



1
00:00:06,070 --> 00:00:03,030
the last session of the day today is

2
00:00:09,110 --> 00:00:06,080
entitled public perceptions priorities

3
00:00:11,910 --> 00:00:09,120
and solar system exploration

4
00:00:13,430 --> 00:00:11,920
my name is heidi hamill i am a planetary

5
00:00:15,190 --> 00:00:13,440
scientist

6
00:00:23,590 --> 00:00:15,200
i am

7
00:00:27,509 --> 00:00:23,600
this is the time for the women to take

8
00:00:31,109 --> 00:00:27,519
over the panels i hope you notice that

9
00:00:33,270 --> 00:00:31,119
so we are going to get into this here

10
00:00:35,030 --> 00:00:33,280
our first speaker today will be linda

11
00:00:37,670 --> 00:00:35,040
billings who is a fellow at george

12
00:00:39,110 --> 00:00:37,680
washington university school of media

13
00:00:41,350 --> 00:00:39,120

and public affairs right here in

14

00:00:44,229 --> 00:00:41,360

washington

15

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

she does communications research she has

16

00:00:50,069 --> 00:00:46,800

her phd in mass communication from

17

00:00:53,189 --> 00:00:50,079

indiana university and quite a diverse

18

00:00:56,310 --> 00:00:53,199

field of research including science and

19

00:00:58,950 --> 00:00:56,320

risk communication social studies of

20

00:01:01,349 --> 00:00:58,960

science and the rhetoric of science and

21

00:01:03,670 --> 00:01:01,359

space we've certainly been hearing some

22

00:01:05,990 --> 00:01:03,680

rhetoric today

23

00:01:07,990 --> 00:01:06,000

she has a lot of experience in many

24

00:01:10,630 --> 00:01:08,000

different areas including lots of

25

00:01:13,910 --> 00:01:10,640

editorial work and today she will be

26

00:01:16,789 --> 00:01:13,920

talking to us about a very interesting

27

00:01:17,749 --> 00:01:16,799

scientific urban myth

28

00:01:18,950 --> 00:01:17,759

about

29

00:01:22,469 --> 00:01:18,960

the uh

30

00:01:25,270 --> 00:01:22,479

presence of uh materials in that have

31

00:01:31,510 --> 00:01:25,280

come back from the moon or not

32

00:01:31,520 --> 00:01:38,630

hey slides

33

00:01:43,830 --> 00:01:41,429

applies to be cute in the meantime uh

34

00:01:46,069 --> 00:01:43,840

for those of you watching on the web uh

35

00:01:48,710 --> 00:01:46,079

i want to say uh that

36

00:01:50,550 --> 00:01:48,720

this is a story that depends on a lot of

37

00:01:52,630 --> 00:01:50,560

details

38

00:01:55,030 --> 00:01:52,640

and i'm gonna try to go back to my there

39

00:01:56,709 --> 00:01:55,040

we go

40

00:01:58,950 --> 00:01:56,719

yes thank you

41

00:02:00,550 --> 00:01:58,960

thank you jonathan

42

00:02:02,149 --> 00:02:00,560

and the details are not going to be in

43

00:02:04,069 --> 00:02:02,159

my talk because we don't have a lot of

44

00:02:06,230 --> 00:02:04,079

time but they are in my paper and i will

45

00:02:07,469 --> 00:02:06,240

email the paper to anybody who wants to

46

00:02:09,630 --> 00:02:07,479

read it

47

00:02:11,990 --> 00:02:09,640

billingslinda1 gmail.com

48

00:02:13,430 --> 00:02:12,000

billingslindawana gmail.com and that

49

00:02:14,390 --> 00:02:13,440

goes for everybody in the audience as

50

00:02:15,350 --> 00:02:14,400

well

51
00:02:18,550 --> 00:02:15,360
so

52
00:02:21,190 --> 00:02:18,560
my story is about a survivor or not the

53
00:02:24,070 --> 00:02:21,200
story of s midas on the move s midas is

54
00:02:26,309 --> 00:02:24,080
streptococcus midas bacteria that

55
00:02:28,150 --> 00:02:26,319
probably all of us have

56
00:02:30,630 --> 00:02:28,160
living in our mouths right now and i'll

57
00:02:32,550 --> 00:02:30,640
get to that in a minute

58
00:02:35,110 --> 00:02:32,560
the story of how nasa technicians found

59
00:02:37,110 --> 00:02:35,120
a viable streptococcus midas bacteria

60
00:02:39,030 --> 00:02:37,120
inside equipment retrieved from the moon

61
00:02:41,589 --> 00:02:39,040
and returned to earth

62
00:02:44,070 --> 00:02:41,599
by astronauts has been replicated widely

63
00:02:46,309 --> 00:02:44,080

and reported as fact for decades

64

00:02:48,470 --> 00:02:46,319

but it appears to be false

65

00:02:49,430 --> 00:02:48,480

and i'm going to try to explain my case

66

00:02:51,270 --> 00:02:49,440

today

67

00:02:53,750 --> 00:02:51,280

more than 30 years after the story was

68

00:02:55,190 --> 00:02:53,760

first told in 1970

69

00:02:57,750 --> 00:02:55,200

it may be difficult to prove it

70

00:03:00,149 --> 00:02:57,760

definitively true or definitively false

71

00:03:02,149 --> 00:03:00,159

however the evidence now points to false

72

00:03:05,030 --> 00:03:02,159

in large part thanks to the unearthing

73

00:03:06,710 --> 00:03:05,040

of old visual records i'll make the case

74

00:03:08,390 --> 00:03:06,720

that the claim that esmitas traveled

75

00:03:10,309 --> 00:03:08,400

from earth to the moon returned to earth

76

00:03:13,589 --> 00:03:10,319

and came back to life in a lab does not

77

00:03:16,149 --> 00:03:13,599

qualify as scientific truth

78

00:03:17,910 --> 00:03:16,159

this story has relevance to astrobiology

79

00:03:19,990 --> 00:03:17,920

planetary protection planetary

80

00:03:24,390 --> 00:03:20,000

exploration and of course the history

81

00:03:28,869 --> 00:03:26,550

as most people know all too well

82

00:03:30,869 --> 00:03:28,879

bacteria are hardy little buggers the

83

00:03:32,710 --> 00:03:30,879

existence of extremophilic microbial

84

00:03:35,190 --> 00:03:32,720

life an exotic concept just a few

85

00:03:36,869 --> 00:03:35,200

decades ago is now common knowledge

86

00:03:38,789 --> 00:03:36,879

we know that some microbes can form

87

00:03:40,470 --> 00:03:38,799

spores dormant non-reproductive

88

00:03:42,070 --> 00:03:40,480

structures that enable them to survive

89

00:03:44,390 --> 00:03:42,080

harsh conditions

90

00:03:46,309 --> 00:03:44,400

thanks in part to 50 years of exobiology

91

00:03:48,149 --> 00:03:46,319

and astrobiology research we know that

92

00:03:49,670 --> 00:03:48,159

microbes can thrive in virtually every

93

00:03:51,430 --> 00:03:49,680

sort of earth environment known to

94

00:03:53,110 --> 00:03:51,440

science and that some can survive

95

00:03:55,670 --> 00:03:53,120

radical changes in environmental

96

00:04:01,670 --> 00:03:55,680

conditions for years centuries or some

97

00:04:05,910 --> 00:04:03,910

meanwhile planetary exploration has

98

00:04:07,670 --> 00:04:05,920

revealed that mars and the jovian moons

99

00:04:09,110 --> 00:04:07,680

europa ganymede and callisto may have

100

00:04:11,030 --> 00:04:09,120

liquid water environments that could

101
00:04:12,789 --> 00:04:11,040
support life as we know it maybe

102
00:04:14,789 --> 00:04:12,799
enceladus too we've heard about this

103
00:04:16,949 --> 00:04:14,799
from previous speakers for missions to

104
00:04:18,710 --> 00:04:16,959
these targets planetary protection the

105
00:04:21,030 --> 00:04:18,720
practice of protecting solar system

106
00:04:22,790 --> 00:04:21,040
bodies from contamination by earth life

107
00:04:24,390 --> 00:04:22,800
and protecting earth from possible life

108
00:04:26,310 --> 00:04:24,400
forms that may be returned from other

109
00:04:28,390 --> 00:04:26,320
solar system bodies has become a

110
00:04:30,230 --> 00:04:28,400
complicated enterprise and john

111
00:04:32,230 --> 00:04:30,240
sarkisian asked a question at the end of

112
00:04:33,990 --> 00:04:32,240
the last session that related to

113
00:04:35,670 --> 00:04:34,000

planetary protection and nasa's current

114

00:04:37,350 --> 00:04:35,680

planetary protection officer cassie

115

00:04:38,950 --> 00:04:37,360

conley is here to answer any questions

116

00:04:41,590 --> 00:04:38,960

about that

117

00:04:44,310 --> 00:04:41,600

so let's get on with our story

118

00:04:45,909 --> 00:04:44,320

here are some and dare i say it facts

119

00:04:48,390 --> 00:04:45,919

about esmitas

120

00:04:49,990 --> 00:04:48,400

this bacterium is part of the auraf flora

121

00:04:51,909 --> 00:04:50,000

of mammals

122

00:04:54,310 --> 00:04:51,919

and there it is i'll introduce you to it

123

00:04:56,230 --> 00:04:54,320

it does not form spores it lives

124

00:04:58,469 --> 00:04:56,240

optimally at temperatures between 30 and

125

00:05:00,710 --> 00:04:58,479

35 degrees celsius which is

126

00:05:02,790 --> 00:05:00,720

approximately 85 to 95 degrees

127

00:05:04,469 --> 00:05:02,800

fahrenheit and it's commonly found in

128

00:05:06,070 --> 00:05:04,479

the human mouth

129

00:05:09,590 --> 00:05:06,080

so think about this

130

00:05:11,029 --> 00:05:09,600

did s midas could esmitas travel from

131

00:05:13,350 --> 00:05:11,039

earth to the moon survive more than two

132

00:05:15,029 --> 00:05:13,360

years of exposure there only to revive

133

00:05:16,870 --> 00:05:15,039

once brought back to earth

134

00:05:18,790 --> 00:05:16,880

and why were scientists and engineers

135

00:05:20,950 --> 00:05:18,800

even thinking about such possibilities

136

00:05:22,710 --> 00:05:20,960

in the 60s and 70s

137

00:05:24,150 --> 00:05:22,720

even before nasa came to be the

138

00:05:26,469 --> 00:05:24,160

international science community was

139

00:05:28,310 --> 00:05:26,479

discussing the possibility of e.t life

140

00:05:32,230 --> 00:05:28,320

and steps that might be taken to prevent

141

00:05:35,830 --> 00:05:34,230

in the early days of apollo nasa planned

142

00:05:38,230 --> 00:05:35,840

for the quarantine of astronauts and

143

00:05:40,150 --> 00:05:38,240

material samples returned from the moon

144

00:05:41,990 --> 00:05:40,160

a lunar receiving laboratory was built

145

00:05:44,230 --> 00:05:42,000

at the manned space center in houston

146

00:05:47,909 --> 00:05:44,240

now johnson space center to contain and

147

00:05:55,110 --> 00:05:49,590

i'm going to give you a little hint of

148

00:05:59,990 --> 00:05:57,749

in april 1967 nasa launched surveyor 3

149

00:06:02,469 --> 00:06:00,000

to the moon it made a soft landing

150

00:06:04,550 --> 00:06:02,479

operated for 14 days then shut down

151
00:06:06,629 --> 00:06:04,560
mission accomplished

152
00:06:16,710 --> 00:06:06,639
two years and seven months later nasa

153
00:06:21,270 --> 00:06:19,510
on november 19 1969

154
00:06:23,990 --> 00:06:21,280
pete conrad and alan bean landed their

155
00:06:25,749 --> 00:06:24,000
lunar module about 163 meters away from

156
00:06:27,590 --> 00:06:25,759
where surveyor 3 sat in the ocean of

157
00:06:29,590 --> 00:06:27,600
storms

158
00:06:31,029 --> 00:06:29,600
on november 20 the astronauts retrieved

159
00:06:33,510 --> 00:06:31,039
several pieces of equipment from

160
00:06:35,270 --> 00:06:33,520
surveyor including its camera they

161
00:06:36,870 --> 00:06:35,280
stashed the camera in a sample pack

162
00:06:38,870 --> 00:06:36,880
zipped it shut brought it back to the

163
00:06:42,550 --> 00:06:38,880

lunar module stowed it on board and took

164

00:06:46,950 --> 00:06:44,309

the crew returned to earth on november

165

00:06:48,309 --> 00:06:46,960

24 photos that splashed down show they

166

00:06:50,790 --> 00:06:48,319

are not wearing their protective

167

00:06:52,390 --> 00:06:50,800

biological isolation garments

168

00:06:54,309 --> 00:06:52,400

once the astronauts removed from their

169

00:06:55,990 --> 00:06:54,319

capsule to an aircraft carrier they don

170

00:06:58,309 --> 00:06:56,000

their protective garments and entered an

171

00:07:00,150 --> 00:06:58,319

isolation unit aboard the carrier the

172

00:07:01,670 --> 00:07:00,160

pack containing the surveyor camera was

173

00:07:03,430 --> 00:07:01,680

retrieved from the capsule and delivered

174

00:07:05,189 --> 00:07:03,440

to the lunar receiving lab where it was

175

00:07:09,029 --> 00:07:05,199

stored at room temperature in a teflon

176
00:07:13,670 --> 00:07:12,629
on january 8 1970

177
00:07:17,670 --> 00:07:13,680
lunar

178
00:07:19,350 --> 00:07:17,680
examining the camera microbial analysis

179
00:07:21,110 --> 00:07:19,360
came first as soon as the camera was

180
00:07:22,710 --> 00:07:21,120
opened working in a clean room

181
00:07:24,550 --> 00:07:22,720
environment they performed standard

182
00:07:26,950 --> 00:07:24,560
microbial assays

183
00:07:29,189 --> 00:07:26,960
and after four days of incubation one

184
00:07:31,270 --> 00:07:29,199
sample apparently produced viable

185
00:07:33,270 --> 00:07:31,280
visible microbial growth the apparently

186
00:07:35,510 --> 00:07:33,280
microblading sample had been taken from

187
00:07:37,110 --> 00:07:35,520
foam embedded inside the camera

188
00:07:39,029 --> 00:07:37,120

the isolate was identified with

189

00:07:42,309 --> 00:07:39,039

confirmation from the u.s public health

190

00:07:44,710 --> 00:07:42,319

service as streptococcus midas

191

00:07:47,110 --> 00:07:44,720

in march 1971 at the second lunar

192

00:07:49,510 --> 00:07:47,120

science conference in houston

193

00:07:51,029 --> 00:07:49,520

this is where this slide comes in

194

00:07:52,550 --> 00:07:51,039

the results of this analysis were

195

00:07:54,710 --> 00:07:52,560

reported and later published in

196

00:07:56,230 --> 00:07:54,720

conference proceedings f j mitchell a

197

00:07:58,070 --> 00:07:56,240

u.s air force major assigned to the

198

00:08:00,390 --> 00:07:58,080

preventive medicine division of nasa's

199

00:08:02,710 --> 00:08:00,400

manned space center and r.h ellis a

200

00:08:04,710 --> 00:08:02,720

contractor working at the center claimed

201
00:08:06,469 --> 00:08:04,720
that the s midas that had been cultured

202
00:08:08,550 --> 00:08:06,479
in the lab had traveled to the moon on

203
00:08:10,309 --> 00:08:08,560
surveyor 3 survived on the lunar surface

204
00:08:13,909 --> 00:08:10,319
for two and a half years and once

205
00:08:15,550 --> 00:08:13,919
returned to earth revived and reproduced

206
00:08:17,589 --> 00:08:15,560
this is a quote from their paper

207
00:08:19,589 --> 00:08:17,599
decontamination measures taken before

208
00:08:21,350 --> 00:08:19,599
the surveyor launch did not eliminate

209
00:08:24,230 --> 00:08:21,360
the possibility that the spacecraft

210
00:08:25,909 --> 00:08:24,240
carried organisms to the moon

211
00:08:28,390 --> 00:08:25,919
they described the conduct of the

212
00:08:30,710 --> 00:08:28,400
surveyor three camera camera analysis in

213
00:08:32,469 --> 00:08:30,720

excruciating detail take my word for it

214

00:08:33,829 --> 00:08:32,479

and i have a lot of those details in my

215

00:08:37,430 --> 00:08:33,839

paper

216

00:08:39,509 --> 00:08:37,440

protocol established for the aerobic and

217

00:08:41,350 --> 00:08:39,519

anaerobic analyses contained a system of

218

00:08:43,829 --> 00:08:41,360

redundancy and cross checks designed to

219

00:08:45,990 --> 00:08:43,839

identify suspected lab contamination

220

00:08:47,590 --> 00:08:46,000

only one sampled surface a one cubic

221

00:08:52,070 --> 00:08:47,600

millimeter piece of foam inside the

222

00:08:56,230 --> 00:08:54,310

extreme precautions were taken at all

223

00:08:58,310 --> 00:08:56,240

times they said in their paper during

224

00:08:59,350 --> 00:08:58,320

the analysis to prevent any handling

225

00:09:02,389 --> 00:08:59,360

errors which might have caused

226

00:09:07,350 --> 00:09:05,110

the available data indicates

227

00:09:08,710 --> 00:09:07,360

their conclusion that s midas was

228

00:09:10,070 --> 00:09:08,720

isolated from the phone sample and

229

00:09:12,310 --> 00:09:10,080

suggests that the bacterium was

230

00:09:15,269 --> 00:09:12,320

deposited on their surveyor 3tv camera

231

00:09:17,350 --> 00:09:15,279

before spacecraft launched

232

00:09:20,230 --> 00:09:17,360

at the very same meeting

233

00:09:21,910 --> 00:09:20,240

m.d nidal ms favero and rh green

234

00:09:23,269 --> 00:09:21,920

presented a paper in which they reported

235

00:09:25,030 --> 00:09:23,279

on the results of their microbial

236

00:09:27,910 --> 00:09:25,040

sampling of returned surveyor iii

237

00:09:29,110 --> 00:09:27,920

electrical cabling

238

00:09:30,949 --> 00:09:29,120

nidal and green were with the jet

239

00:09:32,949 --> 00:09:30,959

propulsion laboratory and faveros with

240

00:09:34,470 --> 00:09:32,959

the u.s public health department their

241

00:09:36,310 --> 00:09:34,480

findings raised some questions about

242

00:09:38,150 --> 00:09:36,320

mitchell and ellis's report keep in mind

243

00:09:40,710 --> 00:09:38,160

these two papers were both presented at

244

00:09:42,230 --> 00:09:40,720

the same conference and all these

245

00:09:43,509 --> 00:09:42,240

guys

246

00:09:45,110 --> 00:09:43,519

knew each other

247

00:09:46,630 --> 00:09:45,120

middle fiverro and green chose to

248

00:09:47,990 --> 00:09:46,640

examine a piece of electrical wire

249

00:09:49,910 --> 00:09:48,000

bundling running from the surveyor

250

00:09:51,590 --> 00:09:49,920

camera to another part of the spacecraft

251
00:09:53,509 --> 00:09:51,600
because earlier studies had shown that a

252
00:09:56,389 --> 00:09:53,519
high level of microbial contamination

253
00:09:58,150 --> 00:09:56,399
was associated with wiring bundles

254
00:10:00,150 --> 00:09:58,160
if during the actual sampling of the

255
00:10:01,750 --> 00:10:00,160
wires they observed and i'm quoting here

256
00:10:03,670 --> 00:10:01,760
a contaminant were accidentally

257
00:10:05,910 --> 00:10:03,680
introduced it would be impossible to

258
00:10:08,150 --> 00:10:05,920
separate it from a lunar survivor thus

259
00:10:10,069 --> 00:10:08,160
it was necessary they said to perform

260
00:10:12,150 --> 00:10:10,079
several simulated assays with a piece of

261
00:10:15,430 --> 00:10:12,160
sterile wiring bundle before the lunar

262
00:10:17,350 --> 00:10:15,440
sample was acid which they did

263
00:10:19,350 --> 00:10:17,360

prior to opening the sealed container

264

00:10:21,430 --> 00:10:19,360

containing the surveyor 3 cable on other

265

00:10:23,350 --> 00:10:21,440

parts technicians discovered that it had

266

00:10:25,269 --> 00:10:23,360

leaked there was concern whether

267

00:10:27,030 --> 00:10:25,279

airborne bacterial contamination of the

268

00:10:29,350 --> 00:10:27,040

exterior wraps would penetrate to the

269

00:10:31,829 --> 00:10:29,360

interior of the bundle their work in the

270

00:10:33,509 --> 00:10:31,839

lab showed that if airborne bacteria did

271

00:10:35,269 --> 00:10:33,519

pass into the container through the leak

272

00:10:37,829 --> 00:10:35,279

the wiring bundle wraps would protect

273

00:10:39,829 --> 00:10:37,839

the wires beneath it from contamination

274

00:10:41,990 --> 00:10:39,839

their results showed quote that no

275

00:10:43,910 --> 00:10:42,000

viable microorganisms were recovered

276
00:10:46,069 --> 00:10:43,920
from that portion of surveyor 3 cable

277
00:10:48,550 --> 00:10:46,079
that was sampled

278
00:10:50,630 --> 00:10:48,560
the implication was that if no viable

279
00:10:53,110 --> 00:10:50,640
microbes were found on these protected

280
00:10:55,030 --> 00:10:53,120
wiring samples then it would not be

281
00:10:57,590 --> 00:10:55,040
likely that any viable microbes would be

282
00:10:59,750 --> 00:10:57,600
found elsewhere on the camera

283
00:11:01,990 --> 00:10:59,760
nasa published verbatim the findings of

284
00:11:04,550 --> 00:11:02,000
both mitchell and ellis and nidal eddal

285
00:11:08,630 --> 00:11:04,560
as reported at the 1970 conference in a

286
00:11:12,470 --> 00:11:10,310
there's a couple pictures

287
00:11:14,630 --> 00:11:12,480
of the camera

288
00:11:16,630 --> 00:11:14,640

and another picture and thanks to john

289

00:11:18,230 --> 00:11:16,640

rummel who's now in the back of the room

290

00:11:19,750 --> 00:11:18,240

uh who got me started on this

291

00:11:22,389 --> 00:11:19,760

investigation and then he'll come into

292

00:11:25,030 --> 00:11:22,399

the story pretty soon

293

00:11:27,030 --> 00:11:25,040

in 1974 the prestigious peer review

294

00:11:29,190 --> 00:11:27,040

journal annual review of microbiology

295

00:11:30,949 --> 00:11:29,200

published a paper by jared taylor of

296

00:11:32,870 --> 00:11:30,959

johnson space center's life sciences

297

00:11:35,110 --> 00:11:32,880

directorship which he was formerly with

298

00:11:36,870 --> 00:11:35,120

the preventive medicine division there

299

00:11:39,990 --> 00:11:36,880

that reported on advances in space

300

00:11:41,750 --> 00:11:40,000

microbiology in this paper taylor cited

301
00:11:44,150 --> 00:11:41,760
the lunar science conference papers by

302
00:11:47,030 --> 00:11:44,160
mitchell and ellis and by nidal at all

303
00:11:48,949 --> 00:11:47,040
in his text however taylor described

304
00:11:50,790 --> 00:11:48,959
only the findings of mitchell and ellis

305
00:11:52,870 --> 00:11:50,800
as follows quote

306
00:11:55,110 --> 00:11:52,880
components of the surveyor 3 spacecraft

307
00:11:57,590 --> 00:11:55,120
which had resided on the moon for 2.5

308
00:11:59,269 --> 00:11:57,600
years were returned during the apollo 12

309
00:12:01,590 --> 00:11:59,279
mission and analyzed for the presence of

310
00:12:03,590 --> 00:12:01,600
viable microorganisms except for the

311
00:12:05,670 --> 00:12:03,600
presence of s midas which was considered

312
00:12:07,829 --> 00:12:05,680
by the investigators to have been

313
00:12:10,150 --> 00:12:07,839

embedded within the camera body before

314

00:12:11,829 --> 00:12:10,160

it left the earth no viable microbes

315

00:12:14,150 --> 00:12:11,839

were recovered from any of the tested

316

00:12:16,470 --> 00:12:14,160

components end quote

317

00:12:18,629 --> 00:12:16,480

over the next three decades according to

318

00:12:21,030 --> 00:12:18,639

science citation index taylor's paper

319

00:12:22,790 --> 00:12:21,040

was cited in 31 peer-reviewed journal

320

00:12:25,110 --> 00:12:22,800

papers in publications ranging from

321

00:12:27,110 --> 00:12:25,120

icarus and infection and immunity to

322

00:12:28,150 --> 00:12:27,120

microbiology and molecular biology

323

00:12:30,069 --> 00:12:28,160

reviews

324

00:12:31,750 --> 00:12:30,079

microbiological research and trends in

325

00:12:33,829 --> 00:12:31,760

biotechnology

326
00:12:35,910 --> 00:12:33,839
meanwhile in places ranging from nasa

327
00:12:37,590 --> 00:12:35,920
fact sheets wikipedia entries and

328
00:12:39,829 --> 00:12:37,600
websites ranging from credible to

329
00:12:41,670 --> 00:12:39,839
dubious the account of how as midas

330
00:12:43,509 --> 00:12:41,680
survived for 27 months on the moon and

331
00:12:47,590 --> 00:12:43,519
came back to life on earth were widely

332
00:12:52,550 --> 00:12:50,230
after 30 years somebody decided to look

333
00:12:54,550 --> 00:12:52,560
into the story during his second stint

334
00:12:57,990 --> 00:12:54,560
as nasa's planetary protection officer

335
00:13:00,470 --> 00:12:58,000
from 1998 to 2006 john rummel a

336
00:13:03,910 --> 00:13:00,480
microbial ecologist by training decided

337
00:13:05,350 --> 00:13:03,920
to investigate the survivor claim

338
00:13:07,269 --> 00:13:05,360

he talked with people knowledgeable

339

00:13:09,110 --> 00:13:07,279

about the surveyor camera analysis who

340

00:13:10,550 --> 00:13:09,120

had indicated the clean room procedures

341

00:13:11,829 --> 00:13:10,560

for the analysis were less than

342

00:13:13,910 --> 00:13:11,839

stringent

343

00:13:15,990 --> 00:13:13,920

i began doing research for planetary

344

00:13:18,470 --> 00:13:16,000

protection in 2002

345

00:13:20,470 --> 00:13:18,480

in a 2002 memo responding to a query

346

00:13:22,870 --> 00:13:20,480

from me about the story of us midas as a

347

00:13:24,949 --> 00:13:22,880

lunar survivor which i'd stumbled across

348

00:13:25,990 --> 00:13:24,959

on the web and doing some routine

349

00:13:28,069 --> 00:13:26,000

research

350

00:13:30,150 --> 00:13:28,079

rommel said the claim is almost

351
00:13:31,829 --> 00:13:30,160
certainly incorrect there was no

352
00:13:36,310 --> 00:13:31,839
peer-reviewed paper with that result at

353
00:13:40,150 --> 00:13:38,310
rommel told me that in 1998 he had

354
00:13:41,829 --> 00:13:40,160
gotten in touch with jpl surveyor

355
00:13:44,069 --> 00:13:41,839
project scientist leonard jaffe about

356
00:13:45,509 --> 00:13:44,079
the survivor claim and that jaffe had

357
00:13:47,910 --> 00:13:45,519
told him there was a film of the

358
00:13:50,629 --> 00:13:47,920
procedure to sample the camera and that

359
00:13:52,550 --> 00:13:50,639
the samplers had broken sterile protocol

360
00:13:55,189 --> 00:13:52,560
inadvertently by placing their sampling

361
00:13:57,910 --> 00:13:55,199
tool outside the sterile hood

362
00:13:59,269 --> 00:13:57,920
jaffee passed along to rummel a message

363
00:14:01,269 --> 00:13:59,279

he had received from his surveyor

364

00:14:03,829 --> 00:14:01,279

project colleague richard green

365

00:14:06,230 --> 00:14:03,839

remember rh green

366

00:14:08,550 --> 00:14:06,240

of the nettle favera and green paper

367

00:14:09,590 --> 00:14:08,560

about the lrl analysis of the surveyor 3

368

00:14:11,350 --> 00:14:09,600

camera

369

00:14:13,269 --> 00:14:11,360

green had told jaffe quote you were

370

00:14:15,509 --> 00:14:13,279

correct the sampling of the camera was

371

00:14:17,910 --> 00:14:15,519

suspect i took movie film the entire

372

00:14:19,350 --> 00:14:17,920

procedure and it shows up on it as well

373

00:14:20,710 --> 00:14:19,360

i believe i still have the film

374

00:14:22,790 --> 00:14:20,720

somewhere in storage if it would be

375

00:14:24,790 --> 00:14:22,800

helpful i could try and find it

376

00:14:28,629 --> 00:14:24,800

that's a long story too

377

00:14:30,949 --> 00:14:28,639

at an astrobiology conference in 2004

378

00:14:33,590 --> 00:14:30,959

rummel discussed mitchell and ellis's

379

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

s-midas survivor claim and he asserted

380

00:14:37,110 --> 00:14:35,040

that the growth they had reported was

381

00:14:39,670 --> 00:14:37,120

the product of lab contamination and he

382

00:14:41,509 --> 00:14:39,680

made a good case a 2004 paper on

383

00:14:43,350 --> 00:14:41,519

biological contamination studies of

384

00:14:44,870 --> 00:14:43,360

lunar landing sites co-authored by

385

00:14:46,790 --> 00:14:44,880

rummel and published in the

386

00:14:48,550 --> 00:14:46,800

international journal of astrobiology

387

00:14:51,670 --> 00:14:48,560

also challenged the claim in a similar

388

00:14:56,230 --> 00:14:54,310

in 2006 i began exploring the story of s

389

00:14:58,389 --> 00:14:56,240

midas on the moon in earnest searching

390

00:15:00,790 --> 00:14:58,399

the web for other accounts

391

00:15:03,030 --> 00:15:00,800

on a nasa goddard web page i found a

392

00:15:04,870 --> 00:15:03,040

following science question of the week

393

00:15:06,629 --> 00:15:04,880

provided by planetary scientist david

394

00:15:08,790 --> 00:15:06,639

williams of nasa's national space

395

00:15:10,949 --> 00:15:08,800

science data center the question can

396

00:15:13,189 --> 00:15:10,959

anything from earth live on the moon the

397

00:15:15,670 --> 00:15:13,199

answer yes

398

00:15:17,350 --> 00:15:15,680

scientists the the s midas claim was

399

00:15:19,910 --> 00:15:17,360

reported here as fact

400

00:15:21,750 --> 00:15:19,920

and quote from this webpage scientists

401
00:15:23,509 --> 00:15:21,760
concluded that the s midas was inside

402
00:15:25,509 --> 00:15:23,519
the camera originally and had managed to

403
00:15:27,269 --> 00:15:25,519
survive on the moon

404
00:15:29,590 --> 00:15:27,279
at the same time i found a much more

405
00:15:31,110 --> 00:15:29,600
detailed account of the survivor story

406
00:15:34,470 --> 00:15:31,120
on a marshall space flight center

407
00:15:36,710 --> 00:15:34,480
website science at nasa dated 1998 and

408
00:15:38,550 --> 00:15:36,720
headlined earth microbes on the moon

409
00:15:40,629 --> 00:15:38,560
three decades after apollo 12 a

410
00:15:43,269 --> 00:15:40,639
remarkable colony of lunar survivors

411
00:15:45,590 --> 00:15:43,279
revisited this account reports on quote

412
00:15:47,350 --> 00:15:45,600
an inadvertent stowaway streptococcus

413
00:15:49,749 --> 00:15:47,360

midas the only known survivor of

414

00:15:51,350 --> 00:15:49,759

unprotected space travel how this

415

00:15:53,269 --> 00:15:51,360

remarkable feat of survival was

416

00:15:55,749 --> 00:15:53,279

accomplished only by strep bacteria

417

00:15:57,590 --> 00:15:55,759

remains speculative but the significance

418

00:15:59,509 --> 00:15:57,600

of a living organism surviving for

419

00:16:01,670 --> 00:15:59,519

nearly three years in the harsh lunar

420

00:16:03,670 --> 00:16:01,680

environment may only now be placed in

421

00:16:05,829 --> 00:16:03,680

perspective after three decades of the

422

00:16:07,910 --> 00:16:05,839

biological revolution in understanding

423

00:16:09,670 --> 00:16:07,920

life in its favored conditions talk

424

00:16:11,430 --> 00:16:09,680

about rhetoric

425

00:16:13,670 --> 00:16:11,440

another official nasa record found

426
00:16:16,069 --> 00:16:13,680
online the apollo 12 lunar surface

427
00:16:18,069 --> 00:16:16,079
journal surveyor crater and surveyor 3

428
00:16:20,069 --> 00:16:18,079
includes a transcript of astronauts

429
00:16:21,670 --> 00:16:20,079
conrad and beans conversation while

430
00:16:23,509 --> 00:16:21,680
around the lunar surface plus

431
00:16:25,430 --> 00:16:23,519
post-flight commentary from them and

432
00:16:27,910 --> 00:16:25,440
others in which they address the story

433
00:16:29,670 --> 00:16:27,920
of us midas on the moon in post-flight

434
00:16:31,829 --> 00:16:29,680
comments conrad said

435
00:16:33,189 --> 00:16:31,839
quote the thing that had the bacteria in

436
00:16:35,030 --> 00:16:33,199
it was the television camera the

437
00:16:37,590 --> 00:16:35,040
styrofoam in between the inner and outer

438
00:16:39,030 --> 00:16:37,600

shells there's a report on that i always

439

00:16:41,189 --> 00:16:39,040

thought the most significant thing that

440

00:16:43,670 --> 00:16:41,199

we ever found on the whole god damn moon

441

00:16:46,150 --> 00:16:43,680

was that little bacteria who came

442

00:16:48,230 --> 00:16:46,160

back and lived and nobody ever said

443

00:16:50,710 --> 00:16:48,240

squat about it

444

00:16:52,069 --> 00:16:50,720

anyone who knows pete conrad

445

00:16:54,470 --> 00:16:52,079

would recognize that quote and that

446

00:16:57,590 --> 00:16:54,480

quote was widely replicated i i think in

447

00:16:59,269 --> 00:16:57,600

large part because of its color

448

00:17:01,350 --> 00:16:59,279

in his post-flight comments journal

449

00:17:03,269 --> 00:17:01,360

contributor ken glover noted quote

450

00:17:05,110 --> 00:17:03,279

there's this distinct possibility that

451
00:17:06,470 --> 00:17:05,120
the microbes found in the surveyor tv

452
00:17:09,429 --> 00:17:06,480
camera got there as a result of

453
00:17:10,949 --> 00:17:09,439
post-flight contamination as of 2004 it

454
00:17:13,350 --> 00:17:10,959
seems generally accepted that the

455
00:17:14,949 --> 00:17:13,360
history of this particular microbe found

456
00:17:16,630 --> 00:17:14,959
in the surveyor three parts will never

457
00:17:19,350 --> 00:17:16,640
be resolved

458
00:17:21,590 --> 00:17:19,360
i also found this is kind of disturbing

459
00:17:23,990 --> 00:17:21,600
a classroom teacher sheet for grades 9

460
00:17:25,829 --> 00:17:24,000
through 12 called all about microbes

461
00:17:27,590 --> 00:17:25,839
developed for a nasa sponsored project

462
00:17:30,070 --> 00:17:27,600
which is now defunct called nasa

463
00:17:31,669 --> 00:17:30,080

explorers and it repeated this survivor

464

00:17:34,150 --> 00:17:31,679

story as fact citing the marshall

465

00:17:36,230 --> 00:17:34,160

website as a source of information

466

00:17:38,710 --> 00:17:36,240

there were many many other sources and

467

00:17:40,950 --> 00:17:38,720

beyond the universe of nasa.gov i found

468

00:17:43,750 --> 00:17:40,960

further accounts of the fact that s

469

00:17:46,390 --> 00:17:43,760

midas was a survivor at reference.com at

470

00:17:50,470 --> 00:17:46,400

wikipedia on a space.com reader forum

471

00:17:54,310 --> 00:17:52,870

in 2006 i began contacting people at

472

00:17:55,830 --> 00:17:54,320

johnson space center who might know

473

00:17:58,230 --> 00:17:55,840

something about the surveyor camera

474

00:18:00,470 --> 00:17:58,240

analysis rummel told me judy alton a

475

00:18:02,870 --> 00:18:00,480

curator with the jsc astro materials

476

00:18:04,950 --> 00:18:02,880

office reportedly had a list of film and

477

00:18:07,110 --> 00:18:04,960

photographic records of the analysis so

478

00:18:10,230 --> 00:18:07,120

i first contacted her she found her

479

00:18:12,070 --> 00:18:10,240

handwritten list provided it to us

480

00:18:13,590 --> 00:18:12,080

her colleague carlton allen referred us

481

00:18:15,430 --> 00:18:13,600

to john lindsay with the lunar and

482

00:18:16,710 --> 00:18:15,440

planetary institute center for advanced

483

00:18:18,470 --> 00:18:16,720

space studies for help with our

484

00:18:20,150 --> 00:18:18,480

investigation

485

00:18:22,150 --> 00:18:20,160

lindsay advised that he was quote part

486

00:18:24,630 --> 00:18:22,160

of the preliminary examination team on

487

00:18:26,070 --> 00:18:24,640

apollo 12 so have some feel for the way

488

00:18:27,750 --> 00:18:26,080

things went and would enjoy working on

489

00:18:30,230 --> 00:18:27,760

the data once again

490

00:18:31,830 --> 00:18:30,240

i put my research on hold in late 2006

491

00:18:33,750 --> 00:18:31,840

when rummel stepped down as planetary

492

00:18:36,710 --> 00:18:33,760

protection officer to take over the nasa

493

00:18:38,390 --> 00:18:36,720

astrobiology program in 2008 rummel left

494

00:18:39,909 --> 00:18:38,400

nasa and john lindsay passed away

495

00:18:41,590 --> 00:18:39,919

unrelated events

496

00:18:43,669 --> 00:18:41,600

nonetheless rummel will still seem

497

00:18:45,990 --> 00:18:43,679

determined to prove if possible that s

498

00:18:47,350 --> 00:18:46,000

midas survivor was actually s midas lab

499

00:18:49,190 --> 00:18:47,360

contamination

500

00:18:51,430 --> 00:18:49,200

ultimately rummel alston and don

501
00:18:52,870 --> 00:18:51,440
morrison completed an investigation into

502
00:18:55,590 --> 00:18:52,880
the matter and rummel reported their

503
00:18:57,029 --> 00:18:55,600
results at a workshop in 2011.

