



AbGradCon 2018

1  
00:00:00,260 --> 00:00:13,770

[Music]

2  
00:00:19,960 --> 00:00:17,560

in getting into outer space so sort of a

3  
00:00:22,450 --> 00:00:19,970

competition at the time and you all know

4  
00:00:24,939 --> 00:00:22,460

it the first satellite that was sentient

5  
00:00:27,999 --> 00:00:24,949

space was Sputnik accomplished by the

6  
00:00:29,740 --> 00:00:28,009

Russians so this really was just a goal

7  
00:00:31,029 --> 00:00:29,750

to get there there was no science

8  
00:00:32,259 --> 00:00:31,039

involved they just wanted to send a

9  
00:00:34,570 --> 00:00:32,269

satellite to say that they could do it

10  
00:00:36,490 --> 00:00:34,580

so the u.s. countered this by sending

11  
00:00:38,110 --> 00:00:36,500

their own probe the Explorer one into

12  
00:00:39,460 --> 00:00:38,120

space so this whole this is whole

13  
00:00:42,490 --> 00:00:39,470

feedback like who's gonna get their

14

00:00:44,439 --> 00:00:42,500

first Russians beat the US and then US

15

00:00:46,030 --> 00:00:44,449

countered and sent out this probe had a

16

00:00:48,009 --> 00:00:46,040

few science instruments on it but not

17

00:00:50,560 --> 00:00:48,019

too many there's really just again to

18

00:00:52,060 --> 00:00:50,570

get there and to prove you could moving

19

00:00:54,189 --> 00:00:52,070

forward what's the next logical step

20

00:00:55,869 --> 00:00:54,199

you send a person into space so the

21

00:00:58,149 --> 00:00:55,879

Russians again beat the United States

22

00:01:01,090 --> 00:00:58,159

which were again were the two really

23

00:01:04,299 --> 00:01:01,100

forefront countries involved in this in

24

00:01:06,820 --> 00:01:04,309

this mission by sending Vostok one with

25

00:01:08,560 --> 00:01:06,830

Yuri Gagarin into into orbit around

26

00:01:10,480 --> 00:01:08,570

Earth so you did one full orbit and

27

00:01:11,890 --> 00:01:10,490

again this was not good enough for the

28

00:01:13,420 --> 00:01:11,900

u.s. so they kept going and sent their

29

00:01:15,520 --> 00:01:13,430

own man into space so that's Alan

30

00:01:17,710 --> 00:01:15,530

Shepard he didn't quite make it around

31

00:01:19,090 --> 00:01:17,720

the earth but he got into orbit and came

32

00:01:20,560 --> 00:01:19,100

back down so these were two successful

33

00:01:22,840 --> 00:01:20,570

missions both by the Russians in the US

34

00:01:25,330 --> 00:01:22,850

but neither country was determined to

35

00:01:27,010 --> 00:01:25,340

give up they were again we're going and

36

00:01:28,990 --> 00:01:27,020

to think what's the next logical step

37

00:01:31,630 --> 00:01:29,000

so the moon's pretty close right so

38

00:01:33,250 --> 00:01:31,640

let's go there and finally at this point

39

00:01:34,870 --> 00:01:33,260

the United States beat the Russians and

40

00:01:37,420 --> 00:01:34,880

sent people to the moon they also had

41

00:01:40,120 --> 00:01:37,430

Apollo 8 which didn't orbit and came

42

00:01:41,920 --> 00:01:40,130

back but finally someone got got people

43

00:01:43,510 --> 00:01:41,930

to the moon and you have all these

44

00:01:46,180 --> 00:01:43,520

iconic pictures and it was a big thing

45

00:01:48,940 --> 00:01:46,190

in the 60s 50s and 60s to even send

46

00:01:51,460 --> 00:01:48,950

someone here this was a really big step

47

00:01:53,020 --> 00:01:51,470

for estable for us for astrobiology and

48

00:01:54,850 --> 00:01:53,030

just space engineering in general

49

00:01:57,130 --> 00:01:54,860

because this really was a major feat

50

00:01:59,830 --> 00:01:57,140

