00:36:19,910 --> 00:36:18,079

understood they also need human

1016

00:36:22,310 --> 00:36:19,920

intervention largely because their

1017

00:36:23,670 --> 00:36:22,320

algorithms are just not good enough to

1018

00:36:26,470 --> 00:36:23,680

deal with them

1019

00:36:28,470 --> 00:36:26,480

so here you have your citizen science

1020

00:36:30,630 --> 00:36:28,480

scientist down here

1021

00:36:32,870 --> 00:36:30,640

dealing in some way with this data that

1022

00:36:33,910 --> 00:36:32,880

requires human intervention

1023

00:36:35,670 --> 00:36:33,920

and

1024

00:36:37,990 --> 00:36:35,680

this touches on a question that was

1025

00:36:40,230 --> 00:36:38,000

asked a few moments ago one of the

1026

00:36:41,349 --> 00:36:40,240

functions that we see to this is not

1027

00:36:43,190 --> 00:36:41,359

just

1028

00:36:44,870 --> 00:36:43,200

understanding the data that wasn't

1029

00:36:46,390 --> 00:36:44,880

understood before

1030

00:36:49,829 --> 00:36:46,400

but also

1031

00:36:52,630 --> 00:36:49,839

as sort of a back channel training

1032

00:36:55,349 --> 00:36:52,640

algorithm so that

1033

00:37:00,310 --> 00:36:55,359

this process here will be more efficient

1034

00:37:03,750 --> 00:37:02,950

so moving on to the the main subject

1035

00:37:06,790 --> 00:37:03,760

here

1036

00:37:09,030 --> 00:37:06,800

how can we use citizen scientists for

1037

00:37:12,150 --> 00:37:09,040

asteroid detection

1038

00:37:13,829 --> 00:37:12,160

so that the the main problem here uh

1039

00:37:16,390 --> 00:37:13,839

especially compared with something like

1040

00:37:19,670 --> 00:37:16,400

space watch is just scale

1041

00:37:22,390 --> 00:37:19,680

so the lsst every night will observe

1042

00:37:25,030 --> 00:37:22,400

something like 1.1 million asteroids and

1043

00:37:25,910 --> 00:37:25,040

this does not include false alarms

1044

00:37:28,470 --> 00:37:25,920

um

1045

00:37:30,390 --> 00:37:28,480

you'll recall that carl said with uh

1046

00:37:31,910 --> 00:37:30,400

with their experiment with citizen

1047

00:37:34,390 --> 00:37:31,920

scientists they were getting a thousand

1048

00:37:36,069 --> 00:37:34,400

false alarms for every real detection

1049

00:37:37,349 --> 00:37:36,079

we hope to do much better than that but

1050

00:37:40,550 --> 00:37:37,359

it's certainly not going to be

1051
00:37:42,390 --> 00:37:40,560
one-to-one so in any case you have

1052
00:37:44,069 --> 00:37:42,400
millions of things to look at every

1053
00:37:46,790 --> 00:37:44,079
night

1054
00:37:47,910 --> 00:37:46,800
and personally i think that this is too

1055
00:37:50,310 --> 00:37:47,920
many

1056
00:37:51,910 --> 00:37:50,320
to have citizen science just look at

1057
00:37:54,790 --> 00:37:51,920
every single

1058
00:37:56,390 --> 00:37:54,800
uh bit of an image that may or may not

1059
00:37:58,550 --> 00:37:56,400
have an asteroid

1060
00:37:59,829 --> 00:37:58,560
and i think there's a very good prospect

1061
00:38:02,790 --> 00:37:59,839
that we can

1062
00:38:05,030 --> 00:38:02,800
have algorithms that work very well at

1063
00:38:06,630 --> 00:38:05,040

the pixel level so that we don't need to

1064

00:38:09,190 --> 00:38:06,640

do that

1065

00:38:10,230 --> 00:38:09,200

but the real problem comes in at higher

1066

00:38:12,390 --> 00:38:10,240

levels

1067

00:38:14,630 --> 00:38:12,400

um and they explain that i have to give

1068

00:38:16,790 --> 00:38:14,640

you a little cartoon of how at least the

1069

00:38:18,870 --> 00:38:16,800

ossp processes

1070

00:38:20,950 --> 00:38:18,880

uh

1071

00:38:22,069 --> 00:38:20,960

asteroids data

1072

00:38:24,870 --> 00:38:22,079

so

1073

00:38:29,910 --> 00:38:24,880

what we try to do is observe every field

1074

00:38:32,950 --> 00:38:29,920

twice a night so you have a set of pairs

1075

00:38:35,430 --> 00:38:32,960

and the software is quite good at

1076

00:38:37,910 --> 00:38:35,440

linking the pairs together

1077

00:38:40,870 --> 00:38:37,920

to form what we call tracklist

1078

00:38:42,550 --> 00:38:40,880

um and then if it's able to it can merge

1079

00:38:44,069 --> 00:38:42,560

tackles from a single knight to make

1080

00:38:47,670 --> 00:38:44,079

longer traffic

1081

00:38:50,310 --> 00:38:47,680

but the real problem comes when you are

1082

00:38:53,109 --> 00:38:50,320

um putting together you're linking

1083

00:38:54,550 --> 00:38:53,119

together data that goes over more than

1084

00:38:56,790 --> 00:38:54,560

one night

1085

00:38:58,310 --> 00:38:56,800

and you know in this cartoon it actually

1086

00:39:00,790 --> 00:38:58,320

looks like a pretty simple thing you

1087

00:39:03,910 --> 00:39:00,800

cannot see obviously where the track is

1088

00:39:06,310 --> 00:39:03,920

but remember that um there's millions of

1089

00:39:08,630 --> 00:39:06,320

detection issues

1090

00:39:10,310 --> 00:39:08,640

if you actually plot out the lsst

1091

00:39:13,270 --> 00:39:10,320

detections over

1092

00:39:15,430 --> 00:39:13,280

on several nights it is just an absolute

1093

00:39:17,990 --> 00:39:15,440

chaotic mess and

1094

00:39:20,390 --> 00:39:18,000

deciding which things go together to

1095

00:39:22,710 --> 00:39:20,400

form a real asteroid track

1096

00:39:25,030 --> 00:39:22,720

is not easy even for the best software

1097

00:39:28,390 --> 00:39:25,040

that we that we can

1098

00:39:31,430 --> 00:39:28,400

so inner citizen science um

1099

00:39:33,589 --> 00:39:31,440

the important thing to know here is that

1100

00:39:35,510 --> 00:39:33,599

the computational complexity of this

1101

00:39:37,109 --> 00:39:35,520

track linking problem grows

1102

00:39:38,870 --> 00:39:37,119

exponentially with the number of

1103

00:39:41,430 --> 00:39:38,880

detections in an image and with the

1104

00:39:43,349 --> 00:39:41,440

speed of their motion and you'll recall

1105

00:39:45,349 --> 00:39:43,359

carl talking about objects that move

1106

00:39:47,030 --> 00:39:45,359

very very fast and those of course are

1107

00:39:48,150 --> 00:39:47,040

also the ones that we're most interested

1108

00:39:50,069 --> 00:39:48,160

in

1109

00:39:51,670 --> 00:39:50,079

so the more than there are the faster

1110

00:39:54,150 --> 00:39:51,680

they move the harder this is

1111

00:39:56,790 --> 00:39:54,160

computationally

1112

00:40:00,630 --> 00:39:56,800

so the current algorithms

1113

00:40:02,390 --> 00:40:00,640

are actually very good at producing

1114

00:40:05,829 --> 00:40:02,400

candidate tracks

1115

00:40:08,150 --> 00:40:05,839

that are plausible by the correctnesses

1116

00:40:11,430 --> 00:40:08,160

far from a shirt

1117

00:40:14,790 --> 00:40:11,440

and once you reached that stage it's not

1118

00:40:17,510 --> 00:40:14,800

clear how to do better algorithmically

1119

00:40:20,309 --> 00:40:17,520

but it is pretty clear how to do better

1120

00:40:22,950 --> 00:40:20,319

if you're a human sitting

1121

00:40:24,710 --> 00:40:22,960

at a terminal in front of the data

1122

00:40:26,710 --> 00:40:24,720

so there are a number of other

1123

00:40:29,750 --> 00:40:26,720

information sources that a person can

1124

00:40:31,430 --> 00:40:29,760

bring to air that are not so easy to do

1125

00:40:34,630 --> 00:40:31,440

algorithmically

1126
00:40:36,950 --> 00:40:34,640
so real orbital dynamics the algorithms

1127
00:40:41,030 --> 00:40:36,960
that we use of just for computational

1128
00:40:44,150 --> 00:40:41,040
necessity can't use for fully

1129
00:40:46,630 --> 00:40:44,160
realistic orbital dynamics

1130
00:40:48,630 --> 00:40:46,640
they don't know about the systematics of

1131
00:40:51,270 --> 00:40:48,640
the solar system population so they

1132
00:40:52,950 --> 00:40:51,280
can't say how plausible some

1133
00:40:54,550 --> 00:40:52,960
track would be

1134
00:40:57,109 --> 00:40:54,560
they don't currently look at light

1135
00:40:59,270 --> 00:40:57,119
curves um which is which is one of the

1136
00:41:02,309 --> 00:40:59,280
most fruitful sources of saying is this

1137
00:41:04,309 --> 00:41:02,319
a real tracker is it not because

1138
00:41:06,870 --> 00:41:04,319

something's intensity

1139

00:41:09,510 --> 00:41:06,880

changes between from night one to night

1140

00:41:11,910 --> 00:41:09,520

two in some unrealistic way you know

1141

00:41:13,270 --> 00:41:11,920

that's probably not a real trap

1142

00:41:15,670 --> 00:41:13,280

and then finally of course their

1143

00:41:17,589 --> 00:41:15,680

observations from other telescopes

1144

00:41:19,910 --> 00:41:17,599

and with the sort of infrastructure

1145

00:41:20,950 --> 00:41:19,920

which is being put together

1146

00:41:23,430 --> 00:41:20,960

around

1147

00:41:25,829 --> 00:41:23,440

vl events

1148

00:41:28,390 --> 00:41:25,839

the ability to process observations from

1149

00:41:31,270 --> 00:41:28,400

other telescopes is going to become an

1150

00:41:33,670 --> 00:41:31,280

increasingly easy thing to do

1151

00:41:35,670 --> 00:41:33,680

so i claim that with the right sort of

1152

00:41:37,589 --> 00:41:35,680

tools it's going to be practical for

1153

00:41:39,589 --> 00:41:37,599

citizen scientists to undertake this

1154

00:41:41,910 --> 00:41:39,599

kind of analysis

1155

00:41:44,870 --> 00:41:41,920

and by doing so they can greatly

1156

00:41:47,430 --> 00:41:44,880

increase the efficiency of the entire

1157

00:41:50,870 --> 00:41:47,440

manned machine system to protecting and

1158

00:41:54,550 --> 00:41:50,880

cataloging any others

1159

00:41:58,870 --> 00:41:54,560

so i just want to conclude with a few

1160

00:42:00,710 --> 00:41:58,880

thoughts about what these tools might be

1161

00:42:03,430 --> 00:42:00,720

and i first want to point out that there

1162

00:42:06,150 --> 00:42:03,440

is a very different application area

1163

00:42:08,710 --> 00:42:06,160

called wide area motion imagery

1164

00:42:09,990 --> 00:42:08,720

um which has many problems in common

1165

00:42:11,829 --> 00:42:10,000

with ours

1166

00:42:13,829 --> 00:42:11,839

and it's much better funded than we are

1167

00:42:17,430 --> 00:42:13,839

because it's all essentially security

1168

00:42:19,030 --> 00:42:17,440

based um or security security oriented

1169

00:42:20,630 --> 00:42:19,040

and essentially the problem is you got a

1170

00:42:21,670 --> 00:42:20,640

bunch of cameras looking at things that

1171

00:42:24,230 --> 00:42:21,680

are moving

1172

00:42:26,950 --> 00:42:24,240

and you want to be able to track objects

1173

00:42:28,470 --> 00:42:26,960

um across them and i don't know i'm

1174

00:42:30,790 --> 00:42:28,480

running out of time so i don't have a

1175

00:42:34,150 --> 00:42:30,800

lot of time to go into what what that

1176

00:42:35,750 --> 00:42:34,160

entails but i think the point is that

1177

00:42:37,510 --> 00:42:35,760

they have a lot of tools that are under

1178

00:42:39,109 --> 00:42:37,520

active development and we can learn a

1179

00:42:42,470 --> 00:42:39,119

lot from them and they're very well

1180

00:42:44,390 --> 00:42:42,480

funded for good with answers i think

1181

00:42:46,550 --> 00:42:44,400

so the cartoon that's at least in my

1182

00:42:50,309 --> 00:42:46,560

show is that when the citizen scientist

1183

00:42:53,190 --> 00:42:50,319

sits down in front of lsst data

1184

00:42:55,270 --> 00:42:53,200

that he or she will have a number of

1185

00:42:57,109 --> 00:42:55,280

tools um

1186

00:42:59,589 --> 00:42:57,119

at his disposal

1187

00:43:02,150 --> 00:42:59,599

and this would include

1188

00:43:04,710 --> 00:43:02,160

the ability to examine the images

1189

00:43:06,550 --> 00:43:04,720

um the ability to look at light curves

1190

00:43:08,150 --> 00:43:06,560

and the ability to interactively set

1191

00:43:10,470 --> 00:43:08,160

orbit

1192

00:43:13,430 --> 00:43:10,480

and so the role of citizen scientist is

1193

00:43:15,190 --> 00:43:13,440

to use those tools to draw a conclusion

1194

00:43:17,109 --> 00:43:15,200

about whether a candidate track is

1195

00:43:18,630 --> 00:43:17,119

likely real or not

1196

00:43:20,230 --> 00:43:18,640

so this is something which is clearly

1197

00:43:22,710 --> 00:43:20,240

going to take a lot of training think

1198

00:43:25,349 --> 00:43:22,720

about carl's talk again but i think it

1199

00:43:26,950 --> 00:43:25,359

will be challenging and fun and will

1200

00:43:29,910 --> 00:43:26,960

actually motivate

1201
00:43:31,829 --> 00:43:29,920
real citizen scientists um as opposed to

1202
00:43:34,069 --> 00:43:31,839
simply mouse clickers

1203
00:43:42,710 --> 00:43:34,079
and i think i think it will be good for

1204
00:43:46,150 --> 00:43:44,630
okay so we'll start with any questions

1205
00:43:47,910 --> 00:43:46,160
from the room

1206
00:43:50,710 --> 00:43:47,920
while heather's looking on social media

1207
00:43:55,910 --> 00:43:53,910
okay i have one um tim are you guys

1208
00:43:58,870 --> 00:43:55,920
considering doing some of the phase

1209
00:44:00,710 --> 00:43:58,880
curve work as well that carl had

1210
00:44:01,750 --> 00:44:00,720
mentioned or

1211
00:44:03,349 --> 00:44:01,760
is that something that you guys

1212
00:44:04,550 --> 00:44:03,359
evaluated and decided not to do because

1213
00:44:06,630 --> 00:44:04,560

of the other projects you have lined up

1214

00:44:09,510 --> 00:44:06,640

for citizen science

1215

00:44:11,829 --> 00:44:09,520

no we've not really gotten into

1216

00:44:14,309 --> 00:44:11,839

uh the details yet at all as i mentioned

1217

00:44:17,190 --> 00:44:14,319

this is a sketch rather than a real plan

1218

00:44:19,589 --> 00:44:17,200

so um i actually wasn't even aware of

1219

00:44:21,670 --> 00:44:19,599

that uh way of processing the data i'm

1220

00:44:23,589 --> 00:44:21,680

not a solar system that scientist

1221

00:44:25,030 --> 00:44:23,599

to add so that's a very interesting

1222

00:44:28,870 --> 00:44:25,040

thing it sounds like it was fitting

1223

00:44:32,950 --> 00:44:30,710

data that you're going to be producing

1224

00:44:35,109 --> 00:44:32,960

you'll have phase functions for

1225

00:44:37,109 --> 00:44:35,119

every asteroid in the main belt most of

1226

00:44:38,950 --> 00:44:37,119

the near-earth asteroids

1227

00:44:41,270 --> 00:44:38,960

it'll greatly increase our knowledge of

1228

00:44:42,870 --> 00:44:41,280

the sizes and albedos of these objects

1229

00:44:44,630 --> 00:44:42,880

especially since even if you do go to a

1230

00:44:46,630 --> 00:44:44,640

spitzer and get thermal infrared

1231

00:44:48,150 --> 00:44:46,640

observations you still need to know the

1232

00:44:49,750 --> 00:44:48,160

phase function and the absolute

1233

00:44:50,390 --> 00:44:49,760

magnitude without that important data

1234

00:44:52,230 --> 00:44:50,400

point

1235

00:44:54,309 --> 00:44:52,240

the thermal observations really are kind

1236

00:44:56,230 --> 00:44:54,319

of hamstrung so a plot you know doing

1237

00:44:58,230 --> 00:44:56,240

phase function photometry with Isst

1238

00:45:02,630 --> 00:44:58,240

would be great

1239

00:45:06,230 --> 00:45:03,750

so

1240

00:45:08,550 --> 00:45:06,240

another question in the room go ahead

1241

00:45:10,950 --> 00:45:08,560

how deep of magnitude does the telescope

1242

00:45:12,309 --> 00:45:10,960

and sensor detect

1243

00:45:13,829 --> 00:45:12,319

oh yeah good question i should have

1244

00:45:15,430 --> 00:45:13,839

mentioned that so

1245

00:45:16,870 --> 00:45:15,440

um

1246

00:45:19,430 --> 00:45:16,880

single frame

1247

00:45:21,270 --> 00:45:19,440

uh exposure has limiting magnitude of

1248

00:45:23,430 --> 00:45:21,280

about 24.5

1249

00:45:25,910 --> 00:45:23,440

so and of course most of the things that

1250

00:45:27,349 --> 00:45:25,920

we detect will be close to that limiting

1251
00:45:30,230 --> 00:45:27,359
magnitude so

1252
00:45:36,230 --> 00:45:30,240
these are really tough to follow up with

1253
00:45:39,910 --> 00:45:38,870
another question tim for me is

1254
00:45:42,309 --> 00:45:39,920
what

1255
00:45:44,470 --> 00:45:42,319
challenges do you think that building a

1256
00:45:47,109 --> 00:45:44,480
citizen science program within a large

1257
00:45:48,309 --> 00:45:47,119
survey like this face

1258
00:45:53,349 --> 00:45:48,319
are they

1259
00:45:55,349 --> 00:45:53,359
they capacity are what type of

1260
00:45:59,270 --> 00:45:55,359
challenges are you designing your

1261
00:46:04,630 --> 00:46:01,270
well at this point we're we're really

1262
00:46:06,790 --> 00:46:04,640
trying to design um a platform which can

1263
00:46:07,910 --> 00:46:06,800

support a wide variety of civic and

1264

00:46:09,750 --> 00:46:07,920

sciences

1265

00:46:12,150 --> 00:46:09,760

citizen science projects because of

1266

00:46:13,670 --> 00:46:12,160

course we realize beginning operation in

1267

00:46:15,430 --> 00:46:13,680

2022

1268

00:46:17,670 --> 00:46:15,440

uh the problems that are interesting for

1269

00:46:19,349 --> 00:46:17,680

citizen science span will be different

1270

00:46:21,829 --> 00:46:19,359

than they are now so

1271

00:46:23,750 --> 00:46:21,839

our big focus is on the architecture

1272

00:46:25,990 --> 00:46:23,760

uh but certainly

1273

00:46:27,910 --> 00:46:26,000

uh the challenges that we face i think

1274

00:46:29,829 --> 00:46:27,920

are not unique to us in this field i

1275

00:46:30,630 --> 00:46:29,839

think it's largely sociology i mean

1276

00:46:33,190 --> 00:46:30,640

again

1277

00:46:35,349 --> 00:46:33,200

listening to colonel's experiences with

1278

00:46:37,190 --> 00:46:35,359

people being trained but not actually

1279

00:46:38,710 --> 00:46:37,200

applying your training

1280

00:46:41,670 --> 00:46:38,720

i think those are probably going to be

1281

00:46:43,510 --> 00:46:41,680

the real challenges

1282

00:46:45,750 --> 00:46:43,520

wise um

1283

00:46:48,550 --> 00:46:45,760

we're certainly thinking hard about

1284

00:46:50,630 --> 00:46:48,560

using the cloud as a way to

1285

00:46:52,150 --> 00:46:50,640

give us the sort of elasticity that a

1286

00:46:53,190 --> 00:46:52,160

project like this

1287

00:46:55,430 --> 00:46:53,200

needs

1288

00:46:57,510 --> 00:46:55,440

so again i think the sociology is

1289

00:46:59,030 --> 00:46:57,520

probably the hardest

1290

00:47:00,630 --> 00:46:59,040

okay great we have a question from

1291

00:47:02,470 --> 00:47:00,640

social media

1292

00:47:07,190 --> 00:47:02,480

the question that came in was how many

1293

00:47:12,150 --> 00:47:10,150

um well i guess i see to be completely

1294

00:47:13,670 --> 00:47:12,160

honest i i guess i would have to say

1295

00:47:17,270 --> 00:47:13,680

that there are

1296

00:47:20,790 --> 00:47:17,280

zero except that um if i go back to my

1297

00:47:22,470 --> 00:47:20,800

listed tools here um

1298

00:47:23,270 --> 00:47:22,480

wherever it wants i guess it is already

1299

00:47:25,349 --> 00:47:23,280

there

1300

00:47:27,750 --> 00:47:25,359

um something like you know image

1301
00:47:28,870 --> 00:47:27,760
examiners unlike her viewers and orbit

1302
00:47:31,589 --> 00:47:28,880
hitters

1303
00:47:35,349 --> 00:47:31,599
um they all exist as tools it's just

1304
00:47:38,790 --> 00:47:35,359
that we haven't yet integrated them into

1305
00:47:39,910 --> 00:47:38,800
our epo uh prototype philly and that's

1306
00:47:41,270 --> 00:47:39,920
sort of one of the things that we're

1307
00:47:44,230 --> 00:47:41,280
going to be doing

1308
00:47:46,470 --> 00:47:44,240
uh over the next few years

1309
00:47:49,349 --> 00:47:46,480
and how small of objects are you going

1310
00:47:53,910 --> 00:47:51,829
uh well you tell me i mean it's sort of

1311
00:47:58,309 --> 00:47:53,920
lit it's magnitude limited for us so

1312
00:47:58,319 --> 00:48:01,990
okay

1313
00:48:06,549 --> 00:48:04,630

any other questions in the room

1314

00:48:07,430 --> 00:48:06,559

i think that we

1315

00:48:10,950 --> 00:48:07,440

can

1316

00:48:13,470 --> 00:48:10,960

get sort of 80 of the way to

1317

00:48:16,150 --> 00:48:13,480

a federally mandated

1318

00:48:18,470 --> 00:48:16,160

140 meter diameter

1319

00:48:21,030 --> 00:48:18,480

requirements that gives you

1320

00:48:28,390 --> 00:48:24,710

okay great thanks jason yeah uh

1321

00:48:30,069 --> 00:48:28,400

you've got an incredibly thoughtful uh

1322

00:48:30,950 --> 00:48:30,079

plan laid out here

1323

00:48:31,829 --> 00:48:30,960

with

1324

00:48:37,109 --> 00:48:31,839

uh

1325

00:48:39,510 --> 00:48:37,119

science ops not until 2022 as i recall

1326

00:48:43,430 --> 00:48:39,520

how are you keeping this all together

1327

00:48:46,870 --> 00:48:45,270

preparing for

1328

00:48:49,670 --> 00:48:46,880

this incredible amount of data that's

1329

00:48:51,990 --> 00:48:49,680

going to be coming

1330

00:48:53,750 --> 00:48:52,000

yeah well excellent question um i of

1331

00:48:55,829 --> 00:48:53,760

course should mention which you you

1332

00:48:57,510 --> 00:48:55,839

probably are already aware of that we

1333

00:48:59,270 --> 00:48:57,520

that we didn't actually begin this

1334

00:49:01,270 --> 00:48:59,280

project thinking we would be on the sky

1335

00:49:02,950 --> 00:49:01,280

in 2022 it just sort of you know

1336

00:49:05,829 --> 00:49:02,960

developed that way

1337

00:49:08,870 --> 00:49:05,839

so maintaining the momentum is always a

1338

00:49:12,390 --> 00:49:08,880

challenge my my own hope is to begin

1339

00:49:14,150 --> 00:49:12,400

prototyping a lot of this stuff as uh as

1340

00:49:17,030 --> 00:49:14,160

soon as possible

1341

00:49:19,109 --> 00:49:17,040

and trying it into

1342

00:49:21,510 --> 00:49:19,119

a real data source which of course will

1343

00:49:24,710 --> 00:49:21,520

not be as large or probably as deep as

1344

00:49:26,390 --> 00:49:24,720

lssp but will still let us uh develop

1345

00:49:28,230 --> 00:49:26,400

the tools and get our feet wet and

1346

00:49:29,190 --> 00:49:28,240

understand what the real challenges are

1347

00:49:31,030 --> 00:49:29,200

so

1348

00:49:33,270 --> 00:49:31,040

i think prototyping is a large bit of

1349

00:49:41,430 --> 00:49:33,280

the answer of how do you keep the

1350

00:49:46,790 --> 00:49:44,069

um and i believe the next

1351

00:49:48,630 --> 00:49:46,800

presenter ray picard

1352

00:49:53,109 --> 00:49:48,640

should be on the phone ray are you there

1353

00:49:53,119 --> 00:49:58,549

ray we can't hear you if you're on muted

1354

00:50:01,589 --> 00:49:59,349

yeah

1355

00:50:02,950 --> 00:50:01,599

sorry you were muted

1356

00:50:08,150 --> 00:50:02,960

you didn't mute yourself hold on one

1357

00:50:13,030 --> 00:50:09,510

okay ray we should be able to hear you

1358

00:50:14,950 --> 00:50:13,040

now there we go great go ahead ray yeah

1359

00:50:17,349 --> 00:50:14,960

okay i'm just waiting for my

1360

00:50:19,109 --> 00:50:17,359

presentation to pop up there

1361

00:50:20,950 --> 00:50:19,119

um i am having a little

1362

00:50:22,470 --> 00:50:20,960

uh a few incident problems this morning

1363

00:50:23,990 --> 00:50:22,480

there are thunderstorms around us and i

1364

00:50:25,829 --> 00:50:24,000

keep knocking out my internet every now

1365

00:50:29,430 --> 00:50:25,839

and again so fingers crossed that we can

1366

00:50:36,150 --> 00:50:31,589

oh yeah just waiting for my presentation

1367

00:50:41,430 --> 00:50:38,470

so what i am talking about

1368

00:50:44,069 --> 00:50:41,440

is actually um

1369

00:50:46,069 --> 00:50:44,079

small grants for for observatories to be

1370

00:50:48,150 --> 00:50:46,079

able to sort of participate

1371

00:50:50,309 --> 00:50:48,160

and some of the ways at which we can

1372

00:50:52,630 --> 00:50:50,319

involve the community

1373

00:50:54,390 --> 00:50:52,640

in asteroid research

1374

00:50:56,390 --> 00:50:54,400

and um

1375

00:50:59,109 --> 00:50:56,400

get get them involved in in some of the

1376

00:51:01,750 --> 00:50:59,119

searching and things like that

1377

00:51:03,750 --> 00:51:01,760

which covers that first slide

1378

00:51:06,710 --> 00:51:03,760

now a brief outline of the presentations

1379

00:51:09,030 --> 00:51:06,720

a little bit about what we do here um

1380

00:51:11,270 --> 00:51:09,040

answering the questions most of the

1381

00:51:12,470 --> 00:51:11,280

um information for the paper i submitted

1382

00:51:14,950 --> 00:51:12,480

were based on

1383

00:51:16,870 --> 00:51:14,960

question 6 of the asteroid initiative in

1384

00:51:18,470 --> 00:51:16,880

particular you're like addressing some

1385

00:51:20,230 --> 00:51:18,480

of those things some other things i've

1386

00:51:21,990 --> 00:51:20,240

put up there will actually change in

1387

00:51:24,710 --> 00:51:22,000

this presentation because even over the

1388

00:51:26,470 --> 00:51:24,720

past few few days

1389

00:51:28,230 --> 00:51:26,480

things have really moved ahead so far

1390

00:51:31,430 --> 00:51:28,240

what we're doing here with um the

1391

00:51:36,549 --> 00:51:34,069

um obviously he's been very keen to do

1392

00:51:38,470 --> 00:51:36,559

astro research for many years it's

1393

00:51:40,069 --> 00:51:38,480

actually a smooth privately operated

1394

00:51:42,230 --> 00:51:40,079

observatory

1395

00:51:45,270 --> 00:51:42,240

funded pretty much

1396

00:51:47,349 --> 00:51:45,280

by donation only entry the occasional

1397

00:51:51,109 --> 00:51:47,359

small grant for equipment but his

1398

00:51:52,470 --> 00:51:51,119

primary role is for public outreach and

1399

00:51:54,870 --> 00:51:52,480

education

1400

00:51:57,430 --> 00:51:54,880

i'm an educator myself

1401

00:51:59,990 --> 00:51:57,440

i teach in schools and that when i can

1402

00:52:01,829 --> 00:52:00,000

um and our primarily primarily our

1403

00:52:05,349 --> 00:52:01,839

research goal and what i'm probably best

1404

00:52:07,270 --> 00:52:05,359

known for is my work on meteorites um

1405

00:52:09,349 --> 00:52:07,280

research work on asteroids and comets as

1406

00:52:11,670 --> 00:52:09,359

well as an imaging program we have to

1407

00:52:13,829 --> 00:52:11,680

stimulate public interest and things

1408

00:52:18,870 --> 00:52:13,839

up there in space as well

1409

00:52:23,190 --> 00:52:21,349

now the question is as i said most of my

1410

00:52:25,270 --> 00:52:23,200

response is based on question six for

1411

00:52:26,710 --> 00:52:25,280

the asteroid initiative and in

1412

00:52:28,390 --> 00:52:26,720

particular some of the things i wanted

1413

00:52:30,150 --> 00:52:28,400

to emphasize from that paper is the

1414

00:52:32,069 --> 00:52:30,160

importance of the dual hemisphere

1415

00:52:34,230 --> 00:52:32,079

coverage most of the asteroid searches

1416

00:52:35,829 --> 00:52:34,240

are located in the northern hemisphere

1417

00:52:38,390 --> 00:52:35,839

where asteroids can approach from any

1418

00:52:39,109 --> 00:52:38,400

direction so therefore we need some sort

