



Ames Research Center

1
00:00:07,670 --> 00:00:05,430
well it's a real pleasure for me to

2
00:00:09,190 --> 00:00:07,680
introduce introduce today's speaker dr

3
00:00:11,749 --> 00:00:09,200
carl pilster

4
00:00:14,230 --> 00:00:11,759
uh going sort of a reverse chronological

5
00:00:17,189 --> 00:00:14,240
order uh he was appointed director of

6
00:00:20,870 --> 00:00:17,199
nasa astrobiology institute in 19 in

7
00:00:23,429 --> 00:00:20,880
2006 prior to becoming nai director he

8
00:00:25,670 --> 00:00:23,439
was a senior scientist for astrobiology

9
00:00:27,589 --> 00:00:25,680
at nasa headquarters

10
00:00:29,269 --> 00:00:27,599
dr pilcher's scientific career was

11
00:00:30,390 --> 00:00:29,279
mostly conducted when he was a member of

12
00:00:33,190 --> 00:00:30,400
the faculty

13
00:00:35,350 --> 00:00:33,200

at the university of hawaii

14

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

his significant achievements include the

15

00:00:39,430 --> 00:00:37,200

discoveries of water frost in saturn's

16

00:00:41,750 --> 00:00:39,440

rings and on the three of jupiter's

17

00:00:43,670 --> 00:00:41,760

galilean satellites and of weather on

18

00:00:46,069 --> 00:00:43,680

neptune

19

00:00:47,510 --> 00:00:46,079

dr pilscher received his bachelor of

20

00:00:49,990 --> 00:00:47,520

science degree in chemistry from the

21

00:00:52,150 --> 00:00:50,000

polytechnic institute of brooklyn and

22

00:00:53,910 --> 00:00:52,160

his phd in chemistry and planetary

23

00:00:55,830 --> 00:00:53,920

science from mit

24

00:00:57,510 --> 00:00:55,840

he also holds a master's in public

25

00:01:01,430 --> 00:00:57,520

affairs degree

26

00:01:04,469 --> 00:01:01,440

international relations from princeton

27

00:01:05,910 --> 00:01:04,479

university so he has quite a few degrees

28

00:01:07,429 --> 00:01:05,920

and he's done quite a few significant

29

00:01:09,350 --> 00:01:07,439

things in his life

30

00:01:11,590 --> 00:01:09,360

today he's going to do a very special

31

00:01:13,030 --> 00:01:11,600

thing he's going to talk about

32

00:01:14,310 --> 00:01:13,040

the scientific career of one of the

33

00:01:15,590 --> 00:01:14,320

greatest men

34

00:01:17,270 --> 00:01:15,600

one of the greatest scientists of the

35

00:01:20,390 --> 00:01:17,280

20th century

36

00:01:23,590 --> 00:01:20,400

a title of his presentation is explorer

37

00:01:25,830 --> 00:01:23,600

nobel laureate astrobiologist things you

38

00:01:27,590 --> 00:01:25,840

never knew about barry bloomberg would

39

00:01:35,270 --> 00:01:27,600

you please give a warm welcome to dr

40

00:01:39,990 --> 00:01:37,109

thank you very much stephanie and thank

41

00:01:42,069 --> 00:01:40,000

you all for coming i see a lot of uh

42

00:01:45,030 --> 00:01:42,079

card carrying friends of barry in the

43

00:01:47,990 --> 00:01:45,040

audience and it's great to see you all

44

00:01:52,230 --> 00:01:48,000

and and thanks for coming to hear

45

00:01:55,510 --> 00:01:52,240

what is truly a remarkable story uh

46

00:01:56,630 --> 00:01:55,520

even as a friend of barry

47

00:01:58,550 --> 00:01:56,640

there are

48

00:02:00,630 --> 00:01:58,560

many things that barry didn't talk about

49

00:02:02,069 --> 00:02:00,640

a whole lot to his friends

50

00:02:04,149 --> 00:02:02,079

uh he did not talk about his

51
00:02:06,550 --> 00:02:04,159
accomplishments he was a genuinely

52
00:02:09,350 --> 00:02:06,560
humble man if you asked him you could

53
00:02:10,469 --> 00:02:09,360
get him talking but if you just met

54
00:02:12,630 --> 00:02:10,479
barry

55
00:02:13,990 --> 00:02:12,640
and we're talking with him chances are

56
00:02:15,750 --> 00:02:14,000
you'd wind up talking about something

57
00:02:19,030 --> 00:02:15,760
that you were interested in because

58
00:02:21,670 --> 00:02:19,040
barry had an insatiable curiosity and

59
00:02:23,670 --> 00:02:21,680
barry would generally ask you what you

60
00:02:26,150 --> 00:02:23,680
were interested in and you'd quickly

61
00:02:28,390 --> 00:02:26,160
find some common area of interest and

62
00:02:30,150 --> 00:02:28,400
you'd find yourself talking about movies

63
00:02:31,750 --> 00:02:30,160

for example which barry was very

64

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

interested in which

65

00:02:37,589 --> 00:02:34,959

many people are or camping or hiking or

66

00:02:39,190 --> 00:02:37,599

a variety of other things

67

00:02:40,630 --> 00:02:39,200

you wouldn't find out about barry's

68

00:02:42,150 --> 00:02:40,640

accomplishments

69

00:02:43,990 --> 00:02:42,160

and

70

00:02:45,990 --> 00:02:44,000

what i would like to do

71

00:02:47,830 --> 00:02:46,000

today is share with you the story of

72

00:02:49,910 --> 00:02:47,840

barry's accomplishments

73

00:02:52,869 --> 00:02:49,920

how he accomplished the things he did

74

00:02:55,830 --> 00:02:52,879

which were really quite extraordinary

75

00:02:58,710 --> 00:02:55,840

and relate those to

76
00:03:00,869 --> 00:02:58,720
what we know about barry's nasa career

77
00:03:02,949 --> 00:03:00,879
which began at the rather advanced age

78
00:03:05,910 --> 00:03:02,959
for barry of 72

79
00:03:07,110 --> 00:03:05,920
when he came to nasa

80
00:03:09,910 --> 00:03:07,120
and

81
00:03:11,589 --> 00:03:09,920
what you will see is that what barry did

82
00:03:14,630 --> 00:03:11,599
as the founding director of the nasa

83
00:03:18,229 --> 00:03:14,640
astrobiology institute

84
00:03:21,750 --> 00:03:18,239
was in fact directly traceable back to

85
00:03:22,630 --> 00:03:21,760
his experiences in medical research

86
00:03:24,790 --> 00:03:22,640
so

87
00:03:26,630 --> 00:03:24,800
let's get started

88
00:03:28,710 --> 00:03:26,640

now a lot of what i'm going to tell you

89

00:03:31,430 --> 00:03:28,720

barry wrote down in his autobiography

90

00:03:34,149 --> 00:03:31,440

the hunt for a killer virus hepatitis b

91

00:03:36,309 --> 00:03:34,159

and if you want to know more of the

92

00:03:37,990 --> 00:03:36,319

details of barry's story i encourage you

93

00:03:39,910 --> 00:03:38,000

to get the book and read it

94

00:03:42,149 --> 00:03:39,920

there are other biographies of barry

95

00:03:45,110 --> 00:03:42,159

available not so much in writing

96

00:03:46,869 --> 00:03:45,120

although he has a an expanded biography

97

00:03:49,750 --> 00:03:46,879

on the nobel

98

00:03:51,430 --> 00:03:49,760

website that is really very good and

99

00:03:53,589 --> 00:03:51,440

complements this one it was written four

100

00:03:55,830 --> 00:03:53,599

years later and there's a wonderful six

101
00:03:57,830 --> 00:03:55,840
or seven hours of video

102
00:03:59,589 --> 00:03:57,840
which is basically an extemporaneous

103
00:04:00,949 --> 00:03:59,599
biography that's available on the web

104
00:04:02,710 --> 00:04:00,959
and i can tell you about that if you're

105
00:04:03,509 --> 00:04:02,720
interested

106
00:04:05,670 --> 00:04:03,519
so

107
00:04:07,429 --> 00:04:05,680
barry's early years he was born in new

108
00:04:09,509 --> 00:04:07,439
york city oops

109
00:04:12,390 --> 00:04:09,519
he was born in new york city grandchild

110
00:04:14,390 --> 00:04:12,400
of eastern european immigrants he had a

111
00:04:15,830 --> 00:04:14,400
jewish parochial education prior to

112
00:04:18,629 --> 00:04:15,840
going to high school he was at the

113
00:04:20,310 --> 00:04:18,639

yeshiva of flatbush which is flatbush is

114

00:04:22,870 --> 00:04:20,320

an area in brooklyn

115

00:04:25,270 --> 00:04:22,880

and his studies included

116

00:04:27,350 --> 00:04:25,280

as as is the custom in jewish parochial

117

00:04:29,510 --> 00:04:27,360

education studies of the torah and the

118

00:04:31,510 --> 00:04:29,520

talmud which are commentaries on the

119

00:04:32,790 --> 00:04:31,520

torah that have been written over many

120

00:04:36,230 --> 00:04:32,800

centuries

121

00:04:37,430 --> 00:04:36,240

and what barry noted in retrospect was

122

00:04:40,870 --> 00:04:37,440

that

123

00:04:43,590 --> 00:04:40,880

the talmudic discourse this fact-based

124