just sending anything into space let

51  
00:02:02,110 --> 00:01:59,840  
alone people so this really sparked the

52  
00:02:04,930 --> 00:02:02,120  
age of astrobiology in the age of space

53  
00:02:07,300 --> 00:02:04,940  
engineering and particularly NASA

54  
00:02:09,249 --> 00:02:07,310  
started sending a lot of equipment into

55  
00:02:10,539 --> 00:02:09,259  
space and they started off one of their

56  
00:02:12,850 --> 00:02:10,549  
main equipment one of the main science

57  
00:02:14,500 --> 00:02:12,860  
equipments with pioneer with the pioneer

58  
00:02:16,839 --> 00:02:14,510  
series and in particular for here

59  
00:02:20,619 --> 00:02:16,849  
pioneer 10 and 11 were meant to go to

60  
00:02:22,209 --> 00:02:20,629  
the outer solar system and you know it

61  
00:02:23,679 --> 00:02:22,219  
was hard enough just to get things to

62  
00:02:24,890 --> 00:02:23,689  
the moon equipment to the moon so they

63  
00:02:26,479 --> 00:02:24,900

they have this ambitious goal

64

00:02:29,030 --> 00:02:26,489

against the outer ends of solar system

65

00:02:30,800 --> 00:02:29,040

and incredibly they did and it was a

66

00:02:34,009 --> 00:02:30,810

really successful mission so Pioneer

67

00:02:36,020 --> 00:02:34,019

1011 actually went out into Saturn and

68

00:02:37,940 --> 00:02:36,030

Jupiter and map and image these these

69

00:02:40,100 --> 00:02:37,950

planets which was in Crete and

70

00:02:42,259 --> 00:02:40,110

completely incredible for the time so

71

00:02:43,699 --> 00:02:42,269

you have these really unique pictures of

72

00:02:46,339 --> 00:02:43,709

things you could previously not you

73

00:02:48,530 --> 00:02:46,349

previously couldn't see from Earth and

74

00:02:51,289 --> 00:02:48,540

this really just kind of took off for a

75

00:02:53,360 --> 00:02:51,299

few years and then they they moved on to

76  
00:02:55,130 --> 00:02:53,370  
the scoop ahead an extra year they moved

77  
00:02:57,440 --> 00:02:55,140  
on to the Voyager so that was sent

78  
00:02:59,599 --> 00:02:57,450  
essentially another a continuation of

79  
00:03:01,729 --> 00:02:59,609  
the Pioneer series with more developed

80  
00:03:03,140 --> 00:03:01,739  
cameras and more more instrumentation so

81  
00:03:05,089 --> 00:03:03,150  
you can see that there's a little bit

82  
00:03:06,740 --> 00:03:05,099  
more complexity to their module that

83  
00:03:08,180 --> 00:03:06,750  
they sent out there so this is sort of

84  
00:03:10,580 --> 00:03:08,190  
this next logical step in space

85  
00:03:12,110 --> 00:03:10,590  
engineering you get somewhere you show

86  
00:03:13,729 --> 00:03:12,120  
that you can do it and then you start

87  
00:03:15,289 --> 00:03:13,739  
sending more advanced equipment so you

88  
00:03:17,059 --> 00:03:15,299

can further characterize it so you send

89

00:03:19,039 --> 00:03:17,069

more and more advanced equipment this

90

00:03:20,629 --> 00:03:19,049

makes a lot of sense so you get even

91

00:03:24,710 --> 00:03:20,639

better pictures and you're starting to

92

00:03:26,929 --> 00:03:24,720

get some some more finite information on

93

00:03:29,689 --> 00:03:26,939

the magnetospheres

94

00:03:32,330 --> 00:03:29,699

and the radiation environments and what

95

00:03:33,259 --> 00:03:32,340

type of minerals you can expect on the

96

00:03:35,270 --> 00:03:33,269

surfaces you're getting better

97

00:03:39,220 --> 00:03:35,280

measurements so this helps your future

98

00:03:41,899 --> 00:03:39,230

equipment that you plan to send and I

99

00:03:43,610 --> 00:03:41,909