1419

00:52:40,950 --> 00:52:39,119

of

1420

00:52:42,790 --> 00:52:40,960

coordinated approach to cover both

1421

00:52:44,309 --> 00:52:42,800

hemispheres

1422

00:52:46,230 --> 00:52:44,319

and in particular

1423

00:52:48,150 --> 00:52:46,240

i know that there's a vast amount of

1424

00:52:49,589 --> 00:52:48,160

equipment out there in amateur hands as

1425

00:52:51,190 --> 00:52:49,599

well as some of the professional hands

1426

00:52:54,230 --> 00:52:51,200

which will be able to

1427

00:52:56,950 --> 00:52:54,240

help in um such adventure

1428

00:52:59,190 --> 00:52:56,960

um particularly so far as yeah i know

1429

00:53:00,950 --> 00:52:59,200

i've captured a few small asteroids on

1430

00:53:02,870 --> 00:53:00,960

images and not known whether or not

1431

00:53:04,950 --> 00:53:02,880

they've been asteroids and finally that

1432

00:53:06,630 --> 00:53:04,960

methodology of being able to check those

1433

00:53:08,549 --> 00:53:06,640

fairly easily

1434

00:53:11,349 --> 00:53:08,559

most of that sort of observational stuff

1435

00:53:13,829 --> 00:53:11,359

i covered in my first talk in the first

1436

00:53:15,589 --> 00:53:13,839

conference a few weeks ago about the

1437

00:53:17,589 --> 00:53:15,599

methodologies and things like that so

1438

00:53:19,750 --> 00:53:17,599

i'm very interested in the target

1439

00:53:21,589 --> 00:53:19,760

asteroid um project which was talked

1440

00:53:23,349 --> 00:53:21,599

about a bit earlier on

1441

00:53:25,270 --> 00:53:23,359

um because i feel that that was

1442

00:53:28,470 --> 00:53:25,280

something that um

1443

00:53:29,670 --> 00:53:28,480

we could probably link into particularly

1444

00:53:31,349 --> 00:53:29,680

in light of

1445

00:53:37,109 --> 00:53:31,359

our negotiations with the university

1446

00:53:41,910 --> 00:53:40,069

now grant now because international

1447

00:53:43,430 --> 00:53:41,920

rules don't allow monetary grants which

1448

00:53:45,270 --> 00:53:43,440

is probably a good thing to other

1449

00:53:47,589 --> 00:53:45,280

countries what i'm thinking about when i

1450

00:53:50,950 --> 00:53:47,599

talk about grants is actually grades of

1451
00:53:53,430 --> 00:53:50,960
equipment i know um target asteroid use

1452
00:53:55,349 --> 00:53:53,440
a plane wave telescope and i've actually

1453
00:53:56,870 --> 00:53:55,359
been inquiring about the cost of some of

1454
00:53:59,109 --> 00:53:56,880
those so that um

1455
00:54:00,309 --> 00:53:59,119
equipment can be light shared around the

1456
00:54:01,190 --> 00:54:00,319
world

1457
00:54:03,349 --> 00:54:01,200
um

1458
00:54:04,950 --> 00:54:03,359
if we spread telescopes thrown right

1459
00:54:06,870 --> 00:54:04,960
right across the globe it ends up being

1460
00:54:09,270 --> 00:54:06,880
a much cheaper option than

1461
00:54:11,990 --> 00:54:09,280
space-based telescopes

1462
00:54:14,390 --> 00:54:12,000
we have tried in the past to establish

1463
00:54:18,950 --> 00:54:14,400

an asteroid search telescope here

1464

00:54:21,750 --> 00:54:18,960

we had a commercial enterprise fund a

1465

00:54:24,390 --> 00:54:21,760

half metre dalker from telescope

1466

00:54:26,470 --> 00:54:24,400

and that telescope was constructed but

1467

00:54:28,230 --> 00:54:26,480

due to the global financial crisis the

1468

00:54:29,670 --> 00:54:28,240

last payment on that telescope was

1469

00:54:32,150 --> 00:54:29,680

unable to be made

1470

00:54:35,030 --> 00:54:32,160

that telescope still to this day some

1471

00:54:38,069 --> 00:54:35,040

four years later resides in a crate

1472

00:54:40,549 --> 00:54:38,079

down in sydney still uninstalled unused

1473

00:54:42,150 --> 00:54:40,559

and waiting to arrive at some point

1474

00:54:44,470 --> 00:54:42,160

now we do try and attract crowds but

1475

00:54:46,150 --> 00:54:44,480

being privately operated in a fairly

1476

00:54:48,230 --> 00:54:46,160

small facility

1477

00:54:50,950 --> 00:54:48,240

generally commercial enterprises aren't

1478

00:54:52,710 --> 00:54:50,960

particularly interested in

1479

00:54:54,950 --> 00:54:52,720

giving us grants because you know they

1480

00:54:56,789 --> 00:54:54,960

don't see the value for money i guess in

1481

00:54:59,109 --> 00:54:56,799

in funding a small facility they don't

1482

00:55:00,950 --> 00:54:59,119

really get their um advertising dollars

1483

00:55:03,670 --> 00:55:00,960

i guess from saying that we sponsor such

1484

00:55:05,670 --> 00:55:03,680

a thing so most of our grads are being

1485

00:55:07,589 --> 00:55:05,680

straight and federal government grants

1486

00:55:09,589 --> 00:55:07,599

but um

1487

00:55:11,750 --> 00:55:09,599

in particular what we feel is that a

1488

00:55:12,470 --> 00:55:11,760

little bit of opportunity a lot so far

1489

00:55:14,230 --> 00:55:12,480

is

1490

00:55:16,390 --> 00:55:14,240

the the research work and that that we

1491

00:55:17,349 --> 00:55:16,400

could do

1492

00:55:19,589 --> 00:55:17,359

now

1493

00:55:22,789 --> 00:55:19,599

involving the community

1494

00:55:25,030 --> 00:55:22,799

operating on a donation basis means that

1495

00:55:26,630 --> 00:55:25,040

i access as many

1496

00:55:29,430 --> 00:55:26,640

general public to the observatory as we

1497

00:55:31,109 --> 00:55:29,440

can get as well as school children being

1498

00:55:33,510 --> 00:55:31,119

an educator one of the things i do is

1499

00:55:35,510 --> 00:55:33,520

write educational programs for students

1500

00:55:36,710 --> 00:55:35,520

and i've just actually worked on one

1501
00:55:38,470 --> 00:55:36,720
that's going to be used throughout new

1502
00:55:40,789 --> 00:55:38,480
south wales on space and i've actually

1503
00:55:42,069 --> 00:55:40,799
included asteroids in that

1504
00:55:43,670 --> 00:55:42,079
um

1505
00:55:45,030 --> 00:55:43,680
as i mentioned earlier the dual

1506
00:55:47,030 --> 00:55:45,040
hemisphere coverage and one of the

1507
00:55:49,109 --> 00:55:47,040
things i'd like to set up is to have a

1508
00:55:51,510 --> 00:55:49,119
telescope internet accessible because

1509
00:55:52,549 --> 00:55:51,520
what was nice in australia day in us

1510
00:55:54,549 --> 00:55:52,559
schools

1511
00:55:56,069 --> 00:55:54,559
so that um if there's any actual work to

1512
00:55:58,309 --> 00:55:56,079
be done there's a possibility of being

1513
00:56:01,829 --> 00:55:58,319

able to link it to the us schools in

1514

00:56:05,109 --> 00:56:01,839

that respect and perhaps if we can form

1515

00:56:06,870 --> 00:56:05,119

a partnership with a u.s based telescope

1516

00:56:07,910 --> 00:56:06,880

a reciprocal arrangement could be done

1517

00:56:10,309 --> 00:56:07,920

there

1518

00:56:12,710 --> 00:56:10,319

um as i mentioned earlier i do a lot of

1519

00:56:14,950 --> 00:56:12,720

my work on meteorites and this sort of

1520

00:56:16,549 --> 00:56:14,960

work strongly links to the meteorite

1521

00:56:18,710 --> 00:56:16,559

work what i do in classification of

1522

00:56:21,270 --> 00:56:18,720

meteorites so the asteroid work and

1523

00:56:23,109 --> 00:56:21,280

moonlight's going to link together

1524

00:56:25,030 --> 00:56:23,119

as i mentioned earlier we've actually

1525

00:56:27,270 --> 00:56:25,040

during the break between conferences

1526

00:56:29,910 --> 00:56:27,280

we've actually started networking and

1527

00:56:32,549 --> 00:56:29,920

have ended talks with the university of

1528

00:56:33,670 --> 00:56:32,559

new zealand university of canada over in

1529

00:56:36,549 --> 00:56:33,680

new zealand

1530

00:56:39,829 --> 00:56:36,559

um to try and do a joint proposal and um

1531

00:56:41,670 --> 00:56:39,839

a joint effort in researching memory

1532

00:56:42,789 --> 00:56:41,680

sort of asteroids

1533

00:56:56,950 --> 00:56:42,799

one of the things we're going to be

1534

00:57:01,510 --> 00:56:58,710

we've discovered too many but a lot of

1535

00:57:03,510 --> 00:57:01,520

that follow-up work i think is an area

1536

00:57:05,589 --> 00:57:03,520

where amateurs can't fit in another

1537

00:57:07,190 --> 00:57:05,599

thing we're doing is um tomorrow i have

1538

00:57:09,430 --> 00:57:07,200

a conference here in bathurst with the

1539

00:57:11,349 --> 00:57:09,440

community talking about asteroids and

1540

00:57:13,829 --> 00:57:11,359

the threat they pose so we're out there

1541

00:57:16,549 --> 00:57:13,839

doing our public outreach already

1542

00:57:17,589 --> 00:57:16,559

um so talk on that

1543

00:57:19,670 --> 00:57:17,599

tomorrow

1544

00:57:21,589 --> 00:57:19,680

what can be done in the short term

1545

00:57:32,789 --> 00:57:21,599

um one of the things i think is needed

1546

00:57:36,950 --> 00:57:34,789

observations that can be done something

1547

00:57:39,589 --> 00:57:36,960

published either by texting the phones

1548

00:57:41,829 --> 00:57:39,599

or email alerts or something like that

1549

00:57:44,230 --> 00:57:41,839

um one of the things i am worried about

1550

00:57:46,789 --> 00:57:44,240

is the momentum after saying after this

1551
00:57:49,349 --> 00:57:46,799
conference that maybe momentum dies out

1552
00:57:50,710 --> 00:57:49,359
and that um everything falls apart at

1553
00:57:52,390 --> 00:57:50,720
the end of this conference so i really

1554
00:57:54,789 --> 00:57:52,400
want to make sure that after this

1555
00:57:56,630 --> 00:57:54,799
conference in particular these networks

1556
00:57:59,030 --> 00:57:56,640
and momentum keeps going and

1557
00:58:01,589 --> 00:57:59,040
communication all that continues

1558
00:58:03,670 --> 00:58:01,599
um one of the places i think where you

1559
00:58:05,829 --> 00:58:03,680
know places like myself can actually

1560
00:58:07,589 --> 00:58:05,839
help is in the

1561
00:58:09,829 --> 00:58:07,599
pilot studies particularly for larger

1562
00:58:12,150 --> 00:58:09,839
ones testing some of the things like if

1563
00:58:14,069 --> 00:58:12,160

you create an image or a set of images

1564

00:58:16,150 --> 00:58:14,079

how quickly can people pick up whether a

1565

00:58:17,829 --> 00:58:16,160

streak is an asteroid or not so being

1566

00:58:20,630 --> 00:58:17,839

able to be used for that and some of

1567

00:58:23,030 --> 00:58:20,640

that will require training

1568

00:58:25,349 --> 00:58:23,040

if uh particularly amateurs

1569

00:58:27,349 --> 00:58:25,359

in order to know what they're looking at

1570

00:58:29,589 --> 00:58:27,359

and i think that's an area where

1571

00:58:31,349 --> 00:58:29,599

not only grants for equipment and that

1572

00:58:36,870 --> 00:58:31,359

can help or

1573

00:58:41,270 --> 00:58:39,510

and my point there is that yeah neos are

1574

00:58:43,750 --> 00:58:41,280

just a threat to one nation it's

1575

00:58:45,910 --> 00:58:43,760

actually a worldwide threat so some of

1576

00:58:47,109 --> 00:58:45,920

the benefits that i can see particularly

1577

00:58:49,670 --> 00:58:47,119

towards our

1578

00:58:51,829 --> 00:58:49,680

facility is the media exposure the media

1579

00:58:53,670 --> 00:58:51,839

here are frantically trying to get an

1580

00:58:55,990 --> 00:58:53,680

interview with me about this nasa

1581

00:58:57,430 --> 00:58:56,000

conference and the asteroid talk i'm

1582

00:58:59,670 --> 00:58:57,440

doing tomorrow

1583

00:59:02,549 --> 00:58:59,680

um being able to test some of these

1584

00:59:04,710 --> 00:59:02,559

systems before they go ahead the

1585

00:59:07,190 --> 00:59:04,720

extension for our public awareness and

1586

00:59:08,549 --> 00:59:07,200

educational program and in particular

1587

00:59:11,030 --> 00:59:08,559

the way i want to try and link in

1588

00:59:14,870 --> 00:59:11,040

schools into

1589

00:59:17,990 --> 00:59:16,150

so far as the technology and

1590

00:59:20,789 --> 00:59:18,000

communication systems now i think if we

1591

00:59:22,549 --> 00:59:20,799

can establish a network of like

1592

00:59:24,069 --> 00:59:22,559

systems around the world which is like

1593

00:59:25,510 --> 00:59:24,079

why we're looking into a plane live

1594

00:59:28,069 --> 00:59:25,520

telescope

1595

00:59:30,309 --> 00:59:28,079

that um the technology and systems are

1596

00:59:31,829 --> 00:59:30,319

like around the world so it simplifies

1597

00:59:34,230 --> 00:59:31,839

the software if we want to do internet

1598

00:59:35,510 --> 00:59:34,240

connections and things like that as well

1599

00:59:38,309 --> 00:59:35,520

and like i say

1600

00:59:40,549 --> 00:59:38,319

closely linked in with the work that i

1601
00:59:44,549 --> 00:59:40,559
do on meteorites

1602
00:59:49,510 --> 00:59:47,349
so finally um i'm happy to send a copy

1603
00:59:52,309 --> 00:59:49,520
since this was a very brief overview of

1604
00:59:53,109 --> 00:59:52,319
the paper uh before anyone wanting them

1605
00:59:55,990 --> 00:59:53,119
um

1606
00:59:57,910 --> 00:59:56,000
i'm always open to suggestions and

1607
00:59:59,910 --> 00:59:57,920
comments and things like that my email

1608
01:00:01,670 --> 00:59:59,920
address is up there and there's a

1609
01:00:03,430 --> 01:00:01,680
facebook page for the observatory where

1610
01:00:05,109 --> 01:00:03,440
we post some of our images which

1611
01:00:09,349 --> 01:00:05,119
includes some of the images of neos and

1612
01:00:17,270 --> 01:00:11,349
thank you i'm open to questions thank

1613
01:00:24,309 --> 01:00:20,789

i'll start us with the first question

1614

01:00:27,109 --> 01:00:24,319
in general ray what do you think

1615

01:00:29,510 --> 01:00:27,119
could be done in general to start

1616

01:00:31,270 --> 01:00:29,520
building more of a community of

1617

01:00:33,109 --> 01:00:31,280
observers and amateurs in the southern

1618

01:00:35,270 --> 01:00:33,119
hemisphere in general

1619

01:00:36,549 --> 01:00:35,280
we saw earlier in

1620

01:00:39,190 --> 01:00:36,559
carl's presentation that there are

1621

01:00:40,710 --> 01:00:39,200
significant kind of gaps in coverage in

1622

01:00:42,069 --> 01:00:40,720
that part of the globe and for your

1623

01:00:43,430 --> 01:00:42,079
country specifically and maybe some of

1624

01:00:45,190 --> 01:00:43,440
the other countries that you've

1625

01:00:47,829 --> 01:00:45,200
initiated collaboration with like new

1626

01:00:50,789 --> 01:00:47,839

zealand um what might be the unique kind

1627

01:00:51,990 --> 01:00:50,799

of cultural or education uh things to to

1628

01:00:53,670 --> 01:00:52,000

take in to

1629

01:00:56,870 --> 01:00:53,680

to take in mind to to recruit more

1630

01:00:59,750 --> 01:00:56,880

observers from that area of the world

1631

01:01:01,109 --> 01:00:59,760

well we've actually started um contacted

1632

01:01:04,069 --> 01:01:01,119

the both the state and federal

1633

01:01:05,829 --> 01:01:04,079

governments and outlined the proposal um

1634

01:01:08,390 --> 01:01:05,839

pretty much as i did

1635

01:01:09,750 --> 01:01:08,400

in the papers to the conference and had

1636

01:01:11,430 --> 01:01:09,760

meetings with federal members and

1637

01:01:14,230 --> 01:01:11,440

everyone quite keen

1638

01:01:17,190 --> 01:01:14,240

about um particularly maybe offering

1639

01:01:18,789 --> 01:01:17,200

some funding towards the project

1640

01:01:20,150 --> 01:01:18,799

um and i think to

1641

01:01:22,789 --> 01:01:20,160

letting the public

1642

01:01:25,270 --> 01:01:22,799

be aware like um say the the russian

1643

01:01:26,069 --> 01:01:25,280

fire ball over chelyabinsk earlier this

1644

01:01:28,069 --> 01:01:26,079

year

1645

01:01:30,069 --> 01:01:28,079

it happened so remotely from australia

1646

01:01:33,510 --> 01:01:30,079

we haven't had a significant meteorite

1647

01:01:35,670 --> 01:01:33,520

fall since about 1969 here and i think

1648

01:01:36,829 --> 01:01:35,680

it's it's way out of the public mind so

1649

01:01:39,430 --> 01:01:36,839

actually

1650

01:01:41,670 --> 01:01:39,440

establishing um

1651
01:01:43,190 --> 01:01:41,680
some of these public education programs

1652
01:01:44,630 --> 01:01:43,200
and getting out there amongst the people

1653
01:01:46,630 --> 01:01:44,640
letting them know

1654
01:01:48,950 --> 01:01:46,640
what's happening so they can support it

1655
01:01:51,430 --> 01:01:48,960
and particularly for say us it's a

1656
01:01:53,510 --> 01:01:51,440
fairly cheap option to do that we're

1657
01:01:56,630 --> 01:01:53,520
looking at um

1658
01:01:58,870 --> 01:01:56,640
probably needed maybe 25 000 which the

1659
01:02:01,750 --> 01:01:58,880
federal government said is peanuts i'm

1660
01:02:03,750 --> 01:02:01,760
glad it's been much for them um

1661
01:02:06,390 --> 01:02:03,760
to establish what would probably be a

1662
01:02:07,510 --> 01:02:06,400
very good follow-up size telescope here

1663
01:02:09,190 --> 01:02:07,520

so

1664

01:02:11,349 --> 01:02:09,200

i think if we can get that support in

1665

01:02:12,950 --> 01:02:11,359

that you know by the government and just

1666

01:02:15,029 --> 01:02:12,960

letting the general public know i think

1667

01:02:18,230 --> 01:02:15,039

particularly the nasa brand if we said

1668

01:02:19,750 --> 01:02:18,240

we're involved with a nasa partnership

1669

01:02:21,829 --> 01:02:19,760

here in bathurst that would really

1670

01:02:23,430 --> 01:02:21,839

stimulate public interest particularly

1671

01:02:25,510 --> 01:02:23,440

regionally here

1672

01:02:27,589 --> 01:02:25,520

um and i think that would also stimulate

1673

01:02:29,670 --> 01:02:27,599

other grants from you know energy

1674

01:02:31,589 --> 01:02:29,680

companies and communication companies

1675

01:02:34,789 --> 01:02:31,599

and things like that if they could see

1676

01:02:37,029 --> 01:02:34,799

that their money was being spent on a

1677

01:02:39,190 --> 01:02:37,039

research project that had a nasa tag

1678

01:02:41,670 --> 01:02:39,200

attached to it i think that

1679

01:02:43,270 --> 01:02:41,680

that is where um i think it could go

1680

01:02:45,990 --> 01:02:43,280

anything to do with nasa the public's

1681

01:02:49,349 --> 01:02:47,910

great question in the room carl

1682

01:02:50,870 --> 01:02:49,359

all right this is carl horton rother

1683

01:02:52,390 --> 01:02:50,880

it's good to talk to another target

1684

01:02:53,349 --> 01:02:52,400

astroider

1685

01:02:57,990 --> 01:02:53,359

have you

1686

01:03:00,710 --> 01:02:58,000

shoemaker grant

1687

01:03:03,190 --> 01:03:00,720

um one of the difficulties i do have is

1688

01:03:05,190 --> 01:03:03,200

being privately funded and even though

1689

01:03:08,549 --> 01:03:05,200

we operate on a donation

1690

01:03:10,069 --> 01:03:08,559

basis is that it makes me exempt from a

1691

01:03:11,750 --> 01:03:10,079

lot of grades i haven't tried any

1692

01:03:14,470 --> 01:03:11,760

overseas grants i'm really trying to

1693

01:03:17,190 --> 01:03:14,480

sort of seek australian sponsorship but

1694

01:03:18,789 --> 01:03:17,200

no i haven't haven't sought one of those

1695

01:03:19,750 --> 01:03:18,799

um one of the things i'm looking for is

1696

01:03:21,990 --> 01:03:19,760

actually

1697

01:03:23,910 --> 01:03:22,000

uh biting the board and setting setting

1698

01:03:26,549 --> 01:03:23,920

the observatory up as a

1699

01:03:29,109 --> 01:03:26,559

stand-alone educational

1700

01:03:31,029 --> 01:03:29,119

entity i guess charity as such where

1701

01:03:33,109 --> 01:03:31,039

i'll step back from it

1702

01:03:35,349 --> 01:03:33,119

and um basically

1703

01:03:37,270 --> 01:03:35,359

gift my stuff to the observatory in

1704

01:03:38,789 --> 01:03:37,280

trust and run it that way which will

1705

01:03:40,950 --> 01:03:38,799

actually aid me in grants but i haven't

1706

01:03:42,230 --> 01:03:40,960

sought any overseas once no yeah just

1707

01:03:43,990 --> 01:03:42,240

for those people who aren't aware of the

1708

01:03:46,069 --> 01:03:44,000

shoemaker grant is a program that's run

1709

01:03:48,870 --> 01:03:46,079

through the planetary society and it's

1710

01:03:51,589 --> 01:03:48,880

completely private and it's for amateurs

1711

01:03:52,710 --> 01:03:51,599

or even small universities to apply for

1712

01:03:54,470 --> 01:03:52,720

mba

1713

01:03:55,829 --> 01:03:54,480

grants on the order five ten fifteen

1714

01:03:57,270 --> 01:03:55,839

thousand dollars to upgrade their

1715

01:03:59,109 --> 01:03:57,280

telescope to support near near-earth

1716

01:04:01,029 --> 01:03:59,119

asteroid research so right i would

1717

01:04:02,950 --> 01:04:01,039

actually suggest look into it i think

1718

01:04:04,309 --> 01:04:02,960

the proposals are due in the spring and

1719

01:04:06,309 --> 01:04:04,319

it's something where you could might be

1720

01:04:08,150 --> 01:04:06,319

able to get some money some seed money

1721

01:04:10,710 --> 01:04:08,160

to help upgrades

1722

01:04:13,589 --> 01:04:10,720

i'll be very much i'll very much inquire

1723

01:04:13,599 --> 01:04:16,870

as much as we can

1724

01:04:20,390 --> 01:04:18,069

do we have any questions from social

1725

01:04:24,309 --> 01:04:20,400

media

1726

01:04:26,630 --> 01:04:24,319

um so rare i have another one for you

1727

01:04:27,589 --> 01:04:26,640

how well do you feel plugged into the

1728

01:04:29,589 --> 01:04:27,599

global

1729

01:04:31,190 --> 01:04:29,599

reporting community so when your

1730

01:04:33,029 --> 01:04:31,200

observatory makes

1731

01:04:36,470 --> 01:04:33,039

observations on asteroids do you guys

1732

01:04:39,190 --> 01:04:36,480

report them into the minor planet center

1733

01:04:41,829 --> 01:04:39,200

um i gotta admit that uh one thing i did

1734

01:04:44,390 --> 01:04:41,839

talk about in my previous conferences we

1735

01:04:46,870 --> 01:04:44,400

do actually feel fairly remote here

1736

01:04:49,670 --> 01:04:46,880

and i i have to but the minor plummet

1737

01:04:51,910 --> 01:04:49,680

center is um almost

1738

01:04:54,069 --> 01:04:51,920

i'll use the word frightening i guess to

1739

01:04:54,950 --> 01:04:54,079

use from an amateur point of view for

1740

01:04:59,349 --> 01:04:54,960

that

1741

01:05:00,870 --> 01:04:59,359

yourself as a serious research place and

1742

01:05:03,510 --> 01:05:00,880

if you make a false

1743

01:05:06,549 --> 01:05:03,520

submission that um

1744

01:05:07,510 --> 01:05:06,559

how that might look upon you we do feel

1745

01:05:08,470 --> 01:05:07,520

um

1746

01:05:10,230 --> 01:05:08,480

i guess

1747

01:05:13,430 --> 01:05:10,240

somewhat disconnected from the world

1748

01:05:15,190 --> 01:05:13,440

community in that way but hopefully by

1749

01:05:17,270 --> 01:05:15,200

establishing links and conferences like

1750

01:05:18,870 --> 01:05:17,280

this where we can network and that i'm

1751

01:05:21,349 --> 01:05:18,880

sure some of those barriers will be

1752

01:05:23,589 --> 01:05:21,359

broken down and particularly the two

1753

01:05:26,069 --> 01:05:23,599

follow-up observations if i find

1754

01:05:27,750 --> 01:05:26,079

something to be able to um send that off

1755

01:05:29,109 --> 01:05:27,760

to to someone in another part of the

1756

01:05:30,710 --> 01:05:29,119

world where it's night time if i'm

1757

01:05:33,190 --> 01:05:30,720

reviewing the data during the morning so

1758

01:05:35,109 --> 01:05:33,200

can you check out this please um i think

1759

01:05:36,870 --> 01:05:35,119

that will that's going to benefit us

1760

01:05:38,950 --> 01:05:36,880

more in the long term

1761

01:05:40,789 --> 01:05:38,960

oh it's carl again yeah the minor planet

1762

01:05:42,230 --> 01:05:40,799

center is a pretty frightening place but

1763

01:05:44,630 --> 01:05:42,240

you'll find that they're actually not

1764

01:05:46,069 --> 01:05:44,640

that scary and uh jose galachi who's

1765

01:05:47,910 --> 01:05:46,079

going to be talking later on is the

1766

01:05:50,470 --> 01:05:47,920

person to talk to they'll definitely

1767

01:05:53,510 --> 01:05:50,480

help you with your observations

1768

01:05:56,630 --> 01:05:53,520

yes you know i'm encouraged that i will

1769

01:05:58,630 --> 01:05:56,640

be submitting more of those of um

1770

01:06:01,190 --> 01:05:58,640

targets and that we do find because one

1771

01:06:02,789 --> 01:06:01,200

of the things that i hope to do is

1772

01:06:04,549 --> 01:06:02,799

here particularly with our education

1773

01:06:06,150 --> 01:06:04,559

program programmers get kids involved in

1774

01:06:08,309 --> 01:06:06,160

searching for asteroids and searching

1775

01:06:10,390 --> 01:06:08,319

for supernovas and

1776

01:06:11,349 --> 01:06:10,400

we can either do that in a targeted way

1777

01:06:13,589 --> 01:06:11,359

where

1778

01:06:15,349 --> 01:06:13,599

we can actually search for the asteroids

1779

01:06:17,670 --> 01:06:15,359

themselves or hopefully

1780

01:06:19,589 --> 01:06:17,680

have them turn up as random objects when

1781

01:06:21,910 --> 01:06:19,599

we're imaging other things we might be

1782

01:06:23,029 --> 01:06:21,920

imaging a galaxy and an asteroid turns

1783

01:06:24,150 --> 01:06:23,039

up in there

1784

01:06:24,870 --> 01:06:24,160

um

1785

01:06:26,630 --> 01:06:24,880

and

1786

01:06:28,150 --> 01:06:26,640

to encourage students in that to be able

1787

01:06:29,910 --> 01:06:28,160

to report their files from that as well

1788

01:06:32,870 --> 01:06:29,920

so they're some of the things that

1789

01:06:34,630 --> 01:06:32,880

we're hoping to do great thank you very

1790

01:06:38,789 --> 01:06:34,640

much ray

1791

01:06:43,589 --> 01:06:40,950

all right and uh before we turn it over

1792

01:06:45,190 --> 01:06:43,599

to peter which i believe he has a video

1793

01:06:47,750 --> 01:06:45,200

for the first part

1794

01:06:50,789 --> 01:06:47,760

of his presentation i just want to give

1795

01:06:52,549 --> 01:06:50,799

30 seconds on um

1796

01:06:54,549 --> 01:06:52,559

kind of the flow of the presentations

1797

01:06:56,950 --> 01:06:54,559

that that we're hearing today so we

1798

01:06:58,630 --> 01:06:56,960

started off a bit with um

1799

01:07:00,309 --> 01:06:58,640

with and you'll notice most of the

1800

01:07:02,870 --> 01:07:00,319

discussion today is around is about

1801
01:07:05,029 --> 01:07:02,880
ground-based observations and using

1802
01:07:07,589 --> 01:07:05,039
ground-based observations to try to

1803
01:07:09,670 --> 01:07:07,599
increase our knowledge of uh the

1804
01:07:11,750 --> 01:07:09,680
asteroid population the neo population

1805
01:07:13,270 --> 01:07:11,760
there's also significant space based

1806
01:07:15,910 --> 01:07:13,280
observation

1807
01:07:18,390 --> 01:07:15,920
tools that are in discussion um and some

1808
01:07:20,630 --> 01:07:18,400
have already occurred like the neowise

1809
01:07:22,390 --> 01:07:20,640
survey that was uh done by nasa so

1810
01:07:24,069 --> 01:07:22,400
there's also space-based observation and

1811
01:07:27,190 --> 01:07:24,079