504
00:18:58,710 --> 00:18:57,039
rommel said that according to nasa

505
00:19:00,950 --> 00:18:58,720
records the surveyor 3 camera reached a

506
00:19:03,029 --> 00:19:00,960
maximum temperature of around 70 degrees

507
00:19:04,950 --> 00:19:03,039
celsius on the moon

508
00:19:06,950 --> 00:19:04,960
nasa records also showed that esmidis

509
00:19:09,830 --> 00:19:06,960
quote was isolated from the apollo 12

510
00:19:12,230 --> 00:19:09,840
crew in routine microbial testing the

511
00:19:14,070 --> 00:19:12,240
team's investigation verified that no

512
00:19:16,789 --> 00:19:14,080
viable microbes were isolated from the

513
00:19:19,190 --> 00:19:16,799

surveyor 3 cables or foam

514

00:19:21,029 --> 00:19:19,200

or for many apollo surface samples

515

00:19:23,029 --> 00:19:21,039

excuse me return to earth and that no

516

00:19:25,909 --> 00:19:23,039

viable microbes were isolated from 10 of

517

00:19:28,230 --> 00:19:25,919

11 sampling locations 32 of 33 samples

518

00:19:30,310 --> 00:19:28,240

within the camera body what clinched the

519

00:19:32,870 --> 00:19:30,320

trio's investigation however was that in

520

00:19:35,190 --> 00:19:32,880

2010 they found the 16 millimeter film

521

00:19:36,230 --> 00:19:35,200

records of the 1970s surveyor camera

522

00:19:38,630 --> 00:19:36,240

analysis

523

00:19:41,029 --> 00:19:38,640

quote in in john john's words

524

00:19:42,549 --> 00:19:41,039

languishing in maryland

525

00:19:44,470 --> 00:19:42,559

all three researchers viewed and

526

00:19:46,870 --> 00:19:44,480

analyzed the film and again in john

527

00:19:48,870 --> 00:19:46,880

rumble's words it wasn't pretty

528

00:19:50,630 --> 00:19:48,880

the film showed lab technicians working

529

00:19:52,710 --> 00:19:50,640

in short sleeves with only their mouths

530

00:19:54,630 --> 00:19:52,720

and noses covered by masks at some

531

00:19:56,470 --> 00:19:54,640

points they were working with bare hands

532

00:19:58,070 --> 00:19:56,480

as rummel observed after all of that how

533

00:19:59,029 --> 00:19:58,080

can you be sure where your microbes came

534

00:20:01,190 --> 00:19:59,039

from

535

00:20:03,110 --> 00:20:01,200

more specifically morrison pinpointed an

536

00:20:05,350 --> 00:20:03,120

anomaly in camera foam sampling which

537

00:20:08,549 --> 00:20:05,360

i've detailed in my paper

538

00:20:10,310 --> 00:20:08,559

as to general protocol judy alton noted

539

00:20:12,149 --> 00:20:10,320

i will add that the participants were

540

00:20:14,310 --> 00:20:12,159

wearing short sleeve scrubs thus arms

541

00:20:16,149 --> 00:20:14,320

were exposed also that the scrub shirt

542

00:20:17,830 --> 00:20:16,159

tails were higher than the flow bench

543

00:20:21,430 --> 00:20:17,840

level and would act as a bellows for

544

00:20:24,310 --> 00:20:21,440

particulates from inside the shirt

545

00:20:26,310 --> 00:20:24,320

on may 2 2011 space.com reported on

546

00:20:27,990 --> 00:20:26,320

rummel adele's findings describing the

547

00:20:30,070 --> 00:20:28,000

story of s midas survivor as a

548

00:20:31,669 --> 00:20:30,080

long-lived bit of apollo moon landing

549

00:20:36,310 --> 00:20:31,679

folklore that now appears to be a

550

00:20:40,630 --> 00:20:38,789

oh i missed some slides now here's a

551

00:20:42,630 --> 00:20:40,640

lovely picture it's a little blurry

552

00:20:45,190 --> 00:20:42,640

because of course this is a still still

553

00:20:46,789 --> 00:20:45,200

imagery taken from 16 millimeter film

554

00:20:48,070 --> 00:20:46,799

but you can see

555

00:20:51,750 --> 00:20:48,080

get a good idea of what we're talking

556

00:20:55,430 --> 00:20:53,510

the contestation or shall we say

557

00:20:56,789 --> 00:20:55,440

refutation of mitchell analysis claim

558

00:20:58,230 --> 00:20:56,799

has had some effect on the public

559

00:21:00,710 --> 00:20:58,240

records so far

560

00:21:02,549 --> 00:21:00,720

while in 2006 i found numerous websites

561

00:21:05,110 --> 00:21:02,559

replicating the story of s midas

562

00:21:07,029 --> 00:21:05,120

survivor in 2012 i found only a few that

563

00:21:09,669 --> 00:21:07,039

were sticking with the story

564

00:21:11,750 --> 00:21:09,679

in 2006 i contacted david williams at

565

00:21:14,870 --> 00:21:11,760

goddard to advise that the claim he

566

00:21:16,390 --> 00:21:14,880

reported as fact was contested in 2012 i

567

00:21:17,590 --> 00:21:16,400

looked for this page and it no longer

568

00:21:20,549 --> 00:21:17,600

exists

569

00:21:23,029 --> 00:21:20,559

in 2012 at reference.com

570

00:21:26,230 --> 00:21:23,039

online entry for surveyor 3 at the very

571

00:21:27,909 --> 00:21:26,240

same url that i checked in 2006 i found

572

00:21:29,510 --> 00:21:27,919

a completely different story about us

573

00:21:31,029 --> 00:21:29,520

midas on the moon

574

00:21:31,990 --> 00:21:31,039

and now the story reported that the

575

00:21:34,310 --> 00:21:32,000

claim

576

00:21:36,310 --> 00:21:34,320

of s midas surviving on the moon and

577

00:21:38,950 --> 00:21:36,320

coming back to life on earth has been

578

00:21:41,590 --> 00:21:38,960

cited as providing credence to the idea

579

00:21:43,909 --> 00:21:41,600

of interplanetary panspermia however

580

00:21:45,430 --> 00:21:43,919

nasa officials now no longer support

581

00:21:46,470 --> 00:21:45,440

this claim

582

00:21:47,990 --> 00:21:46,480

now

583

00:21:49,830 --> 00:21:48,000

i believe even today because i just

584

00:21:53,029 --> 00:21:49,840

checked this about a week ago nasa

585

00:21:55,110 --> 00:21:53,039

marshall signs that nasa entry of 1998

586

00:21:56,230 --> 00:21:55,120

has not been revised since it was posted

587

00:21:58,789 --> 00:21:56,240

there

588

00:22:00,630 --> 00:21:58,799

thus in 2012 at least one nasa.gov

589

00:22:02,710 --> 00:22:00,640

webpage continues to report without

590

00:22:04,870 --> 00:22:02,720

question or qualification

591

00:22:06,390 --> 00:22:04,880

that s midas did indeed survive for two

592

00:22:09,350 --> 00:22:06,400

and a half years on the moon come back

593

00:22:11,110 --> 00:22:09,360

to earth and come back to life

594

00:22:12,950 --> 00:22:11,120

so it remains to be seen we'll have to

595

00:22:13,990 --> 00:22:12,960

wait a few more years to see how long it

596

00:22:16,149 --> 00:22:14,000

will take

597

00:22:18,950 --> 00:22:16,159

to correct the public record

598

00:22:21,350 --> 00:22:18,960

it's still with us on the september 14

599

00:22:23,830 --> 00:22:21,360

edition just last month of national

600

00:22:26,070 --> 00:22:23,840

public radio science friday show ira

601
00:22:27,909 --> 00:22:26,080
fledo asked cassie connolly nasa's

602
00:22:29,909 --> 00:22:27,919
current planetary protection officer

603
00:22:32,470 --> 00:22:29,919
about the bioassays of the surveyor

604
00:22:33,990 --> 00:22:32,480
camera parts and cassie said quote it

605
00:22:35,750 --> 00:22:34,000
turns out that the way they were taking

606
00:22:37,590 --> 00:22:35,760
those samples was about the same level

607
00:22:39,430 --> 00:22:37,600
of sterility as you do in surgery so

608
00:22:41,270 --> 00:22:39,440
they had short sleeve scrubs they didn't

609
00:22:42,950 --> 00:22:41,280
really have good masks so the samples

610
00:22:45,110 --> 00:22:42,960
that were contaminated were taken at the

611
00:22:46,950 --> 00:22:45,120
very end of this whole sampling process

612
00:22:49,110 --> 00:22:46,960
and just after somebody breathed right

613
00:22:50,710 --> 00:22:49,120

on that location on the camera so it

614

00:22:54,789 --> 00:22:50,720

probably was contamination after the

615

00:22:59,750 --> 00:22:56,789

there's another picture

616

00:23:01,350 --> 00:22:59,760

just to show up close and personal

617

00:23:03,110 --> 00:23:01,360

to wrap up

618

00:23:05,430 --> 00:23:03,120

this story shows how a claim became a

619

00:23:07,669 --> 00:23:05,440

widely accepted fact without passing the

620

00:23:09,110 --> 00:23:07,679

conventional test of peer review

621

00:23:10,870 --> 00:23:09,120

how initial counter claims that

622

00:23:13,590 --> 00:23:10,880

challenge the status of the first claim

623

00:23:15,510 --> 00:23:13,600

is fact failed to register how a later

624

00:23:17,430 --> 00:23:15,520

and perhaps more vigorous counter claim

625

00:23:19,510 --> 00:23:17,440

ultimately led to a solid case against

626
00:23:21,990 --> 00:23:19,520
the first claim and how consequently the

627
00:23:27,830 --> 00:23:22,000
first claim is losing its status as fact

628
00:23:30,950 --> 00:23:29,430
rommel at all are interested in this

629
00:23:32,549 --> 00:23:30,960
story as a case that illustrates the

630
00:23:33,990 --> 00:23:32,559
importance of stringent compliance with

631
00:23:36,149 --> 00:23:34,000
planetary protection policy and

632
00:23:38,230 --> 00:23:36,159
procedures and as we've heard from other

633
00:23:39,750 --> 00:23:38,240
speakers in recent years microbiology

634
00:23:41,590 --> 00:23:39,760
research has revealed the extent to

635
00:23:43,510 --> 00:23:41,600
which humans are teeming with microbial

636
00:23:45,269 --> 00:23:43,520
life and the prospect of sending humans

637
00:23:47,190 --> 00:23:45,279
to extraterrestrial environments that

638
00:23:48,710 --> 00:23:47,200

might be habitable for earth life

639

00:23:50,310 --> 00:23:48,720

greatly complicates the task of

640

00:23:52,870 --> 00:23:50,320

compliance with planetary protection

641

00:23:55,110 --> 00:23:52,880

requirements nasa clean room practices

642

00:23:57,029 --> 00:23:55,120

have evolved considerably since the days

643

00:23:58,789 --> 00:23:57,039

of the surveyor analysis where clean

644

00:24:00,549 --> 00:23:58,799

room technicians wore short sleeves to

645

00:24:02,549 --> 00:24:00,559

the present day planetary protection

646

00:24:04,390 --> 00:24:02,559

requirement of bunny suits

647

00:24:06,470 --> 00:24:04,400

there you go i think this was from

648

00:24:08,630 --> 00:24:06,480

genesis john is that right

649

00:24:10,390 --> 00:24:08,640

the genesis crew

650

00:24:12,070 --> 00:24:10,400

today the scientific consensus is that

651
00:24:13,669 --> 00:24:12,080
it is not likely that terrestrial

652
00:24:15,590 --> 00:24:13,679
microbes could survive and thrive on the

653
00:24:17,510 --> 00:24:15,600
moon and this consensus is reflected in

654
00:24:19,430 --> 00:24:17,520
planetary protection policy for missions

655
00:24:22,149 --> 00:24:19,440
to the moon which designates those

656
00:24:23,909 --> 00:24:22,159
missions category two forays to a body

657
00:24:25,510 --> 00:24:23,919
of significant interest relative to the

658
00:24:27,110 --> 00:24:25,520
process of chemical evolution in the

659
00:24:29,110 --> 00:24:27,120
origin of life but where there is only

660
00:24:30,950 --> 00:24:29,120
remote chance that contamination carried

661
00:24:33,269 --> 00:24:30,960
by a spacecraft could compromise future

662
00:24:34,870 --> 00:24:33,279
investigations

663
00:24:37,029 --> 00:24:34,880

for category two missions forward

664

00:24:38,149 --> 00:24:37,039

contamination is not a concern however

665

00:24:39,510 --> 00:24:38,159

there is a concern that an

666

00:24:41,029 --> 00:24:39,520

extraterrestrial environment is where

667

00:24:43,909 --> 00:24:41,039

liquid water might exist and we've

668

00:24:45,430 --> 00:24:43,919

discussed many of them today

669

00:24:47,750 --> 00:24:45,440

it could be possible for terrestrial

670

00:24:49,430 --> 00:24:47,760

microbes to thrive and replicate

671

00:24:51,269 --> 00:24:49,440

and then forward contamination for

672

00:24:53,350 --> 00:24:51,279

missions to those targets is a serious

673

00:24:55,669 --> 00:24:53,360

concern and planetary protection

674

00:24:57,350 --> 00:24:55,679

requirements are strict so for planetary

675

00:24:58,630 --> 00:24:57,360

protection this case illustrates among

676

00:25:00,789 --> 00:24:58,640

other things that microbes are

677

00:25:02,950 --> 00:25:00,799

everywhere at least on earth clean room

678

00:25:05,430 --> 00:25:02,960

procedures for microbial assays can't be

679

00:25:07,669 --> 00:25:05,440

too careful and meticulous and complete

680

00:25:10,470 --> 00:25:07,679

records of such procedures must be made

681

00:25:12,149 --> 00:25:10,480

and preserved for astrobiology this case

682

00:25:14,149 --> 00:25:12,159

illustrates how difficult it will be to

683

00:25:16,149 --> 00:25:14,159

verify any claims of the detection of

684

00:25:18,149 --> 00:25:16,159

extraterrestrial life something else

685

00:25:20,149 --> 00:25:18,159

we've been talking about today consider

686

00:25:21,909 --> 00:25:20,159

the mars science laboratory nasa's first

687

00:25:24,390 --> 00:25:21,919

astrobiology mission to mars since

688

00:25:26,789 --> 00:25:24,400

biking now roving around gale crater

689

00:25:28,470 --> 00:25:26,799

seeking evidence of habitability

690

00:25:30,230 --> 00:25:28,480

questions will continue to arise from

691

00:25:31,830 --> 00:25:30,240

the press and the public and the science

692

00:25:33,830 --> 00:25:31,840

community about the possibility of

693

00:25:35,909 --> 00:25:33,840

finding life on mars or in other

694

00:25:38,230 --> 00:25:35,919

extraterrestrial environments

695

00:25:40,310 --> 00:25:38,240

and how will we ever know for sure

696

00:25:41,909 --> 00:25:40,320

for the history and sociology of science

697

00:25:43,909 --> 00:25:41,919

this case shows how a claim that was

698

00:25:46,230 --> 00:25:43,919

never subjected to formal peer review

699

00:25:48,230 --> 00:25:46,240

became and remained a fact for decades

700

00:25:50,310 --> 00:25:48,240

before it was seriously challenged and

701
00:25:52,070 --> 00:25:50,320
how it took visual evidence to finally

702
00:25:54,310 --> 00:25:52,080
make the case that multiple sources had

703
00:25:56,310 --> 00:25:54,320
made verbally it shows how the paper

704
00:25:58,470 --> 00:25:56,320
trails that we researchers like to

705
00:26:00,630 --> 00:25:58,480
excavate for information are now

706
00:26:02,870 --> 00:26:00,640
intermingled with digital documentation

707
00:26:05,190 --> 00:26:02,880
that can be altered at any time without

708
00:26:07,269 --> 00:26:05,200
leaving any detectable evidence of an

709
00:26:09,510 --> 00:26:07,279
alteration and it shows something that

710
00:26:17,350 --> 00:26:09,520
historians already know that the record

711
00:26:17,360 --> 00:26:36,789
thank you are there questions for linda

712
00:26:40,630 --> 00:26:39,029
innumerable extremophiles that he has

713
00:26:42,470 --> 00:26:40,640

collected all around and i wonder what

714

00:26:43,750 --> 00:26:42,480

his comments were on this

715

00:26:45,510 --> 00:26:43,760

i did not speak to him for this

716

00:26:49,669 --> 00:26:45,520

particular paper because his name did

717

00:26:53,750 --> 00:26:51,590

uh i did not speak to him doing research

718

00:26:55,190 --> 00:26:53,760

for this uh particular paper because his

719

00:26:56,870 --> 00:26:55,200

name did not show up in any of these

720

00:26:58,870 --> 00:26:56,880

records he just retired from national

721

00:27:01,190 --> 00:26:58,880

yeah he's still active so you might want

722

00:27:02,710 --> 00:27:01,200

to do that yes there are lots and lots

723

00:27:05,990 --> 00:27:02,720

of people i'm sure historians in the

724

00:27:07,350 --> 00:27:06,000

audience realize how much more i can do

725

00:27:09,909 --> 00:27:07,360

to fill out this story this is just

726

00:27:11,830 --> 00:27:09,919

scratching the surface i did not

727

00:27:13,590 --> 00:27:11,840

sit down and do a formal interview with

728

00:27:15,269 --> 00:27:13,600

anybody i mean i had some conversations

729

00:27:16,470 --> 00:27:15,279

on the phone and emailed me i would love

730

00:27:18,389 --> 00:27:16,480

to talk to you

731

00:27:20,389 --> 00:27:18,399

okay thank you

732

00:27:22,710 --> 00:27:20,399

yeah i will point out that it is

733

00:27:24,870 --> 00:27:22,720

possible for streptococcus midas to

734

00:27:26,950 --> 00:27:24,880

survive on the surface of moon for two

735

00:27:33,029 --> 00:27:26,960

and a half years if an astronaut is

736

00:27:38,230 --> 00:27:34,789

yeah moon

737

00:27:39,830 --> 00:27:38,240

your talk is very instructive indeed and

738

00:27:40,950 --> 00:27:39,840

this is showing

739

00:27:44,389 --> 00:27:40,960

um

740

00:27:45,350 --> 00:27:44,399

well how easily the different microbes

741

00:27:47,830 --> 00:27:45,360

adapt

742

00:27:48,870 --> 00:27:47,840

to the hostile environment in this

743

00:27:49,990 --> 00:27:48,880

regard

744

00:27:53,510 --> 00:27:50,000

i just

745

00:27:56,789 --> 00:27:53,520

would like to ask you you know we try to

746

00:27:59,669 --> 00:27:56,799

sterilize many martial missions which we

747

00:28:02,389 --> 00:27:59,679

sent okay but it's impossible to

748

00:28:05,750 --> 00:28:02,399

sterilize for reliably completely and

749

00:28:09,590 --> 00:28:05,760

some of them crashed when just landing

750

00:28:11,830 --> 00:28:09,600

on mars so the microbes possibly

751

00:28:14,710 --> 00:28:11,840

easily adapted to the natural

752

00:28:17,510 --> 00:28:14,720

environment on mars and even in the

753

00:28:20,190 --> 00:28:17,520

dynamical very dynamical conditions in

754

00:28:23,350 --> 00:28:20,200

the martian atmosphere just easily

755

00:28:24,950 --> 00:28:23,360

proliferated over the merchant

756

00:28:27,590 --> 00:28:24,960

that the whole pope

757

00:28:29,830 --> 00:28:27,600

so the question is whether we need to

758

00:28:32,149 --> 00:28:29,840

take care about sterilization for the

759

00:28:35,750 --> 00:28:32,159

future mission what we are going to find

760

00:28:38,630 --> 00:28:35,760

out some kind of the mutations or just

761

00:28:41,190 --> 00:28:38,640

completely original terrestrial life

762

00:28:43,430 --> 00:28:41,200

forms what do you think about that

763

00:28:46,630 --> 00:28:43,440

it's a serious challenge in the search

764

00:28:48,310 --> 00:28:46,640

for evidence of life elsewhere to know

765

00:28:50,310 --> 00:28:48,320

whether it's

766

00:28:52,710 --> 00:28:50,320

life we've never seen before

767

00:28:55,110 --> 00:28:52,720

our life that used to be like us that as

768

00:28:56,870 --> 00:28:55,120

you mentioned might have evolved changed

769

00:29:00,230 --> 00:28:56,880

mutated

770

00:29:02,070 --> 00:29:00,240

this is why the more we learn about um

771

00:29:04,389 --> 00:29:02,080

planetary environments potential

772

00:29:06,950 --> 00:29:04,399

habitability and the more we learn about

773

00:29:08,470 --> 00:29:06,960

life as as david grinspoon and others

774

00:29:11,990 --> 00:29:08,480

have discussed today

775

00:29:12,789 --> 00:29:12,000

um and how how weird life really is i

776

00:29:14,389 --> 00:29:12,799

mean

777

00:29:16,149 --> 00:29:14,399

it's just amazing to me it's

778

00:29:18,070 --> 00:29:16,159

mind-blowing to me i'm not a biologist

779

00:29:20,710 --> 00:29:18,080

obviously um

780

00:29:22,470 --> 00:29:20,720

but the more difficult it will be for us

781

00:29:25,110 --> 00:29:22,480

to determine how to make sure that when

782

00:29:26,870 --> 00:29:25,120

we send that uh melter who showed the

783

00:29:28,389 --> 00:29:26,880

slide of the the nuclear oh that was

784

00:29:30,789 --> 00:29:28,399

last night at national geographic the

785

00:29:33,510 --> 00:29:30,799

melt probe yeah through the the icy

786

00:29:35,190 --> 00:29:33,520

surface of europa uh that if we find

787

00:29:36,630 --> 00:29:35,200

anything it there it's not something

788

00:29:38,830 --> 00:29:36,640

that we brought with us it's an

789

00:29:44,549 --> 00:29:38,840

extremely

790

00:29:45,990 --> 00:29:44,559

have i see vicky hipkin who's uh the

791

00:29:47,830 --> 00:29:46,000

queen of planetary protection for the

792

00:29:49,510 --> 00:29:47,840

canadian space agency she's biting her

793

00:29:51,350 --> 00:29:49,520

lip you know so

794

00:29:55,269 --> 00:29:51,360

it's a very very hard job to do but

795

00:30:00,710 --> 00:29:55,279

people are are working at it thank you

796

00:30:05,350 --> 00:30:03,110

my only comment about that linda is that

797

00:30:08,470 --> 00:30:05,360

you know somehow your work has been able

798

00:30:11,029 --> 00:30:08,480

to get this out of the web and why can't

799

00:30:13,190 --> 00:30:11,039

they get rid of the story about the mars

800

00:30:15,750 --> 00:30:13,200

being you know the size of the full moon

801
00:30:17,830 --> 00:30:15,760
out which comes around every august like

802
00:30:20,470 --> 00:30:17,840
clockwork if you could work on that one

803
00:30:23,669 --> 00:30:20,480
next i'd really appreciate it

804
00:30:25,909 --> 00:30:23,679
um our next talk by william mccauley um

805
00:30:28,470 --> 00:30:25,919
instant science space probes planetary

806
00:30:30,389 --> 00:30:28,480
exploration and television

807
00:30:33,190 --> 00:30:30,399
unfortunately had to be withdrawn there

808
00:30:34,950 --> 00:30:33,200
were visa troubles uh for uh william

809
00:30:37,510 --> 00:30:34,960
mccauley and he can't be here but his

810
00:30:39,990 --> 00:30:37,520
paper is quite interesting and if you

811
00:30:43,590 --> 00:30:40,000
are interested in the use of visual

812
00:30:45,430 --> 00:30:43,600
imagery in space the history of how

813
00:30:47,750 --> 00:30:45,440

visual imagery came to be such a big

814

00:30:49,269 --> 00:30:47,760

part of this space program i suggest

815

00:30:53,990 --> 00:30:49,279

that you do track that paper down

816

00:30:58,789 --> 00:30:56,470

and our next topic

817

00:31:02,070 --> 00:30:58,799

is one that's near and dear to my heart

818

00:31:05,750 --> 00:31:02,080

because i happen to be in charge of the

819

00:31:08,789 --> 00:31:05,760

hubble space telescope in 1994

820

00:31:12,310 --> 00:31:08,799

when a comet fragmented comet shimakura

821

00:31:15,110 --> 00:31:12,320

v9 crashed into jupiter creating massive

822

00:31:18,230 --> 00:31:15,120

explosions on the planet which was

823

00:31:20,549 --> 00:31:18,240

headline news for a full week

824

00:31:21,590 --> 00:31:20,559

and how many of you saw that i'm just

825

00:31:23,509 --> 00:31:21,600

curious

826

00:31:25,990 --> 00:31:23,519

yeah a lot of you did and that comes

827

00:31:27,750 --> 00:31:26,000

into the next story which is entitled

828

00:31:29,830 --> 00:31:27,760

killer asteroids

829

00:31:33,590 --> 00:31:29,840

popular depictions and public policy

830

00:31:41,509 --> 00:31:33,600

influence by laura delgado lopez

831

00:31:45,669 --> 00:31:43,509

hello everyone i'm really happy to be

832

00:31:47,350 --> 00:31:45,679

here and before i begin i would just

833

00:31:49,509 --> 00:31:47,360

like to

834

00:31:51,350 --> 00:31:49,519

acknowledge that this paper came as a

835

00:31:53,190 --> 00:31:51,360

collaboration between myself and dwayne

836

00:31:56,070 --> 00:31:53,200

day from the nrc whom you've heard um

837

00:31:57,509 --> 00:31:56,080

earlier this morning and um so now let's

838

00:31:59,909 --> 00:31:57,519

just move right on to it killer

839

00:32:02,470 --> 00:31:59,919

asteroids we know the story so well

840

00:32:04,950 --> 00:32:02,480

basically we find out usually that pure

841

00:32:06,789 --> 00:32:04,960

chance that this that a monstrous

842

00:32:08,310 --> 00:32:06,799

asteroid is heading you know hurling

843

00:32:10,310 --> 00:32:08,320

toward the planet and is threatening

844

00:32:11,909 --> 00:32:10,320

civilization and you know do we have

845

00:32:13,590 --> 00:32:11,919

time to do anything can we do anything

846

00:32:14,389 --> 00:32:13,600

about it and so the story goes and bruce

847

00:32:15,590 --> 00:32:14,399

willis

848

00:32:19,110 --> 00:32:15,600

you know makes an appearance or

849

00:32:21,590 --> 00:32:19,120

something um but what we may not know is

850

00:32:23,750 --> 00:32:21,600

that this narrative is actually um goes

851
00:32:25,590 --> 00:32:23,760
back much further than we may believe

852
00:32:27,190 --> 00:32:25,600
and so when we look at all these

853
00:32:29,669 --> 00:32:27,200
examples some of which i will mention

854
00:32:31,190 --> 00:32:29,679
today we have to ask ourselves you know

855
00:32:33,190 --> 00:32:31,200
what is behind this narrative was it

856
00:32:34,549 --> 00:32:33,200
prompted by real events can it tell us

857
00:32:36,950 --> 00:32:34,559
anything about

858
00:32:38,630 --> 00:32:36,960
real policy impacts or public opinion

859
00:32:40,470 --> 00:32:38,640
about it

860
00:32:42,630 --> 00:32:40,480
and so to begin with i'll tell you a

861
00:32:43,830 --> 00:32:42,640
little bit about the long and explosive

862
00:32:45,909 --> 00:32:43,840
history

863
00:32:47,590 --> 00:32:45,919

and in the paper which you may have an

864

00:32:48,710 --> 00:32:47,600

opportunity to see

865

00:32:50,789 --> 00:32:48,720

there is a

866

00:32:52,710 --> 00:32:50,799

there's a list at the end of a bunch of

867

00:32:54,870 --> 00:32:52,720

examples that we were able to find some

868

00:32:57,750 --> 00:32:54,880

in other languages as you see here

869

00:32:59,669 --> 00:32:57,760

but just to show that this has been

870

00:33:01,990 --> 00:32:59,679

around a long time

871

00:33:04,950 --> 00:33:02,000

the earliest example we found was a

872

00:33:07,750 --> 00:33:04,960

french novel published in 1890 taro la

873

00:33:09,830 --> 00:33:07,760

fondumonde and it was republished again

874

00:33:11,350 --> 00:33:09,840

in the 30s and made into a movie in the

875

00:33:13,110 --> 00:33:11,360

90s

876

00:33:15,990 --> 00:33:13,120

and it was again one of the very

877

00:33:17,509 --> 00:33:16,000

earliest examples and also at the time

878

00:33:19,590 --> 00:33:17,519

and the time you know we see the 40s the

879

00:33:21,590 --> 00:33:19,600

50s also some other movies and books

880

00:33:24,149 --> 00:33:21,600

exploring the issue

881

00:33:26,389 --> 00:33:24,159

in non-fiction we see some work looking

882

00:33:29,909 --> 00:33:26,399

at asteroids comments and other

883

00:33:34,230 --> 00:33:29,919

planetary bodies you know as a threat of

884

00:33:36,470 --> 00:33:34,240

a potential impact and what that meant

885

00:33:39,350 --> 00:33:36,480

and so

886

00:33:41,590 --> 00:33:39,360

what those early events many of them

887

00:33:44,310 --> 00:33:41,600

came as a result of probably came as a

888

00:33:46,710 --> 00:33:44,320

result of an early impact event um in

889

00:33:48,789 --> 00:33:46,720

the 20th century the 1908 tunguska

890

00:33:50,310 --> 00:33:48,799

impact in siberia there are literally

891

00:33:51,990 --> 00:33:50,320

hundreds of works both fiction and

892

00:33:54,870 --> 00:33:52,000

non-fiction exploring exactly what

893

00:33:57,190 --> 00:33:54,880

happened there and even as far back as

894

00:33:59,269 --> 00:33:57,200

excuse me as recently as 2010 in the

895

00:34:02,470 --> 00:33:59,279

national research council report

896

00:34:04,549 --> 00:34:02,480

on on asteroids and new earth objects

897

00:34:07,029 --> 00:34:04,559

more recent research of what it is that

898

00:34:09,909 --> 00:34:07,039

happened that day was actually come come

899

00:34:13,349 --> 00:34:09,919

to come to bear um other important

900

00:34:14,950 --> 00:34:13,359

events that kind of help drive these

901
00:34:17,430 --> 00:34:14,960
narratives

902
00:34:19,909 --> 00:34:17,440
include the 1980 alvarez hypothesis that

903
00:34:21,430 --> 00:34:19,919
for the first time links to cataclysmic

904
00:34:24,629 --> 00:34:21,440
events that led to extinction of the

905
00:34:25,669 --> 00:34:24,639
dinosaurs with an asteroid impact and as

906
00:34:28,389 --> 00:34:25,679
as

907
00:34:30,550 --> 00:34:28,399
haiti mentioned the 1994 shoemaker-levy

908
00:34:32,470 --> 00:34:30,560
9 impact that again captured the

909
00:34:35,669 --> 00:34:32,480
attention of the world and so as a

910
00:34:38,869 --> 00:34:35,679
result particularly in the 90s we see so

911
00:34:40,950 --> 00:34:38,879
many so many of these examples over 25

912
00:34:43,829 --> 00:34:40,960
in our survey alone

913
00:34:46,069 --> 00:34:43,839

also during that time planetary research

914

00:34:47,510 --> 00:34:46,079

had a role to play because

915

00:34:49,589 --> 00:34:47,520

the research that

916

00:34:51,270 --> 00:34:49,599

from from several of the spacecraft that

917

00:34:52,790 --> 00:34:51,280

we had sent out were just confirming the

918

00:34:54,550 --> 00:34:52,800

role that impacts have had in

919

00:34:57,030 --> 00:34:54,560

transforming not just to face but also

920

00:34:58,230 --> 00:34:57,040

the composition of other planets and

921

00:35:00,470 --> 00:34:58,240

also that

922

00:35:03,270 --> 00:35:00,480

um it became clear that our own planet

923

00:35:05,109 --> 00:35:03,280

had had impacts before and that those

924

00:35:08,390 --> 00:35:05,119

things were not just a thing of the past

925

00:35:10,710 --> 00:35:08,400

that they could continue happening

926
00:35:11,829 --> 00:35:10,720
they continued these examples continued

927
00:35:14,069 --> 00:35:11,839
i think

928
00:35:16,230 --> 00:35:14,079
events such as the debate over the

929
00:35:19,910 --> 00:35:16,240
non-negligible possibility of impact of

930
00:35:21,670 --> 00:35:19,920
asteroids such as apophis or ag5 helped

931
00:35:24,470 --> 00:35:21,680
feed the sustaining narrative there's

932
00:35:26,150 --> 00:35:24,480
also the misinterpretation of the mayan

933
00:35:28,950 --> 00:35:26,160
prophecy that the world was going to end

934
00:35:29,910 --> 00:35:28,960
in 2012. that prompted more examples

935
00:35:31,829 --> 00:35:29,920
even

936
00:35:34,630 --> 00:35:31,839
this year in 2012.