think everyone knows this one the Viking

100

00:03:45,559 --> 00:03:43,620

experiments that were sent to Mars like

101  
00:03:47,059 --> 00:03:45,569  
they first person asked a sense of stuff

102  
00:03:48,020 --> 00:03:47,069  
for the outer solar system so they

103  
00:03:49,369 --> 00:03:48,030  
didn't have to worry about landing

104  
00:03:52,430 --> 00:03:49,379  
anywhere they just sent it out there

105  
00:03:54,619 --> 00:03:52,440  
then they finally wanted to land on one

106  
00:03:57,170 --> 00:03:54,629  
of these planets and that in itself is a

107  
00:03:59,360 --> 00:03:57,180  
whole nother ballgame and believe it or

108  
00:04:02,390 --> 00:03:59,370  
not after a few unsuccessful attempts by

109  
00:04:04,069 --> 00:04:02,400  
again the Russians and the US they

110  
00:04:07,640 --> 00:04:04,079  
finally got some tool and so the Viking

111  
00:04:11,089 --> 00:04:07,650  
landers got on Mars and there was one

112  
00:04:13,280 --> 00:04:11,099  
big handicap here or one big under site

113  
00:04:16,009 --> 00:04:13,290

where they they decided to put a

114

00:04:18,680 --> 00:04:16,019

chemistry experiment on it and without

115

00:04:20,810 --> 00:04:18,690

characterizing the mineral content of

116

00:04:22,399 --> 00:04:20,820

the surface so the experiments were a

117

00:04:25,550 --> 00:04:22,409

little up in the air as far as the

118

00:04:28,520 --> 00:04:25,560

results go so this really hurt the Simon

119

00:04:30,020 --> 00:04:28,530

Science instrumentation portion of what

120

00:04:32,570 --> 00:04:30,030

they were sending into space and there

121

00:04:34,730 --> 00:04:32,580

was sort of a low for a long time period

122

00:04:35,899 --> 00:04:34,740

almost 15 years for where they just

123

00:04:38,360 --> 00:04:35,909

weren't really sending anything into

124

00:04:40,460 --> 00:04:38,370

space until we get the

125

00:04:43,159 --> 00:04:40,470

amazing piece of equipment the Hubble

126

00:04:44,900 --> 00:04:43,169

telescope in 1990 and you start getting

127

00:04:46,640 --> 00:04:44,910

all these incredible images of the solar

128

00:04:48,800 --> 00:04:46,650

system and it really revitalizes

129

00:04:51,409 --> 00:04:48,810

everyone's interest in outer space in

130

00:04:53,330 --> 00:04:51,419

space technology and spirits time in

131

00:04:55,580 --> 00:04:53,340

1990 this was like one of the most

132

00:04:58,930 --> 00:04:55,590

incredible developments in space science

133

00:05:02,420 --> 00:04:58,940

so it really just sparked that that

134

00:05:04,550 --> 00:05:02,430

space science expedition and the whole

135

00:05:06,790 --> 00:05:04,560

series of what we were going to think of

136

00:05:09,340 --> 00:05:06,800

even think about sending in the space so

137

00:05:11,719 --> 00:05:09,350

the world started sending these

138

00:05:15,379 --> 00:05:11,729

telescope this the called the great

139

00:05:16,909 --> 00:05:15,389

observers in the space and another well

140

00:05:18,770 --> 00:05:16,919

I'll come to that one in a second but

141

00:05:20,659 --> 00:05:18,780

but first they send out the Cassini

142

00:05:23,240 --> 00:05:20,669

mission and again this is sort of iconic

143

00:05:26,450 --> 00:05:23,250

in at least our setting for astrobiology

144

00:05:29,719 --> 00:05:26,460

where you have these really even more

145

00:05:31,250 --> 00:05:29,729

advanced tools for detecting the sort of

146

00:05:33,890 --> 00:05:31,260

environments we'll expect around these

147

00:05:35,570 --> 00:05:33,900

planets and incredibly advanced so this