00:04:45,830 --> 00:04:43,600

argumentation was very good training for

125

00:04:46,629 --> 00:04:45,840

his later scientific career it started

126

00:04:48,150 --> 00:04:46,639

him

127

00:04:51,990 --> 00:04:48,160

in this

128

00:04:53,830 --> 00:04:52,000

in the mode of looking at what the facts

129

00:04:55,990 --> 00:04:53,840

are and then

130

00:04:58,310 --> 00:04:56,000

debating with others about what those

131

00:04:59,510 --> 00:04:58,320

facts might actually mean and as you'll

132

00:05:01,110 --> 00:04:59,520

see of course

133

00:05:02,469 --> 00:05:01,120

that was a central part of his

134

00:05:04,550 --> 00:05:02,479

scientific career

135

00:05:06,710 --> 00:05:04,560

he graduated from far rockaway high

136

00:05:08,710 --> 00:05:06,720

school which is on a

137

00:05:10,710 --> 00:05:08,720

barrier island basically at the south

138

00:05:12,629 --> 00:05:10,720

end of long island

139

00:05:14,790 --> 00:05:12,639

the graduates from that high school

140

00:05:16,469 --> 00:05:14,800

included remarkably two other nobel

141

00:05:18,310 --> 00:05:16,479

laureates richard feynman who won the

142

00:05:21,029 --> 00:05:18,320

prize in physics in 65 and burton

143

00:05:23,350 --> 00:05:21,039

richter who won the prize the in physics

144

00:05:25,110 --> 00:05:23,360

the same year that barry won the prize

145

00:05:27,270 --> 00:05:25,120

and in fact barry said that the

146

00:05:28,230 --> 00:05:27,280

intellectual atmosphere in his high

147

00:05:30,790 --> 00:05:28,240

school

148

00:05:33,350 --> 00:05:30,800

was so great that he didn't encounter

149

00:05:38,870 --> 00:05:33,360

its equal until he arrived at oxford for

150

00:05:40,469 --> 00:05:38,880

his phd after uh going to med school so

151

00:05:43,670 --> 00:05:40,479

it's really it must have been quite a

152

00:05:47,270 --> 00:05:43,680

remarkable place at that time

153

00:05:49,909 --> 00:05:47,280

he entered the navy in 1946 at age 17

154

00:05:51,590 --> 00:05:49,919

the navy paid for him to complete a

155

00:05:53,830 --> 00:05:51,600

degree in physics at union college in

156

00:05:57,189 --> 00:05:53,840

new york and he was commissioned a line

157

00:05:58,230 --> 00:05:57,199

officer and served for uh three years i

158

00:06:00,469 --> 00:05:58,240

guess it was

159

00:06:04,309 --> 00:06:00,479

rising to the rank of captain of small

160

00:06:05,189 --> 00:06:04,319

amphibious ships and there is barry uh

161

00:06:08,390 --> 00:06:05,199

at

162

00:06:10,710 --> 00:06:08,400

age 0 roughly 22

163

00:06:13,270 --> 00:06:10,720

sitting there

164

00:06:15,270 --> 00:06:13,280

enjoying life

165

00:06:16,790 --> 00:06:15,280

and he said that he always appreciated

166

00:06:19,110 --> 00:06:16,800

the lessons he learned in the navy

167

00:06:20,390 --> 00:06:19,120

responsibility forward planning the

168

00:06:22,790 --> 00:06:20,400

importance of logistics and

169

00:06:25,189 --> 00:06:22,800

infrastructure sorry for the

170

00:06:27,590 --> 00:06:25,199

little font problem there

171

00:06:29,749 --> 00:06:27,600

barry looked back on his time in the

172

00:06:31,189 --> 00:06:29,759

navy as really a very important time of

173

00:06:32,710 --> 00:06:31,199

training for him because one of the

174

00:06:34,870 --> 00:06:32,720

things that he learned in the navy was

175

00:06:37,029 --> 00:06:34,880

that you need to start off with plan a

176

00:06:39,430 --> 00:06:37,039

but you'd better have plans b c and d

177

00:06:41,029 --> 00:06:39,440

ready in case plan a doesn't work out

178

00:06:43,830 --> 00:06:41,039

because you're going to need plans b c

179

00:06:46,629 --> 00:06:43,840

and d really really quickly in that case

180

00:06:48,390 --> 00:06:46,639

and as you'll see so much of barry's

181

00:06:51,990 --> 00:06:48,400

research was done

182

00:06:53,670 --> 00:06:52,000

uh in the field in many many field trips

183

00:06:55,189 --> 00:06:53,680

and in field trips the unexpected was

184

00:06:56,950 --> 00:06:55,199

happening all the time and as you'll see

185

00:06:58,870 --> 00:06:56,960

barry went to some pretty remote and

186

00:07:01,270 --> 00:06:58,880

primitive places in the world to do

187

00:07:04,150 --> 00:07:01,280

scientific research so barry always had

188

00:07:06,070 --> 00:07:04,160

plans b c and d ready just in case plan

189

00:07:09,350 --> 00:07:06,080

a didn't work out and i suspect plan a

190

00:07:12,710 --> 00:07:09,360

probably didn't work out an awful lot

191

00:07:16,629 --> 00:07:12,720

so let me talk a bit now about his early

192

00:07:18,870 --> 00:07:16,639

field work and medical anthropology

193

00:07:22,390 --> 00:07:18,880

so in 1947

194

00:07:24,629 --> 00:07:22,400

barry uh was in graduate work in physics

195

00:07:27,670 --> 00:07:24,639

he had gotten out of the navy

196

00:07:29,270 --> 00:07:27,680

and he entered columbia

197

00:07:31,510 --> 00:07:29,280

university medical school now it was

198

00:07:33,670 --> 00:07:31,520

interesting he left graduate work in

199

00:07:35,990 --> 00:07:33,680

physics because his senior professor and

200

00:07:38,550 --> 00:07:36,000

advisor told him that he really didn't

201
00:07:40,790 --> 00:07:38,560
have the specific intellectual skills

202
00:07:42,870 --> 00:07:40,800
necessary for success

203
00:07:44,309 --> 00:07:42,880
in physics and barry said that he

204
00:07:46,230 --> 00:07:44,319
actually came to agree with that

205
00:07:48,230 --> 00:07:46,240
assessment and apparently his father

206
00:07:50,150 --> 00:07:48,240
agreed with the assessment as well so at

207
00:07:52,469 --> 00:07:50,160
any rate the advice was barry go to

208
00:07:53,670 --> 00:07:52,479
medical school so barry went to medical

209
00:07:55,909 --> 00:07:53,680
school

210
00:07:58,550 --> 00:07:55,919
when he was a third year medical student

211
00:08:01,189 --> 00:07:58,560
he had the opportunity to go to suriname

212
00:08:03,189 --> 00:08:01,199
which is a country in sort of the the

213
00:08:06,550 --> 00:08:03,199

north central part of south america

214

00:08:09,990 --> 00:08:06,560

which was then known as dutch guiana and

215

00:08:11,670 --> 00:08:10,000

french guyana is just to its east

216

00:08:14,790 --> 00:08:11,680

barry was

217

00:08:17,510 --> 00:08:14,800

in some ways a man of his times and the

218

00:08:20,230 --> 00:08:17,520

times associated the tropics with

219

00:08:22,550 --> 00:08:20,240

romance they were mysterious and there

220

00:08:24,869 --> 00:08:22,560

were all these movies which we now

221

00:08:27,350 --> 00:08:24,879

recognize were not politically correct

222

00:08:29,670 --> 00:08:27,360

but at the time were very very popular

223

00:08:30,710 --> 00:08:29,680

and barry was really fascinated with the

224

00:08:32,310 --> 00:08:30,720

tropics

225

00:08:34,070 --> 00:08:32,320

he was also

226

00:08:36,949 --> 00:08:34,080

by this time very deeply committed to

227

00:08:39,909 --> 00:08:36,959

medicine and to providing health care

228

00:08:42,389 --> 00:08:39,919

and for him this was really a fabulous

229

00:08:44,710 --> 00:08:42,399

opportunity to pursue both of these

230

00:08:48,710 --> 00:08:44,720

interests simultaneously

231

00:08:52,070 --> 00:08:48,720

so he spent the summer in suriname

232

00:08:54,389 --> 00:08:52,080

his job there his role was to provide

233

00:08:55,910 --> 00:08:54,399

basic medical services

234

00:08:58,550 --> 00:08:55,920

kinds of things that you could imagine

235

00:09:01,350 --> 00:08:58,560

remote populations needing but also to

236

00:09:04,470 --> 00:09:01,360

study disease and he was based at a

237

00:09:06,870 --> 00:09:04,480

bauxite mine an aluminum ore mine in the

238

00:09:08,870 --> 00:09:06,880

city of moengo which is not far from the

239

00:09:10,470 --> 00:09:08,880

coast but you have to go up a fairly

240

00:09:13,350 --> 00:09:10,480

major river to get there

241

00:09:15,350 --> 00:09:13,360

this was a mine that had produced most

242

00:09:17,269 --> 00:09:15,360

of the bauxite ore that supported the