937
00:35:35,910 --> 00:35:34,640
and so this survey and some of the

938
00:35:38,230 --> 00:35:35,920

examples that i've

939

00:35:39,670 --> 00:35:38,240

selected here are not exhaustive i'm

940

00:35:41,829 --> 00:35:39,680

sure that if we keep looking we will

941

00:35:43,829 --> 00:35:41,839

find more examples in maybe in other

942

00:35:45,349 --> 00:35:43,839

languages and other countries but just

943

00:35:48,230 --> 00:35:45,359

to show that

944

00:35:49,990 --> 00:35:48,240

this was not born with armageddon and

945

00:35:52,150 --> 00:35:50,000

deep impact which are the examples that

946

00:35:54,630 --> 00:35:52,160

very easily come to mind

947

00:35:56,390 --> 00:35:54,640

but in fact this narrative that has been

948

00:35:58,870 --> 00:35:56,400

very present throughout history and that

949

00:36:02,390 --> 00:35:58,880

was just strengthened by this events

950

00:36:03,750 --> 00:36:02,400

that captured the attention of the world

951
00:36:06,150 --> 00:36:03,760
and so um

952
00:36:08,390 --> 00:36:06,160
science fiction studies research will

953
00:36:10,069 --> 00:36:08,400
suggest to us that if we see a

954
00:36:11,589 --> 00:36:10,079
sustaining narrative it should tell us

955
00:36:13,510 --> 00:36:11,599
something about

956
00:36:15,670 --> 00:36:13,520
real deep-rooted perceptions in the

957
00:36:17,990 --> 00:36:15,680
public and so if we look at all these

958
00:36:20,150 --> 00:36:18,000
examples we have to ask ourselves well

959
00:36:21,750 --> 00:36:20,160
um are people really concerned about

960
00:36:24,390 --> 00:36:21,760
asteroid impacts

961
00:36:26,390 --> 00:36:24,400
and the fact is they're not at least um

962
00:36:27,990 --> 00:36:26,400
at least what little research exists on

963
00:36:30,150 --> 00:36:28,000

the subject that has asked this very

964

00:36:32,950 --> 00:36:30,160

question um the first one that may be

965

00:36:35,270 --> 00:36:32,960

the first one of its kind in 1993 slovak

966

00:36:37,670 --> 00:36:35,280

and peterson made a survey of 200 grad

967

00:36:38,390 --> 00:36:37,680

students and they asked them to rank

968

00:36:39,510 --> 00:36:38,400

their

969

00:36:41,750 --> 00:36:39,520

risks

970

00:36:45,270 --> 00:36:41,760

in terms of concern and

971

00:36:47,510 --> 00:36:45,280

impact risks ranked 24 and we're just it

972

00:36:50,150 --> 00:36:47,520

excuse me 14 out of 24 and we're

973

00:36:54,069 --> 00:36:50,160

described as distant in time and

974

00:36:57,349 --> 00:36:54,079

non-immediate and that result continued

975

00:37:00,630 --> 00:36:57,359

even in a survey that was performed at a

976
00:37:02,870 --> 00:37:00,640
pew research center in 1999 and again in

977
00:37:05,030 --> 00:37:02,880
2012 with almost identical results the

978
00:37:06,870 --> 00:37:05,040
majority of the people surveyed

979
00:37:08,390 --> 00:37:06,880
described it as something that will

980
00:37:10,870 --> 00:37:08,400
probably not happen

981
00:37:14,150 --> 00:37:10,880
or will definitely not happen

982
00:37:15,910 --> 00:37:14,160
and so you know we have to ask ourselves

983
00:37:17,349 --> 00:37:15,920
where why is that contradiction there

984
00:37:19,349 --> 00:37:17,359
you know if if

985
00:37:22,950 --> 00:37:19,359
why does that narrative keep occurring

986
00:37:25,349 --> 00:37:22,960
if we if it finds an indifferent public

987
00:37:27,349 --> 00:37:25,359
and so for that i think

988
00:37:29,030 --> 00:37:27,359

that we have to see

989

00:37:31,750 --> 00:37:29,040

we have to look at what kind of threat

990

00:37:34,470 --> 00:37:31,760

we're talking about and first we have to

991

00:37:36,230 --> 00:37:34,480

consider the uniqueness of the threat

992

00:37:38,790 --> 00:37:36,240

if we look again at paul slovak's

993

00:37:41,190 --> 00:37:38,800

research on risk assessment and they've

994

00:37:45,190 --> 00:37:41,200

developed a matrix where

995

00:37:47,349 --> 00:37:45,200

there's a couple of variables including

996

00:37:48,630 --> 00:37:47,359

dread risk and unknown risk that help

997

00:37:49,589 --> 00:37:48,640

rank

998

00:37:53,109 --> 00:37:49,599

risk

999

00:37:54,710 --> 00:37:53,119

towards specific issues

1000

00:37:57,750 --> 00:37:54,720

and we see that

1001
00:37:59,750 --> 00:37:57,760
asteroid impacts would be described very

1002
00:38:01,910 --> 00:37:59,760
highly by all of these characteristics

1003
00:38:04,390 --> 00:38:01,920
you know uncontrollable indiscriminate

1004
00:38:05,670 --> 00:38:04,400
catastrophic consequences unknown to

1005
00:38:06,710 --> 00:38:05,680
science

1006
00:38:08,950 --> 00:38:06,720
and

1007
00:38:11,109 --> 00:38:08,960
that is how it is continually presented

1008
00:38:13,430 --> 00:38:11,119
the dominant narrative it is captured as

1009
00:38:15,829 --> 00:38:13,440
very risky and catastrophic and as

1010
00:38:17,190 --> 00:38:15,839
slovic accurately describes it has a

1011
00:38:20,310 --> 00:38:17,200
unique combination of very low

1012
00:38:21,750 --> 00:38:20,320
probability and very great consequence

1013
00:38:23,190 --> 00:38:21,760

in addition

1014

00:38:25,270 --> 00:38:23,200

the threat is also the more compelling

1015

00:38:27,510 --> 00:38:25,280

because it is always presented as urgent

1016

00:38:30,230 --> 00:38:27,520

even though we've been surveying

1017

00:38:32,550 --> 00:38:30,240

asteroids for many decades it always is

1018

00:38:34,069 --> 00:38:32,560

just hiding behind the moon or

1019

00:38:35,829 --> 00:38:34,079

you know it's it's

1020

00:38:37,109 --> 00:38:35,839

you know we can't see it we only find

1021

00:38:40,230 --> 00:38:37,119

out about it

1022

00:38:42,870 --> 00:38:40,240

months or weeks or hours before it's um

1023

00:38:45,109 --> 00:38:42,880

supposed to impact the planet

1024

00:38:47,670 --> 00:38:45,119

another element that's interesting is

1025

00:38:49,750 --> 00:38:47,680

the tools that we use to tell that story

1026

00:38:51,589 --> 00:38:49,760

the tools of the trade and so

1027

00:38:54,230 --> 00:38:51,599

i think that

1028

00:38:55,990 --> 00:38:54,240

this this threat is particularly

1029

00:38:57,750 --> 00:38:56,000

visually appealing

1030

00:39:02,870 --> 00:38:57,760

and

1031

00:39:04,790 --> 00:39:02,880

in special effects than the cgi

1032

00:39:06,790 --> 00:39:04,800

what was in the 90s something that was

1033

00:39:09,510 --> 00:39:06,800

very surprising that we could we were

1034

00:39:11,270 --> 00:39:09,520

very impressed as an audience that movie

1035

00:39:14,550 --> 00:39:11,280

movie makers could do became an

1036

00:39:17,349 --> 00:39:14,560

expectation in the in the in the 2000s

1037

00:39:20,630 --> 00:39:17,359

and afterwards and so at now at this

1038

00:39:21,670 --> 00:39:20,640

point with relatively little cost you

1039

00:39:23,670 --> 00:39:21,680

can make

1040

00:39:26,550 --> 00:39:23,680

pretty impressive imaginary of the

1041

00:39:29,430 --> 00:39:26,560

asteroid um you know the track and and

1042

00:39:31,270 --> 00:39:29,440

the moment of impact and interestingly

1043

00:39:33,910 --> 00:39:31,280

um you can keep going with that because

1044

00:39:35,910 --> 00:39:33,920

what happens after if the impact happens

1045

00:39:38,790 --> 00:39:35,920

i think the asteroid threat presents a

1046

00:39:40,550 --> 00:39:38,800

lot of opportunities for um developers

1047

00:39:42,550 --> 00:39:40,560

particularly in film

1048

00:39:45,270 --> 00:39:42,560

to showcase advanced special effects

1049

00:39:47,670 --> 00:39:45,280

that are not presented by other natural

1050

00:39:49,510 --> 00:39:47,680

disasters such as earthquakes or um

1051
00:39:51,910 --> 00:39:49,520
hurricanes

1052
00:39:54,069 --> 00:39:51,920
um and and and that's this worth a

1053
00:39:56,470 --> 00:39:54,079
mention you know even in

1054
00:39:58,950 --> 00:39:56,480
non-fiction works like um

1055
00:40:00,150 --> 00:39:58,960
documentaries like this one titled mega

1056
00:40:01,750 --> 00:40:00,160
disasters

1057
00:40:03,270 --> 00:40:01,760
um asteroids are not the only thing

1058
00:40:04,790 --> 00:40:03,280
that's discussed in that in that

1059
00:40:07,270 --> 00:40:04,800
documentary but they still made the

1060
00:40:09,349 --> 00:40:07,280
cover and so even in books you have that

1061
00:40:10,790 --> 00:40:09,359
maybe the asteroid impact happens in

1062
00:40:12,150 --> 00:40:10,800
five pages but

1063
00:40:14,630 --> 00:40:12,160

you know it's compelling enough that you

1064

00:40:16,230 --> 00:40:14,640

will put it on the on the cover

1065

00:40:17,750 --> 00:40:16,240

and then the third element is i think

1066

00:40:19,589 --> 00:40:17,760

the reason why we're here today is to

1067

00:40:22,470 --> 00:40:19,599

draw space the fact that the threat

1068

00:40:24,790 --> 00:40:22,480

comes from space is very powerful

1069

00:40:26,309 --> 00:40:24,800

as mccarty notes in his

1070

00:40:29,030 --> 00:40:26,319

books based on the america and the

1071

00:40:31,190 --> 00:40:29,040

american imagination he talks about how

1072

00:40:33,910 --> 00:40:31,200

space um became entrenched to the

1073

00:40:36,230 --> 00:40:33,920

american imagination particularly after

1074

00:40:38,069 --> 00:40:36,240

the second world war and so the idea

1075

00:40:40,069 --> 00:40:38,079

that both threats and salvation would

1076

00:40:42,069 --> 00:40:40,079

come from space was very compelling and

1077

00:40:43,670 --> 00:40:42,079

i think that that has continued since

1078

00:40:45,670 --> 00:40:43,680

then i think

1079

00:40:47,589 --> 00:40:45,680

you know all these elements together

1080

00:40:50,829 --> 00:40:47,599

make for a very

1081

00:40:54,550 --> 00:40:50,839

compelling if unbelievable

1082

00:40:56,470 --> 00:40:54,560

threat um and so again with

1083

00:40:57,990 --> 00:40:56,480

we see you know taking this line and the

1084

00:40:59,910 --> 00:40:58,000

previous site together we see its

1085

00:41:01,270 --> 00:40:59,920

narrative that has continued but all

1086

00:41:02,870 --> 00:41:01,280

these elements together in particular

1087

00:41:04,230 --> 00:41:02,880

the tools of the trade

1088

00:41:06,069 --> 00:41:04,240

and the opportunity to make this

1089

00:41:07,670 --> 00:41:06,079

narrative even more entertaining even

1090

00:41:10,150 --> 00:41:07,680

more

1091

00:41:12,470 --> 00:41:10,160

amazing visually just

1092

00:41:14,870 --> 00:41:12,480

has this feedback loop continuing and so

1093

00:41:16,950 --> 00:41:14,880

you know there's almost no end we will

1094

00:41:18,550 --> 00:41:16,960

probably continue seeing even more

1095

00:41:20,870 --> 00:41:18,560

examples about it

1096

00:41:23,430 --> 00:41:20,880

so we have that explained we we kind of

1097

00:41:25,430 --> 00:41:23,440

understand now why we keep seeing it but

1098

00:41:27,270 --> 00:41:25,440

we still understand why people are not

1099

00:41:28,470 --> 00:41:27,280

concerned about it when they think about

1100

00:41:30,390 --> 00:41:28,480

the issue

1101

00:41:32,550 --> 00:41:30,400

and so for that i think

1102

00:41:34,630 --> 00:41:32,560

we have to look at how the story is

1103

00:41:36,790 --> 00:41:34,640

represented as depicted

1104

00:41:40,230 --> 00:41:36,800

and

1105

00:41:42,710 --> 00:41:40,240

why is this giggle factor that the

1106

00:41:45,270 --> 00:41:42,720

scientists would usually bemoan still

1107

00:41:46,710 --> 00:41:45,280

alive well you know houston we have a

1108

00:41:48,230 --> 00:41:46,720

problem cliches like that are

1109

00:41:50,309 --> 00:41:48,240

particularly common in this kind of

1110

00:41:52,069 --> 00:41:50,319

movie with few exceptions asteroid

1111

00:41:54,150 --> 00:41:52,079

impact narratives make for decidedly

1112

00:41:56,230 --> 00:41:54,160

unsuccessful movies often only made

1113

00:41:58,390 --> 00:41:56,240

watchable by the special effects used to

1114

00:42:00,150 --> 00:41:58,400

image the asteroid and its path of

1115

00:42:01,670 --> 00:42:00,160

destruction there's

1116

00:42:03,829 --> 00:42:01,680

narrative gaps their incorrect

1117

00:42:06,470 --> 00:42:03,839

scientific and technological assumptions

1118

00:42:08,870 --> 00:42:06,480

predictable storylines you keep going

1119

00:42:10,309 --> 00:42:08,880

and so these are some of these

1120

00:42:12,550 --> 00:42:10,319

one of them is for example incorrect

1121

00:42:14,470 --> 00:42:12,560

science and technology and i'm sure when

1122

00:42:16,550 --> 00:42:14,480

you're in the audience as well you start

1123

00:42:18,470 --> 00:42:16,560

naming all these using the space shuttle

1124

00:42:20,390 --> 00:42:18,480

to go to the asteroid and you know

1125

00:42:21,190 --> 00:42:20,400

deploy the nuclear weapons

1126

00:42:23,190 --> 00:42:21,200

um

1127

00:42:24,950 --> 00:42:23,200

another one that's interesting is this

1128

00:42:25,990 --> 00:42:24,960

inflated nest role it's interesting to

1129

00:42:28,309 --> 00:42:26,000

me that

1130

00:42:29,910 --> 00:42:28,319

in the real world when we talk about the

1131

00:42:31,589 --> 00:42:29,920

possibility of an asteroid impact and

1132

00:42:33,829 --> 00:42:31,599

what do we do there's all these

1133

00:42:35,030 --> 00:42:33,839

discussions about you know it's a dod is

1134

00:42:36,710 --> 00:42:35,040

it um

1135

00:42:38,309 --> 00:42:36,720

department of energy is it nasa's that

1136

00:42:39,589 --> 00:42:38,319

all work together what happens with

1137

00:42:41,990 --> 00:42:39,599

other countries you know do we want to

1138

00:42:44,550 --> 00:42:42,000

cooperate with them if we want to solve

1139

00:42:46,390 --> 00:42:44,560

this issue none of that none of that is

1140

00:42:48,150 --> 00:42:46,400

in the main narrative you know nasa is

1141

00:42:50,470 --> 00:42:48,160

automatically the source of the

1142

00:42:54,150 --> 00:42:50,480

solutions and they have this amazing

1143

00:42:58,309 --> 00:42:56,230

so you know inspection but um

1144

00:42:59,589 --> 00:42:58,319

so a third element that again is also

1145

00:43:01,589 --> 00:42:59,599

very interesting is this focus on

1146

00:43:02,710 --> 00:43:01,599

sciences limitations you know again

1147

00:43:05,030 --> 00:43:02,720

despite the fact that we've been

1148

00:43:07,349 --> 00:43:05,040

surveying asteroids for decades um the

1149

00:43:09,349 --> 00:43:07,359

asteroid is always a surprise in deep

1150

00:43:11,030 --> 00:43:09,359

impact for example the asteroid is found

1151

00:43:13,109 --> 00:43:11,040

out by a 12 year

1152

00:43:15,829 --> 00:43:13,119

12 year old with a not impressive

1153

00:43:18,230 --> 00:43:15,839

telescope not by a ground observatory

1154

00:43:21,670 --> 00:43:18,240

not by an academic institution not by

1155

00:43:24,150 --> 00:43:21,680

nasa it's by a kid with a telescope

1156

00:43:25,910 --> 00:43:24,160

so um and then you see that also as well

1157

00:43:27,349 --> 00:43:25,920

with the kind of fumbling with how what

1158

00:43:28,790 --> 00:43:27,359

do you do about it do you even know

1159

00:43:30,790 --> 00:43:28,800

what's going on

1160

00:43:33,910 --> 00:43:30,800

um and then finally and i think this is

1161

00:43:36,550 --> 00:43:33,920

a very important point too is that

1162

00:43:39,109 --> 00:43:36,560

asteroids are not the focal point of the

1163

00:43:41,910 --> 00:43:39,119

of the story um they are the cover to

1164

00:43:43,670 --> 00:43:41,920

discuss a lot of other issues namely um

1165

00:43:45,589 --> 00:43:43,680

american values the true nature of

1166

00:43:47,030 --> 00:43:45,599

things you know when when crisis comes

1167

00:43:49,829 --> 00:43:47,040

you see the true nature of people that

1168

00:43:53,109 --> 00:43:49,839

kind of thing and so i think as a result

1169

00:43:55,829 --> 00:43:53,119

um there is no requirement from either

1170

00:43:57,190 --> 00:43:55,839

the movie makers or from us the audience

1171

00:43:58,710 --> 00:43:57,200

to have an accurate depiction of

1172

00:44:01,430 --> 00:43:58,720

asteroids because the movies are not

1173

00:44:03,190 --> 00:44:01,440

about that and so when you think of

1174

00:44:05,109 --> 00:44:03,200

again armageddon you think about that

1175

00:44:07,030 --> 00:44:05,119

scene that has been recreated in

1176

00:44:10,630 --> 00:44:07,040

countless movies you don't think about

1177

00:44:12,230 --> 00:44:10,640

the asteroid as the main main character

1178

00:44:14,870 --> 00:44:12,240

in that movie

1179

00:44:16,309 --> 00:44:14,880

and so what comes to mind for us in the

1180

00:44:18,309 --> 00:44:16,319

audience is not a film about a threat

1181

00:44:19,510 --> 00:44:18,319

that should concern us but one where

1182

00:44:21,190 --> 00:44:19,520

individual characters and their

1183

00:44:22,870 --> 00:44:21,200

successes and failures and a lively

1184

00:44:24,950 --> 00:44:22,880

scene or two of destruction

1185

00:44:27,270 --> 00:44:24,960

are the focal point again believable

1186

00:44:29,589 --> 00:44:27,280

enough to keep us entertained but not to

1187

00:44:32,069 --> 00:44:29,599

wake us up at night

1188

00:44:34,390 --> 00:44:32,079

now in contrast to that we have our

1189

00:44:35,349 --> 00:44:34,400
scientific understanding of of the

1190

00:44:37,190 --> 00:44:35,359
thread

1191

00:44:38,630 --> 00:44:37,200
and while the public is entertained but

1192

00:44:40,150 --> 00:44:38,640
i'm concerned the scientific community

1193

00:44:42,309 --> 00:44:40,160
has been preoccupied with it with the

1194

00:44:45,510 --> 00:44:42,319
issue for at least three decades and

1195

00:44:48,230 --> 00:44:45,520
i'll go very briefly through this but um

1196

00:44:50,150 --> 00:44:48,240
this idea that imparts constitute a

1197

00:44:51,910 --> 00:44:50,160
contemporary hazard did not emerge until

1198

00:44:53,990 --> 00:44:51,920
the end of the 20th century so we're not

1199

00:44:55,109 --> 00:44:54,000
looking at a very long history

1200

00:44:56,550 --> 00:44:55,119
but um

1201

00:44:58,630 --> 00:44:56,560

and it was as chapman and morrison

1202

00:45:00,630 --> 00:44:58,640

described even deemed a curiosity before

1203

00:45:03,589 --> 00:45:00,640

this but again these catalysts you know

1204

00:45:06,470 --> 00:45:03,599

the 1980 hypothesis 1994 shoemaker levy

1205

00:45:08,790 --> 00:45:06,480

planetary research it um motivated a

1206

00:45:11,829 --> 00:45:08,800

more urgent appeal to look at this issue

1207

00:45:14,470 --> 00:45:11,839

so in 1990 in 1981 nasa sponsored the

1208

00:45:16,710 --> 00:45:14,480

space watch workshop um in the 90s we

1209

00:45:20,390 --> 00:45:16,720

have the spaceguard survey which was the

1210

00:45:23,510 --> 00:45:20,400

first um comprehensive survey of um

1211

00:45:24,710 --> 00:45:23,520

asteroids over larger than one kilometer

1212

00:45:26,950 --> 00:45:24,720

in diameter

1213

00:45:28,470 --> 00:45:26,960

and and that kind of snowballed and you

1214

00:45:31,270 --> 00:45:28,480

know the the government the us

1215

00:45:33,430 --> 00:45:31,280

government in particular has taken

1216

00:45:35,430 --> 00:45:33,440

consistent steps to understand the issue

1217

00:45:37,670 --> 00:45:35,440

more and there's about four million

1218

00:45:39,430 --> 00:45:37,680

dollars in in funding that go to this

1219

00:45:41,430 --> 00:45:39,440

issue annually

1220

00:45:43,190 --> 00:45:41,440

now as a result of all this our

1221

00:45:45,510 --> 00:45:43,200

scientific understanding of the issue

1222

00:45:48,069 --> 00:45:45,520

has advanced greatly so much in fact

1223

00:45:49,589 --> 00:45:48,079

that as morrison says astronomers have

1224

00:45:51,430 --> 00:45:49,599

already assured us that we are not due

1225

00:45:53,750 --> 00:45:51,440

for an extinction level impact from an

1226

00:45:55,750 --> 00:45:53,760

asteroid within the next century

1227

00:45:57,750 --> 00:45:55,760

bearing an unlikely strike by a large

1228

00:46:01,829 --> 00:45:57,760

comet we are not about to go the way of

1229

00:46:02,950 --> 00:46:01,839

the dinosaurs so you can breathe easy

1230

00:46:05,270 --> 00:46:02,960

um

1231

00:46:06,710 --> 00:46:05,280

but that is in sharp contrast with the

1232

00:46:09,510 --> 00:46:06,720

dominant narrative you know were you to

1233

00:46:12,230 --> 00:46:09,520

watch the movies only by themselves you

1234

00:46:14,950 --> 00:46:12,240

would think that you know this is

1235

00:46:17,190 --> 00:46:14,960

likely going to happen and so um you

1236

00:46:19,750 --> 00:46:17,200

know as as morrison says asteroids do

1237

00:46:22,390 --> 00:46:19,760

not accept in hollywood change orbits

1238

00:46:23,829 --> 00:46:22,400

capriciously and that's because

1239

00:46:26,390 --> 00:46:23,839

this this narrative that we've just

1240

00:46:28,630 --> 00:46:26,400

talked a little bit about ignores this

1241

00:46:30,550 --> 00:46:28,640

at this element of predictability

1242

00:46:31,349 --> 00:46:30,560

you know in in science we understand

1243

00:46:33,430 --> 00:46:31,359

that

1244

00:46:35,030 --> 00:46:33,440

chances are we understand enough of the

1245

00:46:36,309 --> 00:46:35,040

orbits of the larger

1246

00:46:38,470 --> 00:46:36,319

asteroids that we don't need to be

1247

00:46:40,550 --> 00:46:38,480

concerned about those about those in

1248

00:46:44,230 --> 00:46:40,560

fact we are now concerned about the sub

1249

00:46:46,309 --> 00:46:44,240

kilometer items not the larger ones

1250

00:46:49,270 --> 00:46:46,319

but that that element of predictability

1251
00:46:50,390 --> 00:46:49,280
and that nuance of how different sizes

1252
00:46:53,430 --> 00:46:50,400
of items could have different

1253
00:46:55,910 --> 00:46:53,440
consequences completely lost in film and

1254
00:46:58,390 --> 00:46:55,920
particularly in film um but in general

1255