148

00:05:36,830 --> 00:05:35,580

is they had another 15 years to get even

149

00:05:38,689 --> 00:05:36,840

more advanced cameras so they're getting

150

00:05:40,909 --> 00:05:38,699

better images of the moons around these

151  
00:05:43,010 --> 00:05:40,919  
planets and I think everyone knows that

152  
00:05:45,940 --> 00:05:43,020  
this at this point they found the V in

153  
00:05:49,070 --> 00:05:45,950  
celle spoons so this again really put a

154  
00:05:52,100 --> 00:05:49,080  
big step forward in the astrobiology

155  
00:05:53,420 --> 00:05:52,110  
community and specifically because there

156  
00:05:54,710 --> 00:05:53,430  
was like oh what's on these plumes I

157  
00:05:56,360 --> 00:05:54,720  
think this isn't this is an icy world

158  
00:05:58,010 --> 00:05:56,370  
there's water here so there might be

159  
00:06:01,450 --> 00:05:58,020  
life and in these police boats coming

160  
00:06:04,460 --> 00:06:01,460  
off of this planet so the Cassini as

161  
00:06:07,659 --> 00:06:04,470  
famous as it is it really just sort of

162  
00:06:10,010 --> 00:06:07,669  
defines the direction at least for now

163  
00:06:13,400 --> 00:06:10,020

that a lot of the science is heading for

164

00:06:14,450 --> 00:06:13,410

for our planetary research so again this

165

00:06:16,490 --> 00:06:14,460

was another one that sort of

166

00:06:18,980 --> 00:06:16,500

lesser-known Spitzer telescope it's one

167

00:06:21,620 --> 00:06:18,990

part of the great observers the Chandra

168

00:06:22,969 --> 00:06:21,630

is another one but combining all the

169

00:06:26,420 --> 00:06:22,979

telescopes out in space you get these

170

00:06:28,879 --> 00:06:26,430

really awesome composite images and data

171

00:06:31,790 --> 00:06:28,889

from the different cosmos that we can

172

00:06:33,529 --> 00:06:31,800

see from Earth or from surrounding earth

173

00:06:35,600 --> 00:06:33,539

so you can start to really map the

174

00:06:39,050 --> 00:06:35,610

entire galaxy and our known universe

175

00:06:40,640 --> 00:06:39,060

which before before was really like just

176

00:06:46,459 --> 00:06:40,650

challenge that was so out there that no

177

00:06:49,459 --> 00:06:46,469

one no one could even fathom so it's

178

00:06:51,620 --> 00:06:49,469

like mind-boggling to think about it but

179

00:06:52,250 --> 00:06:51,630

also during that time there are a lot of

180

00:06:55,670 --> 00:06:52,260

really

181

00:06:57,530 --> 00:06:55,680

heavily focused on Mars and it's made me

182

00:06:59,090 --> 00:06:57,540

happy that they finally started to send

183

00:07:01,130 --> 00:06:59,100

more experienced Mars even after Viking

184

00:07:03,470 --> 00:07:01,140

landers and the first thing they did was

185

00:07:04,850 --> 00:07:03,480

to send a rover because they hadn't done

186

00:07:06,140 --> 00:07:04,860

that before they'd only sent Landers so

187

00:07:08,150 --> 00:07:06,150

they were first concerned about landing

188

00:07:09,800 --> 00:07:08,160

so now they're concerned about actually

189

00:07:11,510 --> 00:07:09,810

moving around on the planet so you can

190

00:07:12,860 --> 00:07:11,520

get more data and figure out how to map

191

00:07:15,020 --> 00:07:12,870

the area and figure out all the

192

00:07:17,000 --> 00:07:15,030

mineralogy so they sent the Pathfinder

193

00:07:18,980 --> 00:07:17,010

and the Surgenor Rover and they were

194

00:07:21,770 --> 00:07:18,990

able to land on Mars successfully again

195

00:07:23,720 --> 00:07:21,780

which again amazing feat of its own and

196