243

00:09:19,190 --> 00:09:17,279

canadian effort during world war ii and

244

00:09:22,150 --> 00:09:19,200

a lot of the us effort during world war

245

00:09:24,150 --> 00:09:22,160

ii so there was uh you could get large

246

00:09:27,430 --> 00:09:24,160

ships into the mine

247

00:09:31,430 --> 00:09:27,440

and you could export the ore out

248

00:09:33,829 --> 00:09:31,440

now suriname was very interesting

249

00:09:36,470 --> 00:09:33,839

from the standpoint of populations

250

00:09:38,790 --> 00:09:36,480

because there were of course natives of

251

00:09:40,389 --> 00:09:38,800

south america in suriname

252

00:09:43,509 --> 00:09:40,399

uh suriname

253

00:09:46,070 --> 00:09:43,519

like many countries of the new world had

254

00:09:47,750 --> 00:09:46,080

a slave trade for some years but it was

255

00:09:50,070 --> 00:09:47,760

also the site of one of the first

256

00:09:52,790 --> 00:09:50,080

successful slave rebellions in the

257

00:09:54,710 --> 00:09:52,800

mid-18th century so there were also a

258

00:09:57,670 --> 00:09:54,720

number of descendants

259

00:09:59,829 --> 00:09:57,680

of those slaves who formed a very large

260

00:10:02,470 --> 00:09:59,839

population of african origin there are

261

00:10:03,590 --> 00:10:02,480

also europeans particularly

262

00:10:07,590 --> 00:10:03,600

from

263

00:10:09,350 --> 00:10:07,600

holland and northern europe whoops

264

00:10:11,590 --> 00:10:09,360

indonesians

265

00:10:13,509 --> 00:10:11,600

indians

266

00:10:15,430 --> 00:10:13,519

chinese etc

267

00:10:17,430 --> 00:10:15,440

and what barry found in studying the

268

00:10:20,230 --> 00:10:17,440

prevalence of disease and malaria and

269

00:10:22,069 --> 00:10:20,240

filaria two parasitic diseases malaria

270

00:10:24,310 --> 00:10:22,079

of course a protist and filaria is uh

271

00:10:25,670 --> 00:10:24,320

the parasite is a worm particularly

272

00:10:28,150 --> 00:10:25,680

nasty disease

273

00:10:30,790 --> 00:10:28,160

uh what he found was that the

274

00:10:33,269 --> 00:10:30,800

susceptibility to infection

275

00:10:35,110 --> 00:10:33,279

varied greatly among those different

276

00:10:36,870 --> 00:10:35,120

populations now these were people who

277

00:10:39,030 --> 00:10:36,880

were living in the same place at the

278

00:10:40,710 --> 00:10:39,040

same time under the same conditions and

279

00:10:42,230 --> 00:10:40,720

yet some people got sick and some people

280

00:10:43,269 --> 00:10:42,240

didn't get sick

281

00:10:46,310 --> 00:10:43,279

and

282

00:10:47,829 --> 00:10:46,320

barry wondered why

283

00:10:50,870 --> 00:10:47,839

now

284

00:10:55,509 --> 00:10:53,030

sort of what barry was

285

00:10:57,910 --> 00:10:55,519

prepared to do at that time

286

00:11:01,110 --> 00:10:57,920

this is a trip that they made on the

287

00:11:03,590 --> 00:11:01,120

mariwine river while during that summer

288

00:11:06,150 --> 00:11:03,600

this was to get into the

289

00:11:09,509 --> 00:11:06,160

far more remote interior

290

00:11:12,710 --> 00:11:09,519

of suriname to do a study of the

291

00:11:15,670 --> 00:11:12,720

prevalence of filaria and malaria in

292

00:11:18,470 --> 00:11:15,680

really remote areas of suriname so barry

293

00:11:20,310 --> 00:11:18,480

was really prepared to do things at the

294

00:11:22,790 --> 00:11:20,320

time that were

295

00:11:24,790 --> 00:11:22,800

really beyond what most people were

296

00:11:27,350 --> 00:11:24,800

doing certainly most researchers

297

00:11:29,910 --> 00:11:27,360

scientific researchers

298

00:11:31,350 --> 00:11:29,920

so this was really a seminal period for

299

00:11:33,910 --> 00:11:31,360

barry

300

00:11:36,389 --> 00:11:33,920

it was during this period that the

301
00:11:38,550 --> 00:11:36,399
central question that motivated his

302
00:11:41,110 --> 00:11:38,560
entire scientific career was really

303
00:11:43,430 --> 00:11:41,120
formed and that question is how do

304
00:11:45,990 --> 00:11:43,440
inheritance human behavior and the

305
00:11:47,110 --> 00:11:46,000
environment interrelate in the context

306
00:11:48,470 --> 00:11:47,120
of disease

307
00:11:50,069 --> 00:11:48,480
and he wrote in his book it was in

308
00:11:52,069 --> 00:11:50,079
surname that i learned to rely on

309
00:11:56,150 --> 00:11:52,079
observations in the field new

310
00:11:57,750 --> 00:11:56,160
observations led to new hypotheses

311
00:12:00,230 --> 00:11:57,760
that could not have been induced by

312
00:12:01,990 --> 00:12:00,240
laboratory-based experiments the field

313
00:12:03,910 --> 00:12:02,000

work was in turn very dependent on

314

00:12:05,509 --> 00:12:03,920

laboratory techniques and hypotheses

315

00:12:07,269 --> 00:12:05,519

were confirmed or rejected by

316

00:12:08,310 --> 00:12:07,279

experimental testing

317

00:12:12,230 --> 00:12:08,320

this too

318

00:12:15,590 --> 00:12:12,240

was a a way of approaching science that

319

00:12:18,629 --> 00:12:15,600

characterized barry's scientific career

320

00:12:20,550 --> 00:12:18,639

the use of field work

321

00:12:22,150 --> 00:12:20,560

theoretical work that is the development

322

00:12:23,990 --> 00:12:22,160

of hypotheses and then the testing of

323

00:12:26,629 --> 00:12:24,000

those hypotheses in the laboratory and

324

00:12:27,670 --> 00:12:26,639

the interrelationship between those

325

00:12:30,550 --> 00:12:27,680

three

326
00:12:32,069 --> 00:12:30,560
modes of investigation were also central

327
00:12:34,550 --> 00:12:32,079
to barry's work

328
00:12:37,190 --> 00:12:34,560
so after med school barry trained at

329
00:12:38,629 --> 00:12:37,200
bellevue hospital and anybody who

330
00:12:40,550 --> 00:12:38,639
is familiar with new york city and

331
00:12:42,790 --> 00:12:40,560
particularly new york city at that time

332
00:12:45,430 --> 00:12:42,800
knows that bellevue hospital was one

333
00:12:46,710 --> 00:12:45,440
amazing place to train in medicine

334
00:12:48,629 --> 00:12:46,720
at that time

335
00:12:51,190 --> 00:12:48,639
followed by going up to columbia

336
00:12:53,910 --> 00:12:51,200
presbyterian medical center uptown

337
00:12:55,269 --> 00:12:53,920
and again what he found particularly in

338
00:12:57,430 --> 00:12:55,279

the population that was treated at

339

00:13:00,230 --> 00:12:57,440

bellevue which was a city hospital and

340

00:13:03,829 --> 00:13:00,240

this computer is very touchy here

341

00:13:05,670 --> 00:13:03,839

he found again that some populations

342

00:13:07,590 --> 00:13:05,680

some demographic groups scandinavians

343

00:13:09,430 --> 00:13:07,600

for example were much more likely to

344

00:13:11,750 --> 00:13:09,440

contract tuberculosis which was very

345

00:13:15,269 --> 00:13:11,760

common in new york city at the time

346

00:13:17,430 --> 00:13:15,279

then were other populations again

347

00:13:18,629 --> 00:13:17,440

reinforcing the

348

00:13:22,470 --> 00:13:18,639

observations that he had made in

349

00:13:25,910 --> 00:13:22,480

suriname from 1955 to 57 he was at

350

00:13:28,949 --> 00:13:25,920

oxford doing a phd in biochemistry

351

00:13:30,550 --> 00:13:28,959

and during that time he developed a very

352

00:13:32,870 --> 00:13:30,560

specific interest in genetic

353

00:13:34,550 --> 00:13:32,880

polymorphisms basically variations

354

00:13:37,430 --> 00:13:34,560

genetic variations

355

00:13:41,190 --> 00:13:37,440

and their relationship to to disease

356

00:13:43,829 --> 00:13:41,200

susceptibility now the thing that is

357

00:13:45,990 --> 00:13:43,839

important about a genetic

358

00:13:47,590 --> 00:13:46,000

variation that is related to disease

359

00:13:51,269 --> 00:13:47,600

susceptibilities of course you can

360

00:13:54,230 --> 00:13:51,279

determine that before somebody gets sick

361

00:13:56,470 --> 00:13:54,240

so that means that if you know who is

362

00:13:57,910 --> 00:13:56,480

susceptible to a particular disease

363

00:14:00,150 --> 00:13:57,920

there is the potential at least for

364

00:14:01,990 --> 00:14:00,160

intervention for example if you know