00:47:00,630 --> 00:46:58,400
in fiction

1256
00:47:02,470 --> 00:47:00,640
another element that's that's that's

1257
00:47:05,109 --> 00:47:02,480
lost is this this

1258
00:47:07,190 --> 00:47:05,119
tied to the idea that we put aside the

1259
00:47:10,870 --> 00:47:07,200
major threat and there's no sense of

1260
00:47:11,990 --> 00:47:10,880
panic if you read for example the nrc

1261
00:47:13,670 --> 00:47:12,000
report

1262
00:47:15,670 --> 00:47:13,680
it it says and i quote and it's right

1263
00:47:17,190 --> 00:47:15,680

there the time required to mitigate

1264

00:47:19,190 --> 00:47:17,200

optimally is in a range of years to

1265

00:47:21,270 --> 00:47:19,200

decades but this long period may require

1266

00:47:23,829 --> 00:47:21,280

acting before it is known with certainty

1267

00:47:25,829 --> 00:47:23,839

that an neo will impact earth and so the

1268

00:47:29,030 --> 00:47:25,839

arguments are for funding the sub

1269

00:47:30,950 --> 00:47:29,040

kilometer survey called for in 2005 and

1270

00:47:32,870 --> 00:47:30,960

for exploring new technologies to

1271

00:47:34,549 --> 00:47:32,880

identify smaller objects and they are

1272

00:47:36,390 --> 00:47:34,559

rooted in the desire to continue to

1273

00:47:38,069 --> 00:47:36,400

dispel the threat and give us decades or

1274

00:47:39,349 --> 00:47:38,079

centuries to get ready for an

1275

00:47:41,670 --> 00:47:39,359

eventuality

1276
00:47:43,510 --> 00:47:41,680
but as you can see it's a very different

1277
00:47:45,750 --> 00:47:43,520
scenario from what is the main focal

1278
00:47:48,069 --> 00:47:45,760
point of the dominant narrative

1279
00:47:50,390 --> 00:47:48,079
so this mismatch exists between public

1280
00:47:52,790 --> 00:47:50,400
and scientific perception of the issue

1281
00:47:54,309 --> 00:47:52,800
and it helps explain why despite the

1282
00:47:56,069 --> 00:47:54,319
concerted efforts of prominent

1283
00:47:58,069 --> 00:47:56,079
scientists to foster public concern and

1284
00:48:00,069 --> 00:47:58,079
understanding of the issue the public is

1285
00:48:01,510 --> 00:48:00,079
not an active player in lobbying for

1286
00:48:03,910 --> 00:48:01,520
what could be construed as the biggest

1287
00:48:06,390 --> 00:48:03,920
threat the world could ever face

1288
00:48:08,150 --> 00:48:06,400

and there are many many reasons to help

1289

00:48:10,069 --> 00:48:08,160

explain this

1290

00:48:12,150 --> 00:48:10,079

which i won't go into today

1291

00:48:13,589 --> 00:48:12,160

but i think that the link to education

1292

00:48:14,790 --> 00:48:13,599

is interesting and this is what i want

1293

00:48:15,670 --> 00:48:14,800

to leave you with

1294

00:48:17,030 --> 00:48:15,680

um

1295

00:48:19,190 --> 00:48:17,040

because

1296

00:48:21,030 --> 00:48:19,200

many many of the authors say that well

1297

00:48:22,710 --> 00:48:21,040

if we want the public on our side we

1298

00:48:24,549 --> 00:48:22,720

have to design a very aggressive

1299

00:48:26,950 --> 00:48:24,559

educational campaign where they can

1300

00:48:28,549 --> 00:48:26,960

understand the issue and

1301

00:48:32,069 --> 00:48:28,559

chances are that they are just not as

1302

00:48:33,349 --> 00:48:32,079

aware of impacts and impact threats

1303

00:48:35,750 --> 00:48:33,359

as we are

1304

00:48:38,630 --> 00:48:35,760

but i would argue that that situation is

1305

00:48:41,270 --> 00:48:38,640

no longer true um

1306

00:48:43,190 --> 00:48:41,280

you know if you did not watch that great

1307

00:48:45,510 --> 00:48:43,200

science documentary on asteroids you

1308

00:48:47,990 --> 00:48:45,520

probably sat through armageddon and deep

1309

00:48:49,349 --> 00:48:48,000

impact and seeking a friend for the end

1310

00:48:50,150 --> 00:48:49,359

of the world or

1311

00:48:52,150 --> 00:48:50,160

so

1312

00:48:55,109 --> 00:48:52,160

you know culturally we are aware of the

1313

00:48:57,270 --> 00:48:55,119

threat so i think the idea that um the

1314

00:48:59,589 --> 00:48:57,280

public just doesn't know about it no

1315

00:49:02,710 --> 00:48:59,599

longer applies i think there are other

1316

00:49:04,870 --> 00:49:02,720

reasons that help explain why the public

1317

00:49:06,150 --> 00:49:04,880

is not as concerned

1318

00:49:07,750 --> 00:49:06,160

and so i think that's one of the

1319

00:49:09,510 --> 00:49:07,760

assumptions that needs to be questioned

1320

00:49:11,349 --> 00:49:09,520

the other one is

1321

00:49:14,390 --> 00:49:11,359

this idea that improved education would

1322

00:49:17,510 --> 00:49:14,400

lead to greater policy relevance

1323

00:49:18,790 --> 00:49:17,520

and that hollywood and these films and

1324

00:49:20,630 --> 00:49:18,800

these stories

1325

00:49:23,190 --> 00:49:20,640

have a role to play in advancing that

1326
00:49:25,589 --> 00:49:23,200
education um hartwell says scientists

1327
00:49:27,270 --> 00:49:25,599
are a great debt of gratitude to the

1328
00:49:29,270 --> 00:49:27,280
hollywood blockbuster and that's

1329
00:49:31,430 --> 00:49:29,280
something that i would question i think

1330
00:49:33,589 --> 00:49:31,440
that

1331
00:49:35,829 --> 00:49:33,599
what we may be what we may have seen is

1332
00:49:37,910 --> 00:49:35,839
that these depictions only demonstrate

1333
00:49:39,990 --> 00:49:37,920
the perpetuation of a specific view of

1334
00:49:42,069 --> 00:49:40,000
the asteroid threat that is removed from

1335
00:49:44,470 --> 00:49:42,079
a current scientific understanding of

1336
00:49:47,190 --> 00:49:44,480
the issue and therefore it's real risk

1337
00:49:49,190 --> 00:49:47,200
and so um i would leave you with just

1338
00:49:51,270 --> 00:49:49,200

thinking that more research and public

1339

00:49:53,510 --> 00:49:51,280

attitudes will probably be very helpful

1340

00:49:55,589 --> 00:49:53,520

and also considering the lessons from

1341

00:49:57,190 --> 00:49:55,599

field such as risk assessment

1342

00:49:58,390 --> 00:49:57,200

to understand

1343

00:49:59,750 --> 00:49:58,400

and to inform

1344

00:50:06,309 --> 00:49:59,760

educational

1345

00:50:07,670 --> 00:50:06,319

having a real public policy impact

1346

00:50:09,349 --> 00:50:07,680

so with that i thank you very much for

1347

00:50:17,510 --> 00:50:09,359

your attention and i look forward to

1348

00:50:21,910 --> 00:50:20,150

i realized that i forgot to read the bio

1349

00:50:23,030 --> 00:50:21,920

but i want to make sure that you know no

1350

00:50:24,630 --> 00:50:23,040

it's not long so i'm going to read it

1351
00:50:25,349 --> 00:50:24,640
right now so that you all know who laura

1352
00:50:29,750 --> 00:50:25,359
is

1353
00:50:31,990 --> 00:50:29,760
observations associate at the institute

1354
00:50:33,510 --> 00:50:32,000
for global environmental strategies and

1355
00:50:35,349 --> 00:50:33,520
she's also a correspondent for

1356
00:50:37,829 --> 00:50:35,359
spacepolicyonline.com

1357
00:50:39,670 --> 00:50:37,839
and a recent graduate like almost

1358
00:50:41,510 --> 00:50:39,680
everyone in the room it seems of george

1359
00:50:43,270 --> 00:50:41,520
washington university space policy

1360
00:50:44,309 --> 00:50:43,280
institute

1361
00:50:46,390 --> 00:50:44,319
questions

1362
00:50:47,990 --> 00:50:46,400
torrence just a comment is a very

1363
00:50:50,309 --> 00:50:48,000

interesting study i

1364

00:50:52,950 --> 00:50:50,319

appreciated it i used to talk about the

1365

00:50:54,710 --> 00:50:52,960

public perception problem with gene

1366

00:50:56,870 --> 00:50:54,720

shoemaker quite a bit

1367

00:50:58,950 --> 00:50:56,880

and

1368

00:51:00,950 --> 00:50:58,960

one take on this obviously is that

1369

00:51:03,670 --> 00:51:00,960

humans have a hard time relating to

1370

00:51:05,750 --> 00:51:03,680

threats that happen very infrequently on

1371

00:51:07,270 --> 00:51:05,760

the time scale of the human lifetime

1372

00:51:09,430 --> 00:51:07,280

that's something everybody deals with

1373

00:51:11,910 --> 00:51:09,440

this is and it's interesting just as a

1374

00:51:15,430 --> 00:51:11,920

comment to consider a a thought

1375

00:51:17,750 --> 00:51:15,440

experiment that in 1906 the san andreas

1376

00:51:20,470 --> 00:51:17,760

decided to break down in koalinga

1377

00:51:22,309 --> 00:51:20,480

instead of san francisco and the object

1378

00:51:23,670 --> 00:51:22,319

that hit tunguska was on a slightly

1379

00:51:25,750 --> 00:51:23,680

different trajectory and took out

1380

00:51:27,990 --> 00:51:25,760

downtown moscow we might have a

1381

00:51:30,710 --> 00:51:28,000

different public perception

1382

00:51:32,069 --> 00:51:30,720

yes i agree um and and that's something

1383

00:51:34,470 --> 00:51:32,079

that you find a lot in the research your

1384

00:51:35,910 --> 00:51:34,480

first comment about how you know and you

1385

00:51:37,750 --> 00:51:35,920

see it you know there's a big spike in

1386

00:51:39,910 --> 00:51:37,760

interest after a real event after an

1387

00:51:42,069 --> 00:51:39,920

impact after the discussion on the media

1388

00:51:44,230 --> 00:51:42,079

that an asteroid may hit the planet and

1389

00:51:46,870 --> 00:51:44,240

then it wanes and i wouldn't necessarily

1390

00:51:48,549 --> 00:51:46,880

think that that's um that's a bad thing

1391

00:51:50,150 --> 00:51:48,559

because that's that's in our nature i

1392

00:51:51,829 --> 00:51:50,160

mean the public response that way but

1393

00:51:53,270 --> 00:51:51,839

policy makers respond that way and i

1394

00:51:54,870 --> 00:51:53,280

think scientists respond that way too

1395

00:51:56,309 --> 00:51:54,880

because um you know we can't be

1396

00:51:58,390 --> 00:51:56,319

concerned about every single threat all

1397

00:52:03,270 --> 00:51:58,400

the time and so it's just it's just one

1398

00:52:07,910 --> 00:52:04,309

uh

1399

00:52:10,069 --> 00:52:07,920

marsha freeman with the eir magazine

1400

00:52:12,549 --> 00:52:10,079

it doesn't help me sleep too much better

1401
00:52:14,309 --> 00:52:12,559
at night to know that scientists think

1402
00:52:16,790 --> 00:52:14,319
that it'll be a hundred years before

1403
00:52:20,549 --> 00:52:16,800
there's a big impact

1404
00:52:21,750 --> 00:52:20,559
i think we need to know a lot more than

1405
00:52:23,510 --> 00:52:21,760
we know

1406
00:52:25,430 --> 00:52:23,520
and that there's a very interesting

1407
00:52:28,470 --> 00:52:25,440
proposal i was wondering if you knew

1408
00:52:30,790 --> 00:52:28,480
about it or had any thoughts about it

1409
00:52:34,470 --> 00:52:30,800
that the russians have made over the

1410
00:52:37,270 --> 00:52:34,480
last year it's part of the larger

1411
00:52:39,030 --> 00:52:37,280
proposal it was actually by

1412
00:52:41,750 --> 00:52:39,040
general permanoff who had been the head

1413
00:52:44,829 --> 00:52:41,760

of the russian space program

1414

00:52:47,990 --> 00:52:44,839

which is for a whole global

1415

00:52:49,829 --> 00:52:48,000

coordination between global threats to

1416

00:52:53,030 --> 00:52:49,839

earth it certainly includes something

1417

00:52:55,109 --> 00:52:53,040

coming in here from somewhere else but

1418

00:52:58,549 --> 00:52:55,119

even the kinds of things that have large

1419

00:53:00,870 --> 00:52:58,559

scale impacts in terms of tsunamis

1420

00:53:03,750 --> 00:53:00,880

extreme weather events which can affect

1421

00:53:05,190 --> 00:53:03,760

a lot of countries etc and then a sort

1422

00:53:07,670 --> 00:53:05,200

of more

1423

00:53:10,390 --> 00:53:07,680

confined proposal for what's been called

1424

00:53:12,390 --> 00:53:10,400

the strategic defense of earth

1425

00:53:14,630 --> 00:53:12,400

now there are a lot of individual

1426
00:53:17,510 --> 00:53:14,640
programs through the united nations you

1427
00:53:19,670 --> 00:53:17,520
mentioned the us programs but really to

1428
00:53:20,710 --> 00:53:19,680
bring this together and more of a global

1429
00:53:22,470 --> 00:53:20,720
effort and

1430
00:53:24,390 --> 00:53:22,480
to give it you know to take away a

1431
00:53:26,710 --> 00:53:24,400
little bit of the giggle factors you

1432
00:53:29,190 --> 00:53:26,720
mentioned you know and to say this is a

1433
00:53:32,150 --> 00:53:29,200
scientific project that concerns us all

1434
00:53:34,390 --> 00:53:32,160
globally and the world scientists are

1435
00:53:36,390 --> 00:53:34,400
working on it that's a great point i am

1436
00:53:38,309 --> 00:53:36,400
aware of it and i think that again that

1437
00:53:40,230 --> 00:53:38,319
shows a whole very interesting

1438
00:53:41,750 --> 00:53:40,240

discussion that is missing from the

1439

00:53:43,670 --> 00:53:41,760

dominant narrative i think you would

1440

00:53:46,309 --> 00:53:43,680

make a great film talking about how the

1441

00:53:47,670 --> 00:53:46,319

different countries um and the proposals

1442

00:53:49,829 --> 00:53:47,680

that they have and whether they'll be

1443

00:53:50,630 --> 00:53:49,839

successful or not um another point is

1444

00:53:57,990 --> 00:53:50,640

that

1445

00:54:00,790 --> 00:53:58,000

of suggest in my in my very fast

1446

00:54:03,990 --> 00:54:00,800

presentation is that you know we

1447

00:54:06,309 --> 00:54:04,000

understand that even sub kilometer um

1448

00:54:07,829 --> 00:54:06,319

impact would would have

1449

00:54:09,750 --> 00:54:07,839

damage particularly depending on where

1450

00:54:11,750 --> 00:54:09,760

they fall you know if they fell in

1451

00:54:14,710 --> 00:54:11,760

certain locations you know in big cities

1452

00:54:16,549 --> 00:54:14,720

they would have a legitimate um and very

1453

00:54:18,630 --> 00:54:16,559

an impact of a lot of concern and so

1454

00:54:21,349 --> 00:54:18,640

it's interesting that that is missing

1455

00:54:23,030 --> 00:54:21,359

from the popular discussion because i

1456

00:54:26,790 --> 00:54:23,040

think it is something that the public

1457

00:54:30,470 --> 00:54:27,910

hey laura

1458

00:54:32,549 --> 00:54:30,480

so uh one of the slides had a dollar

1459

00:54:33,910 --> 00:54:32,559

figure of about four million dollars for

1460

00:54:35,510 --> 00:54:33,920

tracking

1461

00:54:39,910 --> 00:54:35,520

earth

1462

00:54:41,190 --> 00:54:39,920

which i noticed probably about two

1463

00:54:43,030 --> 00:54:41,200

percent of the budget of the movie

1464

00:54:45,190 --> 00:54:43,040

armageddon uh

1465

00:54:46,950 --> 00:54:45,200

but i noticed

1466

00:54:49,589 --> 00:54:46,960

you also had another slide that showed

1467

00:54:51,430 --> 00:54:49,599

uh statistics talking about the public

1468

00:54:53,430 --> 00:54:51,440

perception and saying that that you know

1469

00:54:54,950 --> 00:54:53,440

large percentages view this as a very

1470

00:54:57,190 --> 00:54:54,960

low uh

1471

00:55:00,549 --> 00:54:57,200

concern do you think that

1472

00:55:02,549 --> 00:55:00,559

the public uh opinion drives the policy

1473

00:55:04,870 --> 00:55:02,559

on that that drives the the low amount

1474

00:55:06,390 --> 00:55:04,880

of funding do you think that perhaps the

1475

00:55:07,910 --> 00:55:06,400

the low amount of funding is the reason

1476

00:55:09,430 --> 00:55:07,920

that the public is

1477

00:55:11,910 --> 00:55:09,440

less concerned or do you think that the

1478

00:55:13,670 --> 00:55:11,920

two are detached

1479

00:55:15,589 --> 00:55:13,680

um

1480

00:55:17,030 --> 00:55:15,599

no i don't think i don't think the

1481

00:55:24,470 --> 00:55:17,040

public

1482

00:55:26,950 --> 00:55:24,480

policy makers are in the same side of

1483

00:55:29,190 --> 00:55:26,960

the table and so like you said before

1484

00:55:31,349 --> 00:55:29,200

their interest is spiked by by real

1485

00:55:33,670 --> 00:55:31,359

events and they do put more funding in

1486

00:55:36,710 --> 00:55:33,680

it but then when it's not well you know

1487

00:55:38,549 --> 00:55:36,720

other priorities take precedence and so

1488

00:55:40,630 --> 00:55:38,559

i don't i don't see i don't have any

1489

00:55:42,630 --> 00:55:40,640

solutions to how you solve that i think

1490

00:55:43,910 --> 00:55:42,640

what the nrc is doing and what some in

1491

00:55:45,589 --> 00:55:43,920

the community are doing i'm saying you

1492

00:55:47,190 --> 00:55:45,599

know sub kilometer impact we need to

1493

00:55:49,990 --> 00:55:47,200

survey those we need to fund what

1494

00:55:53,109 --> 00:55:50,000

congress asked for in 2005

1495

00:55:55,829 --> 00:55:53,119

to to survey those those objects is is

1496

00:55:57,990 --> 00:55:55,839

good but i think that

1497

00:55:59,829 --> 00:55:58,000

bearing that very present and clear

1498

00:56:01,109 --> 00:55:59,839

thread

1499

00:56:03,190 --> 00:56:01,119

there's not going to be that much

1500

00:56:04,870 --> 00:56:03,200

attention given to it

1501

00:56:06,549 --> 00:56:04,880

we'll have time for questions later so

1502

00:56:08,549 --> 00:56:06,559

flindley and you can save your questions

1503

00:56:10,470 --> 00:56:08,559

for the for the panel we will we'll

1504

00:56:11,430 --> 00:56:10,480

certainly have time for that but we do

1505

00:56:14,069 --> 00:56:11,440

want to make sure we get all our

1506

00:56:15,829 --> 00:56:14,079

presentations in i just have a question

1507

00:56:16,950 --> 00:56:15,839

i want to take it not for you but you

1508

00:56:18,390 --> 00:56:16,960

can answer it too

1509

00:56:20,230 --> 00:56:18,400

a survey

1510

00:56:22,789 --> 00:56:20,240

how many of you have ever seen a

1511

00:56:25,829 --> 00:56:22,799

shooting star

1512

00:56:28,230 --> 00:56:25,839

all right so you have seen

1513

00:56:30,630 --> 00:56:28,240

an asteroid impact the earth

1514

00:56:31,990 --> 00:56:30,640

you already have so the statistics about

1515

00:56:34,069 --> 00:56:32,000

62 percent of the people don't think

1516

00:56:36,150 --> 00:56:34,079

it's like going to happen but it happens

1517

00:56:37,510 --> 00:56:36,160

all the time every night it's just a

1518

00:56:41,750 --> 00:56:37,520

question of whether it's a really big

1519

00:56:44,870 --> 00:56:43,430

i know and that's the point she says

1520

00:56:46,549 --> 00:56:44,880

people think of them as shooting stars

1521

00:56:48,390 --> 00:56:46,559

they don't understand what an asteroid

1522

00:56:50,390 --> 00:56:48,400

impact really is because they have a

1523

00:56:53,030 --> 00:56:50,400

hollywood impression and they don't

1524

00:56:55,990 --> 00:56:53,040

realize that asteroid and common impacts

1525

00:56:58,069 --> 00:56:56,000

happen every single day

1526

00:57:00,150 --> 00:56:58,079

and it's just a question of degree all

1527

00:57:02,230 --> 00:57:00,160

right so that's something that we need

1528

00:57:04,630 --> 00:57:02,240

to communicate a little bit better i

1529

00:57:07,670 --> 00:57:04,640

think uh that we aren't just talking

1530

00:57:10,150 --> 00:57:07,680

about a one-off dinosaur killer the

1531

00:57:13,750 --> 00:57:10,160

tunguska event i like to show

1532

00:57:15,910 --> 00:57:13,760

super posed on washington dc

1533

00:57:18,950 --> 00:57:15,920

because it encompasses the tree fall

1534

00:57:21,510 --> 00:57:18,960

pattern tunguska encompasses all

1535

00:57:23,109 --> 00:57:21,520

of metro washington d.c

1536

00:57:26,950 --> 00:57:23,119

so it's just something to keep in mind

1537

00:57:29,589 --> 00:57:26,960

good to show your congress people

1538

00:57:32,630 --> 00:57:29,599

all right our last presentation before

1539

00:57:34,470 --> 00:57:32,640

the panel discussion is by jin hyung and

1540

00:57:36,549 --> 00:57:34,480

she is a doctoral candidate in the

1541

00:57:39,030 --> 00:57:36,559

department of history and

1542

00:57:42,069 --> 00:57:39,040

art history at george mason university

1543

00:57:43,910 --> 00:57:42,079

she's working on her phd which will also

1544

00:57:46,549 --> 00:57:43,920

be looking at questions of public

1545

00:57:48,870 --> 00:57:46,559

perception and the mass media during

1546

00:57:51,589 --> 00:57:48,880

several more of nasa's science missions

1547

00:57:53,430 --> 00:57:51,599

that are mentioned in this talk

1548

00:57:56,150 --> 00:57:53,440

which is entitled

1549

00:57:57,270 --> 00:57:56,160

voyager exploring through the public eye

1550

00:58:09,430 --> 00:57:57,280

but i know she's going to talk about

1551

00:58:13,430 --> 00:58:11,670

all right so how the public gets

1552

00:58:15,030 --> 00:58:13,440

information has certainly evolved over

1553

00:58:17,190 --> 00:58:15,040

the last 30 years

1554

00:58:18,870 --> 00:58:17,200

in the 1970s the public relied on

1555

00:58:20,789 --> 00:58:18,880

newspapers for information and

1556

00:58:23,670 --> 00:58:20,799

television featured only three major

1557

00:58:25,589 --> 00:58:23,680

networks focusing on newspapers the

1558

00:58:27,270 --> 00:58:25,599

voyager mission illustrates the process

1559

00:58:29,670 --> 00:58:27,280

of how the mass media disseminated

1560

00:58:31,750 --> 00:58:29,680

scientific discoveries to the public

1561

00:58:33,829 --> 00:58:31,760

the voyager mission sent twin spacecraft

1562

00:58:36,390 --> 00:58:33,839

to take advantage of an outer planetary

1563

00:58:38,870 --> 00:58:36,400

alignment of jupiter saturn uranus and

1564

00:58:41,750 --> 00:58:38,880

neptune that occurs approximately once

1565

00:58:45,190 --> 00:58:41,760

in every 175 years

1566

00:58:48,230 --> 00:58:45,200

voyager 1 launched on august 1977

1567

00:58:51,670 --> 00:58:48,240

arrived at jupiter in march 1979 and

1568

00:58:53,829 --> 00:58:51,680

then saturn in november 1980

1569

00:58:56,589 --> 00:58:53,839

i'll also examine the media coverage for

1570

00:58:59,910 --> 00:58:56,599

galileo's mission's return to jupiter in

1571

00:59:01,910 --> 00:58:59,920

1995 and cassini's return to saturn in

1572

00:59:03,190 --> 00:59:01,920

2004.