data from those observations that might

1812
01:07:29,349 --> 01:07:27,200
be crowdsourced um as well but

1813
01:07:31,029 --> 01:07:29,359

there's either the ability for citizen

1814

01:07:32,549 --> 01:07:31,039

scientists to physically take new

1815

01:07:34,789 --> 01:07:32,559

measurements either using their own

1816

01:07:36,950 --> 01:07:34,799

equipment in their backyard or renting

1817

01:07:39,750 --> 01:07:36,960

equipment from people like slU or

1818

01:07:41,029 --> 01:07:39,760

itelescope or going to like ray was

1819

01:07:43,270 --> 01:07:41,039

talking about going to their local

1820

01:07:45,990 --> 01:07:43,280

observatory and partnering with a mentor

1821

01:07:47,589 --> 01:07:46,000

scientist like carl and actually getting

1822

01:07:48,950 --> 01:07:47,599

walked through a big observatory how

1823

01:07:51,270 --> 01:07:48,960

they can actually take some measurements

1824

01:07:52,950 --> 01:07:51,280

off off a big telescope so there are

1825

01:07:54,630 --> 01:07:52,960

those folks that can actually take new

1826

01:07:56,630 --> 01:07:54,640

observations and contribute those to the

1827

01:07:58,950 --> 01:07:56,640

data set but then there's also and we'll

1828

01:08:00,309 --> 01:07:58,960

hear later about more of these ideas

1829

01:08:01,910 --> 01:08:00,319

there's also then with all that data

1830

01:08:04,950 --> 01:08:01,920

that we do have how do we more

1831

01:08:07,990 --> 01:08:04,960

effectively mine that data both for

1832

01:08:10,549 --> 01:08:08,000

algorithms and machine learning and also

1833

01:08:12,150 --> 01:08:10,559

to extract new information from that

1834

01:08:13,190 --> 01:08:12,160

from that data through citizen science

1835

01:08:15,109 --> 01:08:13,200

in that way as well so you don't

1836

01:08:16,070 --> 01:08:15,119

necessarily have to own equipment as an

1837

01:08:18,870 --> 01:08:16,080

amateur

1838

01:08:20,870 --> 01:08:18,880

to participate which leads us

1839

01:08:22,550 --> 01:08:20,880

into peter barrett who is an amateur

1840

01:08:24,950 --> 01:08:22,560

astronomer himself

1841

01:08:27,430 --> 01:08:24,960

who wasn't taking uh measurements with

1842

01:08:29,990 --> 01:08:27,440

his own equipment but uh instead was uh

1843

01:08:32,070 --> 01:08:30,000

using uh existing data to try to hunt

1844

01:08:34,470 --> 01:08:32,080

for um comets actually um we'll hear

1845

01:08:36,950 --> 01:08:34,480

more about uh his experience um in the

1846

01:08:38,789 --> 01:08:36,960

video that we're about to show we will

1847

01:08:40,870 --> 01:08:38,799

take a break after this it's not written

1848

01:08:43,590 --> 01:08:40,880

on the agenda but we will take a break

1849

01:08:44,789 --> 01:08:43,600

after this uh this presentation for uh

1850

01:08:47,349 --> 01:08:44,799

ten minutes then we'll come back and

1851

01:08:49,269 --> 01:08:47,359

we'll do the final four uh before we

1852

01:08:51,430 --> 01:08:49,279

take another break and then we enter uh

1853

01:08:54,149 --> 01:08:51,440

into the group discussion so just to

1854

01:08:56,950 --> 01:08:54,159

give us a pulse check on where we're at

1855

01:08:59,749 --> 01:08:56,960

um and with that uh peter are you do we

1856

01:09:03,510 --> 01:08:59,759

have peter on the phone

1857

01:09:06,470 --> 01:09:05,749

yeah okay

1858

01:09:08,070 --> 01:09:06,480

okay

1859

01:09:10,309 --> 01:09:08,080

all right so um peter while we're

1860

01:09:12,470 --> 01:09:10,319

playing your video if you could call in

1861

01:09:14,229 --> 01:09:12,480

so that we can make sure that folks can

1862

01:09:32,870 --> 01:09:14,239

have an opportunity to ask you questions

1863

01:09:36,950 --> 01:09:35,349

hello everyone and a warm welcome from

1864

01:09:39,110 --> 01:09:36,960

melbourne australia

1865

01:09:42,630 --> 01:09:39,120

my name is peter barrett and i'm an

1866

01:09:45,189 --> 01:09:42,640

amateur radio operator podcaster and

1867

01:09:47,269 --> 01:09:45,199

citizen scientist

1868

01:09:49,189 --> 01:09:47,279

first let me thank nasa for this

1869

01:09:51,269 --> 01:09:49,199

opportunity to present my submission to

1870

01:09:53,030 --> 01:09:51,279

this forum and also to the other forum

1871

01:09:55,510 --> 01:09:53,040

participants who gave some useful

1872

01:09:57,110 --> 01:09:55,520

feedback in a google hangout we had a

1873

01:09:59,750 --> 01:09:57,120

few days ago

1874

01:10:02,310 --> 01:09:59,760

i've refined my proposal slightly in

1875

01:10:04,870 --> 01:10:02,320

light of those comments

1876

01:10:07,510 --> 01:10:04,880

my proposal is drawn from my experience

1877

01:10:10,070 --> 01:10:07,520

with another citizen science initiative

1878

01:10:13,510 --> 01:10:10,080

called the sun gracer website which is

1879

01:10:15,910 --> 01:10:13,520

funded by nasa and esa i'd like to take

1880

01:10:17,590 --> 01:10:15,920

a moment to explain how that program

1881

01:10:20,229 --> 01:10:17,600

works

1882

01:10:22,950 --> 01:10:20,239

for the past 17 years the soho

1883

01:10:25,750 --> 01:10:22,960

spacecraft has been taking photographs

1884

01:10:28,950 --> 01:10:25,760

of the region immediately around the sun

1885

01:10:31,189 --> 01:10:28,960

where sun grazer comets fly by

1886

01:10:33,270 --> 01:10:31,199

the the sungrazer website makes these

1887

01:10:35,990 --> 01:10:33,280

photographs available for download to

1888

01:10:39,110 --> 01:10:36,000

the general public it also provides a

1889

01:10:42,310 --> 01:10:39,120

suite of comet hunting tools and a

1890

01:10:45,189 --> 01:10:42,320

comprehensive comet hunting guide

1891

01:10:46,390 --> 01:10:45,199

participants including children can

1892

01:10:48,950 --> 01:10:46,400

register

1893

01:10:51,990 --> 01:10:48,960

download images and then examine a

1894

01:10:54,709 --> 01:10:52,000

series of photographs to look for a dot

1895

01:10:56,630 --> 01:10:54,719

moving in a straight line and at a

1896

01:10:59,270 --> 01:10:56,640

constant speed

1897

01:11:02,070 --> 01:10:59,280

if they find such a dot and it's clearly

1898

01:11:04,070 --> 01:11:02,080

not a star or a known planet they can

1899

01:11:06,550 --> 01:11:04,080

record the object's coordinates in a

1900

01:11:09,990 --> 01:11:06,560

series of images and then fill out an

1901

01:11:12,870 --> 01:11:10,000

online comment reporting form

1902

01:11:16,390 --> 01:11:12,880

that report is then checked by the soho

1903

01:11:19,270 --> 01:11:16,400

site webmaster mr sungraser

1904

01:11:21,830 --> 01:11:19,280

the first person to find and report an

1905

01:11:23,669 --> 01:11:21,840

unknown comment gets credit as its

1906

01:11:26,390 --> 01:11:23,679

discoverer

1907

01:11:29,669 --> 01:11:26,400

it's a great program and to date around

1908

01:11:33,110 --> 01:11:29,679

100 citizen scientists and enthusiasts

1909

01:11:34,470 --> 01:11:33,120

including myself have reported in excess

1910

01:11:37,910 --> 01:11:34,480

of 2

1911

01:11:40,950 --> 01:11:37,920

500 confirmed comments

1912

01:11:44,790 --> 01:11:40,960

now it's really easy to spot a comet

1913

01:11:47,590 --> 01:11:44,800

but it wasn't until may 2013 after four

1914

01:11:50,709 --> 01:11:47,600

years on and off that i was able to be

1915

01:11:52,070 --> 01:11:50,719

credited as the discoverer of the comet

1916

01:11:54,630 --> 01:11:52,080

the reason

1917

01:11:58,229 --> 01:11:54,640

the cameras aboard the soho spacecraft

1918

01:12:00,870 --> 01:11:58,239

only take around 240 photographs a day

1919

01:12:02,550 --> 01:12:00,880

and a new comet only comes along every

1920

01:12:05,189 --> 01:12:02,560

couple of days

1921

01:12:06,830 --> 01:12:05,199

so competition to be the first to report

1922

01:12:08,790 --> 01:12:06,840

a comet is

1923

01:12:10,870 --> 01:12:08,800

intense

1924

01:12:13,189 --> 01:12:10,880

one personal disappointment i had about

1925

01:12:15,189 --> 01:12:13,199

the program was the fact that comet

1926

01:12:17,110 --> 01:12:15,199

discoverers don't get to name their

1927

01:12:19,830 --> 01:12:17,120

comets because the international

1928

01:12:22,229 --> 01:12:19,840

astronomical union has a rule that says

1929

01:12:26,550 --> 01:12:22,239

that discoveries made using space-based

1930

01:12:29,030 --> 01:12:26,560

telescopes get named after the telescope

1931

01:12:31,189 --> 01:12:29,040

however this rule does not apply to

1932

01:12:33,590 --> 01:12:31,199

discoveries made using ground-based

1933

01:12:35,990 --> 01:12:33,600

telescopes and that's an important point

1934

01:12:38,790 --> 01:12:36,000

to note when designing an asteroid

1935

01:12:41,189 --> 01:12:38,800

identification program

1936

01:12:44,149 --> 01:12:41,199

it's clear that the sungrazer program is

1937

01:12:46,310 --> 01:12:44,159

a proven success and my submission is

1938

01:12:49,669 --> 01:12:46,320

that nasa would create a citizen science

1939

01:12:51,669 --> 01:12:49,679

program to find asteroids based upon the

1940

01:12:54,229 --> 01:12:51,679

sun grazer program

1941

01:12:56,390 --> 01:12:54,239

in my proposal nasa would have a large

1942

01:12:58,790 --> 01:12:56,400

fleet of ground-based telescopes

1943

01:13:00,790 --> 01:12:58,800

scanning the areas of the sky that are

1944

01:13:02,550 --> 01:13:00,800

not currently being scanned by current

1945

01:13:04,630 --> 01:13:02,560

sky surveys

1946

01:13:07,830 --> 01:13:04,640

it could then provide the photographs

1947

01:13:10,550 --> 01:13:07,840

online in a special website along with

1948

01:13:13,910 --> 01:13:10,560

an asteroid hunting guide some software

1949

01:13:16,070 --> 01:13:13,920

tools and a reporting form

1950

01:13:18,310 --> 01:13:16,080

the big difference though is that now

1951

01:13:21,030 --> 01:13:18,320

the first person to identify and report

1952

01:13:23,590 --> 01:13:21,040

an asteroid would not only be credited

1953

01:13:27,590 --> 01:13:23,600

as the discoverer but would also get to

1954

01:13:30,310 --> 01:13:27,600

propose a name to the iau for the object

1955

01:13:33,189 --> 01:13:30,320

this would truly be a revolution in

1956

01:13:36,550 --> 01:13:33,199

astronomy and citizen science

1957

01:13:38,950 --> 01:13:36,560

citizen scientists enthusiasts and most

1958

01:13:42,149 --> 01:13:38,960

importantly children would have the

1959

01:13:44,070 --> 01:13:42,159

opportunity to discover a celestial body

1960

01:13:46,630 --> 01:13:44,080

and name it

1961

01:13:48,950 --> 01:13:46,640

no longer would these benefits be the

1962

01:13:51,590 --> 01:13:48,960

exclusive preserve of professional

1963

01:13:55,189 --> 01:13:51,600

astronomers and those amateurs who can

1964

01:13:57,510 --> 01:13:55,199

afford expensive telescopes

1965

01:14:01,189 --> 01:13:57,520

the participation of children in this

1966

01:14:03,590 --> 01:14:01,199

program is very important how better to

1967

01:14:05,990 --> 01:14:03,600

encourage children to study maths and

1968

01:14:08,149 --> 01:14:06,000

science than to get them to use their

1969

01:14:09,189 --> 01:14:08,159

maths and science skills in a practical

1970

01:14:12,070 --> 01:14:09,199

setting

1971

01:14:14,630 --> 01:14:12,080

and reward them with the ability to name

1972

01:14:17,189 --> 01:14:14,640

a patch of the night sky

1973

01:14:19,510 --> 01:14:17,199

i think that the opportunity to name a

1974

01:14:22,390 --> 01:14:19,520

celestial object would be a great

1975

01:14:24,229 --> 01:14:22,400

motivator for citizen scientists

1976

01:14:26,310 --> 01:14:24,239

when i tell people about my comet

1977

01:14:29,830 --> 01:14:26,320

discovery their first question is

1978

01:14:31,510 --> 01:14:29,840

usually what did you call it

1979

01:14:34,470 --> 01:14:31,520

i'll be keen to look at the public

1980

01:14:36,630 --> 01:14:34,480

feedback on twitter and elsewhere to see

1981

01:14:38,790 --> 01:14:36,640

the public's opinion as to whether they

1982

01:14:41,430 --> 01:14:38,800

think that the opportunity to name a

1983

01:14:43,189 --> 01:14:41,440

celestial object is important or not to

1984

01:14:46,070 --> 01:14:43,199

them

1985

01:14:48,790 --> 01:14:46,080

now concerns were raised about people

1986

01:14:51,669 --> 01:14:48,800

who might try to cheat the system

1987

01:14:53,270 --> 01:14:51,679

for example by the use of multiple

1988

01:14:55,990 --> 01:14:53,280

accounts

1989

01:14:58,070 --> 01:14:56,000

i've given this some thought and i think

1990

01:15:00,870 --> 01:14:58,080

that that concern can be addressed

1991

01:15:03,750 --> 01:15:00,880

through a range of measures

1992

01:15:07,430 --> 01:15:03,760

first there needs to be lots of images

1993

01:15:10,390 --> 01:15:07,440

made available to everyone each day

1994

01:15:14,310 --> 01:15:10,400

even hundreds of thousands of sequences

1995

01:15:17,750 --> 01:15:14,320

of images if possible so that any one

1996

01:15:20,790 --> 01:15:17,760

person could not review them all

1997

01:15:23,669 --> 01:15:20,800

next each individual would be limited to

1998

01:15:25,590 --> 01:15:23,679

one asteroid discovery only during the

1999

01:15:28,070 --> 01:15:25,600

life of the program

2000

01:15:30,550 --> 01:15:28,080

one exception to this rule could be that

2001

01:15:33,750 --> 01:15:30,560

you could be credited as a discoverer of

2002

01:15:36,229 --> 01:15:33,760

another asteroid only if the images are

2003

01:15:38,149 --> 01:15:36,239

older than one month

2004

01:15:40,470 --> 01:15:38,159

this would mean that the asteroid

2005

01:15:42,390 --> 01:15:40,480

discoveries would be shared around to as

2006

01:15:44,709 --> 01:15:42,400

many people as possible

2007

01:15:47,110 --> 01:15:44,719

whilst people who have found an object

2008

01:15:52,709 --> 01:15:47,120

previously would still have a chance to

2009

01:15:55,350 --> 01:15:52,719

find another asteroid in archival images

2010

01:15:57,990 --> 01:15:55,360

had such a system been used on the soho

2011

01:16:00,229 --> 01:15:58,000

website there would have been at least

2012

01:16:03,669 --> 01:16:00,239

two thousand five hundred separate

2013

01:16:06,470 --> 01:16:03,679

discoverers not one hundred

2014

01:16:09,030 --> 01:16:06,480

there could also be an additional rule

2015

01:16:10,229 --> 01:16:09,040

that says that anyone who tries to cheat

2016

01:16:11,110 --> 01:16:10,239

the system

2017

01:16:13,350 --> 01:16:11,120

by

2018

01:16:15,830 --> 01:16:13,360

signing up for multiple accounts

2019

01:16:17,830 --> 01:16:15,840

or using false names

2020

01:16:21,110 --> 01:16:17,840

would have any and all of their

2021

01:16:23,830 --> 01:16:21,120

discoveries annulled if caught

2022

01:16:28,229 --> 01:16:23,840

each discovery would instead be credited

2023

01:16:31,270 --> 01:16:28,239

to the next person to report it

2024

01:16:34,070 --> 01:16:31,280

each asteroid report could first be peer

2025

01:16:35,990 --> 01:16:34,080

reviewed by other citizen scientist

2026

01:16:37,990 --> 01:16:36,000

volunteers

2027

01:16:41,270 --> 01:16:38,000

where the majority view is that the

2028

01:16:43,430 --> 01:16:41,280

asteroid is a real undiscovered object

2029

01:16:46,310 --> 01:16:43,440

the report would then go on to the

2030

01:16:48,870 --> 01:16:46,320

asteroid initiative webmaster who would

2031

01:16:51,189 --> 01:16:48,880

schedule further observations

2032

01:16:53,350 --> 01:16:51,199

confirm that the object is a new

2033

01:16:56,229 --> 01:16:53,360

undiscovered asteroid

2034

01:16:58,790 --> 01:16:56,239

calculate its orbital attributes and

2035

01:17:01,510 --> 01:16:58,800

then submit all this information along

2036

01:17:03,590 --> 01:17:01,520

with the discoverer's proposed name to

2037

01:17:06,390 --> 01:17:03,600

the iau

2038

01:17:08,550 --> 01:17:06,400

this system minimizes the number of paid

2039

01:17:13,030 --> 01:17:08,560

staff that are needed to administer the

2040

01:17:19,750 --> 01:17:16,550

now we come to the final question what

2041

01:17:24,070 --> 01:17:19,760

do we call the asteroid initiative

2042

01:17:26,390 --> 01:17:24,080

it needs a name and perhaps an acronym

2043

01:17:32,630 --> 01:17:26,400

thanks for listening to my presentation

2044

01:17:37,750 --> 01:17:35,110

what if

2045

01:17:41,270 --> 01:17:37,760

anyone

2046

01:17:44,709 --> 01:17:41,280

even a 12 year old child

2047

01:17:47,830 --> 01:17:44,719

with their parents permission

2048

01:17:52,470 --> 01:17:47,840

could go online

2049

01:17:56,070 --> 01:17:52,480

participate in a citizen science program

2050

01:18:00,149 --> 01:17:56,080

find an asteroid

2051

01:18:01,430 --> 01:18:00,159

be credited as its discoverer

2052

01:18:04,310 --> 01:18:01,440

and

2053

01:18:06,950 --> 01:18:04,320

get to name it

2054

01:18:10,229 --> 01:18:06,960

what a life-changing experience

2055

01:18:18,390 --> 01:18:15,430

well now there's an australian proposal

2056

01:18:21,270 --> 01:18:18,400

for just such a program

2057

01:18:23,350 --> 01:18:21,280

i nectarine

2058

01:18:26,550 --> 01:18:23,360

the initiative

2059

01:18:30,550 --> 01:18:26,560

for near-earth comet tracking

2060

01:18:31,350 --> 01:18:30,560

asteroid risk identification

2061

01:18:34,550 --> 01:18:31,360

and

2062

01:18:36,870 --> 01:18:34,560

novice education

2063

01:18:39,750 --> 01:18:36,880

and who better

2064

01:18:41,830 --> 01:18:39,760

to take you to the stars

2065

01:18:45,750 --> 01:18:41,840

than the people

2066

01:18:50,709 --> 01:18:47,990

nasa

2067

01:18:54,310 --> 01:18:50,719

lots of telescopes

2068

01:18:57,110 --> 01:18:54,320

taking lots of photographs

2069

01:18:58,870 --> 01:18:57,120

of the night sky

2070

01:19:00,870 --> 01:18:58,880

made available

2071

01:19:04,630 --> 01:19:00,880

through the internet

2072

01:19:06,830 --> 01:19:04,640

for everyone to study

2073

01:19:08,390 --> 01:19:06,840

to find undiscovered

2074

01:19:11,270 --> 01:19:08,400

objects

2075

01:19:14,390 --> 01:19:11,280

that might one day

2076

01:19:18,790 --> 01:19:16,070

so

2077

01:19:19,590 --> 01:19:18,800

don't be surprised

2078

01:19:21,270 --> 01:19:19,600

if

2079

01:19:23,590 --> 01:19:21,280

one day

2080

01:19:26,390 --> 01:19:23,600

a 12 year old child

2081

01:19:28,550 --> 01:19:26,400

with their parents permission

2082

01:19:47,270 --> 01:19:28,560

saves the world

2083

01:19:51,270 --> 01:19:49,669

hello everyone and a warm welcome from

2084

01:19:53,430 --> 01:19:51,280

melbourne australia

2085

01:19:56,950 --> 01:19:53,440

my name is peter barrett and i'm an

2086

01:19:59,510 --> 01:19:56,960

amateur radio operator podcaster and

2087

01:20:01,590 --> 01:19:59,520

citizen scientist

2088

01:20:03,510 --> 01:20:01,600

first let me thank nasa for this

2089

01:20:05,590 --> 01:20:03,520

opportunity to present my submission to

2090

01:20:07,350 --> 01:20:05,600

this forum and also to the other forum

2091

01:20:09,590 --> 01:20:07,360

participants who gave some useful

2092

01:20:11,510 --> 01:20:09,600

feedback in a google hangout quite

2093

01:20:13,830 --> 01:20:11,520

talented and

2094

01:20:14,950 --> 01:20:13,840

also i had a friend in

2095

01:20:17,430 --> 01:20:14,960

france

2096

01:20:19,669 --> 01:20:17,440

faisa who gave me a few suggestions so i

2097

01:20:21,510 --> 01:20:19,679

just want to acknowledge her input as

2098

01:20:23,110 --> 01:20:21,520

well well great job on the video

2099

01:20:25,830 --> 01:20:23,120

everyone in the room was loving that so

2100

01:20:27,590 --> 01:20:25,840

we really enjoyed it thank you um so

2101
01:20:29,270 --> 01:20:27,600
with that um we'll go ahead and turn it

2102
01:20:31,990 --> 01:20:29,280
over to questions

2103
01:20:32,950 --> 01:20:32,000
that we have uh for peter in response to

2104
01:20:36,790 --> 01:20:32,960
his

2105
01:20:39,189 --> 01:20:36,800
um so

2106
01:20:42,470 --> 01:20:39,199
i uh peter i can start um with a

2107
01:20:45,189 --> 01:20:42,480
question um you mentioned a kind of a

2108
01:20:48,310 --> 01:20:45,199
tool kit that you thought would be uh

2109
01:20:50,870 --> 01:20:48,320
useful for a nasa asteroid hunter type

2110
01:20:53,350 --> 01:20:50,880
of activity similar to the comet hunting

2111
01:20:54,470 --> 01:20:53,360
activity that included some basic

2112
01:20:56,550 --> 01:20:54,480
training

2113
01:20:57,270 --> 01:20:56,560

the images themselves

2114

01:20:59,430 --> 01:20:57,280

and

2115

01:21:01,590 --> 01:20:59,440

the reporting form

2116

01:21:03,669 --> 01:21:01,600

i was curious what you as an amateur

2117

01:21:05,510 --> 01:21:03,679

astronomer what what are the tools the

2118

01:21:07,750 --> 01:21:05,520

minimum tools that you think that that

2119

01:21:10,790 --> 01:21:07,760

you need in order to be able to uh

2120

01:21:12,550 --> 01:21:10,800

contribute to a program like that

2121

01:21:14,950 --> 01:21:12,560

uh well first of all basically what

2122

01:21:17,669 --> 01:21:14,960

they've got on the sunday society is a

2123

01:21:19,830 --> 01:21:17,679

very good uh

2124

01:21:21,669 --> 01:21:19,840

example of what's needed first of all

2125

01:21:24,390 --> 01:21:21,679

you need a general guide

2126

01:21:25,910 --> 01:21:24,400

that uh actually

2127

01:21:26,870 --> 01:21:25,920

sets out

2128

01:21:31,350 --> 01:21:26,880

what

2129

01:21:33,830 --> 01:21:31,360

series of photographs there are rules

2130

01:21:36,950 --> 01:21:33,840

that run along the lines of looking for

2131

01:21:40,070 --> 01:21:36,960

a dot moving at a constant speed

2132

01:21:43,110 --> 01:21:40,080

with generally a constant brightness

2133

01:21:45,270 --> 01:21:43,120

in a straight line and uh a lot of

2134

01:21:47,270 --> 01:21:45,280

first-time

2135

01:21:48,790 --> 01:21:47,280

amateur astronomers run into problems

2136

01:21:51,750 --> 01:21:48,800

there because they

2137

01:21:53,750 --> 01:21:51,760

you know that they sort of have a um

2138

01:21:56,229 --> 01:21:53,760

they find a series of dots but it might

2139

01:21:57,910 --> 01:21:56,239

go across then down the runway it

2140

01:22:00,149 --> 01:21:57,920

doesn't actually satisfy all those

2141

01:22:02,550 --> 01:22:00,159

criteria and unless you don't actually

2142

01:22:04,390 --> 01:22:02,560

satisfy those criteria it's unlikely to

2143

01:22:06,550 --> 01:22:04,400

be a common so

2144

01:22:08,149 --> 01:22:06,560

that's where first of all going to

2145

01:22:11,030 --> 01:22:08,159

educate

2146

01:22:13,350 --> 01:22:11,040

the amateur astronomer is a good start

2147

01:22:16,070 --> 01:22:13,360

but then uh you can have a number of

2148

01:22:18,790 --> 01:22:16,080

further tools for example where you

2149

01:22:20,950 --> 01:22:18,800

entered a series of coordinates and your

2150

01:22:23,270 --> 01:22:20,960

computer checks to see that it is in

2151

01:22:26,310 --> 01:22:23,280

fact going in the straight line

2152

01:22:29,189 --> 01:22:26,320

and perhaps uh you know if

2153

01:22:31,189 --> 01:22:29,199

he can analyze the images looks for the

2154

01:22:33,030 --> 01:22:31,199

changes in brightness and if they vary

2155

01:22:35,030 --> 01:22:33,040

too much it might

2156

01:22:37,270 --> 01:22:35,040

say look you know

2157

01:22:39,590 --> 01:22:37,280

this is probably not a comment um

2158

01:22:42,470 --> 01:22:39,600

absolutely i think the best the best way

2159

01:22:44,709 --> 01:22:42,480

to uh um to actually

2160

01:22:47,750 --> 01:22:44,719

to check it is to actually get other and

2161

01:22:50,149 --> 01:22:47,760

amateur astronomers to actually check

2162

01:22:51,990 --> 01:22:50,159

a submission that somebody's put in okay

2163

01:22:54,709 --> 01:22:52,000

because they can then give feedback and

2164

01:22:57,510 --> 01:22:54,719

educate um you know the more experienced

2165

01:22:59,910 --> 01:22:57,520

amateur astronomers can uh educate the

2166

01:23:01,990 --> 01:22:59,920

the newer members as to yeah you know

2167

01:23:03,510 --> 01:23:02,000

you're not you're making a mistake here

2168

01:23:06,470 --> 01:23:03,520

or here

2169

01:23:08,149 --> 01:23:06,480

great another question um we often say

2170

01:23:10,310 --> 01:23:08,159

in the prize world and in the

2171

01:23:12,470 --> 01:23:10,320

crowdsourcing world that you motivate

2172

01:23:14,870 --> 01:23:12,480

people to participate in your activities

2173

01:23:18,390 --> 01:23:14,880

um because of one of four g's

2174

01:23:21,590 --> 01:23:18,400

gold guts good or glory

2175

01:23:22,950 --> 01:23:21,600

and um i i wonder from your perspective

2176

01:23:25,030 --> 01:23:22,960

when you look at the

2177

01:23:26,870 --> 01:23:25,040

you obviously yourself you're motivated

2178

01:23:29,990 --> 01:23:26,880

to participate and do this in your free

2179

01:23:33,350 --> 01:23:30,000

time for your own reasons but i wonder

2180

01:23:36,310 --> 01:23:33,360

um if uh there's going to a comment

2181

01:23:38,629 --> 01:23:36,320

earlier that came in from steve about

2182

01:23:40,709 --> 01:23:38,639

whether or not there's more community

2183

01:23:43,030 --> 01:23:40,719

building activities or kind of amateur

2184

01:23:44,870 --> 01:23:43,040

to amateur connections that might be

2185

01:23:47,189 --> 01:23:44,880

also another incentive that would get

2186

01:23:49,189 --> 01:23:47,199

more people involved kind of pulling on

2187

01:23:50,709 --> 01:23:49,199

that thread about what incentivizes

2188

01:23:52,470 --> 01:23:50,719

amateurs other than being able to name

2189

01:23:53,910 --> 01:23:52,480

it if there's anything other than being

2190

01:23:56,390 --> 01:23:53,920

able to name it that's actually the

2191

01:23:59,030 --> 01:23:56,400

stuff that causes people to spend their

2192

01:24:02,550 --> 01:23:59,040

lonely nights

2193

01:24:05,110 --> 01:24:02,560

looking at asteroids as carl would say

2194

01:24:09,030 --> 01:24:05,120

um i think that probably uh the sense of

2195

01:24:11,910 --> 01:24:09,040

community does help um i actually have a

2196

01:24:13,110 --> 01:24:11,920

a similar experience but not in the

2197

01:24:16,709 --> 01:24:13,120

astronomer

2198

01:24:20,149 --> 01:24:16,719

area i recently participated in mit's

2199

01:24:21,830 --> 01:24:20,159

edx program where they're actually

2200

01:24:22,950 --> 01:24:21,840

making

2201

01:24:25,750 --> 01:24:22,960

what's it

2202

01:24:27,590 --> 01:24:25,760

a number of the units free available for

2203

01:24:29,990 --> 01:24:27,600

people to study

2204

01:24:31,590 --> 01:24:30,000

online and they have a whole social

2205

01:24:33,510 --> 01:24:31,600

networking

2206

01:24:35,830 --> 01:24:33,520

background so you can basically work

2207

01:24:37,830 --> 01:24:35,840

with other students and socially network

2208

01:24:38,709 --> 01:24:37,840

as you're studying through the unit