365

00:14:04,389 --> 00:14:02,000

that you are genetically susceptible to

366

00:14:05,750 --> 00:14:04,399

heart disease you may spend more time

367

00:14:08,550 --> 00:14:05,760

really focusing on keeping your

368

00:14:10,790 --> 00:14:08,560

cholesterol down very simple not so

369

00:14:12,389 --> 00:14:10,800

simple sometimes intervention

370

00:14:15,030 --> 00:14:12,399

but that's the kind of thing that

371

00:14:17,189 --> 00:14:15,040

motivated barry so he wrote that it

372

00:14:19,030 --> 00:14:17,199

began to dawn on me that the study of

373

00:14:20,389 --> 00:14:19,040

human polymorphisms would provide a

374

00:14:21,990 --> 00:14:20,399

conceptual framework for the

375

00:14:23,110 --> 00:14:22,000

investigation of inherited human

376

00:14:25,189 --> 00:14:23,120

variation

377

00:14:26,550 --> 00:14:25,199

and its connections with disease and

378

00:14:28,949 --> 00:14:26,560

survival

379

00:14:32,790 --> 00:14:30,949

that concept

380

00:14:34,949 --> 00:14:32,800

of determining

381

00:14:36,710 --> 00:14:34,959

a susceptibility to disease before

382

00:14:38,790 --> 00:14:36,720

someone gets sick is basically

383

00:14:42,150 --> 00:14:38,800

preventive medicine well preventive

384

00:14:43,990 --> 00:14:42,160

medicine was not a hotly pursued topic

385

00:14:46,550 --> 00:14:44,000

in the medical community at the time and

386

00:14:48,150 --> 00:14:46,560

some would argue even today

387

00:14:49,670 --> 00:14:48,160

it certainly wasn't a high status

388

00:14:52,069 --> 00:14:49,680

professional goal

389

00:14:54,230 --> 00:14:52,079

i mean after all what happens when you

390

00:14:56,230 --> 00:14:54,240

are successful in preventive medicine

391

00:14:58,790 --> 00:14:56,240

nobody gets sick

392

00:15:01,110 --> 00:14:58,800

try imagining a tv medical drama based

393

00:15:03,030 --> 00:15:01,120

on preventive medicine i don't think it

394

00:15:05,910 --> 00:15:03,040

would do too well in the ratings against

395

00:15:07,990 --> 00:15:05,920

er or you know in the oscar competition

396

00:15:09,670 --> 00:15:08,000

against contagion you're not going to

397

00:15:12,629 --> 00:15:09,680

find too many people getting excited

398

00:15:14,629 --> 00:15:12,639

about the results of preventive medicine

399

00:15:16,230 --> 00:15:14,639

at the same time

400

00:15:18,389 --> 00:15:16,240

the particular thing that he was

401
00:15:20,790 --> 00:15:18,399
studying human polymorphisms at the time

402
00:15:22,389 --> 00:15:20,800
were also seen as sort of ho-hum by the

403
00:15:24,310 --> 00:15:22,399
medical community they were used in

404
00:15:27,430 --> 00:15:24,320
forensics of people committed a crime

405
00:15:29,590 --> 00:15:27,440
you know we see on csi now all the time

406
00:15:31,670 --> 00:15:29,600
if there was a paternity suit

407
00:15:33,750 --> 00:15:31,680
blood banking was concerned about human

408
00:15:35,910 --> 00:15:33,760
polymorphisms

409
00:15:37,389 --> 00:15:35,920
make sure that blood types were were the

410
00:15:39,430 --> 00:15:37,399
right type

411
00:15:41,350 --> 00:15:39,440
anthropologists were concerned about

412
00:15:43,509 --> 00:15:41,360
human polymorphisms because it enabled

413
00:15:47,590 --> 00:15:43,519

them to trace populations

414

00:15:49,430 --> 00:15:47,600

so barry was pursuing a not very

415

00:15:51,749 --> 00:15:49,440

medically

416

00:15:55,430 --> 00:15:51,759

exciting or at least a scene exciting by

417

00:15:57,350 --> 00:15:55,440

his contemporaries uh not very exciting

418

00:15:59,110 --> 00:15:57,360

medical field preventive medicine

419

00:16:01,350 --> 00:15:59,120

medicine using

420

00:16:03,509 --> 00:16:01,360

a sort of ho-hum

421

00:16:05,749 --> 00:16:03,519

again as seen by the medical community

422

00:16:08,389 --> 00:16:05,759

techniques studying human polymorphisms

423

00:16:11,590 --> 00:16:08,399

worse to study human polymorphisms you

424

00:16:14,389 --> 00:16:11,600

have to do population studies

425

00:16:17,430 --> 00:16:14,399

well population studies of course

426
00:16:19,430 --> 00:16:17,440
are much less precise as viewed by the

427
00:16:21,110 --> 00:16:19,440
traditional medical community than

428
00:16:23,030 --> 00:16:21,120
reductionist medicine which looks at the

429
00:16:26,069 --> 00:16:23,040
chemistry and the physics of what's

430
00:16:27,430 --> 00:16:26,079
going on inside the body but barry

431
00:16:29,749 --> 00:16:27,440
pressed on

432
00:16:32,949 --> 00:16:29,759
this was barry's nature

433
00:16:36,310 --> 00:16:32,959
he pressed on in face of this skepticism

434
00:16:38,230 --> 00:16:36,320
and did that work for several years at

435
00:16:40,389 --> 00:16:38,240
the national institutes of health before

436
00:16:42,550 --> 00:16:40,399
he moved to what was then called the

437
00:16:46,389 --> 00:16:42,560
institute for cancer research which is

438
00:16:48,470 --> 00:16:46,399

now known as the fox chase cancer center

439

00:16:50,949 --> 00:16:48,480

and he talked about that move

440

00:16:53,829 --> 00:16:50,959

from nih and he said his main problem at

441

00:16:56,389 --> 00:16:53,839

nih was fitting what i wanted to do into

442

00:16:58,550 --> 00:16:56,399

the disciplined determined rigidity

443

00:17:02,069 --> 00:16:58,560

of the constituent institutes

444

00:17:05,350 --> 00:17:02,079

then and now nih comprises about 20

445

00:17:07,990 --> 00:17:05,360

individual institutes each devoted to a

446

00:17:10,230 --> 00:17:08,000

particular disease or category of

447

00:17:12,230 --> 00:17:10,240

disease and of course having that

448

00:17:15,189 --> 00:17:12,240

structure makes it very difficult to

449

00:17:16,470 --> 00:17:15,199

work across the boundaries of those

450

00:17:18,710 --> 00:17:16,480

institutes

451
00:17:20,309 --> 00:17:18,720
barry's research as he says ranged over

452
00:17:22,549 --> 00:17:20,319
several disciplines population

453
00:17:24,710 --> 00:17:22,559
anthropology epidemiology environment

454
00:17:27,110 --> 00:17:24,720
host interactions there was of course a

455
00:17:28,549 --> 00:17:27,120
very major clinical component

456
00:17:30,789 --> 00:17:28,559
to his work

457
00:17:33,270 --> 00:17:30,799
and even though the institute for cancer

458
00:17:35,029 --> 00:17:33,280
research was dedicated to cancer we were

459
00:17:37,590 --> 00:17:35,039
never asked what relation our research

460
00:17:39,750 --> 00:17:37,600
had to immediate cancer applications so

461
00:17:41,909 --> 00:17:39,760
he found a freedom to work across

462
00:17:44,950 --> 00:17:41,919
disciplinary boundaries

463
00:17:48,150 --> 00:17:44,960

at icr now fox chase

464

00:17:50,230 --> 00:17:48,160

and when one thinks about astrobiology

465

00:17:52,470 --> 00:17:50,240

which as most of this audience knows is

466

00:17:54,549 --> 00:17:52,480

extremely interdisciplinary it's not

467

00:17:58,470 --> 00:17:54,559

surprising to find that later in life

468

00:18:00,390 --> 00:17:58,480

when barry had decided not to to uh

469

00:18:02,390 --> 00:18:00,400

not to continue as an active medical

470

00:18:04,150 --> 00:18:02,400

researcher that it was astrobiology as

471

00:18:06,310 --> 00:18:04,160

another science that really got his

472

00:18:07,270 --> 00:18:06,320

attention

473

00:18:10,230 --> 00:18:07,280

so

474

00:18:12,230 --> 00:18:10,240

how did barry come to the nobel prize

475

00:18:14,950 --> 00:18:12,240

one thing i can tell you for sure is he

476

00:18:18,230 --> 00:18:14,960

must have been as surprised as anybody

477

00:18:21,430 --> 00:18:18,240

uh that this is where his path took him

478

00:18:24,710 --> 00:18:21,440

so the question he was focused on what

479

00:18:29,830 --> 00:18:27,669

in 1955 there was a new technique

480

00:18:31,990 --> 00:18:29,840

developed gel electrophoresis now

481

00:18:33,909 --> 00:18:32,000

anybody who has taken elementary biology

482

00:18:36,310 --> 00:18:33,919

even in high school thinks of gel

483

00:18:37,830 --> 00:18:36,320

electrophoresis as you know oh my you