1573

00:59:04,710 --> 00:59:03,200

i'm hoping to show you a few of the

1574

00:59:06,549 --> 00:59:04,720

significant changes in science

1575

00:59:08,870 --> 00:59:06,559

communication through the evolution in

1576
00:59:10,470 --> 00:59:08,880
mass media as well as hinted what's

1577
00:59:12,549 --> 00:59:10,480
happening in the public attitudes

1578
00:59:14,789 --> 00:59:12,559
towards science

1579
00:59:16,710 --> 00:59:14,799
press releases and press briefings acted

1580
00:59:18,870 --> 00:59:16,720
as a conduit for journalists to gain

1581
00:59:20,789 --> 00:59:18,880
information about a mission the major

1582
00:59:22,950 --> 00:59:20,799
newspapers published stories written

1583
00:59:25,430 --> 00:59:22,960
usually by consistent journalists on the

1584
00:59:27,030 --> 00:59:25,440
staff that followed space news

1585
00:59:28,390 --> 00:59:27,040
the articles carried different tones

1586
00:59:29,750 --> 00:59:28,400
according to the writer's style and

1587
00:59:36,390 --> 00:59:29,760
readership and often the more

1588
00:59:41,109 --> 00:59:39,109

what do i mean by popularizing science

1589

00:59:43,270 --> 00:59:41,119

los angeles times science writer george

1590

00:59:45,349 --> 00:59:43,280

alexander provides an excellent example

1591

00:59:49,109 --> 00:59:45,359

in his article for voyager 1's arrival

1592

00:59:50,789 --> 00:59:49,119

at jupiter published on march 1 1979.

1593

00:59:52,950 --> 00:59:50,799

he starts the article

1594

00:59:54,870 --> 00:59:52,960

like a sailboat cresting a reef and

1595

00:59:57,510 --> 00:59:54,880

entering the lagoon of some pacific

1596

00:59:59,109 --> 00:59:57,520

island the voyager 1 spacecraft passed

1597

01:00:01,510 --> 00:59:59,119

through the bow shock of jupiter

1598

01:00:04,630 --> 01:00:01,520

wednesday and slipped inside the big

1599

01:00:06,630 --> 01:00:04,640

planet's magnetic environment

1600

01:00:08,710 --> 01:00:06,640

the simile makes a real-world connection

1601
01:00:10,789 --> 01:00:08,720
to something most may have difficulty

1602
01:00:12,230 --> 01:00:10,799
imagining and goes on to further explain

1603
01:00:14,309 --> 01:00:12,240
the bow shock

1604
01:00:16,150 --> 01:00:14,319
it also hints that the risks inherent to

1605
01:00:18,710 --> 01:00:16,160
the spacecraft before it successfully

1606
01:00:20,789 --> 01:00:18,720
reaches its destination

1607
01:00:22,710 --> 01:00:20,799
popularization isn't perfect i'm sure

1608
01:00:24,710 --> 01:00:22,720
that sailors or engineers might point

1609
01:00:26,150 --> 01:00:24,720
out that the problems in making this

1610
01:00:28,549 --> 01:00:26,160
analogy

1611
01:00:31,109 --> 01:00:28,559
however these stories usually contain

1612
01:00:33,270 --> 01:00:31,119
understandable writing analogies as well

1613
01:00:35,430 --> 01:00:33,280

as enthusiasm which relates to a wider

1614

01:00:36,870 --> 01:00:35,440

public audience than the audience that's

1615

01:00:38,789 --> 01:00:36,880

already interested in learning about

1616

01:00:40,390 --> 01:00:38,799

things like this

1617

01:00:42,069 --> 01:00:40,400

during the planetary encounters the

1618

01:00:43,670 --> 01:00:42,079

media coverage shifted from the planned

1619

01:00:45,990 --> 01:00:43,680

science objectives to the actual

1620

01:00:47,510 --> 01:00:46,000

scientific discoveries and images

1621

01:00:49,670 --> 01:00:47,520

the press releases and briefings

1622

01:00:50,630 --> 01:00:49,680

increased in technical and scientific

1623

01:00:52,549 --> 01:00:50,640

detail

1624

01:00:54,390 --> 01:00:52,559

science journalists however compensated

1625

01:00:57,109 --> 01:00:54,400

for the detail by imbuing emotional

1626
01:00:58,870 --> 01:00:57,119
values surprise and wonder to the news

1627
01:01:01,670 --> 01:00:58,880
and personifying the science whenever

1628
01:01:03,589 --> 01:01:01,680
possible through quotes and interviews

1629
01:01:05,109 --> 01:01:03,599
newspapers also chose to emphasize

1630
01:01:07,270 --> 01:01:05,119
articles through their placement within

1631
01:01:09,030 --> 01:01:07,280
the publication such as the front page

1632
01:01:10,789 --> 01:01:09,040
or special sections

1633
01:01:12,870 --> 01:01:10,799
although the mass media cannot obtain

1634
01:01:15,430 --> 01:01:12,880
their own images using photographers

1635
01:01:17,510 --> 01:01:15,440
like most other earthly news events

1636
01:01:19,750 --> 01:01:17,520
editors determine space and placement

1637
01:01:25,990 --> 01:01:19,760
for the dramatic images like this one of

1638
01:01:30,470 --> 01:01:28,470

here are a couple examples of headline

1639

01:01:31,990 --> 01:01:30,480

news the

1640

01:01:34,470 --> 01:01:32,000

first one to the left and the middle one

1641

01:01:37,190 --> 01:01:34,480

are from the new york times both by john

1642

01:01:38,829 --> 01:01:37,200

noble wilford the first published on

1643

01:01:40,549 --> 01:01:38,839

sunday march 4th

1644

01:01:42,069 --> 01:01:40,559

1979

1645

01:01:45,510 --> 01:01:42,079

and

1646

01:01:46,789 --> 01:01:45,520

the middle one on march 6 1979 which is

1647

01:01:47,990 --> 01:01:46,799

a tuesday

1648

01:01:51,670 --> 01:01:48,000

the one on the right is from the

1649

01:01:53,589 --> 01:01:51,680

washington post also on march 6.

1650

01:01:55,510 --> 01:01:53,599

voyager images appear on the front page

1651
01:01:57,430 --> 01:01:55,520
of these newspapers drawing readers to

1652
01:01:58,630 --> 01:01:57,440
continue the story inside

1653
01:02:00,309 --> 01:01:58,640
if you note

1654
01:02:02,710 --> 01:02:00,319
the first image in the second image you

1655
01:02:04,470 --> 01:02:02,720
really only get the image and you don't

1656
01:02:06,549 --> 01:02:04,480
get much of the story you have caption

1657
01:02:08,150 --> 01:02:06,559
and it tells you to keep reading inside

1658
01:02:09,829 --> 01:02:08,160
it's only the one on the right where you

1659
01:02:12,710 --> 01:02:09,839
start getting the first few paragraphs

1660
01:02:14,470 --> 01:02:12,720
of the story and continued inside

1661
01:02:16,789 --> 01:02:14,480
the other headlines on the page will

1662
01:02:19,190 --> 01:02:16,799
include president carter's mediation of

1663
01:02:22,950 --> 01:02:19,200

a peace treaty between egypt and israel

1664

01:02:24,630 --> 01:02:22,960

and china's withdrawal from vietnam

1665

01:02:27,349 --> 01:02:24,640

john noble wilford had a remarkable

1666

01:02:29,190 --> 01:02:27,359

career at the new york times since 1965

1667

01:02:31,109 --> 01:02:29,200

and although retired as a senior science

1668

01:02:32,470 --> 01:02:31,119

correspondent still writes about science

1669

01:02:34,230 --> 01:02:32,480

news today

1670

01:02:35,910 --> 01:02:34,240

wolford has a more informational style

1671

01:02:38,069 --> 01:02:35,920

in this reporting he uses simple

1672

01:02:40,950 --> 01:02:38,079

description combined with facts

1673

01:02:42,630 --> 01:02:40,960

like the robot spacecraft sped within a

1674

01:02:44,150 --> 01:02:42,640

hundred and seventy four thousand

1675

01:02:46,470 --> 01:02:44,160

hundred thousand miles of the

1676

01:02:48,230 --> 01:02:46,480

multi-colored clouds of jupiter and with

1677

01:02:49,910 --> 01:02:48,240

its television cameras look deep into

1678

01:02:53,270 --> 01:02:49,920

the eye of the huge hurricane-like

1679

01:02:55,109 --> 01:02:53,280

feature known as the great red spot

1680

01:02:57,750 --> 01:02:55,119

wolford uses quotes as a vehicle for

1681

01:03:00,549 --> 01:02:57,760

emotion such as citing we've had a total

1682

01:03:02,789 --> 01:03:00,559

success exclaimed dr edward c stone the

1683

01:03:04,069 --> 01:03:02,799

project's chief scientist at the press

1684

01:03:06,309 --> 01:03:04,079

conference

1685

01:03:08,950 --> 01:03:06,319

he also quotes dr bradford smith from

1686

01:03:10,549 --> 01:03:08,960

the university of arizona saying

1687

01:03:12,870 --> 01:03:10,559

when he displayed the latest color

1688

01:03:14,950 --> 01:03:12,880

photograph of the disc of io with its

1689

01:03:17,109 --> 01:03:14,960

deep reds and yellow and a mingling of

1690

01:03:20,870 --> 01:03:17,119

dark spots he joked that's better

1691

01:03:25,029 --> 01:03:22,710

thomas o'toole repeats the same quotes

1692

01:03:27,029 --> 01:03:25,039

by dr stone dr smith which reminds me

1693

01:03:29,829 --> 01:03:27,039

that sound bites aren't exclusively

1694

01:03:31,750 --> 01:03:29,839

found in television

1695

01:03:34,470 --> 01:03:31,760

emphasizes the mysteries beguiling

1696

01:03:36,950 --> 01:03:34,480

scientists especially jupiter's moon io

1697

01:03:40,230 --> 01:03:36,960

which he quotes dr lawrence a sauder

1698

01:03:42,630 --> 01:03:40,240

blum of the u.s geological survey

1699

01:03:44,950 --> 01:03:42,640

saying as one of the strangest bodies in

1700

01:03:47,510 --> 01:03:44,960

the solar system

1701

01:03:49,029 --> 01:03:47,520

these articles emphasize the newness of

1702

01:03:51,589 --> 01:03:49,039

the color images despite being

1703

01:03:53,589 --> 01:03:51,599

republished in black and white medium

1704

01:03:55,510 --> 01:03:53,599

the questions raised by prior research

1705

01:03:58,390 --> 01:03:55,520

on ground-based telescopes that might

1706

01:04:00,150 --> 01:03:58,400

get answers and the new questions still

1707

01:04:02,150 --> 01:04:00,160

yet to be addressed

1708

01:04:04,150 --> 01:04:02,160

the newspaper editorials generally seem

1709

01:04:06,950 --> 01:04:04,160

to agree that this exploration holds

1710

01:04:09,270 --> 01:04:06,960

some fundamental value for humanity

1711

01:04:10,789 --> 01:04:09,280

as the los angeles times editorial so

1712

01:04:13,190 --> 01:04:10,799

eloquently states

1713

01:04:15,589 --> 01:04:13,200

like monkeys in a dark box

1714

01:04:17,190 --> 01:04:15,599

we use voyager as a window into the

1715

01:04:19,750 --> 01:04:17,200

blackness of space

1716

01:04:22,069 --> 01:04:19,760

we want to see what's out there from the

1717

01:04:24,470 --> 01:04:22,079

standpoint the exploration of space is

1718

01:04:26,470 --> 01:04:24,480

no high-priced public public relations

1719

01:04:27,510 --> 01:04:26,480

gimmick or cockeyed race with the

1720

01:04:29,670 --> 01:04:27,520

russians

1721

01:04:32,069 --> 01:04:29,680

rather it is a fundamental expression of

1722

01:04:35,990 --> 01:04:32,079

human nature a few billion dollars a

1723

01:04:40,390 --> 01:04:37,829

from hollywood star wars and close

1724

01:04:43,349 --> 01:04:40,400

encounters are the third kind of arrived

1725

01:04:44,950 --> 01:04:43,359

in movie theaters in 1977.

1726

01:04:47,029 --> 01:04:44,960

carl sagan had reached enormous

1727

01:04:49,349 --> 01:04:47,039

popularity and his television show

1728

01:04:52,309 --> 01:04:49,359

cosmos a personal voyage would air from

1729

01:04:53,829 --> 01:04:52,319

september to december 1980

1730

01:04:55,190 --> 01:04:53,839

a jpl

1731

01:04:57,430 --> 01:04:55,200

memo cited

1732

01:04:59,190 --> 01:04:57,440

voyager 1's encounter with saturn one

1733

01:05:01,190 --> 01:04:59,200

month ago produced media response

1734

01:05:02,950 --> 01:05:01,200

without parallel in the unmanned space

1735

01:05:05,190 --> 01:05:02,960

exploration program

1736

01:05:07,910 --> 01:05:05,200

the total potential tv viewing audience

1737

01:05:10,630 --> 01:05:07,920

was estimated at 100 million persons on

1738

01:05:12,390 --> 01:05:10,640

four continents

1739

01:05:14,710 --> 01:05:12,400

voyager represents traditional media

1740

01:05:17,029 --> 01:05:14,720

reporting where the journalists flocked

1741

01:05:18,549 --> 01:05:17,039

to get news about the mission

1742

01:05:20,470 --> 01:05:18,559

when public affairs worked with the

1743

01:05:22,710 --> 01:05:20,480

journalists to provide backgrounders and

1744

01:05:24,549 --> 01:05:22,720

hold press briefings and the journalists

1745

01:05:30,630 --> 01:05:24,559

became the primary communicator for

1746

01:05:34,309 --> 01:05:32,710

shifting forward galileo's news coverage

1747

01:05:37,109 --> 01:05:34,319

followed very similar patterns in the

1748

01:05:39,349 --> 01:05:37,119

print media although pioneer and voyager

1749

01:05:41,190 --> 01:05:39,359

completed flybys galileo became the

1750

01:05:43,349 --> 01:05:41,200

first spacecraft to remain in orbit

1751
01:05:46,390 --> 01:05:43,359
around jupiter and send a descent probe

1752
01:05:48,549 --> 01:05:46,400
into the atmosphere in 1995.

1753
01:05:50,870 --> 01:05:48,559
before reaching its destination galileo

1754
01:05:54,950 --> 01:05:50,880
flew by venus and earth from 1990 to

1755
01:05:57,190 --> 01:05:54,960
1992 traveled to an asteroid in 1991 and

1756
01:06:00,069 --> 01:05:57,200
discovered a moon on another asteroid in

1757
01:06:03,430 --> 01:06:00,079
1993 and also covered the comet

1758
01:06:05,589 --> 01:06:03,440
shoemaker levy 9 in 1994

1759
01:06:07,190 --> 01:06:05,599
galileo received extra pre-launch cut

1760
01:06:09,270 --> 01:06:07,200
news coverage because of its many

1761
01:06:12,630 --> 01:06:09,280
unfortunate delays and cost overruns

1762
01:06:14,870 --> 01:06:12,640
before its launch in 1989.

1763
01:06:17,029 --> 01:06:14,880

galileo's high gain antenna also failed

1764

01:06:18,950 --> 01:06:17,039

to fully open on its long voyage and the

1765

01:06:22,630 --> 01:06:18,960

multiple attempts to remedy the issue

1766

01:06:26,870 --> 01:06:24,789

this is an example going forward a

1767

01:06:31,670 --> 01:06:26,880

little bit more than the slide that will

1768

01:06:37,990 --> 01:06:35,029

published on july 22 1996 and it's

1769

01:06:40,150 --> 01:06:38,000

galileo spin on joven moons and it was a

1770

01:06:43,750 --> 01:06:40,160

half page feature and you'll not note at

1771

01:06:45,190 --> 01:06:43,760

the top it's nicely labeled science

1772

01:06:47,750 --> 01:06:45,200

with a little print underneath it that

1773

01:06:50,870 --> 01:06:47,760

says astronomy

1774

01:06:53,349 --> 01:06:50,880

and looking at what's on the front page

1775

01:06:55,670 --> 01:06:53,359

the front page actually has information

1776

01:06:57,670 --> 01:06:55,680

about the olympics that year and the

1777

01:07:01,510 --> 01:06:57,680

failure to find transworld airlines

1778

01:07:03,430 --> 01:07:01,520

flight 800's flight recorders so this is

1779

01:07:10,789 --> 01:07:03,440

a couple pages within the front page of

1780

01:07:16,870 --> 01:07:14,390

this is a word cloud for some

1781

01:07:18,470 --> 01:07:16,880

subset of galileo text taken from the

1782

01:07:23,430 --> 01:07:18,480

new york times and washington post from

1783

01:07:25,109 --> 01:07:23,440

december 3rd 1995 to january 24th 1996.

1784

01:07:26,789 --> 01:07:25,119

an attempt to gather information in new

1785

01:07:29,270 --> 01:07:26,799

ways i tried using this word cloud to

1786

01:07:30,950 --> 01:07:29,280

visually interpret textual data and it

1787

01:07:32,789 --> 01:07:30,960

makes frequent words bigger which can

1788

01:07:34,630 --> 01:07:32,799

vary depending on the algorithm used to

1789

01:07:36,390 --> 01:07:34,640

determine their importance

1790

01:07:38,789 --> 01:07:36,400

the next slide actually shows a more

1791

01:07:43,510 --> 01:07:38,799

organized variation where we can see

1792

01:07:46,150 --> 01:07:44,630

here i'm going to

1793

01:07:48,150 --> 01:07:46,160

pick out another pair of front page

1794

01:07:50,150 --> 01:07:48,160

articles to examine a bit from december

1795

01:07:51,589 --> 01:07:50,160

8 1995.

1796

01:07:53,589 --> 01:07:51,599

from the new york times wilfred

1797

01:07:56,710 --> 01:07:53,599

published probe pierce's jupiter's

1798

01:07:58,789 --> 01:07:56,720

clouds and first interior look at planet

1799

01:08:01,670 --> 01:07:58,799

he quotes dr william o'neill the project

1800

01:08:03,430 --> 01:08:01,680

manager as being ecstatic and dr

1801
01:08:05,109 --> 01:08:03,440
torrence johnson the chief project

1802
01:08:07,910 --> 01:08:05,119
scientist saying

1803
01:08:09,910 --> 01:08:07,920
this is really neat

1804
01:08:11,910 --> 01:08:09,920
wilfred reminds his readers about the

1805
01:08:13,829 --> 01:08:11,920
antenna failure that will result in

1806
01:08:16,309 --> 01:08:13,839
fewer pictures and none before next

1807
01:08:19,030 --> 01:08:16,319
summer although software advances will

1808
01:08:21,590 --> 01:08:19,040
allow the mission to complete 70

1809
01:08:23,590 --> 01:08:21,600
of its science objectives

1810
01:08:26,870 --> 01:08:23,600
the washington post staff writer kathy

1811
01:08:29,189 --> 01:08:26,880
sawyer published galileo starts tour of

1812
01:08:31,189 --> 01:08:29,199
giant planet after six year trek

1813
01:08:32,950 --> 01:08:31,199

spacecraft first to transmit from drove

1814

01:08:34,950 --> 01:08:32,960

in skies

1815

01:08:37,910 --> 01:08:34,960

she poetically uses descriptions like

1816

01:08:39,910 --> 01:08:37,920

the first tiny emissary to send messages

1817

01:08:42,709 --> 01:08:39,920

from inside the atmosphere of an outer

1818

01:08:45,510 --> 01:08:42,719

planet and also kamikaze probe

1819

01:08:46,870 --> 01:08:45,520

dispatched from the mother ship

1820

01:08:49,030 --> 01:08:46,880

she relayed the importance of the

1821

01:08:51,669 --> 01:08:49,040

research as understanding the planet's

1822

01:08:53,910 --> 01:08:51,679

evolution by looking at a planet that

1823

01:08:56,070 --> 01:08:53,920

retain more primeval characteristics

1824

01:08:58,390 --> 01:08:56,080

like a rosetta stone

1825

01:09:01,349 --> 01:08:58,400

the article focused on the probe's path

1826

01:09:04,070 --> 01:09:01,359

to descent like a celestial ballet

1827

01:09:06,070 --> 01:09:04,080

as described by william o'neill

1828

01:09:08,229 --> 01:09:06,080

sawyer also mentions a quote from carl

1829

01:09:09,349 --> 01:09:08,239

sagan from a televised chat where he

1830

01:09:11,189 --> 01:09:09,359

says

1831

01:09:14,390 --> 01:09:11,199

it's a very exciting moment to be alive

1832

01:09:15,669 --> 01:09:14,400

and interested in these issues

1833

01:09:18,149 --> 01:09:15,679

going back to the data from the word

1834

01:09:20,870 --> 01:09:18,159

cloud we see some unremarkable words

1835

01:09:22,789 --> 01:09:20,880

like scientists or atmosphere

1836

01:09:25,110 --> 01:09:22,799

minutes gets repeated from both the

1837

01:09:26,229 --> 01:09:25,120

orbital insertion and communications

1838

01:09:29,030 --> 01:09:26,239

time

1839

01:09:32,229 --> 01:09:29,040

billion refers to the 1.3 billion dollar

1840

01:09:35,349 --> 01:09:32,239

price tag and 2.3 billion miles traveled

1841

01:09:36,950 --> 01:09:35,359

since launch while this method gives me

1842

01:09:38,789 --> 01:09:36,960

the common words it turns out the

1843

01:09:40,789 --> 01:09:38,799

uncommon descriptions seem much more

1844

01:09:43,269 --> 01:09:40,799

interesting to see what these writers

1845

01:09:45,510 --> 01:09:43,279

use to explain complex phenomena in so

1846

01:09:47,590 --> 01:09:45,520

many different ways

1847

01:09:49,829 --> 01:09:47,600

the galileo mission at this particular

1848

01:09:52,229 --> 01:09:49,839

time seemed less immediate and

1849

01:09:53,510 --> 01:09:52,239

definitive from long delays and data and

1850

01:09:55,510 --> 01:09:53,520

images

1851
01:09:57,270 --> 01:09:55,520
in addition to technical issues the

1852
01:10:00,070 --> 01:09:57,280
federal government shut down and delayed

1853
01:10:03,110 --> 01:10:00,080
the initial briefing from december 19 to

1854
01:10:05,430 --> 01:10:03,120
january 22nd which is why

1855
01:10:11,590 --> 01:10:05,440
the articles for this particular mission

1856
01:10:15,750 --> 01:10:13,830
moving on to cassini the cassini mission

1857
01:10:17,750 --> 01:10:15,760
became an international endeavor between

1858
01:10:19,990 --> 01:10:17,760
nasa the european space agency and the

1859
01:10:22,470 --> 01:10:20,000
italian space agency the cassini

1860
01:10:24,470 --> 01:10:22,480
spacecraft also carried the huygens

1861
01:10:26,550 --> 01:10:24,480
probe that would be released into the

1862
01:10:27,430 --> 01:10:26,560
atmosphere of titan saturn's largest

1863
01:10:30,229 --> 01:10:27,440

moon

1864

01:10:33,270 --> 01:10:30,239

cassini-huygens launched on october 15

1865

01:10:37,510 --> 01:10:33,280

1997 and finally arrived at saturn on

1866

01:10:43,350 --> 01:10:41,030

now this is an example of a article

1867

01:10:45,990 --> 01:10:43,360

published by john noble wilford in the

1868

01:10:49,910 --> 01:10:46,000

new york times 31 moons now close enough

1869

01:10:51,910 --> 01:10:49,920

to touch on june 15 2004 this is about

1870

01:10:53,189 --> 01:10:51,920

two weeks before

1871

01:10:55,110 --> 01:10:53,199

cassini

1872

01:10:56,870 --> 01:10:55,120

makes it to saturn you get the initial

1873

01:10:59,110 --> 01:10:56,880

photos from that

1874

01:11:01,030 --> 01:10:59,120

and i have this here because i want to

1875

01:11:02,709 --> 01:11:01,040

point out

1876
01:11:04,870 --> 01:11:02,719
for newspapers there's something called

1877
01:11:06,550 --> 01:11:04,880
above the fold and below the fold above

1878
01:11:09,110 --> 01:11:06,560
the fold

1879
01:11:10,870 --> 01:11:09,120
here on this particular page well it is

1880
01:11:13,430 --> 01:11:10,880
the science time so it's still within

1881
01:11:15,350 --> 01:11:13,440
the newspaper but for the front page of

1882
01:11:16,870 --> 01:11:15,360
this particular section you have

1883
01:11:18,790 --> 01:11:16,880
something about hair

1884
01:11:20,870 --> 01:11:18,800
restoration techniques

1885
01:11:23,750 --> 01:11:20,880
which apparently to the editors was more

1886
01:11:25,189 --> 01:11:23,760
important than this preview of saturn's

1887
01:11:28,870 --> 01:11:25,199
moons

1888
01:11:30,630 --> 01:11:28,880

and also inside and a couple pages later

1889

01:11:33,430 --> 01:11:30,640

i found interesting there's an article

1890

01:11:36,550 --> 01:11:33,440

by kenneth chang made making science

1891

01:11:38,790 --> 01:11:36,560

fact now chronicling science fiction

1892

01:11:41,270 --> 01:11:38,800

and it's about donna shirley who managed

1893

01:11:43,270 --> 01:11:41,280

the mars exploration program and led the

1894

01:11:44,550 --> 01:11:43,280

team that built the mars pathfinder

1895

01:11:46,229 --> 01:11:44,560

rover

1896

01:11:48,149 --> 01:11:46,239

has become the new director for the

1897

01:11:49,510 --> 01:11:48,159

science fiction museum and hall of fame

1898

01:11:51,189 --> 01:11:49,520

in seattle

1899

01:11:53,110 --> 01:11:51,199

and there's some comments in there about

1900

01:11:55,430 --> 01:11:53,120

using science fiction to excite and

1901

01:11:57,270 --> 01:11:55,440

teach people about science

1902

01:11:59,510 --> 01:11:57,280

so i have this particular example

1903

01:12:04,070 --> 01:11:59,520

because i i like the juxtaposition of

1904

01:12:08,470 --> 01:12:06,709

the 1997 mars pathfinder landing may

1905

01:12:10,950 --> 01:12:08,480

have become the first event to make the

1906

01:12:12,870 --> 01:12:10,960

ground breaking transition into digital

1907

01:12:15,270 --> 01:12:12,880

media and redefine how the general

1908

01:12:17,709 --> 01:12:15,280

public learns about outer space

1909

01:12:21,270 --> 01:12:17,719

the new york times reported

1910

01:12:23,110 --> 01:12:21,280

566 million hits in 30 days and 47

1911

01:12:24,870 --> 01:12:23,120

million hits as the highest number on a

1912

01:12:29,990 --> 01:12:24,880

single day which surpassed the

1913

01:12:36,709 --> 01:12:33,430

here's the artistic word cloud

1914

01:12:39,189 --> 01:12:36,719

and here's more readable one

1915

01:12:41,110 --> 01:12:39,199

this was generated again from selected

1916

01:12:43,189 --> 01:12:41,120

articles from the new york times and

1917

01:12:49,510 --> 01:12:43,199

washington post and this time it's from

1918

01:12:53,030 --> 01:12:51,910

voyager rep

1919

01:12:55,270 --> 01:12:53,040

wrong page

1920

01:12:56,870 --> 01:12:55,280

by 2004 i can't just talk about

1921

01:12:58,310 --> 01:12:56,880

newspapers anymore as a source for

1922

01:13:00,790 --> 01:12:58,320

information because we're firmly into

1923

01:13:02,229 --> 01:13:00,800

the digital age while newspapers sources

1924

01:13:04,390 --> 01:13:02,239

decreased i'm finding more short

1925

01:13:07,189 --> 01:13:04,400

mentions on cable news shows and

1926

01:13:09,270 --> 01:13:07,199

web publications like space daily

1927

01:13:11,990 --> 01:13:09,280

during the 64 hours around the saturn

1928

01:13:14,270 --> 01:13:12,000

orbit insertion period space ref

1929

01:13:16,830 --> 01:13:14,280

reported

1930

01:13:18,630 --> 01:13:16,840

136.6 million hits to the mission's

1931

01:13:20,950 --> 01:13:18,640

website

1932

01:13:22,390 --> 01:13:20,960

when huygens landed on titan issa

1933

01:13:25,189 --> 01:13:22,400

reported on their website that they

1934

01:13:27,910 --> 01:13:25,199

received 919

1935

01:13:29,430 --> 01:13:27,920

000 visitor external visitors and 6.8

1936

01:13:33,110 --> 01:13:29,440

million page views

1937

01:13:35,590 --> 01:13:33,120

on january 15 2005.