2209

01:24:40,229 --> 01:24:38,719

and

2210

01:24:42,870 --> 01:24:40,239

that whole experience the social

2211

01:24:44,310 --> 01:24:42,880

networking side of it i actually found

2212

01:24:47,030 --> 01:24:44,320

really really good and you know

2213

01:24:49,669 --> 01:24:47,040

transferring that over into the uh

2214

01:24:51,910 --> 01:24:49,679

the astrology space um you know if there

2215

01:24:54,310 --> 01:24:51,920

was a community there and there is to a

2216

01:24:56,390 --> 01:24:54,320

certain extent with the sunglasses site

2217

01:24:59,669 --> 01:24:56,400

but if there was uh perhaps a um some

2218

01:25:01,590 --> 01:24:59,679

really good uh social media tools there

2219

01:25:03,430 --> 01:25:01,600

i think that that really does encourage

2220

01:25:04,790 --> 01:25:03,440

the whole process

2221

01:25:07,590 --> 01:25:04,800

great i think we have time for one more

2222

01:25:10,229 --> 01:25:07,600

to two questions yeah um i really really

2223

01:25:13,669 --> 01:25:10,239

loved uh the video and you obviously

2224

01:25:15,830 --> 01:25:13,679

have a very talented daughter

2225

01:25:18,310 --> 01:25:15,840

one of the thoughts that occurred to me

2226

01:25:19,910 --> 01:25:18,320

is that the number of asteroids to be

2227

01:25:23,270 --> 01:25:19,920

discovered

2228

01:25:26,310 --> 01:25:23,280

there's a finite number and so

2229

01:25:29,430 --> 01:25:26,320

it are have you thought of other ways

2230

01:25:32,070 --> 01:25:29,440

the naming is obviously the holy grail

2231

01:25:33,910 --> 01:25:32,080

of of motivators it seems

2232

01:25:37,590 --> 01:25:33,920

but are there other ways that you've

2233

01:25:39,590 --> 01:25:37,600

considered to keep people engaged

2234

01:25:41,510 --> 01:25:39,600

you stayed at it for quite some time

2235

01:25:43,350 --> 01:25:41,520

till you were able to find one and and

2236

01:25:45,030 --> 01:25:43,360

then didn't get to name it

2237

01:25:48,390 --> 01:25:45,040

but one of the things i think we might

2238

01:25:51,189 --> 01:25:48,400

discuss a bit tomorrow is badging

2239

01:25:53,189 --> 01:25:51,199

have you thought of other mechanisms

2240

01:25:54,870 --> 01:25:53,199

beyond just the naming of the asteroid

2241

01:25:57,430 --> 01:25:54,880

that might help people

2242

01:25:59,110 --> 01:25:57,440

uh stay connected and enthusiastic with

2243

01:26:01,590 --> 01:25:59,120

this work

2244

01:26:03,990 --> 01:26:01,600

well you can always offer prizes i mean

2245

01:26:06,070 --> 01:26:04,000

if you if you're playing with the um of

2246

01:26:07,990 --> 01:26:06,080

the astronomy space

2247

01:26:11,189 --> 01:26:08,000

and you've got people that are um

2248

01:26:12,950 --> 01:26:11,199

perhaps new to astronomy then perhaps uh

2249

01:26:15,350 --> 01:26:12,960

offering them um

2250

01:26:17,669 --> 01:26:15,360

you know a chance to win a telescope

2251
01:26:19,910 --> 01:26:17,679
logically would uh be something that is

2252
01:26:21,590 --> 01:26:19,920
going to be them that whole experience

2253
01:26:24,310 --> 01:26:21,600
and take them further

2254
01:26:28,629 --> 01:26:26,629
great thank you peter for joining us we

2255
01:26:31,270 --> 01:26:28,639
appreciate it i know it's late there so

2256
01:26:32,709 --> 01:26:31,280
thank you very much for uh joining us

2257
01:26:38,390 --> 01:26:32,719
oh it's early

2258
01:26:44,550 --> 01:26:40,229
all right well thank you peter very very

2259
01:26:46,070 --> 01:26:44,560
much for joining us um uh with that

2260
01:26:47,590 --> 01:26:46,080
okay so there was a comment online that

2261
01:26:50,390 --> 01:26:47,600
we'll take real quick and then we'll uh

2262
01:26:53,030 --> 01:26:50,400
we'll we'll take a break go ahead so the

2263
01:26:55,270 --> 01:26:53,040

comment was it would indeed be nice to

2264

01:26:57,189 --> 01:26:55,280

be associated by our names the celestial

2265

01:26:59,110 --> 01:26:57,199

object we may discover

2266

01:27:01,430 --> 01:26:59,120

yeah so i had tweeted out peter your

2267

01:27:03,510 --> 01:27:01,440

question i wonder what social media will

2268

01:27:05,750 --> 01:27:03,520

say about being able to name

2269

01:27:07,110 --> 01:27:05,760

uh asteroids it seems like we got

2270

01:27:09,189 --> 01:27:07,120

a couple responses to it already we'll

2271

01:27:10,390 --> 01:27:09,199

see if more coming in um you can find

2272

01:27:14,149 --> 01:27:10,400

you can follow that on the asteroid

2273

01:27:15,510 --> 01:27:14,159

grand challenge asteroid gc twitter

2274

01:27:17,110 --> 01:27:15,520

so with that um we'll go ahead and take

2275

01:27:19,990 --> 01:27:17,120

a break for 10 minutes so if everyone

2276

01:27:22,550 --> 01:27:20,000

could come back at 3 10

2277

01:27:23,430 --> 01:27:22,560

um am i in the right time zone yes 3 10

2278

01:27:25,750 --> 01:27:23,440

then

2279

01:27:27,750 --> 01:27:25,760

we will get started with jose from the

2280

01:38:34,629 --> 01:27:27,760

minor planet center at that time at 3

2281

01:38:37,270 --> 01:38:35,590

yes

2282

01:38:38,950 --> 01:38:37,280

okay

2283

01:38:41,430 --> 01:38:38,960

all right um so jose we're gonna go

2284

01:38:44,870 --> 01:38:41,440

ahead and get uh started in the second

2285

01:38:49,430 --> 01:38:44,880

sec uh section here of uh speakers

2286

01:38:50,950 --> 01:38:49,440

we have a lot of focus on crowdsourcing

2287

01:38:52,870 --> 01:38:50,960

this afternoon

2288

01:38:54,550 --> 01:38:52,880

as well as

2289

01:38:57,189 --> 01:38:54,560

a presentation by the minor planet

2290

01:38:58,950 --> 01:38:57,199

center which is largely the hub for most

2291

01:39:00,790 --> 01:38:58,960

of the observations that are coming in

2292

01:39:04,149 --> 01:39:00,800

globally for new uh new asteroid

2293

01:39:06,390 --> 01:39:04,159

observations out of the um out of uh out

2294

01:39:09,109 --> 01:39:06,400

of harvard so um we will have or the

2295

01:39:12,390 --> 01:39:09,119

smithsonian astrophysical observatory so

2296

01:39:13,830 --> 01:39:12,400

next up is jose and jose if you uh will

2297

01:39:15,669 --> 01:39:13,840

run us through your presentation in 10

2298

01:39:17,910 --> 01:39:15,679

minutes and then we'll have about 10

2299

01:39:20,149 --> 01:39:17,920

minutes for discussion and q a for uh

2300

01:39:22,310 --> 01:39:20,159

your particular set of ideas in response

2301
01:39:23,590 --> 01:39:22,320
to the rfi

2302
01:39:26,229 --> 01:39:23,600
okay

2303
01:39:27,830 --> 01:39:26,239
so i think my webcam just went off i

2304
01:39:36,709 --> 01:39:27,840
don't know if you guys can see me but i

2305
01:39:36,719 --> 01:39:43,669
can you hear me jen

2306
01:39:48,390 --> 01:39:45,910
yes jose we can hear you

2307
01:39:49,750 --> 01:39:48,400
okay let me get started then

2308
01:39:52,709 --> 01:39:49,760
so i am

2309
01:39:55,510 --> 01:39:52,719
i am from the scary minor planet center

2310
01:39:58,070 --> 01:39:55,520
as we called it um hopefully

2311
01:39:59,350 --> 01:39:58,080
i'm not that scary so let me quickly go

2312
01:40:01,830 --> 01:39:59,360
through

2313
01:40:05,030 --> 01:40:01,840

uh what the minor planet center does

2314

01:40:08,070 --> 01:40:05,040

let me get this slide up

2315

01:40:09,350 --> 01:40:08,080

uh so

2316

01:40:11,109 --> 01:40:09,360

you can see here that we've been called

2317

01:40:12,470 --> 01:40:11,119

the nerve center asteroid detection in

2318

01:40:14,629 --> 01:40:12,480

our solar system

2319

01:40:16,229 --> 01:40:14,639

and i think it was a bbc who said that

2320

01:40:18,870 --> 01:40:16,239

in one of their documentaries and it

2321

01:40:19,669 --> 01:40:18,880

certainly i think explains what it is we

2322

01:40:20,550 --> 01:40:19,679

do

2323

01:40:22,470 --> 01:40:20,560

so

2324

01:40:24,070 --> 01:40:22,480

uh let me go through this complicated

2325

01:40:25,590 --> 01:40:24,080

looking diagram but it's not that

2326

01:40:27,830 --> 01:40:25,600

complicated i promise

2327

01:40:29,669 --> 01:40:27,840

so let's start off with the surveys uh

2328

01:40:32,310 --> 01:40:29,679

top left hand corner

2329

01:40:33,830 --> 01:40:32,320

and they survey the night sky and

2330

01:40:35,510 --> 01:40:33,840

they're the guys responsible for

2331

01:40:38,550 --> 01:40:35,520

discovering almost every near earth

2332

01:40:39,830 --> 01:40:38,560

asteroid right now so once they discover

2333

01:40:41,910 --> 01:40:39,840

all they think they may have discovered

2334

01:40:44,390 --> 01:40:41,920

a new asteroid near asteroid they will

2335

01:40:45,510 --> 01:40:44,400

send the data to us to the npc here in

2336

01:40:47,270 --> 01:40:45,520

the center

2337

01:40:48,550 --> 01:40:47,280

and we will

2338

01:40:50,709 --> 01:40:48,560

try to get

2339

01:40:53,510 --> 01:40:50,719

a preliminary orbit which is not very

2340

01:40:54,550 --> 01:40:53,520

accurate but it's good enough and we put

2341

01:40:56,790 --> 01:40:54,560

it out in the nearest object

2342

01:40:59,430 --> 01:40:56,800

confirmation page which is checked by

2343

01:41:01,109 --> 01:40:59,440

surveys and amateur astronomers and as a

2344

01:41:04,149 --> 01:41:01,119

place where we say here are these new

2345

01:41:05,669 --> 01:41:04,159

objects that we believe asteroids and

2346

01:41:07,510 --> 01:41:05,679

some of them are most likely nearest

2347

01:41:08,390 --> 01:41:07,520

asteroids can you guys go and confirm

2348

01:41:10,229 --> 01:41:08,400

this

2349

01:41:13,030 --> 01:41:10,239

so astronomers around the world

2350

01:41:15,590 --> 01:41:13,040

check this out this list every night and

2351

01:41:18,790 --> 01:41:15,600

go and observe them then they send us in

2352

01:41:20,790 --> 01:41:18,800

the data we get new observations and in

2353

01:41:21,990 --> 01:41:20,800

some cases we

2354

01:41:23,270 --> 01:41:22,000

figure out that this is a nearest

2355

01:41:26,229 --> 01:41:23,280

asteroid in other cases it's just a

2356

01:41:29,830 --> 01:41:26,239

normal main belt asteroid either way

2357

01:41:33,109 --> 01:41:29,840

this makes it into our mpc database and

2358

01:41:35,189 --> 01:41:33,119

this data is then absorbed by for

2359

01:41:37,590 --> 01:41:35,199

example nasa jpl or

2360

01:41:39,669 --> 01:41:37,600

italian system neodis who do their own

2361

01:41:41,109 --> 01:41:39,679

processing with these observations

2362

01:41:43,109 --> 01:41:41,119

other people

2363

01:41:45,189 --> 01:41:43,119

also download it for their own use and

2364

01:41:47,830 --> 01:41:45,199

of course we then announce the new

2365

01:41:54,390 --> 01:41:47,840

objects through social media and

2366

01:42:00,070 --> 01:41:56,790

so the three most used services that the

2367

01:42:01,350 --> 01:42:00,080

npc provides to observers are what's new

2368

01:42:03,510 --> 01:42:01,360

which is the

2369

01:42:05,669 --> 01:42:03,520

neo confirmation page i just explained

2370

01:42:07,830 --> 01:42:05,679

then what's visible tonight where you

2371

01:42:09,669 --> 01:42:07,840

can put in

2372

01:42:11,270 --> 01:42:09,679

the information of where you are and

2373

01:42:14,470 --> 01:42:11,280

we'll tell you what asteroids are

2374

01:42:17,430 --> 01:42:14,480

visible nearest and not

2375

01:42:19,669 --> 01:42:17,440

and then the third service is

2376

01:42:20,790 --> 01:42:19,679

let me see

2377

01:42:22,390 --> 01:42:20,800

where should i point my telescope

2378

01:42:24,709 --> 01:42:22,400

obviously we can tell you what's up but

2379

01:42:27,030 --> 01:42:24,719

you need to know where to look

2380

01:42:29,109 --> 01:42:27,040

and you can put in a number of objects

2381

01:42:30,870 --> 01:42:29,119

or just one object your location and

2382

01:42:32,950 --> 01:42:30,880

will tell you exactly where in the sky

2383

01:42:36,870 --> 01:42:32,960

you need to point your telescope

2384

01:42:41,270 --> 01:42:39,270

now the data we get

2385

01:42:44,070 --> 01:42:41,280

this is information for 2012 so we

2386

01:42:47,270 --> 01:42:44,080

received almost 8.7 million observations

2387

01:42:51,030 --> 01:42:47,280

from telescopes around the world uh

2388

01:42:52,390 --> 01:42:51,040

observers almost 300 observers in 46

2389

01:42:53,750 --> 01:42:52,400

countries

2390

01:42:56,629 --> 01:42:53,760

and

2391

01:42:59,510 --> 01:42:56,639

just like carl's map we can see here

2392

01:43:01,510 --> 01:42:59,520

that there are dearest observatories in

2393

01:43:03,750 --> 01:43:01,520

africa and asia

2394

01:43:05,590 --> 01:43:03,760

now the difference with carl's map is

2395

01:43:07,430 --> 01:43:05,600

that we do actually have quite an active

2396

01:43:09,590 --> 01:43:07,440

community in japan and i think i'm

2397

01:43:12,629 --> 01:43:09,600

seeing six observatories there that were

2398

01:43:14,390 --> 01:43:12,639

active in 2012 but i think this shows

2399

01:43:15,590 --> 01:43:14,400

that there's certainly a lot of work

2400

01:43:18,470 --> 01:43:15,600

that we can do in trying to get

2401
01:43:21,830 --> 01:43:18,480
observers from africa and asia to join

2402
01:43:24,629 --> 01:43:23,430
now looking at the

2403
01:43:26,470 --> 01:43:24,639
pro-am

2404
01:43:29,270 --> 01:43:26,480
nearest asteroid observation statistic

2405
01:43:30,709 --> 01:43:29,280
says this is for a 21-month period more

2406
01:43:32,390 --> 01:43:30,719
or less

2407
01:43:34,629 --> 01:43:32,400
we can see hopefully you guys can see

2408
01:43:36,070 --> 01:43:34,639
the numbers but more or less

2409
01:43:38,950 --> 01:43:36,080
as far as observations go about

2410
01:43:40,310 --> 01:43:38,960
two-thirds are made by professionals

2411
01:43:41,830 --> 01:43:40,320
however if we look at the number of

2412
01:43:43,669 --> 01:43:41,840
telescopes

2413
01:43:46,390 --> 01:43:43,679

uh then we see that about two-thirds of

2414

01:43:48,790 --> 01:43:46,400

the telescopes are amateur so

2415

01:43:51,270 --> 01:43:48,800

the the numbers uh skewed towards the

2416

01:43:53,750 --> 01:43:51,280

amateurs for numbers of people that are

2417

01:43:55,750 --> 01:43:53,760

looking at near-earth asteroids but

2418

01:43:59,270 --> 01:43:55,760

obviously the professionals which mostly

2419

01:44:01,590 --> 01:43:59,280

the surveys are much more efficient

2420

01:44:03,510 --> 01:44:01,600

and if we look at the discovery rate we

2421

01:44:05,510 --> 01:44:03,520

see a little sliver there which you

2422

01:44:07,830 --> 01:44:05,520

might just be able to make out

2423

01:44:09,750 --> 01:44:07,840

uh which is three nea's discovered

2424

01:44:11,510 --> 01:44:09,760

during this period by amateurs versus

2425

01:44:13,669 --> 01:44:11,520

1670

2426

01:44:15,830 --> 01:44:13,679

for professionals so most of the

2427

01:44:18,550 --> 01:44:15,840

observations that we get are actually

2428

01:44:22,629 --> 01:44:18,560

follow-up observations where amateurs

2429

01:44:27,270 --> 01:44:25,510

so one of the ideas that i've been

2430

01:44:30,629 --> 01:44:27,280

thrown around and which was my

2431

01:44:31,990 --> 01:44:30,639

rfi response was that of creating

2432

01:44:34,470 --> 01:44:32,000

the lack of a better name nearest

2433

01:44:35,910 --> 01:44:34,480

asteroid like curved core

2434

01:44:38,310 --> 01:44:35,920

and

2435

01:44:41,030 --> 01:44:38,320

attracting amateurs to take

2436

01:44:43,430 --> 01:44:41,040

lycos of near-earth asteroids and it

2437

01:44:44,310 --> 01:44:43,440

seems like the npc would be

2438

01:44:46,550 --> 01:44:44,320

the

2439

01:44:48,470 --> 01:44:46,560

best place to organize this from or to

2440

01:44:51,430 --> 01:44:48,480

be a node for this

2441

01:44:54,070 --> 01:44:51,440

because we are the people who announce

2442

01:44:57,189 --> 01:44:54,080

new discoveries uh because of through

2443

01:44:59,350 --> 01:44:57,199

the iau we're allowed to designate them

2444

01:45:01,430 --> 01:44:59,360

so once we have

2445

01:45:03,109 --> 01:45:01,440

a new discovery or even before if it's

2446

01:45:04,950 --> 01:45:03,119

on the neo confirmation page we could

2447

01:45:07,270 --> 01:45:04,960

alert the network of observers around

2448

01:45:09,030 --> 01:45:07,280

the world and um have taken limiting

2449

01:45:11,350 --> 01:45:09,040

this map to add a whole bunch of new

2450

01:45:12,390 --> 01:45:11,360

dots in africa and asia

2451

01:45:14,310 --> 01:45:12,400

and

2452

01:45:16,310 --> 01:45:14,320

we could alert observers that are able

2453

01:45:18,390 --> 01:45:16,320

to see these particular near-earth

2454

01:45:20,229 --> 01:45:18,400

asteroids from their location and with

2455

01:45:22,550 --> 01:45:20,239

the equipment that they have

2456

01:45:25,270 --> 01:45:22,560

they would produce the light curves send

2457

01:45:27,430 --> 01:45:25,280

them back to the npc and from there

2458

01:45:29,189 --> 01:45:27,440

they'd be made available and the mpc

2459

01:45:33,030 --> 01:45:29,199

doesn't just provide observations we do

2460

01:45:35,189 --> 01:45:33,040

actually have a light curve database and

2461

01:45:37,189 --> 01:45:35,199

we would like to see it populated with

2462

01:45:39,750 --> 01:45:37,199

even more white curves right now we have

2463

01:45:41,590 --> 01:45:39,760

a little over 2 000 objects

2464

01:45:43,430 --> 01:45:41,600
of which about 10 and there are

2465

01:45:44,870 --> 01:45:43,440
asteroids which is not a very high

2466

01:45:46,070 --> 01:45:44,880
number

2467

01:45:49,430 --> 01:45:46,080
now

2468

01:45:52,390 --> 01:45:49,440
i agree with what karl said as well

2469

01:45:53,270 --> 01:45:52,400
he was advocating for having a central

2470

01:45:55,430 --> 01:45:53,280
node

2471

01:45:58,229 --> 01:45:55,440
where people could upload their data and

2472

01:46:00,229 --> 01:45:58,239
have it analyzed in a homogeneous way so

2473

01:46:03,189 --> 01:46:00,239
that all the data is analyzed in the

2474

01:46:06,310 --> 01:46:03,199
same way and i think that makes a lot of

2475

01:46:08,310 --> 01:46:06,320
sense and again if this were to be

2476
01:46:11,669 --> 01:46:08,320
housed at the npc

2477
01:46:12,870 --> 01:46:11,679
i i think it makes sense

2478
01:46:14,629 --> 01:46:12,880
now

2479
01:46:16,390 --> 01:46:14,639
the potential for seasonal science and

2480
01:46:18,310 --> 01:46:16,400
this doesn't just apply to like as

2481
01:46:20,870 --> 01:46:18,320
really any type of observations that

2482
01:46:22,229 --> 01:46:20,880
we're making of nearest asteroids with

2483
01:46:24,950 --> 01:46:22,239
amateurs

2484
01:46:27,189 --> 01:46:24,960
the potential is is large

2485
01:46:28,870 --> 01:46:27,199
we can engage universities to create

2486
01:46:30,950 --> 01:46:28,880
student projects

2487
01:46:33,750 --> 01:46:30,960
we can convince amateurs that are taking

2488
01:46:35,430 --> 01:46:33,760

pretty pictures to do science uh because

2489

01:46:38,870 --> 01:46:35,440

i think that we have enough pictures of

2490

01:46:40,470 --> 01:46:38,880

the andromeda galaxy or the orion nebula

2491

01:46:43,430 --> 01:46:40,480

so get these people to use their very

2492

01:46:44,790 --> 01:46:43,440

nice equipment to actually do science

2493

01:46:47,430 --> 01:46:44,800

we can convince amateurs that are

2494

01:46:50,629 --> 01:46:47,440

already doing science like for example

2495

01:46:52,390 --> 01:46:50,639

those at the aavso that do variable star

2496

01:46:54,470 --> 01:46:52,400

observing they already know how to use

2497

01:46:55,270 --> 01:46:54,480

their equipment and do science then have

2498

01:46:57,510 --> 01:46:55,280

them

2499

01:46:59,990 --> 01:46:57,520

come to science for us

2500

01:47:01,590 --> 01:47:00,000

we can also attract people who don't

2501
01:47:03,750 --> 01:47:01,600
have telescopes but who would like to

2502
01:47:06,070 --> 01:47:03,760
use them if we can gain access to

2503
01:47:07,669 --> 01:47:06,080
robotic telescopes and this has already

2504
01:47:10,709 --> 01:47:07,679
proved very successful for example the

2505
01:47:12,870 --> 01:47:10,719
folks telescope where you have students

2506
01:47:15,350 --> 01:47:12,880
in the uk high school students making

2507
01:47:17,590 --> 01:47:15,360
observations and light curves of

2508
01:47:19,270 --> 01:47:17,600
near-earth asteroids

2509
01:47:21,830 --> 01:47:19,280
and there are people who might not want

2510
01:47:24,229 --> 01:47:21,840
to be interested in observing but uh

2511
01:47:26,070 --> 01:47:24,239
they want to collaborate in some way and

2512
01:47:27,030 --> 01:47:26,080
chris lewis for example will talk about

2513
01:47:29,430 --> 01:47:27,040

one of

2514

01:47:31,750 --> 01:47:29,440

their projects for crowdsourcing with

2515

01:47:34,470 --> 01:47:31,760

asteroid zoo and then there are also the

2516

01:47:35,590 --> 01:47:34,480

people who just want to be evangelists

2517

01:47:38,070 --> 01:47:35,600

um

2518

01:47:39,910 --> 01:47:38,080

we at the mpc we get emails every now

2519

01:47:42,390 --> 01:47:39,920

and again from people saying hey

2520

01:47:44,229 --> 01:47:42,400

i want to help out i'm a teacher or i

2521

01:47:45,910 --> 01:47:44,239

work at a planetarium what can you guys

2522

01:47:47,350 --> 01:47:45,920

give us and

2523

01:47:48,709 --> 01:47:47,360

right now we

2524

01:47:50,950 --> 01:47:48,719

we don't really have the infrastructure

2525

01:47:53,030 --> 01:47:50,960

to provide

2526

01:47:56,629 --> 01:47:53,040

material to these people who really want

2527

01:48:01,189 --> 01:47:59,430

and the role of the minor planet center

2528

01:48:03,910 --> 01:48:01,199

really it's the same role that we've

2529

01:48:06,470 --> 01:48:03,920

always had we've coordinated collected

2530

01:48:08,470 --> 01:48:06,480

and disseminated data and observations

2531

01:48:10,470 --> 01:48:08,480

for near-earth asteroids

2532

01:48:12,229 --> 01:48:10,480

we also have light curves and we're

2533

01:48:13,990 --> 01:48:12,239

working on a new database

2534

01:48:16,550 --> 01:48:14,000

that is going to supply physical

2535

01:48:18,950 --> 01:48:16,560

characteristics of asteroids as well so

2536

01:48:21,270 --> 01:48:18,960

really the mpc is going to be your

2537

01:48:23,590 --> 01:48:21,280

one-stop shop for asteroid data so it

2538

01:48:24,870 --> 01:48:23,600

would make sense that

2539

01:48:27,430 --> 01:48:24,880

this

2540

01:48:31,030 --> 01:48:27,440

that our resources be leveraged for any

2541

01:48:33,350 --> 01:48:31,040

type of citizen science project

2542

01:48:35,750 --> 01:48:33,360

and with that my scary presentation is

2543

01:48:41,590 --> 01:48:35,760

over so i can take questions

2544

01:48:46,470 --> 01:48:43,750

all right so um we will take uh

2545

01:48:49,189 --> 01:48:46,480

questions from the room and from

2546

01:48:52,790 --> 01:48:49,199

social media um

2547

01:48:57,510 --> 01:48:52,800

there any in the room to start

2548

01:49:00,470 --> 01:48:58,470

uh

2549

01:49:01,990 --> 01:49:00,480

there are two that came in one is a

2550

01:49:04,070 --> 01:49:02,000

little bit more general

2551
01:49:06,950 --> 01:49:04,080
what is um what are some examples of

2552
01:49:08,629 --> 01:49:06,960
student projects

2553
01:49:11,189 --> 01:49:08,639
so how do you engage the student

2554
01:49:12,709 --> 01:49:11,199
community jose

2555
01:49:14,470 --> 01:49:12,719
well that's not something that we have

2556
01:49:16,750 --> 01:49:14,480
done but like i said for example the

2557
01:49:18,310 --> 01:49:16,760
forks telescope that's

2558
01:49:20,070 --> 01:49:18,320
f-a-u-l-k-e-s

2559
01:49:21,350 --> 01:49:20,080
if you look online

2560
01:49:22,870 --> 01:49:21,360
you'll find

2561
01:49:24,709 --> 01:49:22,880
some of the the projects that they've

2562
01:49:26,629 --> 01:49:24,719
been running with high school students

2563
01:49:28,790 --> 01:49:26,639

in the uk

2564

01:49:29,990 --> 01:49:28,800

i think there are other

2565

01:49:31,830 --> 01:49:30,000

right now i can't remember any other

2566

01:49:33,189 --> 01:49:31,840

telescopes that are doing this but i do

2567

01:49:36,070 --> 01:49:33,199

know that there are more telescopes like

2568

01:49:38,790 --> 01:49:36,080

for example the last observatory

2569

01:49:41,189 --> 01:49:38,800

network they also want to do

2570

01:49:43,030 --> 01:49:41,199

provide this service and they have

2571

01:49:44,629 --> 01:49:43,040

telescopes around the world

2572

01:49:47,109 --> 01:49:44,639

and that's very important that you have

2573

01:49:48,390 --> 01:49:47,119

telescopes at night where

2574

01:49:50,629 --> 01:49:48,400

in some other parts of the world when

2575

01:49:51,669 --> 01:49:50,639

the students are in school

2576

01:49:53,189 --> 01:49:51,679

but if

2577

01:49:55,750 --> 01:49:53,199

i think a google search should bring up

2578

01:49:57,189 --> 01:49:55,760

a few projects but i think that we can

2579

01:49:59,270 --> 01:49:57,199

do a lot more there's not that much

2580

01:50:01,510 --> 01:49:59,280

going on

2581

01:50:03,350 --> 01:50:01,520

another question um for me

2582

01:50:06,149 --> 01:50:03,360

just how much data are we talking about

2583

01:50:07,830 --> 01:50:06,159

that you guys have and are you using

2584

01:50:09,830 --> 01:50:07,840

the cloud at all or do you kind of have

2585

01:50:11,430 --> 01:50:09,840

your own server firm setup or your own

2586

01:50:13,589 --> 01:50:11,440

um your own

2587

01:50:15,589 --> 01:50:13,599

farm setup to do that

2588

01:50:17,990 --> 01:50:15,599

yes we do we have our own machines on

2589

01:50:20,950 --> 01:50:18,000

our own cluster

2590

01:50:31,109 --> 01:50:20,960

and right now we have some over 100

2591

01:50:34,709 --> 01:50:31,910

we have

2592

01:50:35,830 --> 01:50:34,719

10 350 i believe

2593

01:50:36,870 --> 01:50:35,840

that's more or less the number that we

2594

01:50:39,430 --> 01:50:36,880

have now

2595

01:50:43,189 --> 01:50:39,440

and like you saw in 2012 we received

2596

01:50:45,030 --> 01:50:43,199

um 8.7 was it 8.7 million observations

2597

01:50:47,189 --> 01:50:45,040

and

2598

01:50:49,189 --> 01:50:47,199

we know that some of the observatories

2599

01:50:51,109 --> 01:50:49,199

are gearing up like kathleen the sky

2600

01:50:53,430 --> 01:50:51,119

survey is going to be upgraded

2601
01:50:56,229 --> 01:50:53,440
pan stars should be dedicated more time

2602
01:50:58,149 --> 01:50:56,239
to nearest asteroid observations so

2603
01:51:03,430 --> 01:50:58,159
most likely next year we're going to

2604
01:51:07,910 --> 01:51:05,109
and at what rate

2605
01:51:10,709 --> 01:51:07,920
are you uh discovering new ones you said

2606
01:51:12,629 --> 01:51:10,719
you had 10 350 in your database

2607
01:51:15,189 --> 01:51:12,639
right now um

2608
01:51:17,910 --> 01:51:15,199
at what what when do you expect to hit a

2609
01:51:20,229 --> 01:51:17,920
uh 11 000.