484

00:18:39,110 --> 00:18:37,840

know everybody does that you do it in

485

00:18:40,870 --> 00:18:39,120

high school you do it in freshman

486

00:18:42,950 --> 00:18:40,880

biology

487

00:18:45,029 --> 00:18:42,960

but however somebody had to develop it

488

00:18:47,270 --> 00:18:45,039

there was a technique before that was

489

00:18:49,750 --> 00:18:47,280

paper electrophoresis so this was a

490

00:18:51,510 --> 00:18:49,760

newly developed technique in 1955 and

491

00:18:52,950 --> 00:18:51,520

barry and his colleagues began an

492

00:18:55,350 --> 00:18:52,960

extensive study

493

00:18:56,390 --> 00:18:55,360

of genetic polymorphisms about the the

494

00:18:59,830 --> 00:18:56,400

distribution

495

00:19:02,070 --> 00:18:59,840

of different variants of genes in

496

00:19:03,909 --> 00:19:02,080

populations living under very different

497

00:19:05,830 --> 00:19:03,919

environmental conditions again getting

498

00:19:08,470 --> 00:19:05,840

at what's the interaction

499

00:19:10,470 --> 00:19:08,480

between behavior the environment and

500

00:19:13,669 --> 00:19:10,480

your genetic makeup with regard to

501

00:19:15,669 --> 00:19:13,679

susceptibility uh to disease

502

00:19:17,830 --> 00:19:15,679

this was a time that his field work

503

00:19:20,070 --> 00:19:17,840

really took off and he was traveling

504

00:19:21,669 --> 00:19:20,080

literally to the ends of the earth he

505

00:19:23,590 --> 00:19:21,679

started close to home he actually

506

00:19:26,150 --> 00:19:23,600

started around oxford

507

00:19:28,070 --> 00:19:26,160

getting a baseline population

508

00:19:31,110 --> 00:19:28,080

and went to the basque country because

509

00:19:34,630 --> 00:19:31,120

it turns out the basque people actually

510

00:19:37,510 --> 00:19:34,640

have a fairly distinct population

511

00:19:39,430 --> 00:19:37,520

then to nigeria and over the next

512

00:19:42,789 --> 00:19:39,440

several years to northern alaska to

513

00:19:45,909 --> 00:19:42,799

study the inuits greece pacific islands

514

00:19:49,029 --> 00:19:45,919

native americans south america etc what

515

00:19:50,710 --> 00:19:49,039

they generally did was they tagged along

516

00:19:52,950 --> 00:19:50,720

with other studies

517

00:19:55,990 --> 00:19:52,960

which were collecting blood samples and

518

00:19:57,830 --> 00:19:56,000

so they would be able to get a a

519

00:20:01,029 --> 00:19:57,840

portion of those samples that were

520

00:20:02,470 --> 00:20:01,039

collected without causing any additional

521

00:20:04,789 --> 00:20:02,480

interventions

522

00:20:07,270 --> 00:20:04,799

in those populations and they had their

523

00:20:09,110 --> 00:20:07,280

general conceptual framework that by

524

00:20:11,270 --> 00:20:09,120

understanding the distribution of

525

00:20:12,870 --> 00:20:11,280

genetic polymorphisms they would learn

526

00:20:14,549 --> 00:20:12,880

something and doing this in different

527

00:20:16,549 --> 00:20:14,559

environments they would learn something

528

00:20:19,029 --> 00:20:16,559

about disease but they didn't know what

529

00:20:21,029 --> 00:20:19,039

they were going to learn it was way too

530

00:20:23,669 --> 00:20:21,039

early to postulate

531

00:20:26,470 --> 00:20:23,679

that we're going to study this disease

532

00:20:27,909 --> 00:20:26,480

by studying these genetic polymorphisms

533

00:20:29,990 --> 00:20:27,919

so what they were really doing was

534

00:20:31,909 --> 00:20:30,000

exploring in this case the space that

535

00:20:33,590 --> 00:20:31,919

they were exploring was human genetic

536

00:20:35,430 --> 00:20:33,600

variation

537

00:20:36,549 --> 00:20:35,440

and they were exploring for what they

538

00:20:39,190 --> 00:20:36,559

were going to find about the

539

00:20:42,870 --> 00:20:39,200

associations between environment those

540

00:20:45,669 --> 00:20:42,880

human genetic variations and disease

541

00:20:49,430 --> 00:20:45,679

so i would argue that barry was a true

542

00:20:51,110 --> 00:20:49,440

explorer from the outset

543

00:20:52,549 --> 00:20:51,120

this is a picture of barry taken in

544

00:20:55,750 --> 00:20:52,559

suriname

545

00:21:00,630 --> 00:20:58,950

here he is in the in northern alaska

546

00:21:02,549 --> 00:21:00,640

this is during the

547

00:21:04,789 --> 00:21:02,559

inuit study

548

00:21:07,029 --> 00:21:04,799

one of the inuit studies and he is

549

00:21:09,350 --> 00:21:07,039

dressed in this case for a meeting with

550

00:21:11,430 --> 00:21:09,360

village leaders

551
00:21:13,430 --> 00:21:11,440
and here he is in the marvelous picture

552
00:21:18,310 --> 00:21:13,440
that we used on the poster which was

553
00:21:25,590 --> 00:21:21,350
so they had quite a bit of success with

554
00:21:27,990 --> 00:21:25,600
this and they discovered um

555
00:21:29,909 --> 00:21:28,000
well they found

556
00:21:32,870 --> 00:21:29,919
got more information about a number of

557
00:21:34,950 --> 00:21:32,880
previously known

558
00:21:36,549 --> 00:21:34,960
genetic polymorphisms

559
00:21:38,630 --> 00:21:36,559
but what they wanted was they really

560
00:21:40,870 --> 00:21:38,640
wanted to make a splash they wanted to

561
00:21:42,149 --> 00:21:40,880
find a new polymorphic system now to

562
00:21:43,350 --> 00:21:42,159
give you an idea of what they were

563
00:21:45,510 --> 00:21:43,360

looking for

564

00:21:47,990 --> 00:21:45,520

one of the most common known polymorphic

565

00:21:50,710 --> 00:21:48,000

systems is the blood type system whether

566

00:21:52,149 --> 00:21:50,720

you're type a type b type o r h negative

567

00:21:54,710 --> 00:21:52,159

rh positive and it turns out that

568

00:21:55,750 --> 00:21:54,720

there's a whole bunch of other

569

00:21:58,149 --> 00:21:55,760

variants

570

00:22:00,310 --> 00:21:58,159

of blood types and this forms a

571

00:22:02,789 --> 00:22:00,320

polymorphic system you can trace those

572

00:22:04,630 --> 00:22:02,799

variants back to genetic variations and

573

00:22:05,990 --> 00:22:04,640

so what they were looking for

574

00:22:07,430 --> 00:22:06,000

was they were looking for a similar

575

00:22:09,510 --> 00:22:07,440

system but one

576
00:22:10,950 --> 00:22:09,520
that was associated with disease

577
00:22:13,350 --> 00:22:10,960
susceptibility

578
00:22:14,710 --> 00:22:13,360
and they developed a new technique to do

579
00:22:16,390 --> 00:22:14,720
this

580
00:22:17,990 --> 00:22:16,400
and i'd love to i

581
00:22:19,430 --> 00:22:18,000
really wish that barry was still here so

582
00:22:21,110 --> 00:22:19,440
i could ask him how did they think of

583
00:22:22,310 --> 00:22:21,120
this this was this was really a very

584
00:22:24,390 --> 00:22:22,320
clever thing

585
00:22:26,630 --> 00:22:24,400
they decided to study the blood of

586
00:22:29,430 --> 00:22:26,640
patients who had received numerous blood

587
00:22:32,149 --> 00:22:29,440
transfusions now the idea here

588
00:22:35,110 --> 00:22:32,159

is that when a patient receives a blood

589

00:22:37,270 --> 00:22:35,120

transfusion that patient may receive a

590

00:22:38,789 --> 00:22:37,280

blood protein that of course the patient

591

00:22:40,710 --> 00:22:38,799

has because we all have basically the

592

00:22:42,950 --> 00:22:40,720

same proteins but might receive a

593

00:22:45,029 --> 00:22:42,960

slightly different variant of that

594

00:22:46,950 --> 00:22:45,039

protein as the result of a genetic

595

00:22:49,750 --> 00:22:46,960

polymorphism that is

596

00:22:51,590 --> 00:22:49,760

the person who donated the blood has a

597

00:22:54,390 --> 00:22:51,600

different version a different allele of

598

00:22:56,070 --> 00:22:54,400

the gene responsible for that protein

599

00:22:58,710 --> 00:22:56,080

well if that protein was different

600

00:22:59,830 --> 00:22:58,720

enough it might be an antigen that is it

601
00:23:02,549 --> 00:22:59,840
might be

602
00:23:05,830 --> 00:23:02,559
a protein that stimulates an immune

603
00:23:06,950 --> 00:23:05,840
response in the recipient

604
00:23:08,870 --> 00:23:06,960