1938

01:13:37,270 --> 01:13:35,600

looking at this word cloud carolyn porco

1939

01:13:39,430 --> 01:13:37,280

lead for the cassini imaging team

1940

01:13:40,950 --> 01:13:39,440

appears because she gets quoted a lot in

1941

01:13:42,790 --> 01:13:40,960

the news coverage

1942

01:13:44,950 --> 01:13:42,800

wilford quotes her about the beauty and

1943

01:13:46,630 --> 01:13:44,960

clarity in the black and white images as

1944

01:13:48,229 --> 01:13:46,640

just mind-blowing

1945

01:13:51,590 --> 01:13:48,239

while explaining that color would have

1946

01:13:54,390 --> 01:13:51,600

reduced the total quantity possible

1947

01:13:57,510 --> 01:13:54,400

orco presented the ted talks in october

1948

01:14:00,310 --> 01:13:57,520

2007 the ted conferences invite speakers

1949

01:14:02,310 --> 01:14:00,320

to discuss ideas worth spreading and

1950

01:14:04,709 --> 01:14:02,320

their videos have been available online

1951

01:14:06,149 --> 01:14:04,719

since june 2006

1952

01:14:08,470 --> 01:14:06,159

her visibility on the web is the

1953

01:14:11,110 --> 01:14:08,480

development of the digital age and that

1954

01:14:17,830 --> 01:14:11,120

still continues to draw visitors and new

1955

01:14:21,430 --> 01:14:19,669

while cassini made its own new

1956

01:14:23,430 --> 01:14:21,440

scientific discoveries voyager

1957

01:14:25,430 --> 01:14:23,440

technically claimed the new status more

1958

01:14:27,110 --> 01:14:25,440

than a mission returning for further

1959

01:14:29,270 --> 01:14:27,120

observation

1960

01:14:32,390 --> 01:14:29,280

cassini images have also been labeled as

1961

01:14:34,070 --> 01:14:32,400

art in some online communities and blogs

1962

01:14:36,630 --> 01:14:34,080

in comparison to the hubble space

1963

01:14:40,229 --> 01:14:36,640

telescope's popular brightly colored

1964

01:14:42,070 --> 01:14:40,239

images cassini images also often hold a

1965

01:14:46,229 --> 01:14:42,080

stark quality in black and white that

1966

01:14:48,070 --> 01:14:46,239

emphasizes the contrast in space

1967

01:14:50,149 --> 01:14:48,080

the voyager mission illustrated how the

1968

01:14:51,830 --> 01:14:50,159

mass media traditionally advanced

1969

01:14:53,110 --> 01:14:51,840

scientific discoveries into the public

1970

01:14:54,870 --> 01:14:53,120

understanding

1971

01:14:56,470 --> 01:14:54,880

the information from the press releases

1972

01:14:58,630 --> 01:14:56,480

and briefings presented technical

1973

01:15:00,550 --> 01:14:58,640

science that the journalist expanded

1974

01:15:02,149 --> 01:15:00,560

upon to make the stories interesting for

1975

01:15:03,590 --> 01:15:02,159

the public

1976

01:15:05,510 --> 01:15:03,600

in the process the mass media

1977

01:15:07,430 --> 01:15:05,520

necessarily popularized and simplified

1978

01:15:08,870 --> 01:15:07,440

the science through real-world analogies

1979

01:15:10,550 --> 01:15:08,880

or references

1980

01:15:12,149 --> 01:15:10,560

the journalists also added the human

1981

01:15:13,590 --> 01:15:12,159

element through emotional cues and

1982

01:15:15,430 --> 01:15:13,600

quotes

1983

01:15:17,189 --> 01:15:15,440

although journalists often attributed

1984

01:15:19,830 --> 01:15:17,199

surprise and wonder to the scientists

1985

01:15:21,910 --> 01:15:19,840

they also made statistical statistical

1986

01:15:23,990 --> 01:15:21,920

or philosophic

1987

01:15:26,790 --> 01:15:24,000

philosophical appeals for their

1988

01:15:29,110 --> 01:15:26,800

audiences to feel wonder as well

1989

01:15:30,630 --> 01:15:29,120

a small robotic spacecraft hurtling

1990

01:15:32,310 --> 01:15:30,640

millions of miles

1991

01:15:35,030 --> 01:15:32,320

learning something scientists had not

1992

01:15:37,750 --> 01:15:35,040

known before or even simple curiosity as

1993

01:15:39,830 --> 01:15:37,760

a driving human characteristic

1994

01:15:42,229 --> 01:15:39,840

in addition the images became both the

1995

01:15:44,229 --> 01:15:42,239

source and evidence for wonder viewers

1996

01:15:47,590 --> 01:15:44,239

might feel all over the planetary

1997

01:15:49,910 --> 01:15:47,600

snapshots and they might also be amazed

1998

01:15:51,590 --> 01:15:49,920

at the technological prowess necessary

1999

01:15:53,830 --> 01:15:51,600

in obtaining the picture through by the

2000

01:15:56,310 --> 01:15:53,840

guys

2001

01:15:58,310 --> 01:15:56,320

during galileo readers got continually

2002

01:16:01,110 --> 01:15:58,320

reminded about the many disasters and

2003

01:16:02,870 --> 01:16:01,120

news coverage upon reaching its desk and

2004

01:16:05,510 --> 01:16:02,880

the news coverage upon reaching its

2005

01:16:07,910 --> 01:16:05,520

destination seems to have had less

2006

01:16:09,590 --> 01:16:07,920

impact without new images alongside the

2007

01:16:11,910 --> 01:16:09,600

text

2008

01:16:13,910 --> 01:16:11,920

the galileo mission coverage also seems

2009

01:16:15,669 --> 01:16:13,920

to follow the predictable patterns

2010

01:16:17,990 --> 01:16:15,679

driven from press release to news

2011

01:16:19,830 --> 01:16:18,000

article during this time period

2012

01:16:21,510 --> 01:16:19,840

now a different aspect of the galileo

2013

01:16:23,750 --> 01:16:21,520

mission may have

2014

01:16:25,430 --> 01:16:23,760

drastically different results but if

2015

01:16:27,750 --> 01:16:25,440

you've noticed i'm

2016

01:16:29,669 --> 01:16:27,760

pinpointing the moment of when the

2017

01:16:33,110 --> 01:16:29,679

primary mission begins often when the

2018

01:16:34,950 --> 01:16:33,120

planetary encounter begins

2019

01:16:37,430 --> 01:16:34,960

cassini becomes remarkable for breaking

2020

01:16:39,110 --> 01:16:37,440

these patterns using web publishing

2021

01:16:40,470 --> 01:16:39,120

more information about new scientific

2022

01:16:42,070 --> 01:16:40,480

discoveries appear on the mission

2023

01:16:44,790 --> 01:16:42,080

website than gets followed by the

2024

01:16:46,870 --> 01:16:44,800

national print and television media

2025

01:16:49,030 --> 01:16:46,880

information sources proliferate over the

2026
01:16:53,590 --> 01:16:49,040
web from traditional journalism to space

2027
01:16:58,630 --> 01:16:56,470
what does this digital transition mean

2028
01:17:01,189 --> 01:16:58,640
some digital evangelists have promoted

2029
01:17:03,030 --> 01:17:01,199
democratization through new media while

2030
01:17:05,430 --> 01:17:03,040
others have expressed concerns about the

2031
01:17:07,189 --> 01:17:05,440
web that have contracted in different

2032
01:17:09,350 --> 01:17:07,199
ways

2033
01:17:11,590 --> 01:17:09,360
the internet allows users to choose what

2034
01:17:13,910 --> 01:17:11,600
to view where to view it and whether to

2035
01:17:15,510 --> 01:17:13,920
participate for nearly an infinite

2036
01:17:17,750 --> 01:17:15,520
number of interests

2037
01:17:19,669 --> 01:17:17,760
for the publication side writers or

2038
01:17:21,990 --> 01:17:19,679

creators might find greater audiences

2039

01:17:24,070 --> 01:17:22,000

online through blogs and sharing sites

2040

01:17:25,590 --> 01:17:24,080

than traditional media

2041

01:17:27,590 --> 01:17:25,600

the internet however becomes an

2042

01:17:30,470 --> 01:17:27,600

overwhelming

2043

01:17:32,470 --> 01:17:30,480

in quantity and abundance visitors

2044

01:17:35,350 --> 01:17:32,480

develop filters or act more selectively

2045

01:17:36,950 --> 01:17:35,360

to manage the information deluge which

2046

01:17:39,350 --> 01:17:36,960

also results

2047

01:17:41,350 --> 01:17:39,360

narrows

2048

01:17:42,950 --> 01:17:41,360

what they access based on their active

2049

01:17:45,110 --> 01:17:42,960

interests

2050

01:17:46,870 --> 01:17:45,120

in other words interested audiences may

2051
01:17:48,790 --> 01:17:46,880
seek information only about their

2052
01:17:50,470 --> 01:17:48,800
particular interests and not the wider

2053
01:17:52,630 --> 01:17:50,480
world web

2054
01:17:54,630 --> 01:17:52,640
it becomes significantly harder to gauge

2055
01:17:56,630 --> 01:17:54,640
public enthusiasm for planetary

2056
01:17:58,790 --> 01:17:56,640
exploration

2057
01:18:00,709 --> 01:17:58,800
when a handful of published editorials

2058
01:18:02,070 --> 01:18:00,719
used to stimulate and indicate

2059
01:18:04,630 --> 01:18:02,080
conversation about a relevant

2060
01:18:06,870 --> 01:18:04,640
contemporary topic and now the entire

2061
01:18:09,350 --> 01:18:06,880
internet has thousands upon thousands of

2062
01:18:11,750 --> 01:18:09,360
opinions and topics

2063
01:18:13,590 --> 01:18:11,760

despite these issues the web remains

2064

01:18:16,630 --> 01:18:13,600

essential as a direct method to

2065

01:18:18,870 --> 01:18:16,640

disseminate information and science news

2066

01:18:21,110 --> 01:18:18,880

remains strong on the web although its

2067

01:18:23,669 --> 01:18:21,120

sources for the public have deviated

2068

01:18:38,070 --> 01:18:23,679

greatly from the comfortable definition

2069

01:18:43,030 --> 01:18:38,830

we have

2070

01:18:50,229 --> 01:18:43,040

questions for this perfectly timed talk

2071

01:18:53,270 --> 01:18:51,669

but you mentioned

2072

01:18:54,630 --> 01:18:53,280

digital publication and the use of

2073

01:18:57,590 --> 01:18:54,640

websites so

2074

01:19:00,390 --> 01:18:57,600

from my insight is inside jpl's media

2075

01:19:03,030 --> 01:19:00,400

relations and so forth is that there's

2076

01:19:05,669 --> 01:19:03,040

there's now perceived attention between

2077

01:19:08,470 --> 01:19:05,679

traditional media and our use of web

2078

01:19:11,030 --> 01:19:08,480

publication is the same time is that we

2079

01:19:12,709 --> 01:19:11,040

nasa jpl want to market itself ourselves

2080

01:19:13,910 --> 01:19:12,719

to traditional media at the same time

2081

01:19:15,830 --> 01:19:13,920

we're also trying to sell ourselves

2082

01:19:16,630 --> 01:19:15,840

directly to the public

2083

01:19:19,030 --> 01:19:16,640

and

2084

01:19:20,630 --> 01:19:19,040

sometimes from the outside

2085

01:19:29,750 --> 01:19:20,640

perspective those two things are seem to

2086

01:19:34,070 --> 01:19:31,590

then you don't need to answer it

2087

01:19:35,669 --> 01:19:34,080

jeff hi jeff thousands face review uh

2088

01:19:37,830 --> 01:19:35,679

it's very interesting presentation i

2089

01:19:39,510 --> 01:19:37,840

wanted to expand upon or maybe maybe

2090

01:19:41,510 --> 01:19:39,520

even challenge a little bit one of your

2091

01:19:42,870 --> 01:19:41,520

premises towards the very end about

2092

01:19:44,470 --> 01:19:42,880

gauging public interest and the

2093

01:19:46,149 --> 01:19:44,480

challenge of trying to gauge public

2094

01:19:48,149 --> 01:19:46,159

interest now in this fractured media

2095

01:19:50,070 --> 01:19:48,159

environment it seems in some respect it

2096

01:19:51,750 --> 01:19:50,080

might actually be easier to track public

2097

01:19:53,270 --> 01:19:51,760

interest because you now know how many

2098

01:19:54,870 --> 01:19:53,280

people you know how many hits are on a

2099

01:19:56,950 --> 01:19:54,880

website

2100

01:19:58,390 --> 01:19:56,960

you know nasa can provide lots of

2101
01:19:59,590 --> 01:19:58,400
information about how many millions of

2102
01:20:01,990 --> 01:19:59,600
people viewed the web stream of the

2103
01:20:03,830 --> 01:20:02,000
curiosity mars landing for example

2104
01:20:05,430 --> 01:20:03,840
whereas you don't know how many people

2105
01:20:08,629 --> 01:20:05,440
read that editorial in the new york

2106
01:20:09,830 --> 01:20:08,639
times or the washington post uh about

2107
01:20:11,830 --> 01:20:09,840
promoting

2108
01:20:13,510 --> 01:20:11,840
or or taking a stand on space

2109
01:20:15,189 --> 01:20:13,520
exploration one way or another you spend

2110
01:20:18,149 --> 01:20:15,199
on that point a little bit on on the

2111
01:20:20,870 --> 01:20:18,159
challenges of of public perceptions and

2112
01:20:22,470 --> 01:20:20,880
engaging that level of interest

2113
01:20:25,430 --> 01:20:22,480

well i can answer that a little bit with

2114

01:20:27,750 --> 01:20:25,440

the challenges of engaging new media in

2115

01:20:30,790 --> 01:20:27,760

general when you say there are a lot of

2116

01:20:32,229 --> 01:20:30,800

statistics on web hits i could argue the

2117

01:20:33,990 --> 01:20:32,239

same thing about newspapers and

2118

01:20:36,709 --> 01:20:34,000

circulation numbers and subscription

2119

01:20:39,030 --> 01:20:36,719

numbers we may have these numbers but

2120

01:20:42,950 --> 01:20:39,040

they don't necessarily mean anything

2121

01:20:45,510 --> 01:20:42,960

unless you have a good way to

2122

01:20:48,629 --> 01:20:45,520

refine them down just because

2123

01:20:51,750 --> 01:20:48,639

the mars pathfinder website gained

2124

01:20:53,830 --> 01:20:51,760

400 million hits across the period of a

2125

01:20:57,990 --> 01:20:53,840

month well what do we measure that

2126
01:20:58,950 --> 01:20:58,000
against and hits tends to be sort of a

2127
01:21:00,950 --> 01:20:58,960
fuzzy

2128
01:21:03,350 --> 01:21:00,960
measuring tool

2129
01:21:06,550 --> 01:21:03,360
we now know that hits can mean

2130
01:21:09,110 --> 01:21:06,560
every time a person came to a website

2131
01:21:11,750 --> 01:21:09,120
other people will instead say unique

2132
01:21:15,750 --> 01:21:11,760
visitors as an indication of how many

2133
01:21:17,590 --> 01:21:15,760
individual people came to the website

2134
01:21:19,189 --> 01:21:17,600
we also don't

2135
01:21:21,990 --> 01:21:19,199
necessarily

2136
01:21:23,110 --> 01:21:22,000
have that kind of information available

2137
01:21:24,950 --> 01:21:23,120
so

2138
01:21:26,390 --> 01:21:24,960

in a way when i say

2139

01:21:28,790 --> 01:21:26,400

it's difficult to

2140

01:21:30,629 --> 01:21:28,800

take these numbers how do you aggregate

2141

01:21:33,350 --> 01:21:30,639

these numbers how do you take the

2142

01:21:35,750 --> 01:21:33,360

numbers from cnn from space daily from

2143

01:21:37,830 --> 01:21:35,760

your website and how do you know how

2144

01:21:39,910 --> 01:21:37,840

many of these people are the same people

2145

01:21:41,830 --> 01:21:39,920

how many of them are different people

2146

01:21:43,750 --> 01:21:41,840

and like some of the other presentations

2147

01:21:46,790 --> 01:21:43,760

we've heard this session

2148

01:21:49,110 --> 01:21:46,800

if there is so much interest how has it

2149

01:21:50,629 --> 01:21:49,120

not translated to some sort of public

2150

01:21:54,229 --> 01:21:50,639

policy boost

2151
01:21:56,870 --> 01:21:54,239
for planetary exploration

2152
01:21:58,470 --> 01:21:56,880
good good points all thanks

2153
01:22:01,110 --> 01:21:58,480
yeah i wanted to

2154
01:22:03,990 --> 01:22:01,120
john what more i wanted to touch on uh a

2155
01:22:05,669 --> 01:22:04,000
related angle and that is uh you know

2156
01:22:07,510 --> 01:22:05,679
when 100 million people look at

2157
01:22:09,750 --> 01:22:07,520
something on the web those are people

2158
01:22:12,390 --> 01:22:09,760
that were interested in the subject and

2159
01:22:14,229 --> 01:22:12,400
actively looking for it but what about

2160
01:22:15,189 --> 01:22:14,239
the 200 million people

2161
01:22:17,350 --> 01:22:15,199
that

2162
01:22:19,189 --> 01:22:17,360
won't see it at all because

2163
01:22:20,390 --> 01:22:19,199

they don't see it in the newspaper where

2164

01:22:22,470 --> 01:22:20,400

you used to

2165

01:22:25,030 --> 01:22:22,480

accidentally run into it and they didn't

2166

01:22:26,709 --> 01:22:25,040

actively seek it on the web and so how

2167

01:22:28,950 --> 01:22:26,719

do you get

2168

01:22:30,310 --> 01:22:28,960

so you you may be getting a better way

2169

01:22:32,470 --> 01:22:30,320

to reach the people that are already

2170

01:22:34,790 --> 01:22:32,480

interested in space but completely

2171

01:22:37,030 --> 01:22:34,800

missing the general public that doesn't

2172

01:22:38,629 --> 01:22:37,040

have that interest already uh any

2173

01:22:39,910 --> 01:22:38,639

thoughts on that

2174

01:22:41,350 --> 01:22:39,920

well that was pretty much the point i

2175

01:22:44,550 --> 01:22:41,360

was trying to make at the very end of my

2176
01:22:47,669 --> 01:22:44,560
conclusion just because there are direct

2177
01:22:49,350 --> 01:22:47,679
methods for jpl and missions to reach

2178
01:22:51,430 --> 01:22:49,360
the public whether it's through

2179
01:22:53,510 --> 01:22:51,440
newsletters or websites or educational

2180
01:22:56,070 --> 01:22:53,520
material

2181
01:22:57,830 --> 01:22:56,080
how do you count those people and how do

2182
01:23:00,390 --> 01:22:57,840
you know if those people are the same

2183
01:23:01,669 --> 01:23:00,400
ones that will devour space daily every

2184
01:23:02,790 --> 01:23:01,679
day anyway

2185
01:23:04,310 --> 01:23:02,800
or

2186
01:23:07,110 --> 01:23:04,320
is it actually

2187
01:23:09,189 --> 01:23:07,120
a child that has never known anything

2188
01:23:11,189 --> 01:23:09,199

about space and is now really starting

2189

01:23:13,830 --> 01:23:11,199

to get interested

2190

01:23:16,790 --> 01:23:13,840

with the web it's very difficult to know

2191

01:23:19,830 --> 01:23:16,800

who it is that's coming to your website

2192

01:23:22,629 --> 01:23:19,840

i mean the web can get some statistics

2193

01:23:24,390 --> 01:23:22,639

off your cookies or whatever but

2194

01:23:26,310 --> 01:23:24,400

generally they know

2195

01:23:28,470 --> 01:23:26,320

what computer you're using and where

2196

01:23:30,870 --> 01:23:28,480

you're coming from in the united states

2197

01:23:33,270 --> 01:23:30,880

or other countries maybe but they don't

2198

01:23:34,950 --> 01:23:33,280

actually know very much about you

2199

01:23:36,310 --> 01:23:34,960

whether you're male or female whether

2200

01:23:39,030 --> 01:23:36,320

you're in the space

2201
01:23:41,110 --> 01:23:39,040
industry or you're just a random member

2202
01:23:42,070 --> 01:23:41,120
of the general public

2203
01:23:44,470 --> 01:23:42,080
so

2204
01:23:46,470 --> 01:23:44,480
that is the difficulty with determining

2205
01:23:49,110 --> 01:23:46,480
audience anymore how do you reach the

2206
01:23:50,310 --> 01:23:49,120
people that you know hasn't seen this

2207
01:23:52,390 --> 01:23:50,320
before

2208
01:23:53,830 --> 01:23:52,400
versus the audience that you know is

2209
01:23:55,990 --> 01:23:53,840
definitely interested because they're

2210
01:23:57,750 --> 01:23:56,000
subscribing to your newsletters now and

2211
01:24:00,629 --> 01:23:57,760
they're coming to your websites during

2212
01:24:04,790 --> 01:24:03,030
i'm going to ask you guys to stay keep

2213
01:24:06,310 --> 01:24:04,800

standing because we're going to have a

2214

01:24:07,590 --> 01:24:06,320

panel discussion now but stay with there

2215

01:24:09,910 --> 01:24:07,600

you'll get a chance and also i know

2216

01:24:11,830 --> 01:24:09,920

lindley had a question about asteroids

2217

01:24:14,629 --> 01:24:11,840

so i want to invite my panelists to come

2218

01:24:17,430 --> 01:24:14,639

up and to have a seat

2219

01:24:19,590 --> 01:24:17,440

don't i do want to bring another voice

2220

01:24:22,390 --> 01:24:19,600

to this discussion though because we've

2221

01:24:24,550 --> 01:24:22,400

been talking about public perceptions

2222

01:24:26,550 --> 01:24:24,560

and we have been talking about our

2223

01:24:29,189 --> 01:24:26,560

perceptions of the public

2224

01:24:31,030 --> 01:24:29,199

but the public isn't really here

2225

01:24:33,350 --> 01:24:31,040

we're all people who are involved

2226

01:24:34,870 --> 01:24:33,360

somehow and i wanted to share with you

2227

01:24:37,270 --> 01:24:34,880

an actual

2228

01:24:39,270 --> 01:24:37,280

statement from somebody from the public

2229

01:24:41,270 --> 01:24:39,280

which is short

2230

01:24:42,870 --> 01:24:41,280

it was written after the curiosity

2231

01:24:45,590 --> 01:24:42,880

landing and it was sent to president

2232

01:24:47,430 --> 01:24:45,600

obama who sent it to jim green

2233

01:24:49,430 --> 01:24:47,440

who then shared it with me and i

2234

01:24:51,590 --> 01:24:49,440

contacted this young person and said can

2235

01:24:52,629 --> 01:24:51,600

i share with this group because we're

2236

01:24:53,750 --> 01:24:52,639

going to be talking about public

2237

01:24:56,310 --> 01:24:53,760

perceptions

2238

01:24:57,510 --> 01:24:56,320

of nasa so i want to read this to you so

2239

01:25:00,149 --> 01:24:57,520

that you hear

2240

01:25:03,110 --> 01:25:00,159

the current public's voice this is not

2241

01:25:05,030 --> 01:25:03,120

ancient history or like us

2242

01:25:06,709 --> 01:25:05,040

but this is current all right this is a

2243

01:25:10,070 --> 01:25:06,719

young man

2244

01:25:12,470 --> 01:25:10,080

and um he says dear president obama

2245

01:25:14,870 --> 01:25:12,480

i just wanted to let you know how much

2246

01:25:16,310 --> 01:25:14,880

curiosity successful landing on mars

2247

01:25:18,950 --> 01:25:16,320

means to me

2248

01:25:21,750 --> 01:25:18,960

the fact that any organization in the

2249

01:25:24,629 --> 01:25:21,760

world could send a one-ton mobile

2250

01:25:27,830 --> 01:25:24,639

research platform to mars and land it

2251
01:25:29,750 --> 01:25:27,840
safely much less using a hovering rocket

2252
01:25:32,790 --> 01:25:29,760
propelled sky crane

2253
01:25:35,430 --> 01:25:32,800
is a triumph of human intelligence

2254
01:25:37,750 --> 01:25:35,440
civilization and cooperation

2255
01:25:39,430 --> 01:25:37,760
the fact that it was our national

2256
01:25:41,189 --> 01:25:39,440
aeronautics and space administration

2257
01:25:43,750 --> 01:25:41,199
makes me more proud to be an american

2258
01:25:45,750 --> 01:25:43,760
than anything has in a long time

2259
01:25:48,310 --> 01:25:45,760
what truly inspires me about this

2260
01:25:50,470 --> 01:25:48,320
mission however is not the flawless

2261
01:25:52,629 --> 01:25:50,480
success the nasa scientists and

2262
01:25:55,270 --> 01:25:52,639
engineers achieved last night

2263
01:25:57,030 --> 01:25:55,280

or the staggering technological advances

2264

01:25:58,790 --> 01:25:57,040

that have been fueled by similar

2265

01:25:59,910 --> 01:25:58,800

exploration

2266

01:26:03,510 --> 01:25:59,920

rather

2267

01:26:06,070 --> 01:26:03,520

it is the unbridled joy and the unity i

2268

01:26:08,470 --> 01:26:06,080

have seen on the faces of the crying

2269

01:26:11,189 --> 01:26:08,480

hugging members of mission control

2270

01:26:13,590 --> 01:26:11,199

in countless celebratory internet posts

2271

01:26:14,870 --> 01:26:13,600

and an excited conversation with people

2272

01:26:18,790 --> 01:26:14,880

this morning

2273

01:26:20,629 --> 01:26:18,800

i am 20 years old and the only times i

2274

01:26:23,030 --> 01:26:20,639

can remember feeling as close to my

2275

01:26:26,070 --> 01:26:23,040

fellow americans as i do now have been

2276

01:26:28,870 --> 01:26:26,080

during national tragedies

2277

01:26:31,270 --> 01:26:28,880

the unifying effect of scientific

2278

01:26:34,470 --> 01:26:31,280

expeditions like the curiosity and the

2279

01:26:36,790 --> 01:26:34,480

apollo landings is incredibly powerful

2280

01:26:39,430 --> 01:26:36,800

all the more so because it is born out

2281

01:26:40,950 --> 01:26:39,440

of triumphant national success rather

2282

01:26:43,990 --> 01:26:40,960

than sorrow

2283

01:26:45,350 --> 01:26:44,000

please continue to fund nasa and its

2284

01:26:48,070 --> 01:26:45,360

expeditions

2285

01:26:50,709 --> 01:26:48,080

in so many ways we lift ourselves up

2286

01:26:54,070 --> 01:26:50,719

when we shoot for the stars sincerely

2287

01:26:57,830 --> 01:26:56,310

beyond the nationalism in the statement

2288

01:27:01,510 --> 01:26:57,840

which is laudable

2289

01:27:02,870 --> 01:27:01,520

i think it touches on the unif unifying

2290

01:27:04,790 --> 01:27:02,880

themes that this brings to all of

2291

01:27:07,189 --> 01:27:04,800

humanity

2292

01:27:09,189 --> 01:27:07,199

like apollo did that wasn't just the us

2293

01:27:11,110 --> 01:27:09,199

although it was but people around the

2294

01:27:12,790 --> 01:27:11,120

world were looking at the moon and

2295

01:27:15,030 --> 01:27:12,800

knowing that humans were walking on the

2296

01:27:17,270 --> 01:27:15,040

moon people around the world were

2297

01:27:20,229 --> 01:27:17,280

looking at mars when we were landing on

2298

01:27:22,470 --> 01:27:20,239

mars and i i think that that that is an

2299

01:27:24,550 --> 01:27:22,480

aspect that we need to keep in mind

2300

01:27:26,149 --> 01:27:24,560

that's what touches people

2301

01:27:28,310 --> 01:27:26,159

we're talking about people here and if

2302

01:27:29,669 --> 01:27:28,320

you noticed on her word clouds

2303

01:27:31,590 --> 01:27:29,679

scientists

2304

01:27:33,030 --> 01:27:31,600

appeared a lot and i think it's because

2305

01:27:35,830 --> 01:27:33,040

it's people

2306

01:27:37,430 --> 01:27:35,840

so you know we're we're at a turning

2307

01:27:40,390 --> 01:27:37,440

point here

2308

01:27:41,990 --> 01:27:40,400

for planetary exploration

2309

01:27:45,030 --> 01:27:42,000

we've been at turning points in the past

2310

01:27:47,669 --> 01:27:45,040

as we heard from john logsdon and others

2311

01:27:48,790 --> 01:27:47,679

nevertheless we are at a turning point

2312

01:27:52,229 --> 01:27:48,800

right now

2313

01:27:53,830 --> 01:27:52,239

and we we know from letters like this

2314

01:27:55,910 --> 01:27:53,840

that the public

2315

01:27:59,590 --> 01:27:55,920

the public perceives planetary

2316

01:28:01,750 --> 01:27:59,600

exploration as a priority for nasa it's

2317

01:28:04,229 --> 01:28:01,760

question in my mind whether nasa

2318

01:28:07,189 --> 01:28:04,239

perceives planetary exploration as a

2319

01:28:09,189 --> 01:28:07,199

priority for nasa we have a choice

2320

01:28:10,790 --> 01:28:09,199

whether or not we can have another 50

2321

01:28:12,950 --> 01:28:10,800

fabulous years

2322

01:28:15,110 --> 01:28:12,960

doing amazing planetary exploration or

2323

01:28:17,430 --> 01:28:15,120

whether we will retreat to being monkeys

2324

01:28:18,950 --> 01:28:17,440

in a dark box

2325

01:28:23,430 --> 01:28:18,960

and with that we're going to open this

2326

01:28:28,390 --> 01:28:25,110

hello i'm actually going to slide this

2327

01:28:30,470 --> 01:28:28,400

because i can't see any of you hi

2328

01:28:32,709 --> 01:28:30,480

um this is just more of a follow-up to

2329

01:28:34,070 --> 01:28:32,719

the social media and i just wanted to

2330

01:28:35,990 --> 01:28:34,080

follow up on the person who asked the

2331

01:28:37,669 --> 01:28:36,000

question about

2332

01:28:39,030 --> 01:28:37,679

tracking in

2333

01:28:40,950 --> 01:28:39,040

in a digital age so i work in digital

2334

01:28:44,709 --> 01:28:40,960

media at national geographic

2335

01:28:47,030 --> 01:28:44,719

and i i would argue that it's incredibly

2336

01:28:49,669 --> 01:28:47,040

it's so much easier to track impact now

2337

01:28:51,110 --> 01:28:49,679

and meaning than it was back when you

2338

01:28:52,870 --> 01:28:51,120

just had a one-way communication you

2339

01:28:54,310 --> 01:28:52,880

don't know the impact i think it's it's

2340

01:28:56,629 --> 01:28:54,320

very difficult to track the impact of

2341

01:28:58,390 --> 01:28:56,639

journalism generally on the public

2342

01:29:00,629 --> 01:28:58,400

um just last night we had bill nye the

2343

01:29:02,790 --> 01:29:00,639

science guy hosting an event at national

2344

01:29:04,790 --> 01:29:02,800

geographic and uh for all intents and

2345

01:29:07,030 --> 01:29:04,800

purposes you would think he's like not

2346

01:29:08,629 --> 01:29:07,040

relevant to more recent generations but

2347

01:29:10,070 --> 01:29:08,639

how many people stood up in the audience

2348

01:29:11,750 --> 01:29:10,080

and said you changed my life you're the

2349

01:29:13,110 --> 01:29:11,760

reason i'm in science you're the reason

2350

01:29:14,950 --> 01:29:13,120

i'm an engineer right now you're the

2351

01:29:16,870 --> 01:29:14,960

reason i'm you know studying what i'm

2352

01:29:19,030 --> 01:29:16,880

studying or just tonight you've changed

2353

01:29:21,189 --> 01:29:19,040

my mind to go study something else and

2354

01:29:22,950 --> 01:29:21,199

and you know public figures like him and

2355

01:29:25,030 --> 01:29:22,960

journalism will never know how many

2356

01:29:27,270 --> 01:29:25,040

people those stories inspired i remember

2357

01:29:28,870 --> 01:29:27,280

voyager being covered in every like it

2358

01:29:30,950 --> 01:29:28,880

might not have been one story i read but

2359

01:29:31,910 --> 01:29:30,960

the collective impact of voyager had an

2360

01:29:33,430 --> 01:29:31,920

impact

2361

01:29:35,030 --> 01:29:33,440

and that's very hard to measure but in

2362

01:29:36,709 --> 01:29:35,040

social we can actually measure that

2363

01:29:38,310 --> 01:29:36,719

engagement now we know how many people

2364

01:29:39,910 --> 01:29:38,320

are talking about it who are commenting

2365

01:29:42,229 --> 01:29:39,920

on it who are sharing it we know the

2366

01:29:43,910 --> 01:29:42,239

extended impact of that we can track

2367

01:29:46,550 --> 01:29:43,920

with social flow the whole like we have

2368

01:29:48,550 --> 01:29:46,560

this unbelievable almost too much

2369

01:29:50,310 --> 01:29:48,560

information about how much engagement

2370

01:29:51,990 --> 01:29:50,320

and sharing is happening so i was just

2371

01:29:53,830 --> 01:29:52,000

here i would bring that in and and

2372

01:29:55,030 --> 01:29:53,840

factor it in more as a commentary

2373

01:29:56,870 --> 01:29:55,040

because i do think the tools are out

2374

01:29:58,470 --> 01:29:56,880

there we do know demographics we do know

2375

01:30:00,070 --> 01:29:58,480

exactly where everybody lives so that's

2376

01:30:01,830 --> 01:30:00,080

great thank you

2377

01:30:03,669 --> 01:30:01,840

i will comment a little bit about that

2378

01:30:05,590 --> 01:30:03,679

and that's the

2379

01:30:08,070 --> 01:30:05,600

fact that i am kind of looking

2380

01:30:11,189 --> 01:30:08,080

retroactively at historical events

2381

01:30:12,790 --> 01:30:11,199

despite the fact that 2004 was not that

2382

01:30:14,950 --> 01:30:12,800

far back into history

2383

01:30:17,750 --> 01:30:14,960

so right now yeah i can look at google

2384

01:30:19,189 --> 01:30:17,760

trends and other tools that tell me lots

2385

01:30:20,390 --> 01:30:19,199

of things about what people are

2386

01:30:21,830 --> 01:30:20,400

searching for

2387

01:30:24,870 --> 01:30:21,840

and that's great

2388

01:30:26,390 --> 01:30:24,880

but i can't go back to even 2004 and

2389

01:30:28,390 --> 01:30:26,400

necessarily pull up the same kind of

2390

01:30:30,950 --> 01:30:28,400

data and that's what i mean by it's

2391

01:30:33,030 --> 01:30:30,960

really difficult to determine audience

2392

01:30:34,709 --> 01:30:33,040

and as a historian

2393

01:30:37,030 --> 01:30:34,719

i will probably always have this

2394

01:30:38,870 --> 01:30:37,040

question unless i kind of look forward

2395

01:30:41,669 --> 01:30:38,880

in the future and start

2396

01:30:42,470 --> 01:30:41,679

storing away this stuff

2397

01:30:44,310 --> 01:30:42,480

so

2398

01:30:47,030 --> 01:30:44,320

it's just a clarification of what i mean

2399

01:30:49,990 --> 01:30:47,040

by the difficulty in it right

2400

01:30:52,310 --> 01:30:50,000

i wanted to offer a tangible example of

2401
01:30:54,790 --> 01:30:52,320
something that susan poulton just said

2402
01:30:57,590 --> 01:30:54,800
from the national geographic uh from my

2403
01:30:59,830 --> 01:30:57,600
own recent experience of understanding

2404
01:31:01,750 --> 01:30:59,840
the impact of the social media the week

2405
01:31:03,189 --> 01:31:01,760
after curiosity landed i just happened

2406
01:31:05,430 --> 01:31:03,199
to be here in town having dinner with

2407
01:31:07,189 --> 01:31:05,440
susan and we were talking about the uh

2408
01:31:09,030 --> 01:31:07,199
about the events over at nat geo which

2409
01:31:12,229 --> 01:31:09,040
we had last night susan is the vice

2410
01:31:14,550 --> 01:31:12,239
president for the digital media division

2411
01:31:17,110 --> 01:31:14,560
of uh national geographic so she knows a

2412
01:31:19,590 --> 01:31:17,120
lot about this stuff and over the course

2413
01:31:21,910 --> 01:31:19,600

of dinner uh she said hey by the way

2414

01:31:23,510 --> 01:31:21,920

have you seen this latest youtube thing

2415

01:31:24,790 --> 01:31:23,520

that just came out today and she pulls

2416

01:31:27,510 --> 01:31:24,800

out her iphone

2417

01:31:29,030 --> 01:31:27,520

and she fires it up and it's where nasa

2418

01:31:31,590 --> 01:31:29,040

and we know it

2419

01:31:33,910 --> 01:31:31,600

it had 382 hits and i suspect most of

2420

01:31:36,550 --> 01:31:33,920

you have seen it by this time the next

2421

01:31:38,470 --> 01:31:36,560

morning i wake up in my hotel room and i

2422

01:31:40,070 --> 01:31:38,480

said geez i got to go get that link and

2423

01:31:42,310 --> 01:31:40,080

see what that and see it again you know

2424

01:31:44,229 --> 01:31:42,320

now that i'm awake and sober and such

2425

01:31:45,990 --> 01:31:44,239

and by that time it was already up to

2426

01:31:47,350 --> 01:31:46,000
300 000.