2610
01:51:23,750 --> 01:51:20,239
so we discovered about in the last three

2611
01:51:25,750 --> 01:51:23,760
years it's been about 950 a year

2612
01:51:27,589 --> 01:51:25,760
and for next year

2613
01:51:29,910 --> 01:51:27,599

like i said with the upgrades in some of

2614

01:51:31,830 --> 01:51:29,920

the surveys it could easily be two or

2615

01:51:36,390 --> 01:51:31,840

three thousand per year

2616

01:51:40,950 --> 01:51:37,910

like on the slide that you have up right

2617

01:51:41,990 --> 01:51:40,960

now you have a neat light curve core

2618

01:51:44,870 --> 01:51:42,000

concept

2619

01:51:46,709 --> 01:51:44,880

could there also be a nia phase curve

2620

01:51:49,189 --> 01:51:46,719

core concept

2621

01:51:51,270 --> 01:51:49,199

oh yes um definitely

2622

01:51:54,229 --> 01:51:51,280

the important thing that i didn't point

2623

01:51:55,189 --> 01:51:54,239

out is that a lot of the the asteroids

2624

01:51:57,589 --> 01:51:55,199

that we

2625

01:52:00,229 --> 01:51:57,599

discover um we discovered them at their

2626

01:52:03,669 --> 01:52:00,239

brightest apparition in

2627

01:52:05,750 --> 01:52:03,679

maybe a decade or more and i think carl

2628

01:52:08,390 --> 01:52:05,760

said that we need to observe them before

2629

01:52:10,790 --> 01:52:08,400

they disappear and

2630

01:52:11,589 --> 01:52:10,800

that's quite true if we don't observe

2631

01:52:13,990 --> 01:52:11,599

them

2632

01:52:16,470 --> 01:52:14,000

within a week or two of their discovery

2633

01:52:18,790 --> 01:52:16,480

then the next opportunity to observe

2634

01:52:21,350 --> 01:52:18,800

them when they are as bright

2635

01:52:24,790 --> 01:52:21,360

uh might be five ten fifteen years into

2636

01:52:27,589 --> 01:52:24,800

the future or more um hence this uh

2637

01:52:29,270 --> 01:52:27,599

the need to set up an alert system for

2638

01:52:31,750 --> 01:52:29,280

observers so that on the night of

2639

01:52:34,870 --> 01:52:31,760

discovery we can let others know that

2640

01:52:36,790 --> 01:52:34,880

they should go out and take a like curve

2641

01:52:39,189 --> 01:52:36,800

do phase curve

2642

01:52:43,510 --> 01:52:39,199

photometry whatever is they

2643

01:52:47,430 --> 01:52:45,830

question for you jose this is jason um

2644

01:52:48,629 --> 01:52:47,440

hey jason

2645

01:52:49,669 --> 01:52:48,639

hello

2646

01:52:51,669 --> 01:52:49,679

uh

2647

01:52:53,350 --> 01:52:51,679

next steps what would you say would be

2648

01:52:55,589 --> 01:52:53,360

the next uh

2649

01:52:59,030 --> 01:52:55,599

next things to do to get a

2650

01:53:00,390 --> 01:52:59,040

a light curve core going

2651
01:53:02,229 --> 01:53:00,400
um

2652
01:53:04,390 --> 01:53:02,239
i think most of the stuff has already

2653
01:53:05,510 --> 01:53:04,400
been mentioned in the previous talks we

2654
01:53:16,470 --> 01:53:05,520
need to

2655
01:53:18,070 --> 01:53:16,480
are taking good light curbs that i think

2656
01:53:19,189 --> 01:53:18,080
is very important and i'd like to stress

2657
01:53:20,870 --> 01:53:19,199
that

2658
01:53:22,550 --> 01:53:20,880
we don't want to take mickey mouse like

2659
01:53:25,270 --> 01:53:22,560
us we want

2660
01:53:26,870 --> 01:53:25,280
them to be a scientific quality and

2661
01:53:29,109 --> 01:53:26,880
i think this is important for the people

2662
01:53:31,109 --> 01:53:29,119
participating they know that they are

2663
01:53:33,830 --> 01:53:31,119

actually making a real contribution by

2664

01:53:36,229 --> 01:53:33,840

taking science quality data that can be

2665

01:53:38,950 --> 01:53:36,239

publishable

2666

01:53:41,589 --> 01:53:38,960

and once that is set up then we need to

2667

01:53:42,470 --> 01:53:41,599

go find these people

2668

01:53:44,310 --> 01:53:42,480

great

2669

01:53:46,550 --> 01:53:44,320

hi jose it's call

2670

01:53:48,709 --> 01:53:46,560

hey carl hey so one thing we really

2671

01:53:50,070 --> 01:53:48,719

haven't discussed yet today but probably

2672

01:53:51,430 --> 01:53:50,080

is um

2673

01:53:53,430 --> 01:53:51,440

something that needs to be discussed

2674

01:53:55,589 --> 01:53:53,440

especially if we have an online gui is

2675

01:53:57,189 --> 01:53:55,599

actual archiving of data because there's

2676

01:53:58,709 --> 01:53:57,199

really no such thing as bad data

2677

01:54:00,390 --> 01:53:58,719

especially nowadays with all sky

2678

01:54:02,229 --> 01:54:00,400

photometric surveys

2679

01:54:04,470 --> 01:54:02,239

any you know part of the sky you're

2680

01:54:05,830 --> 01:54:04,480

gonna have reference stars in it is that

2681

01:54:07,589 --> 01:54:05,840

something the minor planet center is

2682

01:54:09,669 --> 01:54:07,599

thinking of doing i mean i know it's a

2683

01:54:10,790 --> 01:54:09,679

lot you know we're talking a lot of data

2684

01:54:13,109 --> 01:54:10,800

but is it something you guys are

2685

01:54:15,109 --> 01:54:13,119

thinking of

2686

01:54:16,870 --> 01:54:15,119

so what type of data

2687

01:54:18,950 --> 01:54:16,880

are the actual images

2688

01:54:20,310 --> 01:54:18,960

oh the actual images

2689

01:54:22,149 --> 01:54:20,320

it's something that's been bounced

2690

01:54:24,950 --> 01:54:22,159

around and i think there's been a

2691

01:54:26,550 --> 01:54:24,960

reluctance uh historical reluctance to

2692

01:54:29,350 --> 01:54:26,560

archive images

2693

01:54:31,109 --> 01:54:29,360

um it's something that maybe

2694

01:54:32,709 --> 01:54:31,119

should be discussed

2695

01:54:34,310 --> 01:54:32,719

you know offline

2696

01:54:35,830 --> 01:54:34,320

yeah i mean it's something that going in

2697

01:54:37,510 --> 01:54:35,840

the future with you know that the cost

2698

01:54:39,430 --> 01:54:37,520

of memory going down

2699

01:54:41,669 --> 01:54:39,440

shouldn't be quite as difficult

2700

01:54:43,270 --> 01:54:41,679

it it might make sense um our position

2701
01:54:44,790 --> 01:54:43,280
has been that we didn't want images

2702
01:54:46,870 --> 01:54:44,800
because we wanted

2703
01:54:49,589 --> 01:54:46,880
um let's say part of the initiation

2704
01:54:50,950 --> 01:54:49,599
process right is that the observers who

2705
01:54:51,990 --> 01:54:50,960
take the images

2706
01:54:55,270 --> 01:54:52,000
should be

2707
01:54:57,109 --> 01:54:55,280
qualified enough to do the reduction and

2708
01:54:59,990 --> 01:54:57,119
get

2709
01:55:02,229 --> 01:55:00,000
all the data that they send to us so we

2710
01:55:03,189 --> 01:55:02,239
don't need to see the images

2711
01:55:05,510 --> 01:55:03,199
now

2712
01:55:08,550 --> 01:55:05,520
like i said this is historical and

2713
01:55:11,990 --> 01:55:08,560

what we couldn't do in 1980 maybe we can

2714

01:55:13,030 --> 01:55:12,000

do in 2015 but it's it's not something

2715

01:55:16,070 --> 01:55:13,040

that

2716

01:55:17,910 --> 01:55:16,080

can tell you yes or no

2717

01:55:19,189 --> 01:55:17,920

but it is something that maybe we should

2718

01:55:20,470 --> 01:55:19,199

uh discuss

2719

01:55:22,390 --> 01:55:20,480

right because there's been plenty of

2720

01:55:23,669 --> 01:55:22,400

cases where even i think gareth had went

2721

01:55:25,910 --> 01:55:23,679

back and measured the original

2722

01:55:27,589 --> 01:55:25,920

photographic plates of various asteroids

2723

01:55:29,350 --> 01:55:27,599

back 100 years ago

2724

01:55:31,510 --> 01:55:29,360

so as we get new catalogs it would be

2725

01:55:33,510 --> 01:55:31,520

nice to be able to go back and actually

2726

01:55:35,830 --> 01:55:33,520

you know re-reduce all this data again

2727

01:55:38,229 --> 01:55:35,840

at some point in the future

2728

01:55:40,070 --> 01:55:38,239

yeah maybe it would um and i'll point

2729

01:55:41,430 --> 01:55:40,080

out that like herbs we are taking the

2730

01:55:42,790 --> 01:55:41,440

raw data

2731

01:55:44,709 --> 01:55:42,800

that is something that we actually do

2732

01:55:52,229 --> 01:55:44,719

want for sure the raw data for the white

2733

01:55:56,709 --> 01:55:55,589

all right any other questions in room

2734

01:55:58,550 --> 01:55:56,719

nope

2735

01:55:59,910 --> 01:55:58,560

okay thank you jose very much and please

2736

01:56:01,030 --> 01:55:59,920

stick around for the conversation that

2737

01:56:03,030 --> 01:56:01,040

we're going to have later the larger

2738

01:56:07,910 --> 01:56:03,040

group discussion thank you i definitely

2739

01:56:13,430 --> 01:56:10,229

all right next up we should have paul

2740

01:56:15,270 --> 01:56:13,440

cox on the phone paul can you hear me

2741

01:56:18,550 --> 01:56:15,280

yes john thank you very much

2742

01:56:20,629 --> 01:56:18,560

um and paul is with slu llc and he's

2743

01:56:22,390 --> 01:56:20,639

going to run us a bit through the work

2744

01:56:25,030 --> 01:56:22,400

that they do to enable

2745

01:56:26,629 --> 01:56:25,040

amateurs to make observations and also

2746

01:56:28,470 --> 01:56:26,639

some of the public engagement they work

2747

01:56:31,350 --> 01:56:28,480

the work they do to increase public

2748

01:56:34,070 --> 01:56:31,360

awareness of um uh these observations as

2749

01:56:35,430 --> 01:56:34,080

well so take it away paul

2750

01:56:40,950 --> 01:56:35,440

thank you and just to remind you you

2751

01:56:40,960 --> 01:56:42,950

move um

2752

01:56:46,310 --> 01:56:44,390

good afternoon and thank you very much

2753

01:56:49,030 --> 01:56:46,320

for inviting us back

2754

01:56:51,350 --> 01:56:49,040

to to participate in nasa's asteroid

2755

01:56:53,669 --> 01:56:51,360

grand challenge nice to be back uh as

2756

01:57:13,669 --> 01:56:53,679

you said my name is paul bolt i'm a time

2757

01:57:18,629 --> 01:57:15,669

and since that time our amateur

2758

01:57:21,510 --> 01:57:18,639

astronomer members have taken over 2.4

2759

01:57:23,430 --> 01:57:21,520

million real-time images using ski's

2760

01:57:25,430 --> 01:57:23,440

passive technology

2761

01:57:28,790 --> 01:57:25,440

now i am going to talk about this slide

2762

01:57:30,629 --> 01:57:28,800

now uh we drive huge audiences from our

2763

01:57:32,470 --> 01:57:30,639

live public broadcasters celestial

2764

01:57:34,229 --> 01:57:32,480

events and the highlight of that

2765

01:57:35,669 --> 01:57:34,239

um

2766

01:57:44,470 --> 01:57:35,679

should be going back to the google

2767

01:57:48,790 --> 01:57:47,030

directly into the google doodle on their

2768

01:57:49,589 --> 01:57:48,800

home page for 24 hours so that's pretty

2769

01:58:05,109 --> 01:57:49,599

cool

2770

01:58:05,119 --> 01:58:08,310

pursue telescopes

2771

01:58:13,109 --> 01:58:10,629

those telescopes

2772

01:58:16,550 --> 01:58:13,119

control every minute are based here at

2773

01:58:20,149 --> 01:58:18,070

observatory site

2774

01:58:23,270 --> 01:58:20,159

which is home to some of europe's finest

2775

01:58:25,430 --> 01:58:23,280

telescopes it's uh located in the canary

2776

01:58:27,510 --> 01:58:25,440

islands um

2777

01:58:29,910 --> 01:58:27,520

that means that the hours of darkness is

2778

01:58:32,070 --> 01:58:29,920

absolutely ideal for us users and it

2779

01:58:44,229 --> 01:58:32,080

also eliminates one of those classic

2780

01:58:47,990 --> 01:58:46,310

celebrates the 10th anniversary of our

2781

01:58:51,270 --> 01:58:48,000

public launch so we're very excited

2782

01:58:54,149 --> 01:58:51,280

about that and over that time we have

2783

01:58:56,709 --> 01:58:54,159

honed this robotic observatory solution

2784

01:58:59,430 --> 01:58:56,719

that's proven to be affordable

2785

01:59:09,669 --> 01:58:59,440

and is designed to be extremely scalable

2786

01:59:12,870 --> 01:59:11,350

you are on the correct side now so

2787

01:59:17,270 --> 01:59:12,880

please don't move forward until i say

2788

01:59:21,990 --> 01:59:20,070

patented system deals with every aspect

2789

01:59:24,470 --> 01:59:22,000

of the operations from scheduling the

2790

01:59:27,109 --> 01:59:24,480

missions image acquisition by fully

2791

01:59:29,669 --> 01:59:27,119

automated controllers

2792

01:59:31,830 --> 01:59:29,679

also image reductions and processing all

2793

01:59:34,310 --> 01:59:31,840

in real time and the progressive

2794

01:59:36,709 --> 01:59:34,320

real-time streaming to sleep members in

2795

01:59:37,750 --> 01:59:36,719

what we call the mission interface next

2796

01:59:40,149 --> 01:59:37,760

slide

2797

01:59:41,990 --> 01:59:40,159

uh members not only watch missions but

2798

02:00:10,310 --> 01:59:42,000

they've scheduled they can also watch

2799

02:00:13,830 --> 02:00:11,990

contributing important data and

2800

02:00:15,750 --> 02:00:13,840

measurements to a wide variety of

2801
02:00:17,430 --> 02:00:15,760
institutions and professional bodies let

2802
02:00:18,790 --> 02:00:17,440
me talk about that a little bit in a

2803
02:00:20,310 --> 02:00:18,800
moment

2804
02:00:24,149 --> 02:00:20,320
next slide

2805
02:00:25,030 --> 02:00:24,159
an incredibly important aspect of slu's

2806
02:00:27,910 --> 02:00:25,040
work

2807
02:00:30,790 --> 02:00:27,920
is our live public broadcasting covering

2808
02:00:33,030 --> 02:00:30,800
just about every major celestial event

2809
02:00:35,510 --> 02:00:33,040
including what we consider our long

2810
02:00:39,350 --> 02:00:35,520
tenacious campaign to alert the public

2811
02:00:41,990 --> 02:00:39,360
to the threat to mirror asteroids

2812
02:00:44,390 --> 02:00:42,000
some um of their closest approaches to

2813
02:00:45,669 --> 02:00:44,400

earth often within days or weeks of

2814

02:00:47,669 --> 02:00:45,679

discovery

2815

02:00:49,910 --> 02:00:47,679

our program is being supported by

2816

02:00:51,669 --> 02:00:49,920

experts such as dr lucy green duncan

2817

02:00:54,310 --> 02:00:51,679

copp and

2818

02:00:56,470 --> 02:00:54,320

we also want to showcase the work and

2819

02:00:58,790 --> 02:00:56,480

researchers through members and i'd like

2820

02:01:00,550 --> 02:00:58,800

to give a quick length check to these uh

2821

02:01:01,990 --> 02:01:00,560

few people excuse me for doing this but

2822

02:01:05,270 --> 02:01:02,000

the name approaches dave larkin

2823

02:01:11,669 --> 02:01:05,280

christine feliciano paul turner evans

2824

02:01:16,470 --> 02:01:14,070

and that subsidizes the production cost

2825

02:01:19,910 --> 02:01:16,480

and that's a perfect fit there is one

2826

02:01:22,229 --> 02:01:19,920

example with the sponsorship of our 2009

2827

02:01:25,669 --> 02:01:22,239

luna eclipse coverage by parallel

2828

02:01:28,470 --> 02:01:25,679

pictures for the movie transformers

2829

02:01:31,109 --> 02:01:28,480

uh next slide uh actually you need to go

2830

02:01:32,550 --> 02:01:31,119

to slide nine now i think you're

2831

02:01:37,030 --> 02:01:32,560

a little bit behind

2832

02:01:39,510 --> 02:01:37,040

now for some events we call on

2833

02:01:41,830 --> 02:01:39,520

of observatory partners around the globe

2834

02:01:44,390 --> 02:01:41,840

many of those partners are motivated

2835

02:01:46,709 --> 02:01:44,400

just like we are by their own outreach

2836

02:01:49,750 --> 02:01:46,719

programs and still dramatically

2837

02:01:51,910 --> 02:01:49,760

increases their reach and we're always

2838

02:01:53,350 --> 02:01:51,920

looking for new partners so the slide

2839

02:01:55,189 --> 02:01:53,360

that should be up on the screen at the

2840

02:01:59,430 --> 02:01:55,199

moment will be showing uh

2841

02:02:01,830 --> 02:01:59,440

through one uh thank you very much um

2842

02:02:03,750 --> 02:02:01,840

anyway our technical infrastructure

2843

02:02:06,149 --> 02:02:03,760

means that our event partners can

2844

02:02:08,149 --> 02:02:06,159

connect is almost independent of

2845

02:02:09,830 --> 02:02:08,159

whatever equipment that they have and

2846

02:02:11,589 --> 02:02:09,840

that's really pertinent for the master

2847

02:02:13,430 --> 02:02:11,599

initiative as well and showing these

2848

02:02:15,030 --> 02:02:13,440

events live online have brought them to

2849

02:02:20,470 --> 02:02:15,040

an audience that would otherwise have

2850

02:02:25,510 --> 02:02:22,870

network uh such that media websites now

2851
02:02:27,589 --> 02:02:25,520
can easily embed our live coverage and

2852
02:02:30,870 --> 02:02:27,599
we've become the go-to partner for many

2853
02:02:33,589 --> 02:02:30,880
of them including abc news cc

2854
02:02:35,990 --> 02:02:33,599
cnn and a whole bunch of others because

2855
02:02:37,830 --> 02:02:36,000
you know among other things our robust

2856
02:02:39,270 --> 02:02:37,840
systems can usually be relied on to

2857
02:02:40,950 --> 02:02:39,280
deliver

2858
02:02:42,950 --> 02:02:40,960
and we always try and provide weather

2859
02:02:46,390 --> 02:02:42,960
redundancy when possible

2860
02:02:48,870 --> 02:02:46,400
next slide and because our coverage is

2861
02:02:51,270 --> 02:02:48,880
live our images and footage are often

2862
02:02:52,870 --> 02:02:51,280
the first to hit mainstream tv channels

2863
02:02:55,189 --> 02:02:52,880

and that's been especially true of our

2864

02:02:57,270 --> 02:02:55,199

nearest asteroid close approach shows

2865

02:02:57,990 --> 02:02:57,280

over the last couple of years

2866

02:03:00,790 --> 02:02:58,000

so

2867

02:03:03,270 --> 02:03:00,800

how can we apply our tried and tested

2868

02:03:07,910 --> 02:03:03,280

systems and community to assist in the

2869

02:03:10,390 --> 02:03:07,920

nasa grand challenge well next slide

2870

02:03:13,669 --> 02:03:10,400

one area of our activities which has

2871

02:03:15,350 --> 02:03:13,679

grown uh steadily over the universe has

2872

02:03:17,510 --> 02:03:15,360

been a number of members using slew

2873

02:03:19,109 --> 02:03:17,520

telescope to undertake various research

2874

02:03:20,629 --> 02:03:19,119

and scientific studies

2875

02:03:22,550 --> 02:03:20,639

many submitted observations and

2876
02:03:25,750 --> 02:03:22,560
measurements night after night year

2877
02:03:26,830 --> 02:03:25,760
after year to a broad variety

2878
02:03:28,709 --> 02:03:26,840
of

2879
02:03:30,229 --> 02:03:28,719
organizations and institutions uh

2880
02:03:32,550 --> 02:03:30,239
including as we've seen to the minor

2881
02:03:34,310 --> 02:03:32,560
private center now it quickly became

2882
02:03:36,950 --> 02:03:34,320
apparent to us that many individual

2883
02:03:38,390 --> 02:03:36,960
members were tackling the same steep

2884
02:03:40,629 --> 02:03:38,400
learning curve

2885
02:03:47,990 --> 02:03:40,639
for many areas of study so to go with

2886
02:03:52,229 --> 02:03:49,750
now one member is particularly

2887
02:03:53,109 --> 02:03:52,239
instrumental in setting this up um and

2888
02:03:59,510 --> 02:03:53,119

you

2889

02:04:01,669 --> 02:03:59,520

submissions over a two-week period last

2890

02:04:03,030 --> 02:04:01,679

year and this is a very public thank you

2891

02:04:04,790 --> 02:04:03,040

to norman pritchett so thank you for

2892

02:04:07,030 --> 02:04:04,800

that uh next slide

2893

02:04:10,310 --> 02:04:07,040

in addition to the

2894

02:04:12,709 --> 02:04:10,320

lightning activity members have

2895

02:04:15,189 --> 02:04:12,719

extremely quickly to make follow-up

2896

02:04:17,589 --> 02:04:15,199

observations of various short notice

2897

02:04:19,510 --> 02:04:17,599

events not least because we have this

2898

02:04:22,950 --> 02:04:19,520

huge number of members standing for

2899

02:04:24,629 --> 02:04:22,960

astro news stories uh alerts 24 hours a

2900

02:04:26,629 --> 02:04:24,639

day

2901
02:04:28,069 --> 02:04:26,639
a fantastic classic example which we

2902
02:04:30,790 --> 02:04:28,079
really heard about actually during on

2903
02:04:33,030 --> 02:04:30,800
one of the previous uh presentations

2904
02:04:35,750 --> 02:04:33,040
classic example was when we pointed the

2905
02:04:38,229 --> 02:04:35,760
uh the canary is telescopes to be one of

2906
02:04:43,430 --> 02:04:38,239
the few uh around the world who managed

2907
02:04:47,109 --> 02:04:43,440
to uh image asteroid 2008 tc3

2908
02:04:49,109 --> 02:04:47,119
that was around 80 tons 13 foot diameter

2909
02:04:50,870 --> 02:04:49,119
and we finished it a few hours before it

2910
02:04:53,830 --> 02:04:50,880
entered earth's atmosphere over the

2911
02:04:55,510 --> 02:04:53,840
nubian desert in sedan and of course the

2912
02:04:57,589 --> 02:04:55,520
entire student membership we're able to

2913
02:05:00,310 --> 02:04:57,599

watch the images in real time so this is

2914

02:05:01,189 --> 02:05:00,320

really getting it out to huge numbers of

2915

02:05:03,430 --> 02:05:01,199

people

2916

02:05:05,109 --> 02:05:03,440

but that's only one example so many team

2917

02:05:07,669 --> 02:05:05,119

members have not stopped a terrific

2918

02:05:10,709 --> 02:05:07,679

calorie pre-recovery confirmation and

2919

02:05:13,990 --> 02:05:10,719

other unique observations over the years

2920

02:05:16,470 --> 02:05:14,000

inside now one of the key methods and

2921

02:05:18,470 --> 02:05:16,480

this is very appropriate to some of the

2922

02:05:19,830 --> 02:05:18,480

previous presentations that we've seen

2923

02:05:21,830 --> 02:05:19,840

and one of the key methods we're

2924

02:05:24,709 --> 02:05:21,840

developing to broaden this cooperative

2925

02:05:27,510 --> 02:05:24,719

program is through a structured teaching

2926

02:05:29,910 --> 02:05:27,520

and mentoring program now members of the

2927

02:05:31,990 --> 02:05:29,920

corporate cooperative they graduate to

2928

02:05:33,350 --> 02:05:32,000

each level and i think somebody else

2929

02:05:35,830 --> 02:05:33,360

measured you know maybe somebody has to

2930

02:05:38,550 --> 02:05:35,840

be tested and yes you do because you

2931

02:05:40,709 --> 02:05:38,560

have to maintain your observatory's

2932

02:05:43,270 --> 02:05:40,719

reputation so

2933

02:05:44,629 --> 02:05:43,280

everybody participates in preview data

2934

02:05:46,310 --> 02:05:44,639

and measurements to ensure that the

2935

02:05:48,950 --> 02:05:46,320

reputation and the quality of our

2936

02:05:50,870 --> 02:05:48,960

submissions remains high and we aim to

2937

02:05:52,069 --> 02:05:50,880

use the program to engage a wider

2938

02:05:54,390 --> 02:05:52,079

community

2939

02:05:56,390 --> 02:05:54,400

of amateur astronomers extending our

2940

02:05:58,069 --> 02:05:56,400

partnerships with astronomical

2941

02:06:00,790 --> 02:05:58,079

societies not only in the u.s but

2942

02:06:03,189 --> 02:06:00,800

globally next slide

2943

02:06:05,189 --> 02:06:03,199

our core project program has provided a

2944

02:06:07,350 --> 02:06:05,199

ready-made structure to service certain

2945

02:06:08,310 --> 02:06:07,360

initiatives and projects and one recent

2946

02:06:10,950 --> 02:06:08,320

program

2947

02:06:14,229 --> 02:06:10,960

has been the quantity and consistency of

2948

02:06:15,589 --> 02:06:14,239

data we've acquired for current iso and

2949

02:06:17,750 --> 02:06:15,599

we're currently working with the nasa

2950

02:06:20,149 --> 02:06:17,760

back pro and comic ison observing

2951

02:06:22,790 --> 02:06:20,159

campaign to ensure that that data is

2952

02:06:24,550 --> 02:06:22,800

utilized to the full uh and that will be

2953

02:06:26,629 --> 02:06:24,560

coming out later on this week and

2954

02:06:28,790 --> 02:06:26,639

they're always there to catch the

2955

02:06:31,430 --> 02:06:28,800

unexpected like this series of images

2956

02:06:33,189 --> 02:06:31,440

showing comet ison and its temporary

2957

02:06:36,229 --> 02:06:33,199

travelling companion then near earth

2958

02:06:38,629 --> 02:06:36,239

asteroid 433 eos that was a fantastic

2959

02:06:39,589 --> 02:06:38,639

night next slide

2960

02:06:42,709 --> 02:06:39,599

so

2961

02:06:44,069 --> 02:06:42,719

astrometry asteroid photometry and light

2962

02:06:46,470 --> 02:06:44,079

curves we've heard a lot about this

2963

02:06:48,310 --> 02:06:46,480

already and that's one new era of study

2964

02:06:50,470 --> 02:06:48,320

and observation that we started a few

2965

02:06:52,950 --> 02:06:50,480

weeks ago actually it was just before

2966

02:06:54,709 --> 02:06:52,960

the previous workshop was called and

2967

02:06:56,390 --> 02:06:54,719

we're filming a specialist group of

2968

02:06:57,669 --> 02:06:56,400

members around that

2969

02:06:59,910 --> 02:06:57,679

and it's particularly pertinent

2970

02:07:01,910 --> 02:06:59,920

obviously to nasa's asteroid initiative

2971

02:07:04,709 --> 02:07:01,920

now sleeves were in place to generate

2972

02:07:07,350 --> 02:07:04,719

asteroids and light curves from both our

2973

02:07:10,149 --> 02:07:07,360

existing site and from any partner

2974

02:07:13,350 --> 02:07:10,159

observatory that could be adapted easily

2975

02:07:15,430 --> 02:07:13,360

to use infrastructure now this important

2976

02:07:17,350 --> 02:07:15,440

aspect of asteroid study and monitoring

2977

02:07:19,030 --> 02:07:17,360

is largely neglected as we've heard by

2978

02:07:20,629 --> 02:07:19,040

the professional community and that's

2979

02:07:23,750 --> 02:07:20,639

primarily due to the fact that it

2980

02:07:26,629 --> 02:07:23,760

swallows up a huge amount of time and

2981

02:07:28,310 --> 02:07:26,639

the prose time which actually usually

2982

02:07:29,589 --> 02:07:28,320

the proposed telescope time is usually

2983

02:07:31,669 --> 02:07:29,599

quite limited

2984

02:07:33,830 --> 02:07:31,679

whereas amateurs actually probably have

2985

02:07:34,790 --> 02:07:33,840

far greater access to uh telescopes and

2986

02:07:36,950 --> 02:07:34,800

approach

2987

02:07:39,990 --> 02:07:36,960

now the light cameras as we've seen they

2988

02:07:41,510 --> 02:07:40,000

can take memorize for a single asteroid

2989

02:07:44,149 --> 02:07:41,520

so it really is best suited to a

2990

02:07:46,629 --> 02:07:44,159

dedicated resource but at a capacity to

2991

02:07:48,709 --> 02:07:46,639

use existing facilities we could build a

2992

02:07:50,870 --> 02:07:48,719

formidable and low-cost network of

2993

02:07:53,270 --> 02:07:50,880

instruments dedicated to the past with a

2994

02:07:55,669 --> 02:07:53,280

huge number of amateur astronomers at

2995

02:07:57,910 --> 02:07:55,679

the controls now using the same kind of

2996

02:08:00,390 --> 02:07:57,920

training and mentoring that works so

2997

02:08:03,270 --> 02:08:00,400

well for the existing member groups this

2998

02:08:06,229 --> 02:08:03,280

task could be open to a wider dedicated

2999

02:08:08,229 --> 02:08:06,239

team of citizen scientists very easily a

3000

02:08:10,550 --> 02:08:08,239

coordinated observation campaign would

3001
02:08:12,550 --> 02:08:10,560
also dramatically reduce duplication of

3002
02:08:14,149 --> 02:08:12,560
effort in the field and with multiple

3003
02:08:16,069 --> 02:08:14,159
facilities operating at different

3004
02:08:18,149 --> 02:08:16,079
latitudes it would be possible to

3005
02:08:20,390 --> 02:08:18,159
acquire data for those asteroids with

3006
02:08:22,790 --> 02:08:20,400
periods that really can't effectively be

3007
02:08:24,629 --> 02:08:22,800
covered by a single station uh next

3008
02:08:27,350 --> 02:08:24,639
slide

3009
02:08:28,950 --> 02:08:27,360
and this is another area

3010
02:08:31,030 --> 02:08:28,960
cost-effective and flexible

3011
02:08:32,550 --> 02:08:31,040
infrastructure could be applied towards

3012
02:08:34,550 --> 02:08:32,560
the initiative

3013
02:08:36,390 --> 02:08:34,560

now that we do is far from easy but

3014

02:08:38,470 --> 02:08:36,400

we've developed hardware and software

3015

02:08:40,709 --> 02:08:38,480

systems that can operate in the most

3016

02:08:42,310 --> 02:08:40,719

severe environments so you could add

3017

02:08:43,350 --> 02:08:42,320

capacity to our observatory in the

3018

02:08:45,270 --> 02:08:43,360

canary

3019

02:08:47,030 --> 02:08:45,280

and we had consent and approvals to

3020

02:08:49,109 --> 02:08:47,040

construct new observatories in both

3021

02:08:51,589 --> 02:08:49,119

hemispheres so we could bring new

3022

02:08:53,430 --> 02:08:51,599

instruments online in a matter of months

3023

02:08:55,109 --> 02:08:53,440

not years and don't forget this is

3024

02:08:57,510 --> 02:08:55,119

something that we're already doing this

3025

02:08:59,510 --> 02:08:57,520

is not a paper exercise we're already

3026

02:09:02,310 --> 02:08:59,520

doing this stuff

3027

02:09:04,470 --> 02:09:02,320

now the welcome infrastructure uh it

3028

02:09:06,950 --> 02:09:04,480

could be adapted to accommodate the kind

3029

02:09:08,629 --> 02:09:06,960

of advanced and generally underutilized

3030

02:09:10,229 --> 02:09:08,639

amateur observatories that are being

3031

02:09:11,589 --> 02:09:10,239

talked about by the other workshop

3032

02:09:14,709 --> 02:09:11,599

participants

3033

02:09:16,790 --> 02:09:14,719

and it is really an incredible amount of

3034

02:09:18,550 --> 02:09:16,800

equipment out there that just sits idle

3035

02:09:20,790 --> 02:09:18,560

and we found that actually a lot of

3036

02:09:22,390 --> 02:09:20,800

people they're not using it not because

3037

02:09:25,669 --> 02:09:22,400

of time not because of a lot of other

3038

02:09:27,589 --> 02:09:25,679

excuses but they don't have a purpose

3039

02:09:30,310 --> 02:09:27,599

so if you give the armature astronomer

3040

02:09:32,470 --> 02:09:30,320

with that equipment a purpose to use it

3041

02:09:35,830 --> 02:09:32,480

they jump on it so we were talking about

3042

02:09:38,470 --> 02:09:35,840

the motivation i think earlier of um

3043

02:09:40,390 --> 02:09:38,480

of citizen scientists so

3044

02:09:42,390 --> 02:09:40,400

this would remove a host of barriers

3045

02:09:43,669 --> 02:09:42,400

that many amateur astronomers face when

3046

02:09:45,910 --> 02:09:43,679

they try and set up their own

3047

02:09:47,910 --> 02:09:45,920

observatories high costs poor sites

3048

02:09:50,310 --> 02:09:47,920

complex time consuming setup and

3049

02:09:51,990 --> 02:09:50,320

operations lack of expertise the weather

3050

02:09:54,390 --> 02:09:52,000

of course a little of support no

3051

02:09:56,310 --> 02:09:54,400

training and no fellowship of

3052

02:09:58,229 --> 02:09:56,320

right-minded astronomers to work with

3053

02:10:00,550 --> 02:09:58,239

and that's been raised as well that's

3054

02:10:03,430 --> 02:10:00,560

really the community aspect of this is

3055

02:10:05,750 --> 02:10:03,440

an incredibly big motivator for people

3056

02:10:07,830 --> 02:10:05,760

to get involved and to stay involved

3057