so

605
00:23:10,950 --> 00:23:08,880
the immune response would involve the

606
00:23:12,710 --> 00:23:10,960
generation of an antibody now so we're

607
00:23:14,710 --> 00:23:12,720
going to be talking a lot about antigens

608
00:23:16,149 --> 00:23:14,720
and antibodies and the the

609
00:23:19,029 --> 00:23:16,159
simplest way to keep them straight is to

610
00:23:20,310 --> 00:23:19,039
remember that antigen derives from an

611
00:23:21,590 --> 00:23:20,320
antibody

612
00:23:22,470 --> 00:23:21,600
generator

613
00:23:25,430 --> 00:23:22,480

so

614

00:23:29,190 --> 00:23:25,440

the foreign protein

615

00:23:31,270 --> 00:23:29,200

introduced into the transfused patient

616

00:23:33,909 --> 00:23:31,280

serves as the antigen

617

00:23:36,950 --> 00:23:33,919

and if it is antigenic then the immune

618

00:23:39,270 --> 00:23:36,960

response may produce an antibody

619

00:23:41,590 --> 00:23:39,280

so what they did was they did a double

620

00:23:43,990 --> 00:23:41,600

diffusion using gel electrophoresis

621

00:23:46,950 --> 00:23:44,000

using aggro gels and what they did was

622

00:23:48,549 --> 00:23:46,960

they would put the serum which is the

623

00:23:50,710 --> 00:23:48,559

liquid component of the blood with all

624

00:23:53,270 --> 00:23:50,720

the white cells and red cells

625

00:23:55,830 --> 00:23:53,280

and clotting factors uh separated up

626
00:23:58,470 --> 00:23:55,840
they put the serum from the transfused

627
00:24:00,870 --> 00:23:58,480
patient in a central well and they would

628
00:24:02,870 --> 00:24:00,880
put the sarah from the test subjects in

629
00:24:04,149 --> 00:24:02,880
adjacent wells

630
00:24:05,669 --> 00:24:04,159
what they would do is that they would

631
00:24:08,470 --> 00:24:05,679
then run the gel

632
00:24:09,669 --> 00:24:08,480
and if the test subject contained a

633
00:24:11,750 --> 00:24:09,679
protein

634
00:24:15,830 --> 00:24:11,760
that is an antigen for which the

635
00:24:20,310 --> 00:24:18,070
sorry about that for which for which the

636
00:24:23,029 --> 00:24:20,320
transfused patient serum contained the

637
00:24:24,710 --> 00:24:23,039
antibody the antigen and the antibody

638
00:24:27,590 --> 00:24:24,720

would bind that's what that's how

639

00:24:29,669 --> 00:24:27,600

antibodies deal with antigens and they

640

00:24:31,350 --> 00:24:29,679

would precipitate and you could actually

641

00:24:32,950 --> 00:24:31,360

see that precipitate it would form an

642

00:24:35,830 --> 00:24:32,960

ark and you could either stain it or

643

00:24:37,269 --> 00:24:35,840

sometimes you could just see it directly

644

00:24:41,190 --> 00:24:37,279

and

645

00:24:44,070 --> 00:24:41,200

studied well it turned out that they did

646

00:24:46,549 --> 00:24:44,080

discover a new polymorphic system they

647

00:24:48,789 --> 00:24:46,559

called it the ag system and it turned

648

00:24:51,830 --> 00:24:48,799

out to be a system in low-density

649

00:24:54,149 --> 00:24:51,840

lipoproteins that were correlated with

650

00:24:56,310 --> 00:24:54,159

susceptibility to heart attack stroke

651
00:24:57,909 --> 00:24:56,320
and diabetes

652
00:25:01,590 --> 00:24:57,919
so that was one of the things they

653
00:25:04,149 --> 00:25:01,600
pursued but they

654
00:25:06,710 --> 00:25:04,159
just after they discovered that system

655
00:25:08,149 --> 00:25:06,720
they discovered something that really

656
00:25:10,310 --> 00:25:08,159
piqued their interest and i'm just going

657
00:25:12,789 --> 00:25:10,320
to jump right to that because that

658
00:25:14,070 --> 00:25:12,799
follows the line of our story

659
00:25:16,390 --> 00:25:14,080
they discovered something that they

660
00:25:18,149 --> 00:25:16,400
called the australia antigen now they

661
00:25:19,830 --> 00:25:18,159
called it the australia antigen one

662
00:25:22,310 --> 00:25:19,840
because that was a nice neutral name and

663
00:25:24,950 --> 00:25:22,320

two because it was first observed in the

664

00:25:26,549 --> 00:25:24,960

blood of an australian aboriginal

665

00:25:28,070 --> 00:25:26,559

they discovered other antigens at the

666

00:25:30,870 --> 00:25:28,080

time that they called the pennsylvania

667

00:25:32,789 --> 00:25:30,880

antigen and a variety of other similarly

668

00:25:35,110 --> 00:25:32,799

neutral names and they didn't pursue

669

00:25:36,789 --> 00:25:35,120

those and barry wondered in his book

670

00:25:38,549 --> 00:25:36,799

what might have happened if they had

671

00:25:40,549 --> 00:25:38,559

pursued those why did they pursue the

672

00:25:42,710 --> 00:25:40,559

australia antigen and they didn't pursue

673

00:25:45,350 --> 00:25:42,720

the others you know would would the

674

00:25:47,990 --> 00:25:45,360

world have turned out differently and

675

00:25:50,549 --> 00:25:48,000

perhaps but we will never know

676

00:25:52,310 --> 00:25:50,559

so the australian antigen as i said it

677

00:25:54,230 --> 00:25:52,320

was discovered first in the serum of an

678

00:25:55,909 --> 00:25:54,240

australian aborigine

679

00:25:58,789 --> 00:25:55,919

but it was then found to be common in

680

00:26:01,269 --> 00:25:58,799

populations in asia the pacific africa

681

00:26:03,269 --> 00:26:01,279

eastern and southern europe but not in

682

00:26:04,630 --> 00:26:03,279

the u.s and not in western europe that

683

00:26:06,950 --> 00:26:04,640

is it wasn't common it wasn't

684

00:26:09,029 --> 00:26:06,960

non-existent in those other populations

685

00:26:10,390 --> 00:26:09,039

but it wasn't common

686

00:26:11,510 --> 00:26:10,400

now again remember

687

00:26:14,870 --> 00:26:11,520

they're looking for genetic

688

00:26:17,510 --> 00:26:14,880

polymorphisms they're not looking for

689

00:26:19,830 --> 00:26:17,520

infectious disease at this point

690

00:26:21,590 --> 00:26:19,840

and so the first thing they do is they

691

00:26:24,549 --> 00:26:21,600

analyze their data with an inheritance

692

00:26:26,310 --> 00:26:24,559

model after all they had just found a

693

00:26:28,390 --> 00:26:26,320

polymorphic system

694

00:26:30,149 --> 00:26:28,400

and the data seemed to be consistent

695

00:26:33,909 --> 00:26:30,159

with an inheritance model but there were

696

00:26:36,390 --> 00:26:33,919

some surprising exceptions

697

00:26:38,149 --> 00:26:36,400

the kinds of exceptions would be cases

698

00:26:40,549 --> 00:26:38,159

they started off doing family studies

699

00:26:43,269 --> 00:26:40,559

and so in family studies what you expect

700

00:26:45,669 --> 00:26:43,279

in an inheritance model is if both

701
00:26:47,830 --> 00:26:45,679
parents have the putative gene for the

702
00:26:49,590 --> 00:26:47,840
australia antigen then you expect all

703
00:26:51,190 --> 00:26:49,600
the children to have it and in general

704
00:26:53,430 --> 00:26:51,200
that was the case

705
00:26:55,669 --> 00:26:53,440
if one parent has it then you expect it

706
00:26:58,310 --> 00:26:55,679
to follow a dominant gene recessive gene

707
00:26:59,750 --> 00:26:58,320
model and you would uh the the children

708
00:27:02,630 --> 00:26:59,760
would have it depending upon how they

709
00:27:04,230 --> 00:27:02,640
inherited the genes from the parents and

710
00:27:08,230 --> 00:27:04,240
they could interpret the data in terms

711
00:27:11,110 --> 00:27:08,240
of this model but it didn't always work

712
00:27:13,669 --> 00:27:11,120
so one of the things that they noticed

713
00:27:16,070 --> 00:27:13,679

is that most of the sarah that contained

714

00:27:18,070 --> 00:27:16,080

australia antigen were also from

715

00:27:19,750 --> 00:27:18,080

patients who had been transfused and so

716

00:27:22,310 --> 00:27:19,760

now they found themselves with this

717

00:27:24,149 --> 00:27:22,320

curious observation that they were

718

00:27:26,710 --> 00:27:24,159

looking at patients that had been

719

00:27:28,789 --> 00:27:26,720

transfused in comparison to patients who

720

00:27:30,950 --> 00:27:28,799

had been transfused

721

00:27:33,029 --> 00:27:30,960

now the suggestion here

722

00:27:35,909 --> 00:27:33,039