2427

01:31:49,750 --> 01:31:47,360
and i don't know what it is at this

2428

01:31:51,910 --> 01:31:49,760
point but i mean things like that that

2429

01:31:53,910 --> 01:31:51,920
we do that are so exciting that can

2430

01:31:54,870 --> 01:31:53,920
capture people's imagination can go

2431

01:31:57,350 --> 01:31:54,880
viral

2432

01:31:59,189 --> 01:31:57,360
and as susan had told me

2433

01:32:00,390 --> 01:31:59,199
the key to making this happen is just

2434

01:32:02,629 --> 01:32:00,400
get the stuff out there get the

2435

01:32:04,709 --> 01:32:02,639
information out there let people let the

2436

01:32:06,310 --> 01:32:04,719
people out there in the country take it

2437

01:32:11,350 --> 01:32:06,320
and run with it that's great thank you

2438

01:32:14,629 --> 01:32:12,790

hi janet for testing princeton

2439

01:32:17,189 --> 01:32:14,639

university um that's great you

2440

01:32:18,870 --> 01:32:17,199

discovered nasa and we know it uh that

2441

01:32:20,709 --> 01:32:18,880

link has been out there for a good six

2442

01:32:22,550 --> 01:32:20,719

months so so it may be that you're

2443

01:32:24,070 --> 01:32:22,560

seeing different versions as someone who

2444

01:32:26,149 --> 01:32:24,080

works in human computer interaction and

2445

01:32:27,669 --> 01:32:26,159

publishes in that domain i'd also like

2446

01:32:29,669 --> 01:32:27,679

to make it clear that there's different

2447

01:32:30,709 --> 01:32:29,679

versions of tweeting and retweeting we

2448

01:32:32,709 --> 01:32:30,719

all know the difference between

2449

01:32:34,790 --> 01:32:32,719

different kinds of friends and it's that

2450

01:32:36,070 --> 01:32:34,800

qualitative assessment of what it is

2451

01:32:37,830 --> 01:32:36,080

people are doing with digital material

2452

01:32:38,870 --> 01:32:37,840

that i think is also i'm really glad you

2453

01:32:40,470 --> 01:32:38,880

pointed that out because i think that's

2454

01:32:42,470 --> 01:32:40,480

very tricky to get at despite the

2455

01:32:44,310 --> 01:32:42,480

numbers of counts one can get it's very

2456

01:32:45,990 --> 01:32:44,320

different the qualitative experience but

2457

01:32:47,910 --> 01:32:46,000

that leads into my question which has to

2458

01:32:50,229 --> 01:32:47,920

do with the construction of various

2459

01:32:52,629 --> 01:32:50,239

publics and there's something about the

2460

01:32:54,149 --> 01:32:52,639

use of the monolithic term public

2461

01:32:56,709 --> 01:32:54,159

again that is a facing the fact that

2462

01:32:58,709 --> 01:32:56,719

these media and these personages whether

2463

01:33:01,030 --> 01:32:58,719

they're uh whether you're making a film

2464

01:33:03,270 --> 01:33:01,040

or whether you're uh um

2465

01:33:05,590 --> 01:33:03,280

or whether you're a reporter that you're

2466

01:33:07,110 --> 01:33:05,600

not just seamlessly reporting or

2467

01:33:09,030 --> 01:33:07,120

seamlessly producing something but

2468

01:33:11,350 --> 01:33:09,040

you're also producing a particular

2469

01:33:13,270 --> 01:33:11,360

public and a particular audience and i'd

2470

01:33:15,430 --> 01:33:13,280

really like to know a little more about

2471

01:33:16,790 --> 01:33:15,440

the fine distinctions between you know

2472

01:33:17,750 --> 01:33:16,800

if you're writing for the new york times

2473

01:33:19,030 --> 01:33:17,760

it's very different than if you're

2474

01:33:20,709 --> 01:33:19,040

writing for

2475

01:33:21,669 --> 01:33:20,719

science science daily it's very

2476

01:33:22,870 --> 01:33:21,679

different than the big spreads on

2477

01:33:25,270 --> 01:33:22,880

voyager that i remember seeing a

2478

01:33:26,790 --> 01:33:25,280

national geographic when i was a child

2479

01:33:27,990 --> 01:33:26,800

if you're producing you know documentary

2480

01:33:29,990 --> 01:33:28,000

films it's very different than if you're

2481

01:33:30,950 --> 01:33:30,000

producing deep impact et cetera so i

2482

01:33:33,030 --> 01:33:30,960

really like to know a little bit more

2483

01:33:34,310 --> 01:33:33,040

about the fine grain distinctions in

2484

01:33:36,229 --> 01:33:34,320

publix

2485

01:33:37,669 --> 01:33:36,239

that nasa is speaking to and the variety

2486

01:33:39,750 --> 01:33:37,679

of different media that they're using to

2487

01:33:41,590 --> 01:33:39,760

do that

2488

01:33:43,990 --> 01:33:41,600

thank you for that because it's actually

2489

01:33:46,229 --> 01:33:44,000

far more detail that i would go into in

2490

01:33:47,590 --> 01:33:46,239

the paper but wouldn't be able to do in

2491

01:33:51,030 --> 01:33:47,600

the presentation

2492

01:33:53,510 --> 01:33:51,040

and i try to meet that challenge by

2493

01:33:56,070 --> 01:33:53,520

trying to go across a variety of major

2494

01:33:57,510 --> 01:33:56,080

national papers so today i think i

2495

01:33:59,750 --> 01:33:57,520

talked about the washington post and new

2496

01:34:01,990 --> 01:33:59,760

york times in the la times

2497

01:34:04,550 --> 01:34:02,000

i took a variety of more papers than

2498

01:34:05,830 --> 01:34:04,560

that to try to get more of an aggregate

2499

01:34:07,830 --> 01:34:05,840

sample

2500

01:34:10,229 --> 01:34:07,840

with different kinds of audiences and i

2501
01:34:11,990 --> 01:34:10,239
recognize that a newspaper reading

2502
01:34:14,470 --> 01:34:12,000
audience is

2503
01:34:16,310 --> 01:34:14,480
often a somewhat more educated audience

2504
01:34:17,910 --> 01:34:16,320
who wants to pay attention to what's

2505
01:34:18,629 --> 01:34:17,920
happening in the news

2506
01:34:21,510 --> 01:34:18,639
so

2507
01:34:24,550 --> 01:34:21,520
in of itself i've limited the public to

2508
01:34:26,390 --> 01:34:24,560
that particular segment that is either

2509
01:34:28,470 --> 01:34:26,400
reading the paper or watching the

2510
01:34:30,950 --> 01:34:28,480
nightly news which is actually most of

2511
01:34:32,709 --> 01:34:30,960
the hits that i get for even voyager

2512
01:34:35,510 --> 01:34:32,719
coverage it's the evening news from the

2513
01:34:38,870 --> 01:34:35,520

three major networks

2514

01:34:43,109 --> 01:34:40,950

there's also things like the magazines

2515

01:34:45,030 --> 01:34:43,119

you mentioned like national geographic i

2516

01:34:46,310 --> 01:34:45,040

can look in newsweek which is definitely

2517

01:34:48,390 --> 01:34:46,320

a different audience than national

2518

01:34:50,310 --> 01:34:48,400

geographic

2519

01:34:52,790 --> 01:34:50,320

i actually do tend to stay away from the

2520

01:34:54,310 --> 01:34:52,800

more specialized publications like

2521

01:34:57,030 --> 01:34:54,320

aviation week

2522

01:34:59,510 --> 01:34:57,040

because i know that that audience is

2523

01:35:00,950 --> 01:34:59,520

very self-selected in wanting to see

2524

01:35:04,310 --> 01:35:00,960

that news

2525

01:35:05,189 --> 01:35:04,320

so i've even looked at

2526

01:35:07,990 --> 01:35:05,199

kind of

2527

01:35:11,109 --> 01:35:08,000

not so great newspapers like usa today

2528

01:35:13,270 --> 01:35:11,119

to see if they do mention

2529

01:35:16,149 --> 01:35:13,280

these missions at all because it's a

2530

01:35:18,709 --> 01:35:16,159

great source that's a quick easy read

2531

01:35:20,229 --> 01:35:18,719

and it's found in hotels all around the

2532

01:35:21,990 --> 01:35:20,239

united states

2533

01:35:24,149 --> 01:35:22,000

so

2534

01:35:26,310 --> 01:35:24,159

i do kind of toss around the public in

2535

01:35:28,629 --> 01:35:26,320

my presentation a lot without making

2536

01:35:29,669 --> 01:35:28,639

this specification

2537

01:35:35,590 --> 01:35:29,679

that

2538

01:35:38,550 --> 01:35:35,600

to keep up on national news and chooses

2539

01:35:40,070 --> 01:35:38,560

to keep themselves informed

2540

01:35:41,669 --> 01:35:40,080

to answer your question more generally i

2541

01:35:43,430 --> 01:35:41,679

think nasa is very aware of the

2542

01:35:45,990 --> 01:35:43,440

different audiences that are out there

2543

01:35:48,470 --> 01:35:46,000

and they do track things like usa today

2544

01:35:50,149 --> 01:35:48,480

public news and the new york that we're

2545

01:35:51,590 --> 01:35:50,159

working on the times square because they

2546

01:35:53,830 --> 01:35:51,600

know they're reaching a different

2547

01:35:56,390 --> 01:35:53,840

audience in times square than they would

2548

01:35:58,070 --> 01:35:56,400

in the new york times so they're very

2549

01:36:00,070 --> 01:35:58,080

aware of that and

2550

01:36:01,750 --> 01:36:00,080

that factors in let's keep going so we

2551
01:36:03,350 --> 01:36:01,760
get a few more questions in and i know

2552
01:36:05,350 --> 01:36:03,360
lindley you were very patient last time

2553
01:36:07,350 --> 01:36:05,360
so i'm calling you now that's okay

2554
01:36:10,870 --> 01:36:07,360
thanks so lonely johnson your local

2555
01:36:12,470 --> 01:36:10,880
planetary asteroid defense officer

2556
01:36:14,870 --> 01:36:12,480
the question is going to be for laura

2557
01:36:15,990 --> 01:36:14,880
but i also appreciate the thoughts of

2558
01:36:16,870 --> 01:36:16,000
the rest of you

2559
01:36:18,870 --> 01:36:16,880
lori

2560
01:36:20,790 --> 01:36:18,880
you pointed out that the public doesn't

2561
01:36:22,310 --> 01:36:20,800
seem to be worried about the about the

2562
01:36:25,030 --> 01:36:22,320
asteroid threat

2563
01:36:27,270 --> 01:36:25,040

and i like your thoughts and uh um

2564

01:36:30,390 --> 01:36:27,280

how much that perception might be

2565

01:36:32,790 --> 01:36:30,400

influenced uh by the storyline that you

2566

01:36:36,709 --> 01:36:32,800

you see in all these popular

2567

01:36:39,109 --> 01:36:36,719

movies and and fiction stories that uh

2568

01:36:41,350 --> 01:36:39,119

that uh as you pointed out the public

2569

01:36:43,430 --> 01:36:41,360

seems to think nasa has all this money

2570

01:36:46,470 --> 01:36:43,440

uh and we can do anything you know we

2571

01:36:48,070 --> 01:36:46,480

can land a 110 spacecraft on on on the

2572

01:36:50,709 --> 01:36:48,080

surface of mars

2573

01:36:53,109 --> 01:36:50,719

uh and the storyline always gets to a

2574

01:36:54,870 --> 01:36:53,119

happy ending you know that nasa might be

2575

01:36:56,229 --> 01:36:54,880

trials and tribulations but we always

2576

01:36:58,950 --> 01:36:56,239

save the day

2577

01:37:00,709 --> 01:36:58,960

and so how much do you think uh

2578

01:37:05,910 --> 01:37:00,719

public perception

2579

01:37:07,189 --> 01:37:05,920

uh always the happy ending to the to the

2580

01:37:09,350 --> 01:37:07,199

to the movie

2581

01:37:11,910 --> 01:37:09,360

well um it's it's a little bit more

2582

01:37:15,189 --> 01:37:11,920

complex than that in the sense that i i

2583

01:37:17,910 --> 01:37:15,199

i am using those examples to read public

2584

01:37:20,629 --> 01:37:17,920

perception so i don't think they are

2585

01:37:23,030 --> 01:37:20,639

driving public perception i think it's a

2586

01:37:24,950 --> 01:37:23,040

feedback loop where as an audience this

2587

01:37:27,830 --> 01:37:24,960

is what we expect and so that's what

2588

01:37:30,070 --> 01:37:27,840

hollywood gives us so um

2589

01:37:32,229 --> 01:37:30,080

you know i i think that

2590

01:37:34,310 --> 01:37:32,239

so so you think there's this expectation

2591

01:37:35,830 --> 01:37:34,320

on the public that nasa is going to be

2592

01:37:37,030 --> 01:37:35,840

there to save the day

2593

01:37:40,790 --> 01:37:37,040

oh yes

2594

01:37:42,629 --> 01:37:40,800

the nests of the things that nasa does

2595

01:37:44,629 --> 01:37:42,639

they're surprised every time you know

2596

01:37:47,030 --> 01:37:44,639

the general public that's not that

2597

01:37:48,870 --> 01:37:47,040

doesn't follow space all that well

2598

01:37:50,310 --> 01:37:48,880

that kind of segment on the public but i

2599

01:37:52,550 --> 01:37:50,320

think if they

2600

01:37:54,709 --> 01:37:52,560

knew that that threat was coming they

2601
01:37:57,669 --> 01:37:54,719
would think they would be pretty sure

2602
01:38:09,109 --> 01:37:57,679
they would bet that nasa would solve it

2603
01:38:13,189 --> 01:38:11,030
it's always an interesting bar a

2604
01:38:14,229 --> 01:38:13,199
conversation when i tell people what i

2605
01:38:15,189 --> 01:38:14,239
do and

2606
01:38:17,669 --> 01:38:15,199
and

2607
01:38:19,590 --> 01:38:17,679
they talk about uh you know well nasa's

2608
01:38:21,910 --> 01:38:19,600
you know obviously got the uh

2609
01:38:23,590 --> 01:38:21,920
wherewithal and the material to you know

2610
01:38:25,750 --> 01:38:23,600
to prevent this and

2611
01:38:27,270 --> 01:38:25,760
and uh uh it's always an interesting

2612
01:38:28,070 --> 01:38:27,280
perception from them when i tell them

2613
01:38:31,109 --> 01:38:28,080

that

2614

01:38:33,669 --> 01:38:31,119

no we really we really don't at best we

2615

01:38:35,350 --> 01:38:33,679

might be able to find them right now

2616

01:38:37,109 --> 01:38:35,360

i think though it's clear that um the

2617

01:38:39,189 --> 01:38:37,119

public perception is that nasa has a

2618

01:38:41,669 --> 01:38:39,199

whole lot of really smart people

2619

01:38:43,750 --> 01:38:41,679

and if they discover an asteroid coming

2620

01:38:45,590 --> 01:38:43,760

in that nasa would marshal its resources

2621

01:38:47,669 --> 01:38:45,600

and put all those real smart people on

2622

01:38:48,950 --> 01:38:47,679

on the subject and try to get something

2623

01:38:51,030 --> 01:38:48,960

done

2624

01:38:52,950 --> 01:38:51,040

and i talk about this a lot in public

2625

01:38:54,149 --> 01:38:52,960

lectures and um

2626

01:38:56,229 --> 01:38:54,159

you know even though one of your

2627

01:38:58,629 --> 01:38:56,239

conclusions was that education is not

2628

01:39:00,870 --> 01:38:58,639

the answer i think that was sort of what

2629

01:39:02,070 --> 01:39:00,880

you said i found that people honestly

2630

01:39:04,470 --> 01:39:02,080

don't know

2631

01:39:05,510 --> 01:39:04,480

about things like comet impacts asteroid

2632

01:39:07,109 --> 01:39:05,520

impacts

2633

01:39:08,870 --> 01:39:07,119

they get those little wake-up calls like

2634

01:39:11,590 --> 01:39:08,880

you said and then they kind of drift

2635

01:39:13,990 --> 01:39:11,600

back into complacency but i do want to

2636

01:39:15,510 --> 01:39:14,000

say that you know there were things that

2637

01:39:17,750 --> 01:39:15,520

were threats and i want to make this

2638

01:39:20,390 --> 01:39:17,760

analogy and maybe have you comment on it

2639

01:39:22,149 --> 01:39:20,400

um people didn't used to wear seat belts

2640

01:39:23,189 --> 01:39:22,159

ever like when i was a kid you know

2641

01:39:25,270 --> 01:39:23,199

throw all the kids in the back of the

2642

01:39:26,870 --> 01:39:25,280

car and drive off but now everybody

2643

01:39:29,030 --> 01:39:26,880

wears seat belts all right because we've

2644

01:39:31,669 --> 01:39:29,040

learned that it is important for saving

2645

01:39:34,149 --> 01:39:31,679

lives do you think there's an analogy

2646

01:39:35,830 --> 01:39:34,159

one once my conclusion was not that we

2647

01:39:38,070 --> 01:39:35,840

should stop the education effort please

2648

01:39:39,590 --> 01:39:38,080

please let me clarify that i think nasa

2649

01:39:41,270 --> 01:39:39,600

should continue to educate because we

2650

01:39:42,709 --> 01:39:41,280

have to because the learned society is a

2651
01:39:45,430 --> 01:39:42,719
worthy goal and you know we have to

2652
01:39:47,990 --> 01:39:45,440
continue that but i i what i meant to

2653
01:39:50,149 --> 01:39:48,000
say was that if the goal is to drive

2654
01:39:51,830 --> 01:39:50,159
public policy change

2655
01:39:54,070 --> 01:39:51,840
then you know you may find that

2656
01:39:55,669 --> 01:39:54,080
education may not lead you to that

2657
01:39:57,750 --> 01:39:55,679
education in and of itself will be a

2658
01:40:00,229 --> 01:39:57,760
worthy goal but maybe it won't lead to

2659
01:40:02,790 --> 01:40:00,239
the public policy change that you want

2660
01:40:04,550 --> 01:40:02,800
that that was the point um but also on

2661
01:40:06,950 --> 01:40:04,560
the thread again it's this very unique

2662
01:40:09,109 --> 01:40:06,960
thread it's not car collisions it's not

2663
01:40:11,270 --> 01:40:09,119

you will see accident we've all seen car

2664

01:40:14,470 --> 01:40:11,280

accidents we have not all seen

2665

01:40:16,950 --> 01:40:14,480

a really um big catastrophic asteroid

2666

01:40:18,550 --> 01:40:16,960

people had seen an asteroid but not not

2667

01:40:20,790 --> 01:40:18,560

you know not one that will scare you

2668

01:40:22,070 --> 01:40:20,800

don't connect the two yeah so you know

2669

01:40:23,830 --> 01:40:22,080

in the literature you will find that

2670

01:40:26,310 --> 01:40:23,840

scientists are very aware of you know

2671

01:40:28,070 --> 01:40:26,320

crying wolf and if they start

2672

01:40:29,510 --> 01:40:28,080

saying you know blowing up the threat

2673

01:40:31,590 --> 01:40:29,520

and saying that you know

2674

01:40:33,590 --> 01:40:31,600

comets and asteroids do impact the earth

2675

01:40:35,990 --> 01:40:33,600

every day and you know therefore a real

2676

01:40:37,590 --> 01:40:36,000

big impact can come at any moment um you

2677

01:40:39,430 --> 01:40:37,600

know they could be crying wolf and the

2678

01:40:41,270 --> 01:40:39,440

public may not like that because then

2679

01:40:43,430 --> 01:40:41,280

they will be proven wrong and and they

2680

01:40:45,350 --> 01:40:43,440

may not believe that message so it's

2681

01:40:47,189 --> 01:40:45,360

again it's also not saying that that

2682

01:40:48,950 --> 01:40:47,199

that effort should be discontinued but

2683

01:40:50,629 --> 01:40:48,960

it's that there's a challenge there and

2684

01:40:52,390 --> 01:40:50,639

that i don't think that just talking

2685

01:40:54,709 --> 01:40:52,400

about the issue and trying to explain it

2686

01:40:56,070 --> 01:40:54,719

the best way you can will solve that

2687

01:40:58,229 --> 01:40:56,080

yeah i just want to make sure i bring

2688

01:41:00,310 --> 01:40:58,239

linda in discussion by mentioning the

2689

01:41:02,550 --> 01:41:00,320

andromeda strain you know where we

2690

01:41:08,070 --> 01:41:02,560

combine the impacts and the microbes

2691

01:41:11,590 --> 01:41:09,510

there's a small

2692

01:41:13,590 --> 01:41:11,600

credible body of research and science

2693

01:41:16,390 --> 01:41:13,600

and risk communication that

2694

01:41:18,470 --> 01:41:16,400

explains how

2695

01:41:21,510 --> 01:41:18,480

informing and educating

2696

01:41:23,669 --> 01:41:21,520

non-expert audiences about

2697

01:41:26,629 --> 01:41:23,679

science and risk

2698

01:41:29,350 --> 01:41:26,639

may not have the effect that you desire

2699

01:41:32,229 --> 01:41:29,360

in other words the more informed that a

2700

01:41:34,070 --> 01:41:32,239

non-expert becomes about a scientific or

2701
01:41:35,430 --> 01:41:34,080
technological issue

2702
01:41:39,669 --> 01:41:35,440
that

2703
01:41:41,669 --> 01:41:39,679
is a potential hazard or risk

2704
01:41:43,109 --> 01:41:41,679
the more they may decide this is the

2705
01:41:45,430 --> 01:41:43,119
problem they don't want to deal with it

2706
01:41:47,830 --> 01:41:45,440
could go you know it could go either way

2707
01:41:49,669 --> 01:41:47,840
so my feeling personally as a scholar

2708
01:41:51,510 --> 01:41:49,679
and as a citizen i think that it's an

2709
01:41:53,109 --> 01:41:51,520
obligation

2710
01:41:54,950 --> 01:41:53,119
on the part of

2711
01:41:57,270 --> 01:41:54,960
federal agencies and federally funded

2712
01:41:59,109 --> 01:41:57,280
researchers like myself

2713
01:42:00,709 --> 01:41:59,119

to inform anybody who wants to know

2714

01:42:02,709 --> 01:42:00,719

about the work that we do everything we

2715

01:42:04,950 --> 01:42:02,719

do know it's you know we're doing this

2716

01:42:07,350 --> 01:42:04,960

in the public interest but

2717

01:42:09,750 --> 01:42:07,360

education is not the key

2718

01:42:10,870 --> 01:42:09,760

it doesn't solve all your problems

2719

01:42:12,870 --> 01:42:10,880

question

2720

01:42:15,430 --> 01:42:12,880

hi thank you my name is steve williams

2721

01:42:17,990 --> 01:42:15,440

i'm i work in jim green shop as the epo

2722

01:42:19,430 --> 01:42:18,000

guy but i'm my i'm a detailee from the

2723

01:42:20,870 --> 01:42:19,440

national air space museum where i was

2724

01:42:22,310 --> 01:42:20,880

chair of education

2725

01:42:24,550 --> 01:42:22,320

so i've been working for the last 10

2726

01:42:26,790 --> 01:42:24,560

years with the general public and i

2727

01:42:29,510 --> 01:42:26,800

really wanted to resonate on

2728

01:42:31,109 --> 01:42:29,520

the discussion going back to greg and

2729

01:42:32,550 --> 01:42:31,119

some of the previous uh

2730

01:42:34,550 --> 01:42:32,560

responses

2731

01:42:36,470 --> 01:42:34,560

in how the public uh how we deal with

2732

01:42:39,270 --> 01:42:36,480

the public we are trying to drive

2733

01:42:42,870 --> 01:42:39,280

public perceptions okay we do a great

2734

01:42:44,709 --> 01:42:42,880

job with the specialist to be in their

2735

01:42:46,470 --> 01:42:44,719

educational process our good students

2736

01:42:47,590 --> 01:42:46,480

are as good as they ever were and

2737

01:42:49,910 --> 01:42:47,600

they're as

2738

01:42:52,229 --> 01:42:49,920

plentiful as they ever were but we're

2739

01:42:53,590 --> 01:42:52,239

doing a progressively less good job in

2740

01:42:55,189 --> 01:42:53,600

my opinion

2741

01:42:57,830 --> 01:42:55,199

in dealing with the public

2742

01:42:59,350 --> 01:42:57,840

uh in in the non-specialist now let's

2743

01:43:02,470 --> 01:42:59,360

see in a private universe and some of

2744

01:43:04,550 --> 01:43:02,480

these other things uh jaywalking

2745

01:43:05,750 --> 01:43:04,560

there are people who most people at

2746

01:43:08,390 --> 01:43:05,760

least in the united states have a

2747

01:43:10,709 --> 01:43:08,400

fundamental misunderstanding of basic

2748

01:43:13,189 --> 01:43:10,719

science and if you're going to use a

2749

01:43:14,390 --> 01:43:13,199

risk assessment argument uh you're

2750

01:43:16,470 --> 01:43:14,400

talking to people who live on the san

2751
01:43:17,510 --> 01:43:16,480
andreas fault in the shadow of mount st

2752
01:43:18,390 --> 01:43:17,520
helens

2753
01:43:20,470 --> 01:43:18,400
and

2754
01:43:22,390 --> 01:43:20,480
who actually believe that if they roll

2755
01:43:24,870 --> 01:43:22,400
sevens three times in a row they're

2756
01:43:26,550 --> 01:43:24,880
never gonna roll a 7 again

2757
01:43:28,310 --> 01:43:26,560
you know las vegas pays a lot of

2758
01:43:29,750 --> 01:43:28,320
electrical bills on these kinds of

2759
01:43:31,189 --> 01:43:29,760
misperceptions

2760
01:43:32,950 --> 01:43:31,199
so