00:07:27,140 --> 00:07:23,730

had like the weird bubble system but it

197

00:07:28,670 --> 00:07:27,150

worked so whatever works it's good so

198

00:07:30,050 --> 00:07:28,680

they moved on from that and they went to

199

00:07:30,980 --> 00:07:30,060

the spirit an opportunity and I think a

200

00:07:32,660 --> 00:07:30,990

lot of people have seen this once

201  
00:07:35,960 --> 00:07:32,670  
picture of Earth as pale blue dot

202  
00:07:38,660 --> 00:07:35,970  
picture of Earth from Mars and it's sort

203  
00:07:40,340 --> 00:07:38,670  
of it defines where science was at that

204  
00:07:42,350 --> 00:07:40,350  
time like we were able to get there we

205  
00:07:44,570 --> 00:07:42,360  
have these really faint images of all

206  
00:07:46,210 --> 00:07:44,580  
these planets and the surfaces of these

207  
00:07:49,100 --> 00:07:46,220  
planets

208  
00:07:50,210 --> 00:07:49,110  
got to the point where we can we can see

209  
00:07:51,560 --> 00:07:50,220  
our own planet with these

210  
00:07:54,200 --> 00:07:51,570  
high-resolution cameras and we're

211  
00:07:55,310 --> 00:07:54,210  
getting mineralogy composition of the of

212  
00:07:57,890 --> 00:07:55,320  
the land so we can actually start

213  
00:08:00,320 --> 00:07:57,900

sending more relevant wet chemistry

214

00:08:02,930 --> 00:08:00,330

techniques which we didn't think of them

215

00:08:05,900 --> 00:08:02,940

passed and they did so they sent the

216

00:08:08,780 --> 00:08:05,910

Phoenix lander which I think everyone

217

00:08:10,760 --> 00:08:08,790

knows saw the water or the water from

218

00:08:12,440 --> 00:08:10,770

its collection sample go over time so

219

00:08:14,870 --> 00:08:12,450

you can see that there's liquid water at

220

00:08:16,430 --> 00:08:14,880

least some evaporation over time and

221

00:08:17,480 --> 00:08:16,440

they have another interesting landing

222

00:08:18,980 --> 00:08:17,490

technique

223

00:08:23,000 --> 00:08:18,990

they even photographed it as it was

224

00:08:25,220 --> 00:08:23,010

going down and again big feet and at the

225

00:08:26,750 --> 00:08:25,230

time bringing us all the way to the

226

00:08:29,120 --> 00:08:26,760

Curiosity rover which had a more

227

00:08:30,950 --> 00:08:29,130

advanced what chemistry lab so again

228

00:08:33,230 --> 00:08:30,960

there's this all this holes logical step

229

00:08:34,610 --> 00:08:33,240

of progression where you go to where you

230

00:08:36,530 --> 00:08:34,620

want to go is just to prove you can do

231

00:08:37,730 --> 00:08:36,540

it and then you start sending more and

232

00:08:39,680 --> 00:08:37,740

more advanced technologies so you

233

00:08:41,630 --> 00:08:39,690

further characterize the area that

234

00:08:43,100 --> 00:08:41,640

you're going that you want the area of

235

00:08:46,730 --> 00:08:43,110

interest and then you send in your

236

00:08:48,560 --> 00:08:46,740

really fine-tuned equipment and some of

237

00:08:49,910 --> 00:08:48,570

the future directions so this is really

238

00:08:52,580 --> 00:08:49,920

defining the future directions of space

239

00:08:54,860 --> 00:08:52,590

technology for this specific or for our

240

00:08:55,850 --> 00:08:54,870

specific context in astrobiology so we

241

00:08:57,680 --> 00:08:55,860

have the James Webb Space Telescope

242

00:08:58,970 --> 00:08:57,690

that's essentially going to be the

243

00:09:00,470 --> 00:08:58,980

Gentoo of the Hubble and we're really

244

00:09:02,600 --> 00:09:00,480

going to be able to zoom in further on

245

00:09:03,230 --> 00:09:02,610