was that well

723

00:27:38,549 --> 00:27:35,919

if if au is associated with transfusion

724

00:27:39,590 --> 00:27:38,559

maybe it's a blood-borne infectious

725

00:27:41,350 --> 00:27:39,600

disease

726
00:27:44,149 --> 00:27:41,360
rather than a

727
00:27:45,830 --> 00:27:44,159
inherently a a genetic

728
00:27:48,230 --> 00:27:45,840
disease

729
00:27:50,789 --> 00:27:48,240
and they started getting other data that

730
00:27:52,789 --> 00:27:50,799
led them down that same track they were

731
00:27:54,470 --> 00:27:52,799
also doing normal population studies

732
00:27:56,149 --> 00:27:54,480
that is studies again they were

733
00:27:58,149 --> 00:27:56,159
piggybacking on other people's work in

734
00:28:00,389 --> 00:27:58,159
many cases just studying background

735
00:28:02,389 --> 00:28:00,399
populations they were doing one in the

736
00:28:04,549 --> 00:28:02,399
in the south pacific they were doing one

737
00:28:08,149 --> 00:28:04,559
in georgia here in the u.s

738
00:28:10,630 --> 00:28:08,159

and they found rare instances uh in some

739

00:28:13,909 --> 00:28:10,640

of these normal populations

740

00:28:16,870 --> 00:28:13,919

of uh au positive individuals who had

741

00:28:19,269 --> 00:28:16,880

the australia antigen and in one case it

742

00:28:21,190 --> 00:28:19,279

turned out that that person

743

00:28:23,190 --> 00:28:21,200

which was one person in a study of

744

00:28:25,510 --> 00:28:23,200

several hundred had just been diagnosed

745

00:28:27,750 --> 00:28:25,520

with a case of hepatitis in another case

746

00:28:29,990 --> 00:28:27,760

somebody who had not been

747

00:28:31,669 --> 00:28:30,000

au positive became a u positive and

748

00:28:34,389 --> 00:28:31,679

turned out that they had just received a

749

00:28:36,470 --> 00:28:34,399

transfusion so again

750

00:28:37,750 --> 00:28:36,480

they were getting clues

751
00:28:42,310 --> 00:28:37,760
as to

752
00:28:43,990 --> 00:28:42,320
what a.u the australia antigen might be

753
00:28:46,070 --> 00:28:44,000
they also found that there was a

754
00:28:47,430 --> 00:28:46,080
correlation with patients at high risk

755
00:28:49,510 --> 00:28:47,440
for leukemia

756
00:28:51,190 --> 00:28:49,520
for example people who survived the

757
00:28:53,190 --> 00:28:51,200
atomic bombs

758
00:28:56,389 --> 00:28:53,200
in hiroshima and nagasaki people who

759
00:28:58,549 --> 00:28:56,399
were exposed to radiation during

760
00:29:00,950 --> 00:28:58,559
atomic testing in the pacific

761
00:29:03,510 --> 00:29:00,960
and down syndrome patients

762
00:29:06,549 --> 00:29:03,520
now the study of down syndrome patients

763
00:29:08,870 --> 00:29:06,559

proved to be very very informative

764

00:29:13,590 --> 00:29:08,880

a bit of history

765

00:29:17,190 --> 00:29:13,600

prior to 1950 1960 the medical advice to

766

00:29:20,070 --> 00:29:17,200

patients uh parents who had a down's

767

00:29:22,549 --> 00:29:20,080

child was to institutionalize the child

768

00:29:24,070 --> 00:29:22,559

now obviously practice today is very

769

00:29:26,470 --> 00:29:24,080

different but this was the practice in

770

00:29:30,230 --> 00:29:26,480

the first part of this century and so

771

00:29:32,549 --> 00:29:30,240

there were by 1950 huge institutions

772

00:29:35,190 --> 00:29:32,559

with thousands in some cases

773

00:29:36,710 --> 00:29:35,200

of down syndrome patients uh all

774

00:29:38,789 --> 00:29:36,720

institutionalized

775

00:29:42,389 --> 00:29:38,799

but that pattern was starting to break

776

00:29:44,630 --> 00:29:42,399

down in the 1950s and by the mid-1960s

777

00:29:46,310 --> 00:29:44,640

a lot of these institutions had been at

778

00:29:50,070 --> 00:29:46,320

least partially dismantled and there

779

00:29:52,389 --> 00:29:50,080

were a lot of down syndrome patients in

780

00:29:55,110 --> 00:29:52,399

group homes in smaller group

781

00:29:57,669 --> 00:29:55,120

environments so what they had was they

782

00:29:58,710 --> 00:29:57,679

had a population which had something in

783

00:30:01,110 --> 00:29:58,720

common

784

00:30:03,990 --> 00:30:01,120

genetic uh

785

00:30:05,590 --> 00:30:04,000

based disease down syndrome but they had

786

00:30:08,230 --> 00:30:05,600

them in

787

00:30:09,990 --> 00:30:08,240

environments where there were a thousand

788

00:30:12,149 --> 00:30:10,000

or more people interacting on a daily

789

00:30:13,590 --> 00:30:12,159

basis in environments where smaller and

790

00:30:15,669 --> 00:30:13,600

smaller groups

791

00:30:17,510 --> 00:30:15,679

were interacting and what they found was

792

00:30:19,029 --> 00:30:17,520

the frequency of the Australian antigen

793

00:30:20,230 --> 00:30:19,039

which was fairly common among down

794

00:30:22,230 --> 00:30:20,240

syndrome

795

00:30:23,750 --> 00:30:22,240

patients was inversely related to the

796

00:30:25,909 --> 00:30:23,760

institution size in other words they

797

00:30:28,789 --> 00:30:25,919

were more likely to find

798

00:30:31,269 --> 00:30:28,799

au positive individuals in the large

799

00:30:33,909 --> 00:30:31,279

institutions than they were in the small

800

00:30:36,710 --> 00:30:33,919

group homes and again this is consistent

801
00:30:39,029 --> 00:30:36,720
with an infectious model that is that

802
00:30:41,909 --> 00:30:39,039
the more people you have to pass

803
00:30:43,590 --> 00:30:41,919
the infectious agent around between

804
00:30:47,750 --> 00:30:43,600
the more likely you are to find

805
00:30:50,230 --> 00:30:47,760
individuals with that infectious agent

806
00:30:52,310 --> 00:30:50,240
and they continue to find other

807
00:30:55,830 --> 00:30:52,320
individuals just surprising results

808
00:30:57,029 --> 00:30:55,840
which i don't have the time to go uh

809
00:30:59,350 --> 00:30:57,039
into

810
00:31:02,870 --> 00:30:59,360
um

811
00:31:09,190 --> 00:31:06,630
the the surprises continued to associate

812
00:31:12,630 --> 00:31:09,200
australia antigen with hepatitis so this

813
00:31:15,110 --> 00:31:12,640

led to them deciding you know let's not

814

00:31:16,389 --> 00:31:15,120

do more family studies and more studies

815

00:31:18,389 --> 00:31:16,399

of of

816

00:31:19,669 --> 00:31:18,399

populations related genetically let's

817

00:31:21,830 --> 00:31:19,679

start looking at people who have

818

00:31:23,830 --> 00:31:21,840

clinical cases of hepatitis and

819

00:31:25,750 --> 00:31:23,840

understand what relationship the

820

00:31:27,990 --> 00:31:25,760

australian antigen has

821

00:31:31,350 --> 00:31:28,000

uh to those populations

822

00:31:32,389 --> 00:31:31,360

and by mid 1967 they had documented

823

00:31:35,510 --> 00:31:32,399

the association

824

00:31:36,310 --> 00:31:35,520

of the australian antigen with hepatitis

825

00:31:38,230 --> 00:31:36,320

so

826

00:31:40,870 --> 00:31:38,240

what do they do they write a paper

827

00:31:43,029 --> 00:31:40,880

reporting this result

828

00:31:44,870 --> 00:31:43,039

and the paper gets rejected

829

00:31:46,630 --> 00:31:44,880

by the journal annals of internal

830

00:31:49,750 --> 00:31:46,640

medicine

831

00:31:50,549 --> 00:31:49,760

why did the paper get rejected

832

00:31:52,149 --> 00:31:50,559

well

833

00:31:54,149 --> 00:31:52,159

there were several reasons

834

00:31:56,710 --> 00:31:54,159

first of all no one on the team was a

835

00:31:58,470 --> 00:31:56,720

virologist hepatitis was a disease that

836

00:32:00,389 --> 00:31:58,480

had been known for many many years

837

00:32:01,669 --> 00:32:00,399

yellow jaundice the symptoms of

838

00:32:03,750 --> 00:32:01,679

hepatitis

839

00:32:05,990 --> 00:32:03,760

are very very obvious there was a

840

00:32:08,070 --> 00:32:06,000

well-developed community that had been

841

00:32:10,230 --> 00:32:08,080

studying hepatitis for decades they had

842

00:32:12,950 --> 00:32:10,240

been searching for the infectious agent

843

00:32:17,509 --> 00:32:12,960

of hepatitis for decades and they hadn't

844

00:32:18,470 --> 00:32:17,519

found it now here came along people who

845

00:32:20,710 --> 00:32:18,480