02:10:09,510 --> 02:10:07,840

next slide and last night

3058

02:10:11,510 --> 02:10:09,520

so i hope

3059

02:10:13,669 --> 02:10:11,520

we've illustrated those slew's existing

3060

02:10:16,310 --> 02:10:13,679

operations infrastructure public and

3061

02:10:18,310 --> 02:10:16,320

media outreach all along perfectly in

3062

02:10:20,229 --> 02:10:18,320

our lives with none of the aims and

3063

02:10:22,470 --> 02:10:20,239

ambitions of the initiative

3064

02:10:25,350 --> 02:10:22,480

and maybe above all else we can make

3065

02:10:27,510 --> 02:10:25,360

active and meaningful participation in

3066

02:10:29,750 --> 02:10:27,520

the initiative accessible to huge

3067

02:10:31,990 --> 02:10:29,760

numbers of amateur astronomers around

3068

02:10:33,750 --> 02:10:32,000

the globe removing all of the barriers

3069

02:10:35,750 --> 02:10:33,760

that typically prevent them from

3070

02:10:36,790 --> 02:10:35,760

pursuing their passion for science and

3071

02:10:39,189 --> 02:10:36,800

astronomy

3072

02:10:41,589 --> 02:10:39,199

now we could utilize our real-world and

3073

02:10:44,149 --> 02:10:41,599

tested scalable infrastructure to place

3074

02:10:45,830 --> 02:10:44,159

equipment at their disposal to monitor

3075

02:10:48,310 --> 02:10:45,840

rare asteroids from world-class

3076

02:10:50,709 --> 02:10:48,320

observatory sites and elsewhere

3077

02:10:52,550 --> 02:10:50,719

and the structure of our self-supporting

3078

02:10:55,189 --> 02:10:52,560

groups would provide the kind of

3079

02:10:57,510 --> 02:10:55,199

hand-holding and training that really is

3080

02:10:59,830 --> 02:10:57,520

required when people are first faced

3081

02:11:01,030 --> 02:10:59,840

with the enormous steep learning curve

3082

02:11:03,430 --> 02:11:01,040

when they're when they start to

3083

02:11:06,310 --> 02:11:03,440

undertake this kind of work and last but

3084

02:11:08,709 --> 02:11:06,320

not least actually we can use our

3085

02:11:11,669 --> 02:11:08,719

existing and extensive media and partner

3086

02:11:14,229 --> 02:11:11,679

reach to publicize the initiative and

3087

02:11:16,709 --> 02:11:14,239

showcase the achievements of the legion

3088

02:11:19,270 --> 02:11:16,719

of amateur astronomers we'd rally for

3089

02:11:21,270 --> 02:11:19,280

the initiative uh anybody can contact me

3090

02:11:24,870 --> 02:11:21,280

if they're interested in contacting me

3091

02:11:26,550 --> 02:11:24,880

they can just send an email to paul

3092

02:11:33,430 --> 02:11:26,560

calm and that will reach me but thank

3093

02:11:36,310 --> 02:11:34,870

all right so um while we're waiting for

3094

02:11:38,950 --> 02:11:36,320

other folks in the room who have

3095

02:11:42,069 --> 02:11:38,960

questions um i have one i know that you

3096

02:11:43,430 --> 02:11:42,079

talked a lot paul about the scalability

3097

02:11:44,310 --> 02:11:43,440

of

3098

02:11:45,830 --> 02:11:44,320

your

3099

02:11:48,149 --> 02:11:45,840

company's system

3100

02:11:50,550 --> 02:11:48,159

which largely is a subscription model

3101
02:11:53,189 --> 02:11:50,560
for members to enter a cooperative

3102
02:11:55,430 --> 02:11:53,199
pay an annual fee and be able to reserve

3103
02:11:57,109 --> 02:11:55,440
time on your telescopes for various

3104
02:11:58,629 --> 02:11:57,119
types of observing so it's for folks

3105
02:12:01,430 --> 02:11:58,639
that don't have their own

3106
02:12:03,750 --> 02:12:01,440
capable telescopes they can pay

3107
02:12:05,350 --> 02:12:03,760
a fee to get access to not only your

3108
02:12:06,709 --> 02:12:05,360
telescopes but also your processing

3109
02:12:08,870 --> 02:12:06,719
software and

3110
02:12:10,870 --> 02:12:08,880
a bunch of that those other capabilities

3111
02:12:12,390 --> 02:12:10,880
as well i mean

3112
02:12:14,470 --> 02:12:12,400
you spoke a lot about

3113
02:12:18,550 --> 02:12:14,480

scaling this model so more people can

3114

02:12:21,350 --> 02:12:18,560

use it i uh wonder to what extent um

3115

02:12:23,510 --> 02:12:21,360

the reliance on local uh

3116

02:12:24,709 --> 02:12:23,520

uh local astronomy clubs um it seemed to

3117

02:12:27,669 --> 02:12:24,719

be that your your

3118

02:12:30,229 --> 02:12:27,679

one to one mentoring model relied on

3119

02:12:32,629 --> 02:12:30,239

local astronomy clubs kind of buying in

3120

02:12:35,830 --> 02:12:32,639

and signing on and wanting to actually

3121

02:12:37,430 --> 02:12:35,840

uh focus on asteroid i i want to know a

3122

02:12:40,069 --> 02:12:37,440

little bit more about your strategy to

3123

02:12:42,069 --> 02:12:40,079

get those locals kind of enrolled um is

3124

02:12:43,510 --> 02:12:42,079

it a one-on-one kind of going and

3125

02:12:45,270 --> 02:12:43,520

talking to each of the local astronomy

3126

02:12:46,950 --> 02:12:45,280

clubs is there a way to kind of tackle

3127

02:12:48,470 --> 02:12:46,960

all the ones in the u.s at the same time

3128

02:12:49,990 --> 02:12:48,480

kind of what's your enrollment

3129

02:12:51,830 --> 02:12:50,000

strategy there when you're talking about

3130

02:12:53,430 --> 02:12:51,840

scaling for technical assistance for

3131

02:12:55,109 --> 02:12:53,440

mentoring to actually get more people

3132

02:12:57,669 --> 02:12:55,119

observing

3133

02:12:59,990 --> 02:12:57,679

it's not actually dependent on local

3134

02:13:01,990 --> 02:13:00,000

astronomy clubs what we've found has

3135

02:13:03,109 --> 02:13:02,000

worked and

3136

02:13:05,109 --> 02:13:03,119

this

3137

02:13:06,629 --> 02:13:05,119

our scheme at the moment our mentoring

3138

02:13:09,030 --> 02:13:06,639

scheme at the moment

3139

02:13:10,390 --> 02:13:09,040

people kind of aren't allowed in unless

3140

02:13:11,350 --> 02:13:10,400

they promise that they're going to

3141

02:13:16,709 --> 02:13:11,360

mentor

3142

02:13:19,510 --> 02:13:16,719

they're up to up to speed on something

3143

02:13:21,669 --> 02:13:19,520

then they then take over two newbies

3144

02:13:23,510 --> 02:13:21,679

coming in so it's kind of a little bit

3145

02:13:25,990 --> 02:13:23,520

like network marketing from that point

3146

02:13:28,950 --> 02:13:26,000

of view um you know so it's not really

3147

02:13:32,149 --> 02:13:28,960

reliant on local astronomy clubs at all

3148

02:13:33,589 --> 02:13:32,159

and frankly when we get down to the bare

3149

02:13:34,790 --> 02:13:33,599

bones of this and especially when we're

3150

02:13:36,550 --> 02:13:34,800

talking about

3151

02:13:39,270 --> 02:13:36,560

um specific

3152

02:13:41,109 --> 02:13:39,280

scientific tasks it actually becomes

3153

02:13:43,589 --> 02:13:41,119

really quite routine

3154

02:13:45,750 --> 02:13:43,599

um and it's not difficult to do i know

3155

02:13:47,830 --> 02:13:45,760

people have mentioned how difficult the

3156

02:13:48,550 --> 02:13:47,840

mpc site is to use and stuff like that

3157

02:13:51,350 --> 02:13:48,560

but

3158

02:13:53,750 --> 02:13:51,360

our members frankly as soon as they're

3159

02:13:55,589 --> 02:13:53,760

as soon as their hand is held

3160

02:14:04,790 --> 02:13:55,599

for their first couple of submissions

3161

02:14:04,800 --> 02:14:08,470

alone

3162

02:14:13,750 --> 02:14:09,350

great

3163

02:14:15,750 --> 02:14:13,760

um other questions on social media

3164

02:14:16,709 --> 02:14:15,760

i have i have a question paul this is

3165

02:14:19,109 --> 02:14:16,719

jason

3166

02:14:23,109 --> 02:14:20,550

you've provided an incredible

3167

02:14:25,109 --> 02:14:23,119

opportunity for folks that

3168

02:14:26,950 --> 02:14:25,119

don't have the means to have a telescope

3169

02:14:28,870 --> 02:14:26,960

in their backyard if say they live in a

3170

02:14:30,950 --> 02:14:28,880

city

3171

02:14:33,109 --> 02:14:30,960

but for some people there is still the

3172

02:14:35,109 --> 02:14:33,119

allure of going unto the mountain and

3173

02:14:37,669 --> 02:14:35,119

seeing the telescope

3174

02:14:40,870 --> 02:14:37,679

are there opportunities for people to

3175

02:14:42,950 --> 02:14:40,880

travel to the sites um

3176
02:14:45,430 --> 02:14:42,960
to the canaries and

3177
02:14:46,709 --> 02:14:45,440
and either

3178
02:14:49,189 --> 02:14:46,719
work there

3179
02:14:50,229 --> 02:14:49,199
uh first hand or see how the operation

3180
02:14:52,229 --> 02:14:50,239
works and

3181
02:14:54,229 --> 02:14:52,239
from that regard

3182
02:14:56,870 --> 02:14:54,239
that is such a pertinent question at

3183
02:14:59,910 --> 02:14:56,880
this particular time we have

3184
02:15:01,510 --> 02:14:59,920
we just found a new 10-year deal with

3185
02:15:03,030 --> 02:15:01,520
our partners at the site the managers of

3186
02:15:05,750 --> 02:15:03,040
the site at the institute of

3187
02:15:08,310 --> 02:15:05,760
astrophysics in the canary islands and

3188
02:15:11,430 --> 02:15:08,320

uh one of the things that we've been

3189

02:15:12,550 --> 02:15:11,440

asking new members to tell us about is

3190

02:15:13,589 --> 02:15:12,560

would you be

3191

02:15:15,990 --> 02:15:13,599

prepared

3192

02:15:17,709 --> 02:15:16,000

to travel to a flu conference and it is

3193

02:15:21,270 --> 02:15:17,719

something that we're actually looking at

3194

02:15:23,990 --> 02:15:21,280

2014 to actually pull together groups of

3195

02:15:26,629 --> 02:15:24,000

members who are able to travel

3196

02:15:28,550 --> 02:15:26,639

to the observatory to get more hands-on

3197

02:15:30,709 --> 02:15:28,560

and that won't just be with maybe sluice

3198

02:15:33,510 --> 02:15:30,719

telescopes but our new partnership and

3199

02:15:35,990 --> 02:15:33,520

your agreement with uh the emac uh means

3200

02:15:37,510 --> 02:15:36,000

that potentially we'll also members will

3201

02:15:39,270 --> 02:15:37,520

have the opportunity of using some of

3202

02:15:41,350 --> 02:15:39,280

the larger professional telescopes there

3203

02:15:43,750 --> 02:15:41,360

as well

3204

02:15:45,430 --> 02:15:43,760

um on the media side of what you guys do

3205

02:15:47,430 --> 02:15:45,440

paula says jen again on the media side

3206

02:15:49,030 --> 02:15:47,440

of what you guys do

3207

02:15:51,510 --> 02:15:49,040

do you find that more often than not

3208

02:15:53,910 --> 02:15:51,520

you're pitching your story to

3209

02:15:56,149 --> 02:15:53,920

the fox news and the cnns and the

3210

02:15:58,629 --> 02:15:56,159

msnbc's the world to get them to cover

3211

02:16:00,390 --> 02:15:58,639

um the live event or are they

3212

02:16:01,750 --> 02:16:00,400

coming are they coming and covering it

3213

02:16:04,069 --> 02:16:01,760

on their own because it's of interest to

3214

02:16:05,669 --> 02:16:04,079

them kind of how are you generating what

3215

02:16:07,030 --> 02:16:05,679

what's your process for generating kind

3216

02:16:08,390 --> 02:16:07,040

of the media coverage of some of these

3217

02:16:10,550 --> 02:16:08,400

events

3218

02:16:13,030 --> 02:16:10,560

well it's changed jen over the last

3219

02:16:13,830 --> 02:16:13,040

couple of years i mean we started

3220

02:16:15,589 --> 02:16:13,840

um

3221

02:16:18,470 --> 02:16:15,599

trying to raise the profile of these

3222

02:16:20,229 --> 02:16:18,480

things when i became more aware of how

3223

02:16:23,830 --> 02:16:20,239

many of these new earth asteroids were

3224

02:16:25,990 --> 02:16:23,840

being discovered only days before their

3225

02:16:28,629 --> 02:16:26,000

closest approach to earth so we started

3226
02:16:29,669 --> 02:16:28,639
covering these events and at the

3227
02:16:31,750 --> 02:16:29,679
beginning

3228
02:16:34,549 --> 02:16:31,760
we were having to really push for the

3229
02:16:37,110 --> 02:16:34,559
media to pick up the stories but as

3230
02:16:38,469 --> 02:16:37,120
those few years evolved and certainly

3231
02:16:39,990 --> 02:16:38,479
this year

3232
02:16:41,589 --> 02:16:40,000
we have had

3233
02:16:44,150 --> 02:16:41,599
we've had some of the networks

3234
02:16:45,589 --> 02:16:44,160
contacting us asking us

3235
02:16:48,070 --> 02:16:45,599
is there anything on the cards at the

3236
02:16:50,230 --> 02:16:48,080
moment because there seems to be

3237
02:16:51,910 --> 02:16:50,240
a momentum of this whole story and i

3238
02:16:54,150 --> 02:16:51,920

think this workshop has obviously done

3239

02:16:57,270 --> 02:16:54,160

that as well uh but there seems to be a

3240

02:16:58,870 --> 02:16:57,280

momentum uh in the media uh to follow up

3241

02:17:01,669 --> 02:16:58,880

on this story and one of our biggest

3242

02:17:05,030 --> 02:17:01,679

challenges i believe over the next year

3243

02:17:05,990 --> 02:17:05,040

is to maintain that momentum to keep it

3244

02:17:08,070 --> 02:17:06,000

because

3245

02:17:09,990 --> 02:17:08,080

what we did find is i think there was a

3246

02:17:10,950 --> 02:17:10,000

one period earlier on this year where

3247

02:17:14,150 --> 02:17:10,960

there were

3248

02:17:16,790 --> 02:17:14,160

several very more uh passes uh by

3249

02:17:18,870 --> 02:17:16,800

recently discovered asteroids uh within

3250

02:17:21,270 --> 02:17:18,880

a couple of weeks and we did find that

3251

02:17:23,990 --> 02:17:21,280

the media were happy to cover the first

3252

02:17:25,910 --> 02:17:24,000

but on the second the coverage went down

3253

02:17:27,030 --> 02:17:25,920

uh but we're in a period at the moment

3254

02:17:30,469 --> 02:17:27,040

where actually there haven't been any

3255

02:17:32,709 --> 02:17:30,479

recent uh close past uh asteroids

3256

02:17:34,309 --> 02:17:32,719

discovered over the last month or two we

3257

02:17:36,070 --> 02:17:34,319

were hoping there would be so we can

3258

02:17:37,349 --> 02:17:36,080

actually bring you all liars images of

3259

02:17:38,870 --> 02:17:37,359

it tonight but

3260

02:17:43,110 --> 02:17:38,880

unfortunately they never cooperate like

3261

02:17:46,070 --> 02:17:44,549

right it looks like we've got a question

3262

02:17:48,070 --> 02:17:46,080

from carl

3263

02:17:49,830 --> 02:17:48,080

yeah speaking you know since i'm

3264

02:17:51,830 --> 02:17:49,840

involved with target asteroids what is

3265

02:17:53,589 --> 02:17:51,840

the easiest way to basically like

3266

02:17:55,990 --> 02:17:53,599

communicate with the uh

3267

02:17:57,589 --> 02:17:56,000

the members of slu is it uh you know put

3268

02:17:59,509 --> 02:17:57,599

out little bulletins that hey here's an

3269

02:18:09,509 --> 02:17:59,519

object of interest and would be people

3270

02:18:13,669 --> 02:18:12,230

but there are other means that we have

3271

02:18:14,469 --> 02:18:13,679

um of

3272

02:18:16,629 --> 02:18:14,479

uh

3273

02:18:18,309 --> 02:18:16,639

producing pop-ups on the site so anybody

3274

02:18:20,309 --> 02:18:18,319

who's actually on the site watching live

3275

02:18:22,709 --> 02:18:20,319

images at a time we could put a pop-up

3276

02:18:32,070 --> 02:18:22,719

in there and they could immediately

3277

02:18:35,750 --> 02:18:33,750

like putting chrome books in the grade

3278

02:18:38,629 --> 02:18:35,760

schools and maxing the grade school and

3279

02:18:40,230 --> 02:18:38,639

stuff is there any effort to um advocate

3280

02:18:41,990 --> 02:18:40,240

this to school systems to generate

3281

02:18:44,790 --> 02:18:42,000

observatory clubs in order to generate

3282

02:18:48,709 --> 02:18:47,190

we have gone out to schools at various

3283

02:18:50,830 --> 02:18:48,719

points but

3284

02:18:53,669 --> 02:18:50,840

it's been very very difficult

3285

02:18:56,230 --> 02:18:53,679

to to generate the momentum in the

3286

02:18:58,469 --> 02:18:56,240

school itself um

3287

02:19:00,469 --> 02:18:58,479

part of that is about timing uh we

3288

02:19:03,030 --> 02:19:00,479

really want um

3289

02:19:04,469 --> 02:19:03,040

live images into the classroom so some

3290

02:19:17,110 --> 02:19:04,479

schools in the states would have to stay

3291

02:19:21,589 --> 02:19:18,830

great any other any social media

3292

02:19:24,309 --> 02:19:21,599

questions good lin

3293

02:19:25,830 --> 02:19:24,319

um okay so thank you very much paul that

3294

02:19:30,070 --> 02:19:25,840

was great we appreciate you taking the

3295

02:19:35,349 --> 02:19:32,230

and please paul try to rejoin us in

3296

02:19:36,549 --> 02:19:35,359

about uh 50 minutes after our last uh

3297

02:19:39,349 --> 02:19:36,559

two presentations for the group

3298

02:19:40,629 --> 02:19:39,359

discussion if you can just call back in

3299

02:19:42,790 --> 02:19:40,639

certainly thank you

3300

02:19:44,870 --> 02:19:42,800

all right so uh now before we get into

3301

02:19:46,389 --> 02:19:44,880

our last two presenters which is chris

3302

02:19:48,630 --> 02:19:46,399

lewicki from planetary resources and

3303

02:19:51,349 --> 02:19:48,640

andy lamoire from topcoder i want to

3304

02:19:53,030 --> 02:19:51,359

welcome lynn buko from the center of

3305

02:19:55,670 --> 02:19:53,040

excellence for collaborative innovation

3306

02:19:57,830 --> 02:19:55,680

which is the organization for nasa that

3307

02:19:59,270 --> 02:19:57,840

uh helps not only to

3308

02:20:01,510 --> 02:19:59,280

run our own internal prizes and

3309

02:20:03,830 --> 02:20:01,520

crowdsourcing activities that we do at

3310

02:20:05,030 --> 02:20:03,840

nasa but also acts as a

3311

02:20:06,469 --> 02:20:05,040

center of excellence for the rest of

3312

02:20:09,110 --> 02:20:06,479

government and helps the rest of

3313

02:20:10,870 --> 02:20:09,120

government uh figure out how to do these

3314

02:20:12,230 --> 02:20:10,880

new activities as well

3315

02:20:13,990 --> 02:20:12,240

she's going to give us a little bit more

3316

02:20:16,150 --> 02:20:14,000

detail and something we're announcing

3317

02:20:18,790 --> 02:20:16,160

here today which is the first new

3318

02:20:20,469 --> 02:20:18,800

partnership um associated with the

3319

02:20:22,309 --> 02:20:20,479

asteroid grand challenge in the area of

3320

02:20:23,830 --> 02:20:22,319

crowdsourcing and citizen science it's

3321

02:20:25,110 --> 02:20:23,840

actually being announced via press

3322

02:20:27,670 --> 02:20:25,120

release in the next

3323

02:20:30,469 --> 02:20:27,680

eight minutes um both on nasa site and

3324

02:20:31,670 --> 02:20:30,479

on planetary resources site so uh we'll

3325

02:20:33,110 --> 02:20:31,680

tell you a little bit more about what

3326

02:20:35,030 --> 02:20:33,120

this activity is going to be what this

3327

02:20:36,230 --> 02:20:35,040

partnership is lynn will talk a little

3328

02:20:37,910 --> 02:20:36,240

bit more about what it looks like at a

3329

02:20:39,429 --> 02:20:37,920

high level before chris talks about it

3330

02:20:41,830 --> 02:20:39,439

in much more detail

3331

02:20:42,710 --> 02:20:41,840

and then andy a bit from the top coder

3332

02:20:44,630 --> 02:20:42,720

angle

3333

02:20:46,630 --> 02:20:44,640

this is also to say that nasa wants to

3334

02:20:47,830 --> 02:20:46,640

partner with a lot of people in a lot of

3335

02:20:49,110 --> 02:20:47,840

different interesting ways in the grand

3336

02:20:51,910 --> 02:20:49,120

challenge so this is the first of

3337

02:20:54,389 --> 02:20:51,920

partnerships but uh this guy is looking

3338

02:20:55,990 --> 02:20:54,399

for many many space act agreements so if

3339

02:20:58,230 --> 02:20:56,000

other folks are interested in partnering

3340

02:20:59,990 --> 02:20:58,240

um with nasa on the grand challenge um

3341

02:21:01,750 --> 02:21:00,000

we're looking to do many more types of

3342

02:21:03,750 --> 02:21:01,760

partnerships like this so please feel

3343

02:21:05,510 --> 02:21:03,760

free to work with jason on those so with

3344

02:21:07,270 --> 02:21:05,520

that being said lynn

3345

02:21:09,429 --> 02:21:07,280

all right well let me add a little bit

3346

02:21:11,670 --> 02:21:09,439

jen gave you the reader's digest version

3347

02:21:13,429 --> 02:21:11,680

of what i was going to talk about so let

3348

02:21:14,950 --> 02:21:13,439

me get into just a little bit more

3349

02:21:16,790 --> 02:21:14,960

detail

3350

02:21:19,190 --> 02:21:16,800

i have the distinct privilege of

3351
02:21:21,190 --> 02:21:19,200
managing the day-to-day operations of

3352
02:21:22,710 --> 02:21:21,200
the nasa center of excellence for

3353
02:21:26,309 --> 02:21:22,720
collaborative innovation that's a

3354
02:21:27,349 --> 02:21:26,319
mouthful we call it cosy

3355
02:21:31,110 --> 02:21:27,359
that

3356
02:21:33,110 --> 02:21:31,120
organization is a true collaborative

3357
02:21:35,110 --> 02:21:33,120
organization

3358
02:21:37,750 --> 02:21:35,120
among the the

3359
02:21:39,429 --> 02:21:37,760
organization is supported by our human

3360
02:21:42,790 --> 02:21:39,439
exploration office

3361
02:21:44,790 --> 02:21:42,800
jen's oct organization

3362
02:21:46,710 --> 02:21:44,800
and the human health and performance

3363
02:21:49,510 --> 02:21:46,720

director here at the johnson space

3364

02:21:52,309 --> 02:21:49,520

center so as challenging as that makes

3365

02:21:54,790 --> 02:21:52,319

my job occasionally to have three bosses

3366

02:21:57,670 --> 02:21:54,800

it is also part and parcel of the reason

3367

02:21:59,110 --> 02:21:57,680

why the organization i think has been so

3368

02:22:01,190 --> 02:21:59,120

successful

3369

02:22:03,030 --> 02:22:01,200

nasa created the center of excellence

3370

02:22:05,110 --> 02:22:03,040

because of the groundbreaking work dr

3371

02:22:08,150 --> 02:22:05,120

jeff davis was doing here at the johnson

3372

02:22:09,990 --> 02:22:08,160

space center using crowdsourcing to

3373

02:22:12,790 --> 02:22:10,000

advance efforts in the space life

3374

02:22:15,510 --> 02:22:12,800

sciences discipline and just to qualify

3375

02:22:17,990 --> 02:22:15,520

a little bit i love walking into a room

3376

02:22:20,790 --> 02:22:18,000

where crowdsourcing is actually being

3377

02:22:22,870 --> 02:22:20,800

used there was a definition of it

3378

02:22:25,670 --> 02:22:22,880

for us specifically i just wanted to

3379

02:22:29,590 --> 02:22:25,680

refine the definition just a little bit

3380

02:22:32,790 --> 02:22:29,600

because for us it really means we run

3381

02:22:34,710 --> 02:22:32,800

competitions challenges contests we kind

3382

02:22:36,870 --> 02:22:34,720

of use those terms interchangeably and

3383

02:22:39,429 --> 02:22:36,880

sometimes confusingly i know

3384

02:22:41,750 --> 02:22:39,439

in large established communities where

3385

02:22:44,870 --> 02:22:41,760

there is a vendor who curates that

3386

02:22:47,110 --> 02:22:44,880

community and we pay only the winners

3387

02:22:49,510 --> 02:22:47,120

for the solutions that we choose to pay

3388

02:22:51,910 --> 02:22:49,520

for so when i talk crowdsourcing for

3389

02:22:53,510 --> 02:22:51,920

cosi that's the specific definition for

3390

02:22:55,510 --> 02:22:53,520

us

3391

02:22:58,630 --> 02:22:55,520

while jeff was down here doing this

3392

02:23:00,950 --> 02:22:58,640

groundbreaking work in his disciplinary

3393

02:23:03,750 --> 02:23:00,960

area jason kruzan and the human

3394

02:23:05,910 --> 02:23:03,760

exploration office at headquarters now

3395

02:23:08,469 --> 02:23:05,920

our advanced exploration systems

3396

02:23:11,110 --> 02:23:08,479

director became intrigued by this

3397

02:23:13,510 --> 02:23:11,120

practice of crowdsourcing and he

3398

02:23:16,790 --> 02:23:13,520

launched efforts to use it to address

3399

02:23:18,710 --> 02:23:16,800

complex algorithmic data processing and

3400

02:23:20,710 --> 02:23:18,720

software development efforts

3401
02:23:22,790 --> 02:23:20,720
because of the highly visible work jeff

3402
02:23:24,870 --> 02:23:22,800
was doing and jason was doing at

3403
02:23:26,469 --> 02:23:24,880
headquarters they were asked by the

3404
02:23:28,790 --> 02:23:26,479
white house office of science and

3405
02:23:30,870 --> 02:23:28,800
technology policy if nasa would be

3406
02:23:33,429 --> 02:23:30,880
willing to create an organization to

3407
02:23:35,990 --> 02:23:33,439
help other federal agencies capitalize

3408
02:23:38,710 --> 02:23:36,000
on our lessons learned and our best

3409
02:23:42,030 --> 02:23:38,720
practices and if we wouldn't be willing

3410
02:23:44,630 --> 02:23:42,040
to sort of enable their use of of

3411
02:23:46,550 --> 02:23:44,640
crowdsourcing to facilitate their

3412
02:23:47,590 --> 02:23:46,560
mission so they didn't have to reinvent

3413
02:23:49,429 --> 02:23:47,600

the wheel

3414

02:23:51,429 --> 02:23:49,439

believe it or not the government really

3415

02:23:54,150 --> 02:23:51,439

didn't want to reinvent the wheel they

3416

02:23:56,469 --> 02:23:54,160

wanted agencies to take advantage of

3417

02:23:58,550 --> 02:23:56,479

this technique to capitalize on it and

3418

02:24:02,150 --> 02:23:58,560

start using it and infusing it within

3419

02:24:04,230 --> 02:24:02,160

their own agencies so jeff and jason ask

3420

02:24:05,590 --> 02:24:04,240

bill gerstenmaier do you know who bill

3421

02:24:07,349 --> 02:24:05,600

is right

3422

02:24:09,270 --> 02:24:07,359

if he would support the creation of our

3423

02:24:11,670 --> 02:24:09,280

little organization and it's a little

3424

02:24:13,910 --> 02:24:11,680

organization indeed and of course his

3425

02:24:15,830 --> 02:24:13,920

specific question to jason was what does

3426

02:24:18,469 --> 02:24:15,840

nasa get out of this

3427

02:24:20,469 --> 02:24:18,479

jason eloquently answered that we get to

3428

02:24:22,950 --> 02:24:20,479

learn from others mistakes that's always

3429

02:24:25,190 --> 02:24:22,960

nice before we make them ourselves and

3430

02:24:28,309 --> 02:24:25,200

we can be so much smarter about how we

3431

02:24:29,670 --> 02:24:28,319

use these techniques internal to nasa

3432

02:24:31,910 --> 02:24:29,680

and i'm here to tell you that we've

3433

02:24:34,790 --> 02:24:31,920

learned a lot

3434

02:24:37,349 --> 02:24:34,800

um we are now as of this month space

3435

02:24:39,110 --> 02:24:37,359

station is 15 cosi is two we're two

3436

02:24:40,710 --> 02:24:39,120

years old we're out of our infancy and

3437

02:24:43,030 --> 02:24:40,720

into our toddlership

3438

02:24:44,950 --> 02:24:43,040

um so far we have worked or are

3439

02:24:46,710 --> 02:24:44,960

currently working with the u.s patent

3440

02:24:48,870 --> 02:24:46,720

and trade office the centers for

3441

02:24:51,590 --> 02:24:48,880

medicare and medicaid services the

3442

02:24:53,910 --> 02:24:51,600

office of personnel management epa

3443

02:24:57,110 --> 02:24:53,920

department of energy and the united

3444

02:24:59,590 --> 02:24:57,120

states association for international

3445

02:25:01,590 --> 02:24:59,600

development or u.s aid

3446

02:25:03,429 --> 02:25:01,600

but it's important and always important

3447

02:25:04,309 --> 02:25:03,439

for us to come back to gerstenmeier's

3448

02:25:06,070 --> 02:25:04,319

question

3449

02:25:08,630 --> 02:25:06,080

because cosi isn't just about helping

3450

02:25:10,710 --> 02:25:08,640

other federal agencies core to our

3451

02:25:13,750 --> 02:25:10,720

mission is to ensure direct benefit to

3452

02:25:16,710 --> 02:25:13,760

nasa and its projects and programs from

3453

02:25:19,110 --> 02:25:16,720

the use of this what i consider a really

3454

02:25:20,870 --> 02:25:19,120

promising technique

3455

02:25:23,030 --> 02:25:20,880

and it is promising

3456

02:25:24,630 --> 02:25:23,040

i'd be happy to share more details and i

3457

02:25:26,630 --> 02:25:24,640

wanted to introduce steve raider my

3458

02:25:28,870 --> 02:25:26,640

deputy sitting in the audience if you

3459

02:25:30,389 --> 02:25:28,880

want details of what specifically we've

3460

02:25:32,550 --> 02:25:30,399

done with these other agencies what

3461

02:25:34,790 --> 02:25:32,560

challenges we've run ourselves i'd be

3462

02:25:37,510 --> 02:25:34,800

happy to share them jen is very eloquent

3463

02:25:39,110 --> 02:25:37,520

in sharing what we've done so so far

3464

02:25:42,469 --> 02:25:39,120

but i wanted to talk about one of the

3465

02:25:45,030 --> 02:25:42,479

primary tools that cosi uses it from its

3466

02:25:46,710 --> 02:25:45,040

tool kit and that tool is called the

3467

02:25:49,270 --> 02:25:46,720

nasa tournament lab

3468

02:25:51,750 --> 02:25:49,280

the ntl was a result of a contract with

3469

02:25:54,150 --> 02:25:51,760

harvard university because we were

3470

02:25:56,469 --> 02:25:54,160

really interested in furthering research

3471

02:25:58,790 --> 02:25:56,479

in the use of crowdsourcing and open

3472

02:26:00,469 --> 02:25:58,800

innovation practices particularly in the

3473

02:26:01,590 --> 02:26:00,479

software and algorithm development

3474

02:26:03,990 --> 02:26:01,600

domain

3475

02:26:07,110 --> 02:26:04,000

harvard established a subcontract with

3476

02:26:10,550 --> 02:26:07,120

topcoder recently acquired by imperio

3477

02:26:13,110 --> 02:26:10,560

who now has a community of over 600 000

3478

02:26:15,750 --> 02:26:13,120

developers that we can tap into

3479

02:26:18,630 --> 02:26:15,760

that's a large international community

3480

02:26:21,190 --> 02:26:18,640

of coding talent who in large part share

3481

02:26:22,710 --> 02:26:21,200

the common language of math

3482

02:26:25,190 --> 02:26:22,720

we're just finishing up two pretty

3483

02:26:27,670 --> 02:26:25,200

exciting algorithm contests one was for

3484

02:26:29,750 --> 02:26:27,680

usaid and their tech challenge for

3485

02:26:33,030 --> 02:26:29,760

atrocities prevention it's been

3486

02:26:35,830 --> 02:26:33,040

interesting to look at as diverse as our

3487

02:26:38,870 --> 02:26:35,840

government missions are the application

3488

02:26:41,910 --> 02:26:38,880

of this technique has had some pretty

3489

02:26:43,910 --> 02:26:41,920

universal benefits regardless of what

3490

02:26:46,389 --> 02:26:43,920

that particular mission is

3491

02:26:48,469 --> 02:26:46,399

usaid has in hand now five winning

3492

02:26:50,230 --> 02:26:48,479

algorithm algorithms

3493

02:26:52,630 --> 02:26:50,240

that would greatly assist them in

3494

02:26:55,429 --> 02:26:52,640

developing the ability to actually

3495

02:26:58,389 --> 02:26:55,439

predict the occurrence of human induced

3496

02:27:00,230 --> 02:26:58,399

atrocities they went into this not

3497

02:27:02,790 --> 02:27:00,240

really knowing whether they would get a

3498

02:27:05,270 --> 02:27:02,800

result or not and have been pretty

3499

02:27:07,590 --> 02:27:05,280

excited about the outcome

3500

02:27:10,309 --> 02:27:07,600