our universe in ours and our solar

246

00:09:05,960 --> 00:09:03,240

system

247

00:09:08,809 --> 00:09:05,970

as well to pick out more fine-tuned care

248

00:09:10,490 --> 00:09:08,819

tourists excelsov Europa clipper so this

249

00:09:13,460 --> 00:09:10,500

is highly relevant to the astrobiology

250

00:09:14,929 --> 00:09:13,470

community look at the the Europa

251

00:09:17,030 --> 00:09:14,939

environment so we can send more

252

00:09:19,910 --> 00:09:17,040

equipment so actually land on the planet

253

00:09:21,860 --> 00:09:19,920

or land on the moon and the Mars 2020

254

00:09:23,449 --> 00:09:21,870

Rover will be sending it back to Mars

255

00:09:25,790 --> 00:09:23,459

and gathering samples for a few

256

00:09:27,499 --> 00:09:25,800

potential future quote collection so

257

00:09:30,679 --> 00:09:27,509

bringing this back to the talks that are

258

00:09:33,949 --> 00:09:30,689

coming up it's really important to go

259

00:09:36,199 --> 00:09:33,959

through all the the the general path of

260

00:09:38,420 --> 00:09:36,209

how you send things out into space

261

00:09:40,639 --> 00:09:38,430

because for this talk talk number one

262

00:09:43,040 --> 00:09:40,649

they're using x-ray imaging techniques

263

00:09:44,269 --> 00:09:43,050

to study micro fossils and we've seen

264

00:09:45,980 --> 00:09:44,279

some pictures on Mars where there were

265

00:09:48,679 --> 00:09:45,990

micro fossils you know but it was really

266

00:09:49,610 --> 00:09:48,689

or they were pretending or they were

267

00:09:51,410 --> 00:09:49,620

there was thought to be micro fossils

268

00:09:53,059 --> 00:09:51,420

but we weren't really sure so we need to

269

00:09:55,009 --> 00:09:53,069

develop our own techniques to do that on

270

00:09:57,290 --> 00:09:55,019

earth before so we can really hone down

271

00:10:00,800 --> 00:09:57,300

on it so one way to do that is with this

272

00:10:04,670 --> 00:10:00,810

3d - GOG rafi and it takes x-ray images

273

00:10:06,619 --> 00:10:04,680

and creates 3d model you can also do

274

00:10:08,480 --> 00:10:06,629

that with micro CT we're still be going

275

00:10:09,949 --> 00:10:08,490

over after and same thing with confocal

276

00:10:11,840 --> 00:10:09,959

laser scanning microscopy that's just

277

00:10:12,980 --> 00:10:11,850

taking pictures and 3d images top number

278

00:10:14,329 --> 00:10:12,990

two we'll be going over this region

279

00:10:16,780 --> 00:10:14,339

based convolutional neural networks

280

00:10:20,569 --> 00:10:16,790

which is different than just a

281

00:10:22,519 --> 00:10:20,579

prediction of what our using an image

282

00:10:23,990 --> 00:10:22,529

and picking out spots on the image and

283

00:10:26,269 --> 00:10:24,000

telling you what they are it's actually

284

00:10:28,449 --> 00:10:26,279

figuring that out and interpreting that

285

00:10:31,999 --> 00:10:28,459

source image to give you what it thinks

286

00:10:34,850 --> 00:10:32,009

is actually there and lastly looking

287

00:10:36,799 --> 00:10:34,860

forward is this SETI talk they're using

288

00:10:38,660 --> 00:10:36,809

the Green Bay Conservatory to look for

289

00:10:39,889 --> 00:10:38,670

signs of extraterrestrial life which in

290

00:10:41,990 --> 00:10:39,899

and of itself is a really difficult

291

00:10:43,220 --> 00:10:42,000

challenge because it's hard to penetrate

292

00:10:44,749 --> 00:10:43,230

through the background noise to the

293

00:10:46,990 --> 00:10:44,759

universe so we're looking for these

294

00:10:49,660 --> 00:10:47,000

talks in