2761
01:43:35,109 --> 01:43:32,960
my point is that

2762
01:43:36,550 --> 01:43:35,119
we have to do the same thing any kind of

2763
01:43:38,629 --> 01:43:36,560

a mass

2764

01:43:40,550 --> 01:43:38,639

audience entertainment thing does the

2765

01:43:43,510 --> 01:43:40,560

reason that they have the little kid

2766

01:43:46,709 --> 01:43:43,520

with a crummy telescope discover the

2767

01:43:48,709 --> 01:43:46,719

killer asteroid is because the audience

2768

01:43:51,109 --> 01:43:48,719

would never identify with a real

2769

01:43:53,669 --> 01:43:51,119

scientist doing a real study using real

2770

01:43:55,430 --> 01:43:53,679

equipment that's foreign to them

2771

01:43:56,149 --> 01:43:55,440

they've got to feel like they're part of

2772

01:43:58,709 --> 01:43:56,159

the

2773

01:44:01,430 --> 01:43:58,719

participatory exploration process in

2774

01:44:03,350 --> 01:44:01,440

learning as well as space exploration

2775

01:44:05,350 --> 01:44:03,360

in our day the baby boomers i'll be

2776

01:44:08,149 --> 01:44:05,360

quick i

2777

01:44:10,229 --> 01:44:08,159

wanted to use role models to stimulate

2778

01:44:11,350 --> 01:44:10,239

their imaginations but young people

2779

01:44:12,550 --> 01:44:11,360

today

2780

01:44:15,030 --> 01:44:12,560

don't do that

2781

01:44:17,510 --> 01:44:15,040

they're more attuned to mechanical

2782

01:44:19,030 --> 01:44:17,520

assistance electronic assistance to the

2783

01:44:21,430 --> 01:44:19,040

exploration process

2784

01:44:23,510 --> 01:44:21,440

so by approaching it that way and the

2785

01:44:24,709 --> 01:44:23,520

social media is a big help with that

2786

01:44:27,350 --> 01:44:24,719

is a big deal

2787

01:44:30,790 --> 01:44:27,360

the one comment i feel that more than

2788

01:44:33,270 --> 01:44:30,800

any other since curiosity added was

2789

01:44:35,430 --> 01:44:33,280

how cool is nasa these days they landed

2790

01:44:37,990 --> 01:44:35,440

a one ton craft on mars and one of the

2791

01:44:39,270 --> 01:44:38,000

guys that did it was wearing a mohawk

2792

01:44:41,189 --> 01:44:39,280

okay

2793

01:44:43,189 --> 01:44:41,199

never mind any of the science

2794

01:44:44,149 --> 01:44:43,199

they could identify with that and that's

2795

01:44:45,109 --> 01:44:44,159

what i would like to leave you with

2796

01:44:47,510 --> 01:44:45,119

sorry

2797

01:44:48,390 --> 01:44:47,520

now we have time for just two very brief

2798

01:44:51,109 --> 01:44:48,400

comments

2799

01:44:53,430 --> 01:44:51,119

or questions would be even better

2800

01:44:56,149 --> 01:44:53,440

please okay i just thought it'd be might

2801
01:44:58,870 --> 01:44:56,159
be useful to add a couple of numbers to

2802
01:45:01,750 --> 01:44:58,880
the conversation that uh

2803
01:45:03,990 --> 01:45:01,760
much of the conversation in this entire

2804
01:45:05,590 --> 01:45:04,000
session has been limited to the united

2805
01:45:07,750 --> 01:45:05,600
states

2806
01:45:10,070 --> 01:45:07,760
but there is a self-selected

2807
01:45:13,830 --> 01:45:10,080
group of people out there members of the

2808
01:45:16,709 --> 01:45:13,840
planetary society in 100 countries the

2809
01:45:18,790 --> 01:45:16,719
planetary society exploded from nothing

2810
01:45:21,430 --> 01:45:18,800
to a hundred thousand members at its

2811
01:45:24,149 --> 01:45:21,440
founding uh they're not that many now

2812
01:45:27,750 --> 01:45:24,159
but they're still in a hundred countries

2813
01:45:30,390 --> 01:45:27,760

uh and uh cost them forty five dollars a

2814

01:45:31,990 --> 01:45:30,400

year if they're not in the u.s 35 if

2815

01:45:33,189 --> 01:45:32,000

they're here i think

2816

01:45:34,950 --> 01:45:33,199

but

2817

01:45:37,669 --> 01:45:34,960

i think it's relevant

2818

01:45:40,629 --> 01:45:37,679

to the whole conversation

2819

01:45:41,750 --> 01:45:40,639

to introduce the international element

2820

01:45:43,590 --> 01:45:41,760

here

2821

01:45:46,070 --> 01:45:43,600

the other thing i've been involved in

2822

01:45:48,709 --> 01:45:46,080

since i retired from jpl is the

2823

01:45:50,790 --> 01:45:48,719

international space university

2824

01:45:53,910 --> 01:45:50,800

which just celebrated its 25th

2825

01:45:56,709 --> 01:45:53,920

anniversary over across town

2826

01:45:59,030 --> 01:45:56,719

i'd like to see the conversation

2827

01:46:02,550 --> 01:45:59,040

continue to include

2828

01:46:04,310 --> 01:46:02,560

this other public that's out there

2829

01:46:06,470 --> 01:46:04,320

i realize that they don't have as much

2830

01:46:09,189 --> 01:46:06,480

influence perhaps no influence on what

2831

01:46:11,030 --> 01:46:09,199

happens in congress or whatever

2832

01:46:13,350 --> 01:46:11,040

but they are important because they're

2833

01:46:15,350 --> 01:46:13,360

supporters yep that's thank you very

2834

01:46:18,149 --> 01:46:15,360

much for those comments and uh you know

2835

01:46:20,629 --> 01:46:18,159

i i do want to echo that and and remark

2836

01:46:24,310 --> 01:46:20,639

that the planetary society's current

2837

01:46:27,430 --> 01:46:24,320

vision is to cultivate a global culture

2838

01:46:29,430 --> 01:46:27,440

that explores our earth and

2839

01:46:31,109 --> 01:46:29,440

other worlds so

2840

01:46:33,350 --> 01:46:31,119

the planter site is very much aware of

2841

01:46:35,750 --> 01:46:33,360

that and i encourage you all to

2842

01:46:37,830 --> 01:46:35,760

engage with that organization

2843

01:46:40,229 --> 01:46:37,840

yes please last question thank you honey

2844

01:46:43,030 --> 01:46:40,239

i'm john sykison from csiro this is to

2845

01:46:45,189 --> 01:46:43,040

to linda lin i just want to applaud your

2846

01:46:48,790 --> 01:46:45,199

efforts in

2847

01:46:50,629 --> 01:46:48,800

correcting the public record about the

2848

01:46:52,950 --> 01:46:50,639

the the bacteria that was found on the

2849

01:46:55,270 --> 01:46:52,960

apollo 12 camera

2850

01:46:57,030 --> 01:46:55,280

as someone who works at parks and has

2851
01:47:00,070 --> 01:46:57,040
been researching the role of the apollo

2852
01:47:01,030 --> 01:47:00,080
missions over the last decade and a half

2853
01:47:03,669 --> 01:47:01,040
um

2854
01:47:04,709 --> 01:47:03,679
the film capricorn 1 has a lot to answer

2855
01:47:06,229 --> 01:47:04,719
for

2856
01:47:08,229 --> 01:47:06,239
and

2857
01:47:10,790 --> 01:47:08,239
you know once in the raid a narrative

2858
01:47:13,189 --> 01:47:10,800
takes hold in the public mind it's very

2859
01:47:14,709 --> 01:47:13,199
very difficult to to correct that

2860
01:47:16,470 --> 01:47:14,719
misconception

2861
01:47:18,470 --> 01:47:16,480
and um

2862
01:47:20,229 --> 01:47:18,480
and so any effort to correct the public

2863
01:47:22,470 --> 01:47:20,239

record and bring things back to the

2864

01:47:23,750 --> 01:47:22,480

truth is is fantastic and i applaud your

2865

01:47:25,590 --> 01:47:23,760

efforts on that

2866

01:47:28,070 --> 01:47:25,600

um also i think

2867

01:47:30,470 --> 01:47:28,080

nasa was founded partly to to boost

2868

01:47:31,990 --> 01:47:30,480

public morale in the united states and

2869

01:47:34,310 --> 01:47:32,000

and um

2870

01:47:36,790 --> 01:47:34,320

to demonstrate american

2871

01:47:38,550 --> 01:47:36,800

leadership um in science and technology

2872

01:47:39,990 --> 01:47:38,560

and in many ways it's become a victim of

2873

01:47:42,709 --> 01:47:40,000

its own success

2874

01:47:45,350 --> 01:47:42,719

um so you know when when something they

2875

01:47:48,070 --> 01:47:45,360

do nasa does do spectacular things like

2876

01:47:50,229 --> 01:47:48,080

land people on the on the moon and

2877

01:47:51,270 --> 01:47:50,239

rovers on mars and so on and so when

2878

01:47:52,870 --> 01:47:51,280

something

2879

01:47:55,830 --> 01:47:52,880

does threaten the earth

2880

01:47:57,750 --> 01:47:55,840

it's only natural that people go to the

2881

01:48:00,950 --> 01:47:57,760

to the organization that has a proven

2882

01:48:03,590 --> 01:48:00,960

record of success to do that and so um

2883

01:48:07,189 --> 01:48:03,600

um and it's i don't think it's a it's an

2884

01:48:09,189 --> 01:48:07,199

accident that deep impact in armageddon

2885

01:48:11,669 --> 01:48:09,199

appeared just two or three years after

2886

01:48:13,350 --> 01:48:11,679

the comet schumacher levy 9 impacts on

2887

01:48:15,830 --> 01:48:13,360

jupiter

2888

01:48:17,830 --> 01:48:15,840

and nasa's fantastic

2889

01:48:21,109 --> 01:48:17,840

pr in publicizing that to the world with

2890

01:48:24,310 --> 01:48:21,119

the hubble images and and so on um

2891

01:48:27,350 --> 01:48:24,320

so um you know i again i do applaud you

2892

01:48:29,669 --> 01:48:27,360

your efforts in in correcting that

2893

01:48:31,109 --> 01:48:29,679

that record thank you

2894

01:48:32,790 --> 01:48:31,119

i was having a little problem

2895

01:48:35,189 --> 01:48:32,800

coordinating my brain with my remote

2896

01:48:36,870 --> 01:48:35,199

finger and somehow other didn't show my

2897

01:48:38,390 --> 01:48:36,880

acknowledgement slide so there were a

2898

01:48:40,470 --> 01:48:38,400

lot of people who

2899

01:48:43,109 --> 01:48:40,480

collected the information i did a lot of

2900

01:48:45,510 --> 01:48:43,119

reading and a lot of research myself but

2901

01:48:46,950 --> 01:48:45,520

they're all acknowledged in the paper

2902

01:48:49,510 --> 01:48:46,960

so thank you all thank you to my

2903

01:48:56,149 --> 01:48:49,520

panelists and it's been very interesting

2904

01:49:00,390 --> 01:48:58,310

thank you heidi and the gang of three

2905

01:49:02,310 --> 01:49:00,400

pale but certainly not stale ladies that

2906

01:49:04,070 --> 01:49:02,320

was a very stimulating uh

2907

01:49:05,590 --> 01:49:04,080

conversation and in fact the whole the

2908

01:49:07,109 --> 01:49:05,600

whole day has been

2909

01:49:13,510 --> 01:49:07,119

i think we should thank all of our

2910

01:49:18,229 --> 01:49:15,669

so so bill asked me if i might say a few

2911

01:49:20,550 --> 01:49:18,239

words to kind of wrap up uh today as we

2912

01:49:22,629 --> 01:49:20,560

segue over to the reception here

2913

01:49:24,550 --> 01:49:22,639

and uh

2914

01:49:26,390 --> 01:49:24,560

my mind has been expanded i mean setting

2915

01:49:28,149 --> 01:49:26,400

aside the fact that i'm a member of the

2916

01:49:30,470 --> 01:49:28,159

you know the program committee that put

2917

01:49:33,030 --> 01:49:30,480

this together this has exceeded my

2918

01:49:35,189 --> 01:49:33,040

expectations uh tremendously

2919

01:49:37,350 --> 01:49:35,199

and i think the fact that everybody is

2920

01:49:39,189 --> 01:49:37,360

still glued to their seats since 8 30

2921

01:49:41,510 --> 01:49:39,199

this morning and still raring to go says

2922

01:49:43,189 --> 01:49:41,520

we probably all feel the same way

2923

01:49:45,430 --> 01:49:43,199

i don't know how you wrap up a day like

2924

01:49:47,990 --> 01:49:45,440

this because we've covered so much uh

2925

01:49:50,390 --> 01:49:48,000

territory and we've all learned so much

2926

01:49:52,070 --> 01:49:50,400

from it uh that it would probably take a

2927

01:49:55,510 --> 01:49:52,080

day to wrap the whole thing up you know

2928

01:49:57,350 --> 01:49:55,520

just the past day i did want to to share

2929

01:49:59,910 --> 01:49:57,360

with you one

2930

01:50:02,070 --> 01:49:59,920

major insight that i got from from

2931

01:50:04,950 --> 01:50:02,080

today's conversations

2932

01:50:07,030 --> 01:50:04,960

that i didn't really appreciate up until

2933

01:50:09,030 --> 01:50:07,040

today and i say that in spite of the

2934

01:50:11,109 --> 01:50:09,040

fact that i've personally had a passion

2935

01:50:12,149 --> 01:50:11,119

for solar system exploration for all of

2936

01:50:14,310 --> 01:50:12,159

my life

2937

01:50:16,229 --> 01:50:14,320

in fact i have to tell the story

2938

01:50:17,189 --> 01:50:16,239

i was first uh

2939

01:50:19,270 --> 01:50:17,199

caught

2940

01:50:21,350 --> 01:50:19,280

i guess i should say bitten by the bug

2941

01:50:22,629 --> 01:50:21,360

of insatiable curiosity at the tender

2942

01:50:24,709 --> 01:50:22,639

age of seven

2943

01:50:25,990 --> 01:50:24,719

it was a starry summer night in rural

2944

01:50:27,750 --> 01:50:26,000

indiana

2945

01:50:30,310 --> 01:50:27,760

my brother and sister and i were in the

2946

01:50:32,070 --> 01:50:30,320

back seat of my dad's packard

2947

01:50:33,669 --> 01:50:32,080

convertible the top was down we were on

2948

01:50:36,229 --> 01:50:33,679

our way home from a drive-in movie

2949

01:50:38,149 --> 01:50:36,239

theater our heads were on the back you

2950

01:50:39,750 --> 01:50:38,159

know looking up at the starry skies that

2951
01:50:41,270 --> 01:50:39,760
you know the spectacular milky way

2952
01:50:42,390 --> 01:50:41,280
overhead because the skies were really

2953
01:50:45,830 --> 01:50:42,400
dark then

2954
01:50:47,430 --> 01:50:45,840
and heidi a spectacular bolide went

2955
01:50:49,589 --> 01:50:47,440
streaming overhead

2956
01:50:52,470 --> 01:50:49,599
exploded into two pieces with a loud

2957
01:50:53,910 --> 01:50:52,480
boom sparks flying out of it it was

2958
01:50:56,310 --> 01:50:53,920
unbelievable

2959
01:50:58,229 --> 01:50:56,320
so in unison i'm sure my brother and

2960
01:50:59,830 --> 01:50:58,239
sister and i all said the same thing dad

2961
01:51:02,229 --> 01:50:59,840
what was that

2962
01:51:04,950 --> 01:51:02,239
my father was a metallurgical engineer

2963
01:51:06,390 --> 01:51:04,960

and a great fan of science fiction and

2964

01:51:08,790 --> 01:51:06,400

we had been seeing science fiction

2965

01:51:10,790 --> 01:51:08,800

movies from a tender age but to his

2966

01:51:13,030 --> 01:51:10,800

credit he answered responsibly that

2967

01:51:15,109 --> 01:51:13,040

night

2968

01:51:16,229 --> 01:51:15,119

he said son i don't think it was a

2969

01:51:17,750 --> 01:51:16,239

spaceship

2970

01:51:20,550 --> 01:51:17,760

why don't we go to the library tomorrow

2971

01:51:22,229 --> 01:51:20,560

and we'll start researching it and i've

2972

01:51:24,149 --> 01:51:22,239

had this passion and i'm sure that

2973

01:51:25,109 --> 01:51:24,159

virtually everybody in this audience has

2974

01:51:28,229 --> 01:51:25,119

as well

2975

01:51:30,629 --> 01:51:28,239

so uh getting new insights you know at

2976

01:51:32,470 --> 01:51:30,639

this time at this phase of my career i'm

2977

01:51:35,669 --> 01:51:32,480

really impressed by that the thing that

2978

01:51:37,990 --> 01:51:35,679

really hit me today is

2979

01:51:40,390 --> 01:51:38,000

we all agree how fantastic it is what we

2980

01:51:43,270 --> 01:51:40,400

do but i've come to appreciate even more

2981

01:51:46,310 --> 01:51:43,280

just how tenuous our fate is and i think

2982

01:51:49,510 --> 01:51:46,320

that when jason uh callahan gave his

2983

01:51:51,430 --> 01:51:49,520

marvelous uh background this uh this

2984

01:51:53,030 --> 01:51:51,440

morning that's when it really hit me i

2985

01:51:55,030 --> 01:51:53,040

mean we've had the ups and downs we've

2986

01:51:57,669 --> 01:51:55,040

had the lost decade

2987

01:52:00,550 --> 01:51:57,679

and you know it really takes a perfect

2988

01:52:02,870 --> 01:52:00,560

alignment of three major constituencies

2989

01:52:04,390 --> 01:52:02,880

to keep us on this track we got the

2990

01:52:06,550 --> 01:52:04,400

folks who are the well they're they're

2991

01:52:09,510 --> 01:52:06,560

really for jim is right i'll get to the

2992

01:52:11,430 --> 01:52:09,520

fourth one in a minute one of them is

2993

01:52:12,709 --> 01:52:11,440

on capitol hill

2994

01:52:14,550 --> 01:52:12,719

another is at the other end of

2995

01:52:16,790 --> 01:52:14,560

pennsylvania avenue

2996

01:52:18,790 --> 01:52:16,800

there's a constituency within nasa the

2997

01:52:20,629 --> 01:52:18,800

senior leadership when they're all

2998

01:52:23,109 --> 01:52:20,639

aligned and the public the fourth is

2999

01:52:25,189 --> 01:52:23,119

behind all of this fantastic things

3000

01:52:27,350 --> 01:52:25,199

happen but what we have seen through the

3001

01:52:30,149 --> 01:52:27,360

history of the past 50 years is

3002

01:52:32,149 --> 01:52:30,159

most of the time they're not all aligned

3003

01:52:34,470 --> 01:52:32,159

and i've realized today from our

3004

01:52:36,229 --> 01:52:34,480

conversations that the thing that sees

3005

01:52:38,070 --> 01:52:36,239

us through those periods of time and the

3006

01:52:39,830 --> 01:52:38,080

reason that we're still here

3007

01:52:41,589 --> 01:52:39,840

is the leadership

3008

01:52:44,310 --> 01:52:41,599

that our community has produced the

3009

01:52:47,270 --> 01:52:44,320

people with the vision with the moxie

3010

01:52:49,510 --> 01:52:47,280

with the savvy the passion and i should

3011

01:52:51,430 --> 01:52:49,520

say the savvy to know how to use it in

3012

01:52:53,750 --> 01:52:51,440

order to beat back the odds and keep

3013

01:52:55,990 --> 01:52:53,760

things going most of them are actually

3014

01:52:56,790 --> 01:52:56,000

in this room here today or they have

3015

01:52:59,350 --> 01:52:56,800

been

3016

01:53:01,589 --> 01:52:59,360

and i personally want to say thank you

3017

01:53:03,109 --> 01:53:01,599

thank you very much and i'm looking at

3018

01:53:05,189 --> 01:53:03,119

two of them right now

3019

01:53:07,430 --> 01:53:05,199

for what you have done to keep this

3020

01:53:09,510 --> 01:53:07,440

enterprise alive and i think that as

3021

01:53:11,750 --> 01:53:09,520

long as we can continue to do the

3022

01:53:14,310 --> 01:53:11,760

exciting things that we have been doing

3023

01:53:16,070 --> 01:53:14,320

curiosity on mars all of the new things

3024

01:53:18,870 --> 01:53:16,080

that are in the pipeline we will

3025

01:53:20,950 --> 01:53:18,880

continue to inspire the next generation

3026

01:53:22,470 --> 01:53:20,960

of leaders like the folks in this room

3027

01:53:24,310 --> 01:53:22,480

who will keep us going that's what we're

3028

01:53:26,629 --> 01:53:24,320

going to need because times are going to

3029

01:53:28,149 --> 01:53:26,639

be tough and we got to keep doing the

3030

01:53:30,709 --> 01:53:28,159

exciting stuff

3031

01:53:34,709 --> 01:53:32,470

i wanted to say one other thing i mean

3032

01:53:37,189 --> 01:53:34,719

this has been a magical day for a lot of

3033

01:53:38,629 --> 01:53:37,199

reasons but i think several of us

3034

01:53:41,830 --> 01:53:38,639

commented before that when you put

3035

01:53:44,070 --> 01:53:41,840

together historians and sociologists and

3036

01:53:45,430 --> 01:53:44,080

scientists really cool things happen who

3037

01:53:47,990 --> 01:53:45,440

would have thought

3038

01:53:51,189 --> 01:53:48,000

and i think we owe a big debt of

3039

01:53:53,669 --> 01:53:51,199

gratitude to nasa's chief historian bill

3040

01:54:01,189 --> 01:53:53,679

berry and the national aerospace museum

3041

01:54:05,910 --> 01:54:03,189

who had the vision to bring together

3042

01:54:07,189 --> 01:54:05,920

this diverse eclectic group of people we

3043

01:54:08,709 --> 01:54:07,199

were starting to think about doing

3044

01:54:09,910 --> 01:54:08,719

something out in pasadena wait a minute

3045

01:54:11,430 --> 01:54:09,920

just a bunch of scientists sitting

3046

01:54:13,990 --> 01:54:11,440

around talking you guys have really made

3047

01:54:18,950 --> 01:54:14,000

this thing successful and i thank you

3048

01:54:22,229 --> 01:54:20,550

i'll take the second to disavow any

3049

01:54:23,910 --> 01:54:22,239

credit for uh this thing is a it's a

3050

01:54:25,270 --> 01:54:23,920

very big team effort so thanks to

3051

01:54:26,390 --> 01:54:25,280

everybody for the help

3052

01:54:27,990 --> 01:54:26,400

um

3053

01:54:29,430 --> 01:54:28,000

two quick announcements one there's been

3054

01:54:31,109 --> 01:54:29,440

a lot of talk about planetary protection

3055

01:54:32,870 --> 01:54:31,119

this afternoon we actually produced a

3056

01:54:35,430 --> 01:54:32,880

book about planetary protection last

3057

01:54:37,750 --> 01:54:35,440

year called when biospheres collide in

3058

01:54:39,510 --> 01:54:37,760

the mass history program and i'm sorry

3059

01:54:40,550 --> 01:54:39,520

that i didn't think to bring some copies

3060

01:54:41,589 --> 01:54:40,560

over because we have some copies of

3061

01:54:43,270 --> 01:54:41,599

other books we've done so we'll try and

3062

01:54:44,629 --> 01:54:43,280

get some copies of planet that planetary

3063

01:54:46,149 --> 01:54:44,639

protection book over here tomorrow

3064

01:54:47,030 --> 01:54:46,159

anybody wants a copy feel free to help

3065

01:54:48,790 --> 01:54:47,040

yourself

3066

01:54:50,950 --> 01:54:48,800

okay so it paid announcement about our

3067

01:54:53,750 --> 01:54:50,960

products over with let's turn to the

3068

01:54:55,270 --> 01:54:53,760

reception those of you who

3069

01:54:57,270 --> 01:54:55,280

sign up for the reception you're welcome

3070

01:54:58,390 --> 01:54:57,280

to join us on the far side of the lobby

3071

01:54:59,510 --> 01:54:58,400

over there in the space experience

3072

01:55:01,830 --> 01:54:59,520

center

3073

01:55:03,270 --> 01:55:01,840

you'll be given a ticket for a drink and

3074

01:55:04,470 --> 01:55:03,280

if you want more than one drink you have

3075

01:55:06,149 --> 01:55:04,480

to buy it yourself there'll be a cash

3076

01:55:09,189 --> 01:55:06,159

bar available there

3077

01:55:11,350 --> 01:55:09,199

if you're a civil servant and you've

3078

01:55:13,990 --> 01:55:11,360

accepted more than 50 worth of things

3079

01:55:15,270 --> 01:55:14,000

from lockheed martin in the last year

3080

01:55:18,310 --> 01:55:15,280

you should

3081

01:55:20,709 --> 01:55:18,320

hand some money over to um kelly wants

3082

01:55:22,390 --> 01:55:20,719

to stand up for us

3083

01:55:23,430 --> 01:55:22,400

kelly victor french specter our intern

3084

01:55:24,390 --> 01:55:23,440

is going to be manning the table and

3085

01:55:25,990 --> 01:55:24,400

there'll be some of the folks over there

3086

01:55:27,990 --> 01:55:26,000

too they'll be happy to take cash or a

3087

01:55:29,589 --> 01:55:28,000

check from you to cover any difference

3088

01:55:31,510 --> 01:55:29,599

there or if you or if you're a political

3089

01:55:32,870 --> 01:55:31,520

appointee and you're required to do that

3090

01:55:34,070 --> 01:55:32,880

the rules have changed a lot thanks to

3091

01:55:35,350 --> 01:55:34,080

our friends

3092

01:55:36,790 --> 01:55:35,360

who have had some issues with the

3093

01:55:38,550 --> 01:55:36,800

conferences in the last couple years so

3094

01:55:41,189 --> 01:55:38,560

please be careful about it

3095

01:55:42,870 --> 01:55:41,199

attending to those issues