nasa just ran a challenge called the

3501
02:27:12,469 --> 02:27:10,319
collective minds and machines challenge

3502
02:27:14,710 --> 02:27:12,479
that really is cut was based on a lot of

3503
02:27:17,429 --> 02:27:14,720
what you've been talking about here the

3504
02:27:19,750 --> 02:27:17,439
collective minds was humans who were

3505
02:27:20,950 --> 02:27:19,760
looking at imagery of

3506
02:27:23,510 --> 02:27:20,960
of

3507
02:27:25,190 --> 02:27:23,520
archaeological potential archaeological

3508
02:27:27,190 --> 02:27:25,200
interest

3509
02:27:29,590 --> 02:27:27,200
and then figuring out how we could take

3510
02:27:30,550 --> 02:27:29,600
that data set and apply machine learning

3511
02:27:32,230 --> 02:27:30,560
to it

3512
02:27:34,630 --> 02:27:32,240
harvard is still putting together the

3513
02:27:39,030 --> 02:27:34,640

final analysis on the winning algorithms

3514

02:27:41,910 --> 02:27:39,040

we had too but in my extremely extremely

3515

02:27:44,870 --> 02:27:41,920

simplified version we now have in hand

3516

02:27:47,630 --> 02:27:44,880

two promising algorithms potentially

3517

02:27:50,870 --> 02:27:47,640

demonstrating that instead of relying on

3518

02:27:53,030 --> 02:27:50,880

2.3 million imagery tags to identify

3519

02:27:55,349 --> 02:27:53,040

specific targets of interest

3520

02:27:58,710 --> 02:27:55,359

the same result can actually occur with

3521

02:28:00,550 --> 02:27:58,720

only 10 000. that's a pretty significant

3522

02:28:02,150 --> 02:28:00,560

result

3523

02:28:04,950 --> 02:28:02,160

so um

3524

02:28:07,670 --> 02:28:04,960

cosi is at its two-year mark and we

3525

02:28:09,750 --> 02:28:07,680

build on these successes and with that

3526
02:28:11,830 --> 02:28:09,760
it gives me great pleasure to announce

3527
02:28:13,750 --> 02:28:11,840
that nasa has entered into a

3528
02:28:15,830 --> 02:28:13,760
non-reimbursable space act agreement

3529
02:28:17,590 --> 02:28:15,840
with planetary resources

3530
02:28:19,750 --> 02:28:17,600
to develop crowdsourced software

3531
02:28:21,990 --> 02:28:19,760
solutions to enhance detection of

3532
02:28:24,230 --> 02:28:22,000
near-earth objects we're going to be

3533
02:28:26,550 --> 02:28:24,240
able to apply what we've learned working

3534
02:28:29,190 --> 02:28:26,560
with chris wiki and there is a lot of

3535
02:28:31,270 --> 02:28:29,200
excitement around it

3536
02:28:33,270 --> 02:28:31,280
as jen already announced the agreement

3537
02:28:35,349 --> 02:28:33,280
is nasa's first partnership associated

3538
02:28:37,590 --> 02:28:35,359

with the asteroid grand challenge and

3539

02:28:40,469 --> 02:28:37,600

it's really asteroids and near-earth

3540

02:28:42,790 --> 02:28:40,479

objects why you all are here i want to

3541

02:28:46,070 --> 02:28:42,800

thank jen for the opportunity to talk a

3542

02:28:47,990 --> 02:28:46,080

little bit about cosi and i'm excited

3543

02:28:49,910 --> 02:28:48,000

and we'll get off the stage so chris can

3544

02:28:51,429 --> 02:28:49,920

take the stage and really give you some

3545

02:28:52,309 --> 02:28:51,439

details about where we're going with

3546

02:28:55,990 --> 02:28:52,319

this

3547

02:28:57,670 --> 02:28:56,000

we'll be working with harvard

3548

02:29:00,630 --> 02:28:57,680

top coder

3549

02:29:02,790 --> 02:29:00,640

nasa science mission directorate oct

3550

02:29:04,710 --> 02:29:02,800

this is going to be an across nasa

3551

02:29:11,030 --> 02:29:04,720

effort so cosi's looking forward to

3552

02:29:15,110 --> 02:29:12,870

and with that uh we'll toss it over to

3553

02:29:18,150 --> 02:29:15,120

chris um if you want to uh start your

3554

02:29:19,990 --> 02:29:18,160

presentation thank you chris

3555

02:29:22,790 --> 02:29:20,000

all right thanks jen

3556

02:29:24,550 --> 02:29:22,800

and thanks for the introduction uh on uh

3557

02:29:27,110 --> 02:29:24,560

the space act agreement uh that we're

3558

02:29:30,309 --> 02:29:27,120

underway uh today on in partnering with

3559

02:29:32,230 --> 02:29:30,319

nasa in uh using crowdsourcing to help

3560

02:29:33,349 --> 02:29:32,240

identify even more on earth objects that

3561

02:29:35,910 --> 02:29:33,359

are out there

3562

02:29:38,070 --> 02:29:35,920

so i wanted to give you a background of

3563

02:29:40,309 --> 02:29:38,080

exactly what this project is

3564

02:29:42,870 --> 02:29:40,319

a portion of it involves work that we're

3565

02:29:44,790 --> 02:29:42,880

announcing today with nasa a portion

3566

02:29:47,030 --> 02:29:44,800

involves work that planetary resources

3567

02:29:48,790 --> 02:29:47,040

is doing privately with the adler

3568

02:29:50,389 --> 02:29:48,800

planetarium in his universe and of

3569

02:29:51,990 --> 02:29:50,399

course this work wouldn't be possible

3570

02:29:54,790 --> 02:29:52,000

without the support of a number of

3571

02:29:56,309 --> 02:29:54,800

different places which i will talk along

3572

02:29:59,030 --> 02:29:56,319

the way

3573

02:30:00,950 --> 02:29:59,040

so ultimately what we're interested in

3574

02:30:02,870 --> 02:30:00,960

is discovering more asteroids being able

3575

02:30:05,270 --> 02:30:02,880

to track them more accurately being able

3576

02:30:07,510 --> 02:30:05,280

to do that more efficiently and make the

3577

02:30:10,150 --> 02:30:07,520

best use of the resources that we've had

3578

02:30:12,870 --> 02:30:10,160

out there today so that we can apply new

3579

02:30:14,469 --> 02:30:12,880

resources more efficiently and despite

3580

02:30:16,870 --> 02:30:14,479

all the progress that we've seen and the

3581

02:30:18,790 --> 02:30:16,880

fact that ninety percent of the solar

3582

02:30:21,830 --> 02:30:18,800

system has been discovered since the

3583

02:30:24,230 --> 02:30:21,840

year 2000 uh most of this stuff happens

3584

02:30:26,150 --> 02:30:24,240

pretty late pretty close to earth uh

3585

02:30:27,990 --> 02:30:26,160

it's not until they get close enough and

3586

02:30:30,309 --> 02:30:28,000

bright enough uh that the surveys can

3587

02:30:32,389 --> 02:30:30,319

find them and of course this is as much

3588

02:30:34,950 --> 02:30:32,399

art as it is science point pulling this

3589

02:30:37,270 --> 02:30:34,960

data out of the weeds

3590

02:30:39,349 --> 02:30:37,280

most of these very small asteroids like

3591

02:30:41,510 --> 02:30:39,359

the one we experienced earlier this year

3592

02:30:43,750 --> 02:30:41,520

over the city of chelyabinsk

3593

02:30:46,230 --> 02:30:43,760

remain undetected and

3594

02:30:47,990 --> 02:30:46,240

there is a lot of work to go here yet so

3595

02:30:50,550 --> 02:30:48,000

how can we for

3596

02:30:52,309 --> 02:30:50,560

very little funds just make an

3597

02:30:54,870 --> 02:30:52,319

incremental increase in what we're able

3598

02:30:57,110 --> 02:30:54,880

to do here and open up the potential for

3599

02:30:58,870 --> 02:30:57,120

a lot of activity to come out of this

3600

02:31:01,910 --> 02:30:58,880

so we're in the crowdsourcing session

3601
02:31:04,630 --> 02:31:01,920
today and this is an idea that we came

3602
02:31:06,550 --> 02:31:04,640
up with which was a perfect application

3603
02:31:08,469 --> 02:31:06,560
of the cognitive surplus that we have on

3604
02:31:11,429 --> 02:31:08,479
the planet and the desire for everyone

3605
02:31:13,270 --> 02:31:11,439
out there to help nasa to help private

3606
02:31:15,349 --> 02:31:13,280
industry and to really help the world

3607
02:31:17,510 --> 02:31:15,359
take on these challenges and do better

3608
02:31:19,349 --> 02:31:17,520
than we've done to date i was speaking

3609
02:31:21,830 --> 02:31:19,359
with tim sparr the director of the

3610
02:31:23,429 --> 02:31:21,840
planet center about this project uh

3611
02:31:25,510 --> 02:31:23,439
earlier this year

3612
02:31:27,110 --> 02:31:25,520
and uh also the work that jose galeche

3613
02:31:29,830 --> 02:31:27,120

talked about today with

3614

02:31:31,270 --> 02:31:29,840

light curves and planetary resources was

3615

02:31:32,870 --> 02:31:31,280

exploring what we might be able to do in

3616

02:31:35,110 --> 02:31:32,880

this area and this really this project

3617

02:31:37,990 --> 02:31:35,120

really came out of that discussion

3618

02:31:39,830 --> 02:31:38,000

so we want to harness the crowd to find

3619

02:31:42,710 --> 02:31:39,840

the gems in the data

3620

02:31:44,389 --> 02:31:42,720

find the things that the surveys haven't

3621

02:31:46,309 --> 02:31:44,399

found

3622

02:31:48,790 --> 02:31:46,319

machines of course are programmed by

3623

02:31:50,870 --> 02:31:48,800

humans and humans are fallible but

3624

02:31:52,389 --> 02:31:50,880

humans are a lot better at recognizing

3625

02:31:53,910 --> 02:31:52,399

patterns than the machines are and

3626

02:31:55,750 --> 02:31:53,920

they're of course only as good as we

3627

02:31:57,750 --> 02:31:55,760

program them to

3628

02:31:59,190 --> 02:31:57,760

as was mentioned with regards to the

3629

02:32:00,469 --> 02:31:59,200

nasa agreement and what lynn was

3630

02:32:01,910 --> 02:32:00,479

describing is

3631

02:32:04,230 --> 02:32:01,920

we're going to be working with the nasa

3632

02:32:06,309 --> 02:32:04,240

tournament lab to have algorithm

3633

02:32:07,910 --> 02:32:06,319

challenges as has been done several

3634

02:32:10,070 --> 02:32:07,920

times before with the national

3635

02:32:11,750 --> 02:32:10,080

tournament lab and we'll get into more

3636

02:32:15,030 --> 02:32:11,760

detail on that

3637

02:32:17,910 --> 02:32:15,040

we want to improve the efficiency by re

3638

02:32:20,550 --> 02:32:17,920

reducing the false positives and increa

3639

02:32:23,830 --> 02:32:20,560

increase the detection capability and

3640

02:32:25,349 --> 02:32:23,840

the sensitivity of these uh data sets

3641

02:32:26,630 --> 02:32:25,359

without really having to to build

3642

02:32:28,150 --> 02:32:26,640

anything new

3643

02:32:30,950 --> 02:32:28,160

and this is something that we can do

3644

02:32:32,550 --> 02:32:30,960

because with groups like xenoverse and

3645

02:32:35,670 --> 02:32:32,560

other crowdsourcing platform there are

3646

02:32:37,670 --> 02:32:35,680

nearly a million people who are doing

3647

02:32:39,830 --> 02:32:37,680

peer-reviewed level of science on

3648

02:32:41,190 --> 02:32:39,840

different projects every day

3649

02:32:43,590 --> 02:32:41,200

probably the most famous of which in

3650

02:32:46,630 --> 02:32:43,600

this area is the galaxy zoo which has

3651
02:32:47,590 --> 02:32:46,640
been a breakaway successful project

3652
02:32:49,349 --> 02:32:47,600
so

3653
02:32:51,270 --> 02:32:49,359
the audience is probably very familiar

3654
02:32:53,910 --> 02:32:51,280
with how it is that we detect asteroids

3655
02:32:56,389 --> 02:32:53,920
but i just wanted to give a basic review

3656
02:32:59,110 --> 02:32:56,399
to remind you how this works you're

3657
02:33:01,590 --> 02:32:59,120
looking for things that move in the sky

3658
02:33:03,750 --> 02:33:01,600
stuff that are not static like the stars

3659
02:33:06,870 --> 02:33:03,760
so terrestrial telescopes and even space

3660
02:33:10,070 --> 02:33:06,880
based telescopes take several images

3661
02:33:12,230 --> 02:33:10,080
over time of the same patch of of sky

3662
02:33:13,110 --> 02:33:12,240
and then look to see the objects that

3663
02:33:14,710 --> 02:33:13,120

move

3664

02:33:16,870 --> 02:33:14,720

algorithm is usually applied in this

3665

02:33:18,950 --> 02:33:16,880

product project to find the

3666

02:33:22,150 --> 02:33:18,960

moving object in this and then a human

3667

02:33:23,990 --> 02:33:22,160

operator really goes in and cleans it up

3668

02:33:25,990 --> 02:33:24,000

they verify what the algorithm found

3669

02:33:27,990 --> 02:33:26,000

with high confidence uh they can throw

3670

02:33:30,150 --> 02:33:28,000

some out of the spurious data and it's

3671

02:33:32,150 --> 02:33:30,160

really their training their intelligence

3672

02:33:34,389 --> 02:33:32,160

and their human pattern recognition that

3673

02:33:36,790 --> 02:33:34,399

allows them to do that pretty quickly

3674

02:33:38,309 --> 02:33:36,800

and pretty accurately and ultimately

3675

02:33:40,389 --> 02:33:38,319

this data is reported to the miners

3676

02:33:42,790 --> 02:33:40,399

planet center and they do the great work

3677

02:33:44,710 --> 02:33:42,800

they do and report and collate these

3678

02:33:47,030 --> 02:33:44,720

results and take into all the different

3679

02:33:49,510 --> 02:33:47,040

factors into result and compute orbits

3680

02:33:51,750 --> 02:33:49,520

and the project continues every day of

3681

02:33:52,710 --> 02:33:51,760

the week every night of the week year on

3682

02:33:54,790 --> 02:33:52,720

year

3683

02:33:56,230 --> 02:33:54,800

until we find them all before they find

3684

02:33:58,790 --> 02:33:56,240

us first

3685

02:34:00,309 --> 02:33:58,800

so a typical one of these pictures looks

3686

02:34:01,910 --> 02:34:00,319

like this

3687

02:34:03,429 --> 02:34:01,920

i don't have the animated version of

3688

02:34:04,309 --> 02:34:03,439

this up but if it were animated you

3689

02:34:06,710 --> 02:34:04,319

would see

3690

02:34:08,550 --> 02:34:06,720

a little bit less than 10 uh asteroids

3691

02:34:10,309 --> 02:34:08,560

that are moving through the scene and in

3692

02:34:12,630 --> 02:34:10,319

many cases the algorithm really finds

3693

02:34:14,630 --> 02:34:12,640

all of them but uh from a human

3694

02:34:17,030 --> 02:34:14,640

standpoint we could really examine this

3695

02:34:18,230 --> 02:34:17,040

data to to try and determine is it

3696

02:34:19,590 --> 02:34:18,240

complete

3697

02:34:21,590 --> 02:34:19,600

and that's really what we're going to be

3698

02:34:23,349 --> 02:34:21,600

doing in the first part of this

3699

02:34:25,750 --> 02:34:23,359

crowdsourcing challenge which is the

3700

02:34:28,150 --> 02:34:25,760

part where human eyeballs are going to

3701

02:34:29,830 --> 02:34:28,160

look at data and find everything that

3702

02:34:32,230 --> 02:34:29,840

there is to

3703

02:34:34,710 --> 02:34:32,240

so the challenges uh in the overall

3704

02:34:36,150 --> 02:34:34,720

project is that these pipelines and the

3705

02:34:39,030 --> 02:34:36,160

algorithms that are run to date are kind

3706

02:34:41,030 --> 02:34:39,040

of conservatively tuned we don't want uh

3707

02:34:42,469 --> 02:34:41,040

someone spending all night throwing out

3708

02:34:45,190 --> 02:34:42,479

a thousand things that weren't an

3709

02:34:46,630 --> 02:34:45,200

asteroid trying to find the 12 that were

3710

02:34:48,950 --> 02:34:46,640

when automatically they might just be

3711

02:34:50,790 --> 02:34:48,960

able to say 10 and they can find with 90

3712

02:34:52,950 --> 02:34:50,800

percent efficiency so we tend to

3713

02:34:55,510 --> 02:34:52,960

conserve them tune them conservatively

3714

02:34:57,270 --> 02:34:55,520

so we can minimize the humans work

3715

02:34:59,670 --> 02:34:57,280

the code that's used in this some of it

3716

02:35:01,830 --> 02:34:59,680

is state of the art some of it's old but

3717

02:35:04,230 --> 02:35:01,840

in many cases it's drawn upon legacy

3718

02:35:06,230 --> 02:35:04,240

astronomy code that was developed either

3719

02:35:08,469 --> 02:35:06,240

for this purpose or for others

3720

02:35:10,550 --> 02:35:08,479

but as we know code and algorithm and

3721

02:35:12,309 --> 02:35:10,560

detection capability is evolving all the

3722

02:35:14,309 --> 02:35:12,319

time

3723

02:35:17,110 --> 02:35:14,319

the other part of this is that most of

3724

02:35:18,790 --> 02:35:17,120

this data is acquired it's looked at

3725

02:35:20,870 --> 02:35:18,800

precisely once by the algorithm and

3726

02:35:23,190 --> 02:35:20,880

operator and then it's archived never to

3727

02:35:25,190 --> 02:35:23,200

be looked at again and occasionally we

3728

02:35:27,830 --> 02:35:25,200

go back to a night to look at a

3729

02:35:30,070 --> 02:35:27,840

follow-up but for the vast majority of

3730

02:35:33,030 --> 02:35:30,080

this data it served its useful purpose

3731

02:35:35,190 --> 02:35:33,040

in life and it sits on spinning disks or

3732

02:35:36,950 --> 02:35:35,200

tape or cds

3733

02:35:39,429 --> 02:35:36,960

the process of analyzing this stuff is

3734

02:35:40,790 --> 02:35:39,439

very compute intensive and it's limited

3735

02:35:43,270 --> 02:35:40,800

in this applications of how you could

3736

02:35:45,590 --> 02:35:43,280

apply the stuff in space uh on a

3737

02:35:47,110 --> 02:35:45,600

embedded system in a spacecraft and then

3738

02:35:49,030 --> 02:35:47,120

as was mentioned in this session the

3739

02:35:51,110 --> 02:35:49,040

ability to access the raw data for

3740

02:35:53,270 --> 02:35:51,120

others to take another look at is not

3741

02:35:55,190 --> 02:35:53,280

something that's openly available and we

3742

02:35:56,550 --> 02:35:55,200

would love to make this data available

3743

02:35:57,910 --> 02:35:56,560

for everyone who would like to take a

3744

02:36:00,790 --> 02:35:57,920

look at it

3745

02:36:03,670 --> 02:36:00,800

so the benefits of this is by increasing

3746

02:36:06,710 --> 02:36:03,680

the detection capability we can find

3747

02:36:09,270 --> 02:36:06,720

smaller lower albedo darker more distant

3748

02:36:11,750 --> 02:36:09,280

objects we can get faster analysis of

3749

02:36:13,510 --> 02:36:11,760

global data data sets by making it more

3750

02:36:15,349 --> 02:36:13,520

compute efficient

3751

02:36:17,190 --> 02:36:15,359

also this improves space-based surveys

3752

02:36:19,830 --> 02:36:17,200

by being able to get more of the good

3753

02:36:21,349 --> 02:36:19,840

data to the ground and not send raw data

3754

02:36:23,429 --> 02:36:21,359

and then having this data online of

3755

02:36:25,830 --> 02:36:23,439

course allows all the scientific inquiry

3756

02:36:28,230 --> 02:36:25,840

that we can have uh with open data sets

3757

02:36:29,830 --> 02:36:28,240

and access to that especially with the

3758

02:36:32,309 --> 02:36:29,840

computing capability that's available

3759

02:36:33,590 --> 02:36:32,319

today versus 10 years ago

3760

02:36:35,830 --> 02:36:33,600

we've developed a list of science

3761

02:36:37,830 --> 02:36:35,840

priorities uh between

3762

02:36:39,830 --> 02:36:37,840

the catalina sky survey team from which

3763

02:36:41,510 --> 02:36:39,840

we draw the initial data set the

3764

02:36:43,349 --> 02:36:41,520

xenoverse team and the minor planet

3765

02:36:45,429 --> 02:36:43,359

center and i'll let you read through

3766

02:36:48,150 --> 02:36:45,439

this ordered list primarily what we're

3767

02:36:49,910 --> 02:36:48,160

interested in is completeness making

3768

02:36:52,230 --> 02:36:49,920

sure that we have a raw data set that

3769

02:36:54,710 --> 02:36:52,240

can be used as the basis of an algorithm

3770

02:36:56,790 --> 02:36:54,720

challenge so that when an algorithm

3771

02:36:58,710 --> 02:36:56,800

is testing against this data set we know

3772

02:37:00,710 --> 02:36:58,720

that what it's found is indeed something

3773

02:37:03,030 --> 02:37:00,720

that's real and not an artifact that

3774

02:37:04,870 --> 02:37:03,040

wasn't picked up by the original survey

3775

02:37:06,710 --> 02:37:04,880

there's another a number of other

3776

02:37:08,150 --> 02:37:06,720

opportunities that i won't go into

3777

02:37:10,630 --> 02:37:08,160

detail today

3778

02:37:12,870 --> 02:37:10,640

but we have a poster agu coming up here

3779

02:37:14,790 --> 02:37:12,880

next month that we can go into this but

3780

02:37:18,230 --> 02:37:14,800

just lots of opportunity by taking a

3781

02:37:23,670 --> 02:37:20,790

in the process of the asteroid zoo and

3782

02:37:26,070 --> 02:37:23,680

other zoos that the universe maintains

3783

02:37:28,630 --> 02:37:26,080

it's as much about the data set as it is

3784

02:37:30,870 --> 02:37:28,640

about the people and the performance of

3785

02:37:32,790 --> 02:37:30,880

individuals to perform the task you're

3786

02:37:34,070 --> 02:37:32,800

asking them to and having confidence

3787

02:37:36,870 --> 02:37:34,080

that they're performing that task

3788

02:37:39,270 --> 02:37:36,880

accurately so the universe is world

3789

02:37:41,349 --> 02:37:39,280

experts in this training process in

3790

02:37:44,070 --> 02:37:41,359

understanding human

3791

02:37:46,550 --> 02:37:44,080

human analysis and using kind of

3792

02:37:49,190 --> 02:37:46,560

qualified humans to rank the other ones

3793

02:37:51,190 --> 02:37:49,200

and say how well this is being done but

3794

02:37:53,110 --> 02:37:51,200

there's been many papers that have been

3795

02:37:55,030 --> 02:37:53,120

published which have demonstrated that

3796

02:37:57,429 --> 02:37:55,040

this citizen science and well-posed

3797

02:37:59,990 --> 02:37:57,439

problems can yield scientific output

3798

02:38:01,750 --> 02:38:00,000

that's every bit as good as the experts

3799

02:38:03,110 --> 02:38:01,760

who did it originally and the great

3800

02:38:06,070 --> 02:38:03,120

thing about this is what we can

3801

02:38:08,070 --> 02:38:06,080

ultimately do is free up those highly

3802

02:38:09,910 --> 02:38:08,080

trained very well educated experts to

3803

02:38:12,070 --> 02:38:09,920

work on even more difficult and more

3804

02:38:13,590 --> 02:38:12,080

challenging tasks

3805

02:38:16,070 --> 02:38:13,600

the results that we're expecting by

3806

02:38:18,309 --> 02:38:16,080

taking about three million catalina sky

3807

02:38:20,870 --> 02:38:18,319

survey images is to

3808

02:38:23,349 --> 02:38:20,880

figure out what the actual complete

3809

02:38:25,190 --> 02:38:23,359

detection efficiency is of that survey

3810

02:38:27,190 --> 02:38:25,200

one of the most prolific surveys on the

3811

02:38:29,590 --> 02:38:27,200

on the planet how much we might be able

3812

02:38:31,670 --> 02:38:29,600

to improve it with better algorithms we

3813

02:38:33,349 --> 02:38:31,680

can work in areas where catalina's

3814

02:38:35,429 --> 02:38:33,359

algorithms are throwing out the data

3815

02:38:37,510 --> 02:38:35,439

because it's difficult for a algorithm

3816

02:38:39,349 --> 02:38:37,520

to involve training losses is a common

3817

02:38:41,750 --> 02:38:39,359

example of this where the asteroid is

3818

02:38:43,590 --> 02:38:41,760

moving through the scene too quickly

3819

02:38:45,349 --> 02:38:43,600

we can also try to figure out from the

3820

02:38:48,790 --> 02:38:45,359

data set itself how many humans does it

3821

02:38:50,389 --> 02:38:48,800

take to really verify this result

3822

02:38:52,870 --> 02:38:50,399

so a number of other things in terms of

3823

02:38:55,429 --> 02:38:52,880

just educating people on asteroids and

3824

02:38:57,270 --> 02:38:55,439

near earth object detection and how this

3825

02:38:58,870 --> 02:38:57,280

science actually works and perhaps

3826

02:39:00,950 --> 02:38:58,880

inspire some people to take up this

3827

02:39:03,990 --> 02:39:00,960

career in the future for students who

3828

02:39:07,030 --> 02:39:05,429

in terms of how we can leverage in the

3829

02:39:09,190 --> 02:39:07,040

future one of them is being announced

3830

02:39:11,270 --> 02:39:09,200

today by using this data set of

3831

02:39:13,670 --> 02:39:11,280

completeness we can then have algorithm

3832

02:39:15,830 --> 02:39:13,680

challenges and work successive algorithm

3833

02:39:17,990 --> 02:39:15,840

challenges to put better algorithms out

3834

02:39:19,750 --> 02:39:18,000

in the field get a five percent increase

3835

02:39:22,150 --> 02:39:19,760

in efficiency perhaps maybe a one

3836

02:39:24,070 --> 02:39:22,160

percent may be greater than that

3837

02:39:25,910 --> 02:39:24,080

but be able to make those surveys

3838

02:39:27,750 --> 02:39:25,920

perform a little bit better

3839

02:39:29,590 --> 02:39:27,760

there's potential for integrating live

3840

02:39:32,070 --> 02:39:29,600

data into this where data could come off

3841

02:39:34,230 --> 02:39:32,080

the telescope the very night and people

3842

02:39:35,750 --> 02:39:34,240

could involved and be verifying the

3843

02:39:37,510 --> 02:39:35,760

discoveries that are made and reporting

3844

02:39:39,190 --> 02:39:37,520

them to the minor planet center

3845

02:39:40,630 --> 02:39:39,200

and other interesting projects like

3846

02:39:43,110 --> 02:39:40,640

project snoopy is one of them that's

3847

02:39:45,030 --> 02:39:43,120

been brought up of finding the apollo 10

3848

02:39:46,790 --> 02:39:45,040

lunar excursion module

3849

02:39:48,550 --> 02:39:46,800

and also linking all those one-night

3850

02:39:51,510 --> 02:39:48,560

observations of things that were found

3851

02:39:54,710 --> 02:39:51,520

but just weren't confirmable

3852

02:39:58,230 --> 02:39:54,720

the algorithm challenges again about

3853

02:40:00,309 --> 02:39:58,240

efficiency uh about detection capability

3854

02:40:01,830 --> 02:40:00,319

about optimizing these pipelines and

3855

02:40:03,670 --> 02:40:01,840

then also using this as a general

3856

02:40:05,190 --> 02:40:03,680

purpose thing not just for near-earth

3857

02:40:06,389 --> 02:40:05,200

objects but everything in the solar

3858

02:40:08,550 --> 02:40:06,399

system that moves

3859

02:40:10,550 --> 02:40:08,560

and planetary resources is interesting

3860

02:40:12,950 --> 02:40:10,560

in taking this technology not only to

3861

02:40:14,950 --> 02:40:12,960

find more asteroids but also to improve

3862

02:40:16,469 --> 02:40:14,960

the ability of space-based surveys to

3863

02:40:18,389 --> 02:40:16,479

make the most efficient use of their

3864

02:40:20,469 --> 02:40:18,399

data pipelines back to earth

3865

02:40:22,230 --> 02:40:20,479

so all closed now uh just wanted to

3866

02:40:24,710 --> 02:40:22,240

thank a few people involved in this not

3867

02:40:27,590 --> 02:40:24,720

only uh the people at nasa with jen

3868

02:40:31,750 --> 02:40:27,600

jason lindley johnson lin

3869

02:40:33,590 --> 02:40:31,760

uh and uh jason cruzan um but uh also

3870

02:40:35,510 --> 02:40:33,600

steve larsen and erica christensen of

3871

02:40:37,670 --> 02:40:35,520

the catalina sky survey for graciously

3872

02:40:39,910 --> 02:40:37,680

providing the data chris lindtot and

3873

02:40:41,590 --> 02:40:39,920

laura white from xenoverse amazon web

3874

02:40:43,750 --> 02:40:41,600

services who will be hosting the

3875

02:40:47,510 --> 02:40:43,760

catalina sky survey as an amazon public

3876

02:40:48,950 --> 02:40:47,520

data set very shortly and tim sparr for

3877

02:40:51,349 --> 02:40:48,960

ruling the solar system like he's always

3878

02:40:53,429 --> 02:40:51,359

been done and keeping the data organized

3879

02:40:55,910 --> 02:40:53,439

so we're very excited to get this

3880

02:40:58,230 --> 02:40:55,920

project started and off the ground we're

3881

02:41:00,309 --> 02:40:58,240

expecting to have some results here

3882

02:41:03,190 --> 02:41:00,319

and have projects online here in just a

3883

02:41:04,870 --> 02:41:03,200

few short months very early in 2014 and

3884

02:41:08,469 --> 02:41:04,880

i hope this can be a model of great

3885

02:41:11,269 --> 02:41:08,479

partnerships between nasa the public and

3886

02:41:12,630 --> 02:41:11,279

private industry capability for solving

3887

02:41:13,830 --> 02:41:12,640

the problems that we have in front of us

3888

02:41:19,269 --> 02:41:13,840

today

3889

02:41:22,309 --> 02:41:21,030

so i can start with one question as

3890

02:41:23,830 --> 02:41:22,319

folks in the room are thinking about

3891

02:41:25,990 --> 02:41:23,840

theirs

3892

02:41:27,990 --> 02:41:26,000

for the benefit of folks in the room and

3893

02:41:29,030 --> 02:41:28,000

also those online can you also explain

3894

02:41:31,590 --> 02:41:29,040

to us

3895

02:41:33,590 --> 02:41:31,600

how this effort um at least in this

3896

02:41:35,030 --> 02:41:33,600

universe effort links up to some of the

3897

02:41:36,230 --> 02:41:35,040

activity you had earlier in the year

3898

02:41:37,750 --> 02:41:36,240

with planetary resources with your

3899

02:41:40,070 --> 02:41:37,760

crowdfunding effort as well just to kind

3900

02:41:41,590 --> 02:41:40,080

of show the whole picture of a little

3901
02:41:44,230 --> 02:41:41,600
bit of how you guys are supporting the

3902
02:41:46,309 --> 02:41:44,240
xenoverse activity as well

3903
02:41:48,230 --> 02:41:46,319
oh absolutely i forgot to even mention

3904
02:41:50,870 --> 02:41:48,240
that this was a project that uh

3905
02:41:53,510 --> 02:41:50,880
planetary resources announced uh back in

3906
02:41:55,590 --> 02:41:53,520
june towards the end of our crowdfunding

3907
02:41:58,550 --> 02:41:55,600
campaign on kickstarter with the arked

3908
02:42:00,150 --> 02:41:58,560
space telescope and part of the activity

3909
02:42:02,469 --> 02:42:00,160
and and funding it at planetary

3910
02:42:05,510 --> 02:42:02,479
resources and also at the adler

3911
02:42:07,349 --> 02:42:05,520
planetarium was funded by crowdfunding

3912
02:42:09,349 --> 02:42:07,359
through kickstarter this was one of the

3913
02:42:12,230 --> 02:42:09,359

pledge levels and stretch goals that we

3914

02:42:14,630 --> 02:42:12,240

had uh near the near the end days of our

3915

02:42:16,150 --> 02:42:14,640

campaign and as a result of that uh the

3916

02:42:18,389 --> 02:42:16,160

xenoverse team decided to take this

3917

02:42:20,389 --> 02:42:18,399

project up and uh we've been working on

3918

02:42:22,150 --> 02:42:20,399

uh getting the project developed and

3919

02:42:25,190 --> 02:42:22,160

incorporated in work that uh we can

3920

02:42:27,830 --> 02:42:25,200

provide data for nasa as well

3921

02:42:29,830 --> 02:42:27,840

so interesting models for um fundraising

3922

02:42:32,630 --> 02:42:29,840

um that they've that they've begun to

3923

02:42:34,870 --> 02:42:32,640

experience so another question um chris

3924

02:42:36,870 --> 02:42:34,880

uh additional data you said that

3925

02:42:38,870 --> 02:42:36,880

catalina would start off this universe

3926
02:42:40,710 --> 02:42:38,880
activity do you have any other thoughts

3927
02:42:42,150 --> 02:42:40,720
about other surveys potentially other

3928
02:42:43,990 --> 02:42:42,160
data sources that you're thinking

3929
02:42:46,150 --> 02:42:44,000
downstream might be plugged into this

3930
02:42:48,870 --> 02:42:46,160
universe activity

3931
02:42:51,670 --> 02:42:48,880
absolutely it's very easy to go to the

3932
02:42:53,830 --> 02:42:51,680
jpl or the minor planet website and look

3933
02:42:56,550 --> 02:42:53,840
at the detection rates of the various

3934
02:42:58,630 --> 02:42:56,560
surveys that are out there uh most of

3935
02:43:00,230 --> 02:42:58,640
them nasa funded them some of them

3936
02:43:02,230 --> 02:43:00,240
department of defense and some of them

3937
02:43:04,550 --> 02:43:02,240
private work catalina has been the most

3938
02:43:07,110 --> 02:43:04,560

prolific and the data set that we have

3939

02:43:10,150 --> 02:43:07,120

to work with from them is about 25

3940

02:43:11,670 --> 02:43:10,160

telescope years of data about 3 million

3941

02:43:13,910 --> 02:43:11,680

images total

3942

02:43:15,590 --> 02:43:13,920

that we'll go through and analyze but

3943

02:43:17,990 --> 02:43:15,600

things like linear

3944

02:43:20,550 --> 02:43:18,000

space watch which actually run ran its

3945

02:43:22,790 --> 02:43:20,560

own citizen science activity

3946

02:43:25,590 --> 02:43:22,800

and were pioneers in this area very

3947

02:43:28,950 --> 02:43:25,600

early on uh is an opportunity for uh get

3948

02:43:30,630 --> 02:43:28,960

to that data online uh and essentially

3949

02:43:32,389 --> 02:43:30,640

prove this out with the catalina data

3950

02:43:34,550 --> 02:43:32,399

set and then as we're able and

3951
02:43:36,469 --> 02:43:34,560
interested and if we have shown that

3952
02:43:41,510 --> 02:43:36,479
it's producing good results

3953
02:43:45,349 --> 02:43:43,910
thanks so much chris this is jason um

3954
02:43:47,910 --> 02:43:45,359
and in a

3955
02:43:50,710 --> 02:43:47,920
an effort of continual improvement uh

3956
02:43:53,429 --> 02:43:50,720
this is very fresh but do you have a

3957
02:43:55,510 --> 02:43:53,439
sense of anything that we on the nasa

3958
02:43:57,590 --> 02:43:55,520
side that could have done better to make

3959
02:44:00,070 --> 02:43:57,600
this easier

3960
02:44:02,150 --> 02:44:00,080
thoughts on as we move forward in

3961
02:44:03,349 --> 02:44:02,160
additional partnerships how can we

3962
02:44:04,870 --> 02:44:03,359
improve

3963
02:44:08,469 --> 02:44:04,880

from our end

3964

02:44:10,550 --> 02:44:08,479

for folks that want to engage with us

3965

02:44:14,389 --> 02:44:10,560

well i think as you mentioned it is very

3966

02:44:15,750 --> 02:44:14,399

fresh and uh not quite first of its kind

3967

02:44:17,269 --> 02:44:15,760

but for us

3968

02:44:19,269 --> 02:44:17,279

as a as

3969

02:44:21,670 --> 02:44:19,279

as a business and as a commercial

3970

02:44:23,910 --> 02:44:21,680

for-profit company uh it was kind of a

3971

02:44:26,309 --> 02:44:23,920

new thing both with our xenoverse

3972

02:44:28,309 --> 02:44:26,319

partners as well as with nasa the space

3973

02:44:29,269 --> 02:44:28,319

act process allows us to kind of work

3974

02:44:31,030 --> 02:44:29,279

these

3975

02:44:33,269 --> 02:44:31,040

relationships out and define the

3976

02:44:35,110 --> 02:44:33,279

responsibilities and i think in doing

3977

02:44:37,830 --> 02:44:35,120

that that was a very valuable thing for

3978

02:44:39,510 --> 02:44:37,840

planetary resources to identify what

3979

02:44:41,670 --> 02:44:39,520

nasa was going to take on and be

3980

02:44:43,990 --> 02:44:41,680

responsible for and where nasa was going

3981

02:44:45,830 --> 02:44:44,000

to commit resources and similarly where

3982

02:44:47,670 --> 02:44:45,840

planetary resources was going to do the

3983

02:44:49,510 --> 02:44:47,680

same and where we each can bring

3984

02:44:51,990 --> 02:44:49,520

leadership and capability and knowledge

3985

02:44:54,389 --> 02:44:52,000

to the table to achieve what ultimately

3986

02:44:56,230 --> 02:44:54,399

is a common goal as articulated in our

3987

02:44:59,349 --> 02:44:56,240

space act agreement

3988

02:45:04,150 --> 02:45:01,670

we have a question from social media

3989

02:45:05,910 --> 02:45:04,160

yeah somebody is asking if you could

3990

02:45:08,790 --> 02:45:05,920

provide more details on levels of

3991

02:45:12,469 --> 02:45:10,870

on levels of partnership this might be a

3992

02:45:14,469 --> 02:45:12,479

you question on levels of partnership

3993

02:45:16,150 --> 02:45:14,479

with the asteroid grand challenge

3994

02:45:17,429 --> 02:45:16,160

so we can define levels how we want to

3995

02:45:20,150 --> 02:45:17,439

define levels because it's not clear in

3996

02:45:21,990 --> 02:45:20,160

the question yeah yeah i'm

3997

02:45:23,349 --> 02:45:22,000

not sure i'm clear on what they're

3998

02:45:26,830 --> 02:45:23,359

asking but

3999

02:45:29,830 --> 02:45:26,840

uh in terms of the grand challenge

4000

02:45:31,590 --> 02:45:29,840

uh really our first step has been to

4001
02:45:32,469 --> 02:45:31,600
engage

4002
02:45:35,110 --> 02:45:32,479
with

4003
02:45:37,990 --> 02:45:35,120
communicating about what it is

4004
02:45:40,230 --> 02:45:38,000
and recognizing that they're going to be

4005
02:45:41,590 --> 02:45:40,240
lots of different people that can plug

4006
02:45:43,510 --> 02:45:41,600
in that are going to bring lots of

4007
02:45:45,830 --> 02:45:43,520
different resources

4008
02:45:48,230 --> 02:45:45,840
here we see an excellent example of a

4009
02:45:50,150 --> 02:45:48,240
space act agreement that

4010
02:45:55,110 --> 02:45:50,160
has made it through the system where

4011
02:46:00,150 --> 02:45:56,950
areas of interest that overlap and the

4012
02:46:02,630 --> 02:46:00,160
parties can can can come together to get

4013
02:46:03,429 --> 02:46:02,640

to that future that we share

4014

02:46:04,790 --> 02:46:03,439

uh

4015

02:46:07,510 --> 02:46:04,800

i'm sitting next to the prize and

4016

02:46:10,950 --> 02:46:07,520

challenges lead uh and i anticipate that

4017

02:46:12,950 --> 02:46:10,960

there's a future there as well where uh

4018

02:46:16,710 --> 02:46:12,960

a level of partnership

4019

02:46:17,590 --> 02:46:16,720

could be a prize uh or some incentive

4020

02:46:19,910 --> 02:46:17,600

that

4021

02:46:22,550 --> 02:46:19,920

brings people into this and so

4022

02:46:25,110 --> 02:46:22,560

at this point we're really wide open in

4023

02:46:26,550 --> 02:46:25,120

our conversation we've heard a number of

4024

02:46:30,309 --> 02:46:26,560

great presentations here in the

4025

02:46:34,630 --> 02:46:32,309

discussion already

4026
02:46:35,990 --> 02:46:34,640
and in terms of getting amateurs engaged

4027
02:46:37,590 --> 02:46:36,000
i think

4028
02:46:40,309 --> 02:46:37,600
it's been clear that one of the things

4029
02:46:42,070 --> 02:46:40,319
that nasa can bring

4030
02:46:44,630 --> 02:46:42,080
usefully is

4031
02:46:47,590 --> 02:46:44,640
is our brand and some of the science and

4032
02:46:49,750 --> 02:46:47,600
technical expertise uh and and part of

4033
02:46:52,950 --> 02:46:49,760
the question i was

4034
02:46:54,630 --> 02:46:52,960
asking uh with chris was how do we not

4035
02:46:55,990 --> 02:46:54,640
slow people down

4036
02:46:57,429 --> 02:46:56,000
because that's one of the things i heard

4037
02:47:00,230 --> 02:46:57,439
this morning in the partnership

4038
02:47:02,070 --> 02:47:00,240

participatory engagement is

4039

02:47:04,469 --> 02:47:02,080

our processes can be

4040

02:47:06,469 --> 02:47:04,479

slow and government can move at a pace

4041

02:47:08,070 --> 02:47:06,479

that's a little different and so that's

4042

02:47:12,550 --> 02:47:08,080

going to be one for us to explore as we

4043

02:47:15,590 --> 02:47:14,070

any other questions for chris yep in the

4044

02:47:18,150 --> 02:47:15,600

room so

4045

02:47:20,230 --> 02:47:18,160

given your long-term goal of uh actually

4046

02:47:20,950 --> 02:47:20,240

finding resources on an asteroid how do

4047

02:47:27,910 --> 02:47:20,960

you

4048

02:47:32,950 --> 02:47:30,710

so part of this is for the specific goal

4049

02:47:34,870 --> 02:47:32,960

of finding more asteroids and finding

4050

02:47:38,150 --> 02:47:34,880

more potential targets and understanding

4051

02:47:39,990 --> 02:47:38,160

their orbits in higher higher precision

4052

02:47:41,670 --> 02:47:40,000

but part of it also is about

4053

02:47:44,309 --> 02:47:41,680

understanding this technique for solving

4054

02:47:46,070 --> 02:47:44,319

problems as a generic tool

4055

02:47:48,230 --> 02:47:46,080

using the best minds on the planet to

4056

02:47:49,670 --> 02:47:48,240

create the best algorithms to do

4057

02:47:50,389 --> 02:47:49,680

efficient things

4058

02:47:55,429 --> 02:47:50,399

with

4059

02:47:58,230 --> 02:47:55,439

robotics that allow us to give our goals

4060

02:47:59,990 --> 02:47:58,240

so this is a bit of a pathfinder for

4061

02:48:02,630 --> 02:48:00,000

what we're doing and i anticipate that

4062

02:48:05,269 --> 02:48:02,640

we will do a number of things like this

4063

02:48:06,469 --> 02:48:05,279

to engage the broad community i think

4064

02:48:09,429 --> 02:48:06,479

andy is going to give you some more

4065

02:48:11,910 --> 02:48:09,439

detail from a top coder perspective on

4066

02:48:13,830 --> 02:48:11,920

how challenges like these actually work

4067

02:48:15,750 --> 02:48:13,840

in finding the best algorithms and the

4068

02:48:18,389 --> 02:48:15,760

best coders out there

4069

02:48:21,349 --> 02:48:18,399

so that's in part how it helps us to

4070

02:48:23,590 --> 02:48:21,359

start achieve our objectives uh and uh

4071

02:48:25,750 --> 02:48:23,600

as as often said you can't go and mine

4072

02:48:28,230 --> 02:48:25,760

an asteroid unless you know where it is

4073

02:48:29,990 --> 02:48:28,240

and that's uh we have a great database

4074

02:48:31,269 --> 02:48:30,000

to start with and we'd like to to make

4075

02:48:33,670 --> 02:48:31,279

it even better

4076
02:48:35,269 --> 02:48:33,680
um and one i have one additional quest

4077
02:48:37,030 --> 02:48:35,279
uh question this is both for chris and

4078
02:48:39,349 --> 02:48:37,040
for lynn just because i want to make

4079
02:48:41,030 --> 02:48:39,359
sure i remember correctly the algorithms

4080
02:48:42,710 --> 02:48:41,040
at the end of the challenges it's the

4081
02:48:44,070 --> 02:48:42,720
intention to release these open source

4082
02:48:45,510 --> 02:48:44,080
or what happens with the algorithms at

4083
02:48:47,030 --> 02:48:45,520
the end

4084
02:48:48,550 --> 02:48:47,040
yeah and lynn says in the room the

4085
02:48:50,389 --> 02:48:48,560
intention is to release them open source

4086
02:48:52,309 --> 02:48:50,399
so this becomes an important thing for

4087
02:48:53,830 --> 02:48:52,319
those other folks that are interested in

4088
02:48:55,670 --> 02:48:53,840

increasing the detection efficiency of

4089

02:48:57,429 --> 02:48:55,680

surveys the point of this is that it's a

4090

02:48:59,110 --> 02:48:57,439

pub that that algorithm becomes a public

4091

02:49:01,590 --> 02:48:59,120

good

4092

02:49:02,630 --> 02:49:01,600

yes and this is released via gnu

4093

02:49:04,230 --> 02:49:02,640

licenses

4094

02:49:06,950 --> 02:49:04,240

uh gpl

4095

02:49:09,510 --> 02:49:06,960

type uh information the algorithms

4096

02:49:11,670 --> 02:49:09,520

as well as the data associated with the

4097

02:49:13,110 --> 02:49:11,680

surveys

4098

02:49:16,070 --> 02:49:13,120

thank you chris any other questions in

4099

02:49:24,070 --> 02:49:16,080

room if not we'll move on to andy

4100

02:49:29,110 --> 02:49:26,710

all right um we will move on to the last

4101

02:49:31,670 --> 02:49:29,120

presenter right now um andy lamora who's

4102

02:49:33,750 --> 02:49:31,680

with topcoder who as lynn um had

4103

02:49:35,349 --> 02:49:33,760

mentioned earlier is one of the

4104

02:49:36,870 --> 02:49:35,359

subcontractors that we work with through

4105

02:49:38,550 --> 02:49:36,880

the nasa tournament lab that will be

4106

02:49:41,190 --> 02:49:38,560

working with us on

4107

02:49:44,309 --> 02:49:41,200

this particular contest-driven algorithm

4108

02:49:46,950 --> 02:49:44,319

development activity um he's the last

4109

02:49:48,469 --> 02:49:46,960

presenter of uh the afternoon we'll take

4110

02:49:51,030 --> 02:49:48,479

a quick break and then we'll come back

4111

02:49:53,110 --> 02:49:51,040

for uh the general discussion for the

4112

02:49:55,110 --> 02:49:53,120

remainder of the time

4113

02:49:57,750 --> 02:49:55,120

and i would like to propose that we

4114

02:49:59,590 --> 02:49:57,760

maybe move our chairs into a circle and

4115

02:50:00,790 --> 02:49:59,600

have more of a discussion for that that

4116

02:50:03,910 --> 02:50:00,800

point so it doesn't feel quite so

4117

02:50:06,469 --> 02:50:03,920

auditorium style um and uh we'll finish

4118

02:50:08,469 --> 02:50:06,479

it off having a discussion about filling

4119

02:50:10,550 --> 02:50:08,479

the gaps um on some of these print

4120

02:50:14,309 --> 02:50:10,560

presentations synergies between some of

4121

02:50:16,309 --> 02:50:14,319

the ideas um and uh figuring out um

4122

02:50:17,670 --> 02:50:16,319

potentially uh ways to move forward as a

4123

02:50:20,870 --> 02:50:17,680

community so

4124

02:50:23,349 --> 02:50:20,880

um with that andy can you hear me

4125

02:50:25,510 --> 02:50:23,359

hi jen yes i can okay can we turn up

4126
02:50:27,110 --> 02:50:25,520
andy's volume a little bit great um all

4127
02:50:29,349 --> 02:50:27,120
right andy i'm going to toss it over the

4128
02:50:30,950 --> 02:50:29,359
fence to you

4129
02:50:33,510 --> 02:50:30,960
all right thanks a lot jen

4130
02:50:35,269 --> 02:50:33,520
and it's obviously wonderful to be here

4131
02:50:36,630 --> 02:50:35,279
we're really honored to be able to speak

4132
02:50:39,349 --> 02:50:36,640
to such a

4133
02:50:42,309 --> 02:50:39,359
good and engaged and interesting group

4134
02:50:44,550 --> 02:50:42,319
um i'd like to also echo lynn i said

4135
02:50:46,469 --> 02:50:44,560
earlier that walking into a room and

4136
02:50:47,990 --> 02:50:46,479
finding that there's a ready definition

4137
02:50:51,349 --> 02:50:48,000
of crowdsourcing

4138
02:50:53,510 --> 02:50:51,359

is both extremely welcome um and and a

4139

02:50:55,030 --> 02:50:53,520

little surprising uh it's not what we're

4140

02:50:56,790 --> 02:50:55,040

always used to

4141

02:50:58,630 --> 02:50:56,800

as a result some of my slides are

4142

02:51:00,309 --> 02:50:58,640

probably a bit more high school level

4143

02:51:02,710 --> 02:51:00,319

than this graduate level transformation

4144

02:51:05,429 --> 02:51:02,720

class so i'll try to skip over them as

4145

02:51:07,510 --> 02:51:05,439

quickly as i can um but without further

4146

02:51:09,190 --> 02:51:07,520

ado let's jump in

4147

02:51:13,030 --> 02:51:09,200

as christian i'd like to talk a little

4148

02:51:14,950 --> 02:51:13,040

bit uh about how we handle crowdsourcing

4149

02:51:16,710 --> 02:51:14,960

um because i think we have a

4150

02:51:19,190 --> 02:51:16,720

slightly unique take on it from what

4151
02:51:22,309 --> 02:51:19,200
you've seen before um

4152
02:51:23,910 --> 02:51:22,319
and let me try advancing a slide here

4153
02:51:25,830 --> 02:51:23,920
now i have someone to advance this up i

4154
02:51:26,870 --> 02:51:25,840
never mind i have it right here

4155
02:51:27,910 --> 02:51:26,880
thank you

4156
02:51:29,830 --> 02:51:27,920
um

4157
02:51:31,590 --> 02:51:29,840
i have to mention first of course that

4158
02:51:33,750 --> 02:51:31,600
you know you may have heard one of the

4159
02:51:36,389 --> 02:51:33,760
two top code in september is acquired by

4160
02:51:37,830 --> 02:51:36,399
april apparel had an existing

4161
02:51:39,910 --> 02:51:37,840
crowdsourcing company

4162
02:51:42,469 --> 02:51:39,920
called cloud spokes as a subdivision

4163
02:51:44,790 --> 02:51:42,479

which ironically have been developed by

4164

02:51:46,630 --> 02:51:44,800

former top codings anyway

4165

02:51:50,630 --> 02:51:46,640

and the combined community is now just

4166

02:51:53,269 --> 02:51:50,640

shy of six hundred thousand contributors

4167

02:51:54,790 --> 02:51:53,279

um it's as a practical matter it doesn't

4168

02:51:56,870 --> 02:51:54,800

have much effect on what we're doing

4169

02:51:58,389 --> 02:51:56,880

with ntl except that it does bring

4170

02:52:00,950 --> 02:51:58,399

additional competencies to bear

4171

02:52:03,590 --> 02:52:00,960

especially uh especially in

4172

02:52:05,990 --> 02:52:03,600

cloud and service-based technologies

4173

02:52:08,950 --> 02:52:06,000

so my journey through today is to talk

4174

02:52:11,349 --> 02:52:08,960

about community by community

4175

02:52:12,950 --> 02:52:11,359

through us this is the concept of using

4176

02:52:14,630 --> 02:52:12,960

one community and

4177

02:52:17,590 --> 02:52:14,640

directing and channeling it through

4178

02:52:19,269 --> 02:52:17,600

incentives uh to focusing on a problem

4179

02:52:21,750 --> 02:52:19,279

that might interest another community so

4180

02:52:23,349 --> 02:52:21,760

how can you see one with the other

4181

02:52:25,830 --> 02:52:23,359

first we'll talk a little bit about our

4182

02:52:27,830 --> 02:52:25,840

top coated those things crowdsourcing in

4183

02:52:29,830 --> 02:52:27,840

general accomplishments and contests

4184

02:52:32,870 --> 02:52:29,840

just to kind of move to the case of how

4185

02:52:34,550 --> 02:52:32,880

we use these to work with crowdsourcing

4186

02:52:36,230 --> 02:52:34,560

communities in general

4187

02:52:37,670 --> 02:52:36,240

and then let's apply it let's talk about

4188

02:52:39,990 --> 02:52:37,680

what we can do

4189

02:52:40,790 --> 02:52:40,000

to advance asteroids

4190

02:52:47,510 --> 02:52:40,800

so

4191

02:52:49,830 --> 02:52:47,520

community it's 519 000 people worldwide

4192

02:52:52,469 --> 02:52:49,840

uh all interested in design and

4193

02:52:54,389 --> 02:52:52,479

development in some manner so we have

4194

02:52:56,710 --> 02:52:54,399

front end design so people are doing

4195

02:52:58,150 --> 02:52:56,720

graphics like for example the slide uh

4196

02:53:00,389 --> 02:52:58,160

folks who are doing development

4197

02:53:03,910 --> 02:53:00,399

everything from software to mobile

4198

02:53:06,710 --> 02:53:03,920

applications software services.com uh to

4199

02:53:08,710 --> 02:53:06,720

algorithmics and analytics um and to

4200

02:53:10,550 --> 02:53:08,720

people who are not represented on this

4201
02:53:13,830 --> 02:53:10,560
slide but who simply comes here to have

4202
02:53:16,230 --> 02:53:13,840
fun they join top coder and work on

4203
02:53:18,469 --> 02:53:16,240
three 90-minute extremely difficult word

4204
02:53:19,990 --> 02:53:18,479
problems in competition with each other

4205
02:53:20,870 --> 02:53:20,000
in the middle of the night and they call

4206
02:53:23,269 --> 02:53:20,880
that

4207
02:53:27,030 --> 02:53:24,710
falconer

4208
02:53:29,190 --> 02:53:27,040
comes to the project or a challenge and

4209
02:53:30,870 --> 02:53:29,200
as we said we kind of use them

4210
02:53:33,030 --> 02:53:30,880
interchangeably throughout the challenge

4211
02:53:35,349 --> 02:53:33,040
is something that you want to accomplish

4212
02:53:37,750 --> 02:53:35,359
we approach them by breaking them down

4213
02:53:41,190 --> 02:53:37,760

into a lot of constituents

4214

02:53:43,830 --> 02:53:41,200

interest areas we call this atomization

4215

02:53:46,309 --> 02:53:43,840

we do it because we have found that the

4216

02:53:48,230 --> 02:53:46,319

best way to attract people and against

4217

02:53:51,349 --> 02:53:48,240

the interest of people who have covered

4218

02:53:53,110 --> 02:53:51,359

surplus is to do in a spot where they

4219

02:53:55,190 --> 02:53:53,120

have a sharp interest at a certain

4220

02:53:57,269 --> 02:53:55,200

amount at a certain time

4221

02:53:58,870 --> 02:53:57,279

for example as a practical matter it

4222

02:54:01,510 --> 02:53:58,880

might be difficult to find somebody

4223

02:54:03,590 --> 02:54:01,520

who's willing to build an entire mobile

4224

02:54:05,670 --> 02:54:03,600

application that's able to integrate

4225

02:54:08,230 --> 02:54:05,680

four or five different data sources

4226
02:54:10,309 --> 02:54:08,240
provide augmented reality uh and look

4227
02:54:13,349 --> 02:54:10,319
beautifully easy to use

4228
02:54:15,750 --> 02:54:13,359
for a couple hundred dollars in a week

4229
02:54:16,950 --> 02:54:15,760
but you can find somebody for usually if

4230
02:54:18,550 --> 02:54:16,960
you're really interested in doing

4231
02:54:20,070 --> 02:54:18,560
something that's beautiful

4232
02:54:21,590 --> 02:54:20,080
and another person who's really

4233
02:54:24,389 --> 02:54:21,600
interested in doing something that's

4234
02:54:26,230 --> 02:54:24,399
wonderful code and yet another one who's

4235
02:54:28,389 --> 02:54:26,240
very interested in

4236
02:54:30,070 --> 02:54:28,399
data sources and figuring out how to get

4237
02:54:32,150 --> 02:54:30,080
them synchronized

4238
02:54:33,510 --> 02:54:32,160

so if you can break your challenge down

4239

02:54:35,750 --> 02:54:33,520

into many

4240

02:54:37,670 --> 02:54:35,760

constituent challenges you have a much

4241

02:54:39,910 --> 02:54:37,680

higher probability of having a

4242

02:54:42,309 --> 02:54:39,920

sustainable outcome you might once or

4243

02:54:44,710 --> 02:54:42,319

twice get the moons hot but having a

4244

02:54:47,030 --> 02:54:44,720

sustainable outcome both in algorithmics

4245

02:54:49,510 --> 02:54:47,040

and in regular software production

4246

02:54:51,269 --> 02:54:49,520

requires this sort of approach

4247

02:54:53,429 --> 02:54:51,279

if anybody has more questions about this

4248

02:54:56,950 --> 02:54:53,439

feel free to give me afterwards i think

4249

02:55:01,190 --> 02:54:59,190

we're often asked how you if you're

4250

02:55:02,870 --> 02:55:01,200

running a contest how do you decide a

4251
02:55:04,309 --> 02:55:02,880
winner really briefly because i think it

4252
02:55:07,110 --> 02:55:04,319
would play into what we're going to talk

4253
02:55:09,429 --> 02:55:07,120
about few minutes here um a very

4254
02:55:11,510 --> 02:55:09,439
subjective contest can only be judged

4255
02:55:13,349 --> 02:55:11,520
subjectively that you pick it

4256
02:55:15,590 --> 02:55:13,359
but a software contest it gets

4257
02:55:17,670 --> 02:55:15,600
increasingly deterministic as you work

4258
02:55:19,830 --> 02:55:17,680
with requirements i want this thing that

4259
02:55:22,550 --> 02:55:19,840
does that thing this many times in that

4260
02:55:23,750 --> 02:55:22,560
amount of time um with this much space

4261
02:55:25,830 --> 02:55:23,760
on the screen

4262
02:55:27,910 --> 02:55:25,840
in that case it's objectives we scored

4263
02:55:30,870 --> 02:55:27,920

things on a scorecard and then you get

4264

02:55:33,510 --> 02:55:30,880

the algorithm contents and analytics

4265

02:55:35,429 --> 02:55:33,520

our take on running a marathon where we

4266

02:55:38,070 --> 02:55:35,439

call it marathon challenge by an

4267

02:55:39,990 --> 02:55:38,080

algorithm challenge is not to have an

4268

02:55:42,550 --> 02:55:40,000

open call and ask for the best

4269

02:55:43,269 --> 02:55:42,560

it's to develop a scoring algorithm

4270

02:55:47,910 --> 02:55:43,279

that

4271

02:55:50,870 --> 02:55:47,920

and to build a little bit around it so

4272

02:55:52,630 --> 02:55:50,880

over a two three or one week period

4273

02:55:55,190 --> 02:55:52,640

contestants are submitting code it's

4274

02:56:01,349 --> 02:55:55,200

actually run and compiled by top code

4275

02:56:07,670 --> 02:56:04,469

so you're kind of hitting the four g's

4276

02:56:10,309 --> 02:56:07,680

that jim had referenced before

4277

02:56:12,550 --> 02:56:10,319

you have guts just to take on a problem

4278

02:56:15,269 --> 02:56:12,560

like find a better configuration for the

4279

02:56:17,190 --> 02:56:15,279

solar panels on the on the

4280

02:56:20,790 --> 02:56:17,200

international space station

4281

02:56:22,469 --> 02:56:20,800

gold because there's 30 grand in space

4282

02:56:24,389 --> 02:56:22,479

because you're helping the iss and

4283

02:56:27,110 --> 02:56:24,399

growing because you should solve the

4284

02:56:29,429 --> 02:56:27,120

problem on the iss

4285

02:56:32,389 --> 02:56:29,439

i move things along here um i'll skip

4286

02:56:34,389 --> 02:56:32,399

this line in the sense of time okay this

4287

02:56:35,750 --> 02:56:34,399

is probably speaking appreciate to

4288

02:56:37,830 --> 02:56:35,760

acquire but

4289

02:56:39,750 --> 02:56:37,840

we'll cover anyway just to make sure our

4290

02:56:42,070 --> 02:56:39,760

terminology is the same

4291

02:56:43,830 --> 02:56:42,080

as probably familiar a lot has been

4292

02:56:45,910 --> 02:56:43,840

accomplished with crowdsourcing in the

4293

02:56:48,710 --> 02:56:45,920

last couple years some very notable

4294

02:56:51,269 --> 02:56:48,720

examples of course are linux java

4295

02:56:53,830 --> 02:56:51,279

wikipedia service and national

4296

02:56:56,389 --> 02:56:53,840

geographic um the national geographic

4297

02:56:58,230 --> 02:56:56,399

fuel expedition mongolia is a project

4298

02:56:59,910 --> 02:56:58,240

that moon was referring to earlier and

4299

02:57:01,190 --> 02:56:59,920

we'll that'll come back to us here in

4300

02:57:02,790 --> 02:57:01,200

just a minute

4301

02:57:04,070 --> 02:57:02,800

uh linux i think everyone published

4302

02:57:06,309 --> 02:57:04,080

memories which although won't be a

4303

02:57:09,269 --> 02:57:06,319

surprise this is one that started with

4304

02:57:12,389 --> 02:57:09,279

begun by fun but was amplified by a

4305

02:57:16,630 --> 02:57:14,070

so too have things been accomplished

4306

02:57:18,309 --> 02:57:16,640

with contests some famous and maybe some

4307

02:57:19,990 --> 02:57:18,319

surprising examples include the

4308

02:57:22,550 --> 02:57:20,000

longitude contest

4309

02:57:24,550 --> 02:57:22,560

in the 18th century the

4310

02:57:26,550 --> 02:57:24,560

british parliament put a 20 thousand

4311

02:57:28,309 --> 02:57:26,560

pound prize up for anyone who could

4312

02:57:30,550 --> 02:57:28,319

figure out how to

4313

02:57:32,710 --> 02:57:30,560

determine longitude at sea so that they

4314

02:57:34,309 --> 02:57:32,720

would stop losing entire fleets

4315

02:57:37,590 --> 02:57:34,319

the fellow who run it was a cabinet

4316

02:57:40,870 --> 02:57:37,600

maker who knew the value of having uh of

4317

02:57:42,950 --> 02:57:40,880

understanding how it works uh and

4318

02:57:44,870 --> 02:57:42,960

keeping it from chronometer steady so

4319

02:57:46,950 --> 02:57:44,880

you'd know when you were at sea

4320

02:57:49,030 --> 02:57:46,960

the white house

4321

02:57:50,870 --> 02:57:49,040

was running through contests that was

4322

02:57:52,309 --> 02:57:50,880

hosted and judged by none other than

4323

02:57:55,030 --> 02:57:52,319

george washington

4324

02:57:57,590 --> 02:57:55,040

canned food was developed by a contest

4325

02:57:59,910 --> 02:57:57,600

posted by napoleon who was very

4326
02:58:02,389 --> 02:57:59,920
concerned about how to feed his troops

4327
02:58:04,630 --> 02:58:02,399
you have lindbergh's flight and sorry x

4328
02:58:05,830 --> 02:58:04,640
prize and maybe one or two things goes

4329
02:58:07,910 --> 02:58:05,840
out there

4330
02:58:09,429 --> 02:58:07,920
he's done a lot of academic research

4331
02:58:11,190 --> 02:58:09,439
about this and

4332
02:58:12,710 --> 02:58:11,200
you can i can make this slide available

4333
02:58:14,710 --> 02:58:12,720
for anyone who'd like to find it but

4334
02:58:16,309 --> 02:58:14,720
it's a it's a hot topic and under a

4335
02:58:18,790 --> 02:58:16,319
large study right now

4336
02:58:20,950 --> 02:58:18,800
so how is topcoder look at this and how

4337
02:58:25,190 --> 02:58:20,960
is this going to help in uh in

4338
02:58:27,510 --> 02:58:25,200

crowdsourcing uh and community science

4339

02:58:30,070 --> 02:58:27,520

uh we run through a few examples um

4340

02:58:32,550 --> 02:58:30,080

really cuts from this one we are a

4341

02:58:34,630 --> 02:58:32,560

subcontractor to harvard institute of

4342

02:58:36,630 --> 02:58:34,640

politics social science

4343

02:58:38,550 --> 02:58:36,640

and serve the advanced deployment lab

4344

02:58:40,710 --> 02:58:38,560

through them we've developed an ipad

4345

02:58:43,510 --> 02:58:40,720

application for use by the astronauts

4346

02:58:45,429 --> 02:58:43,520

the tractor diet on the space station

4347

02:58:47,670 --> 02:58:45,439

we've developed an image processing

4348

02:58:50,150 --> 02:58:47,680

algorithm to determine if there are any

4349

02:58:53,110 --> 02:58:50,160

threats near an oil pipeline

4350

02:58:55,910 --> 02:58:53,120

and we've developed a web-based api q a

4351
02:58:58,309 --> 02:58:55,920
restful api that integrates the

4352
02:59:00,309 --> 02:58:58,319
federated data systems for planetary

4353
02:59:02,150 --> 02:59:00,319
data services on top of that we also

4354
02:59:04,630 --> 02:59:02,160
built some applications that demonstrate

4355
02:59:05,429 --> 02:59:04,640
its uh its utility and of course back in

4356
02:59:09,510 --> 02:59:05,439
this

4357
02:59:11,269 --> 02:59:09,520
ran a marquee challenge for the

4358
02:59:13,429 --> 02:59:11,279
international space station

4359
02:59:17,830 --> 02:59:13,439
to determine optimum configuration from

4360
02:59:20,230 --> 02:59:17,840
solar panels that minimize the shadowing

4361
02:59:22,630 --> 02:59:20,240
so this is the point here it's a very

4362
02:59:24,469 --> 02:59:22,640
broad spectrum of questions that you can

4363
02:59:27,349 --> 02:59:24,479

ask the community even one that is

4364

02:59:30,469 --> 02:59:27,359

engaged with with math

4365

02:59:32,469 --> 02:59:30,479

perhaps not that surprising uh this is a

4366

02:59:36,070 --> 02:59:32,479

challenge to improve the performance of

4367

02:59:38,550 --> 02:59:36,080

mega blast the green m is what the nih

4368

02:59:40,830 --> 02:59:38,560

uh has achieved the blue f is when

4369

02:59:42,550 --> 02:59:40,840

oxford trained mit

4370

02:59:44,630 --> 02:59:42,560

graduate

4371

02:59:47,670 --> 02:59:44,640

phd postdoc who was able to achieve in

4372

02:59:49,590 --> 02:59:47,680

about a year um and the red dot is the

4373

02:59:51,510 --> 02:59:49,600

top total result in the period contest

4374

02:59:53,429 --> 02:59:51,520

for six thousand dollars

4375

02:59:54,950 --> 02:59:53,439

so some surprising outcomes can be

4376

02:59:56,389 --> 02:59:54,960

achieved with contests when you can

4377

02:59:58,469 --> 02:59:56,399

attract crowds who have an interest in