were

846

00:32:23,669 --> 00:32:20,720

basically clinical physicians and some

847

00:32:26,070 --> 00:32:23,679

biochemists and and a few laboratory

848

00:32:27,830 --> 00:32:26,080

spectroscopists they had no formal

849

00:32:30,230 --> 00:32:27,840

training in epidemiology none of them

850

00:32:32,149 --> 00:32:30,240

was a virologist and none of them were a

851
00:32:34,870 --> 00:32:32,159
member of the hepatitis research

852
00:32:38,870 --> 00:32:35,669
so

853
00:32:42,149 --> 00:32:38,880
that was part of the problem this was uh

854
00:32:43,430 --> 00:32:42,159
about the time that barry read thomas

855
00:32:45,750 --> 00:32:43,440
kuhn's the structure of scientific

856
00:32:47,350 --> 00:32:45,760
revolutions and he began to get some

857
00:32:48,630 --> 00:32:47,360
perspective

858
00:32:50,070 --> 00:32:48,640
those of you familiar with the book and

859
00:32:51,190 --> 00:32:50,080
i suspect that's many people in this

860
00:32:54,149 --> 00:32:51,200
room

861
00:32:54,950 --> 00:32:54,159
know that what what cune argued is that

862
00:33:05,269 --> 00:32:54,960
a

863
00:33:09,269 --> 00:33:05,279

community

864

00:33:11,990 --> 00:33:09,279

and when data first start to appear

865

00:33:14,870 --> 00:33:12,000

that tend to undercut that model

866

00:33:16,389 --> 00:33:14,880

contradict that model the first reaction

867

00:33:17,669 --> 00:33:16,399

of that scientific community is to

868

00:33:18,950 --> 00:33:17,679

resist

869

00:33:23,669 --> 00:33:18,960

this

870

00:33:25,110 --> 00:33:23,679

their model their paradigm

871

00:33:26,549 --> 00:33:25,120

because a little data here is

872

00:33:27,750 --> 00:33:26,559

inconsistent there's always ways to

873

00:33:30,630 --> 00:33:27,760

explain why a little data are

874

00:33:34,870 --> 00:33:30,640

inconsistent and what has to happen is

875

00:33:37,430 --> 00:33:34,880

the evidence that the model is

876

00:33:39,509 --> 00:33:37,440

not a correct model has to build up to a

877

00:33:42,950 --> 00:33:39,519

point and there's resistance up to that

878

00:33:44,870 --> 00:33:42,960

point and when the

879

00:33:46,789 --> 00:33:44,880

contradictory data

880

00:33:49,430 --> 00:33:46,799

reach a critical point

881

00:33:51,669 --> 00:33:49,440

then a change occurs very rapidly and

882

00:33:53,909 --> 00:33:51,679

that change kuhn referred to as a

883

00:33:56,149 --> 00:33:53,919

scientific revolution

884

00:33:57,430 --> 00:33:56,159

and what barry began to conclude was

885

00:33:59,750 --> 00:33:57,440

that they were on the cutting edge of a

886

00:34:02,070 --> 00:33:59,760

scientific revolution and of course he

887

00:34:04,230 --> 00:34:02,080

was exactly right

888

00:34:06,389 --> 00:34:04,240

the reviewer

889

00:34:08,710 --> 00:34:06,399

the principal reviewer of the paper

890

00:34:10,069 --> 00:34:08,720

later told barry that the reason he had

891

00:34:11,669 --> 00:34:10,079

rejected it

892

00:34:13,750 --> 00:34:11,679

was that there had been so many

893

00:34:15,669 --> 00:34:13,760

erroneous claims of discovery of the

894

00:34:17,270 --> 00:34:15,679

serum hepatitis which is what hepatitis

895

00:34:19,030 --> 00:34:17,280

b was called at the time

896

00:34:21,270 --> 00:34:19,040

the serum hepatitis virus that the

897

00:34:23,030 --> 00:34:21,280

reviewer just didn't want to see another

898

00:34:26,230 --> 00:34:23,040

erroneous claim in the literature which

899

00:34:28,790 --> 00:34:26,240

was only you know bound to be retracted

900

00:34:30,389 --> 00:34:28,800

someplace downstream

901
00:34:31,510 --> 00:34:30,399
barry's reaction to this was very

902
00:34:33,349 --> 00:34:31,520
interesting

903
00:34:35,270 --> 00:34:33,359
if such rejections are taken too

904
00:34:37,589 --> 00:34:35,280
seriously he wrote they can lead to an

905
00:34:39,909 --> 00:34:37,599
attitude of martyrdom and of opposition

906
00:34:41,589 --> 00:34:39,919
to a recalcitrant establishment we of

907
00:34:43,109 --> 00:34:41,599
course know of no colleagues who ever

908
00:34:45,909 --> 00:34:43,119
responded that way

909
00:34:48,389 --> 00:34:45,919
to the rejection of the paper

910
00:34:52,710 --> 00:34:48,399
our unhappy sentiments didn't last

911
00:34:53,990 --> 00:34:52,720
and the rebuff didn't slow us down again

912
00:34:55,270 --> 00:34:54,000
this is barry

913
00:34:57,349 --> 00:34:55,280

press on

914

00:34:58,950 --> 00:34:57,359

don't don't worry about that

915

00:35:06,230 --> 00:34:58,960

just keep doing what you're doing as

916

00:35:09,670 --> 00:35:07,990

now they had written an earlier paper

917

00:35:11,510 --> 00:35:09,680

before the main paper submitted to the

918

00:35:13,270 --> 00:35:11,520

same journal the earlier paper didn't

919

00:35:14,829 --> 00:35:13,280

make a strong acclaim

920

00:35:17,349 --> 00:35:14,839

and the earlier paper actually got

921

00:35:19,589 --> 00:35:17,359

published but it still remained to be

922

00:35:21,510 --> 00:35:19,599

demonstrated that the australia antigen

923

00:35:23,190 --> 00:35:21,520

could be equated with hepatitis virus so

924

00:35:24,950 --> 00:35:23,200

at this point they knew that there was

925

00:35:27,430 --> 00:35:24,960

an association but they didn't actually

926
00:35:28,710 --> 00:35:27,440
know what the Australian antigen was

927
00:35:30,630 --> 00:35:28,720
now at this point they did something

928
00:35:32,390 --> 00:35:30,640
very important let me skip down to to

929
00:35:34,150 --> 00:35:32,400
the quote from Barry's book

930
00:35:35,750 --> 00:35:34,160
one of the most important steps we took

931
00:35:39,030 --> 00:35:35,760
was to distribute vials of the

932
00:35:41,270 --> 00:35:39,040
anti-serum that is the the antibodies

933
00:35:43,430 --> 00:35:41,280
and the antigen to investigators who

934
00:35:45,589 --> 00:35:43,440
requested them with these it was very

935
00:35:47,109 --> 00:35:45,599
easy for scientists even in laboratories

936
00:35:53,349 --> 00:35:47,119
with

937
00:35:55,349 --> 00:35:53,359
there was confirmation from other

938
00:35:57,510 --> 00:35:55,359

investigators often from parts of the

939

00:36:00,710 --> 00:35:57,520

world where hepatitis b was more common

940

00:36:06,390 --> 00:36:04,069

so in essence what barry did was to

941

00:36:07,990 --> 00:36:06,400

practice science in the most open and

942

00:36:09,589 --> 00:36:08,000

generous way

943

00:36:12,150 --> 00:36:09,599

give his reagents

944

00:36:15,829 --> 00:36:12,160

that he and his team had spent a lot of

945

00:36:18,150 --> 00:36:15,839

time a lot of years of their lives

946

00:36:20,310 --> 00:36:18,160

developing just give these reagents out

947

00:36:22,470 --> 00:36:20,320

freely to the scientific community to

948

00:36:23,510 --> 00:36:22,480

anybody who asked

949

00:36:25,750 --> 00:36:23,520

so

950

00:36:27,990 --> 00:36:25,760

what resulted was research started going

951
00:36:29,990 --> 00:36:28,000
on all over the world in many many

952
00:36:32,550 --> 00:36:30,000
different laboratories

953
00:36:35,190 --> 00:36:32,560
and it was that research with barry's

954
00:36:37,670 --> 00:36:35,200
team contributing but at this time by

955
00:36:40,870 --> 00:36:37,680
this point barry's team really wasn't

956
00:36:43,109 --> 00:36:40,880
really that much in the lead on the this

957
00:36:45,589 --> 00:36:43,119
final stage in the research

958
00:36:47,670 --> 00:36:45,599
they were in the lead on direct imaging

959
00:36:49,270 --> 00:36:47,680
by electron microscopy because they had

960
00:36:51,270 --> 00:36:49,280
one of the world's leaders in electron

961
00:36:53,190 --> 00:36:51,280
microscopy which again was a relatively

962
00:36:55,589 --> 00:36:53,200
new field

963
00:36:58,470 --> 00:36:55,599

at fox chase cancer center and they

964

00:37:01,109 --> 00:36:58,480

finally demonstrated that the australian

965

00:37:03,430 --> 00:37:01,119

antigen is not the hepatitis virus but

966

00:37:06,390 --> 00:37:03,440

it is a component of the virus

967

00:37:10,230 --> 00:37:06,400

so here is the hepatitis virus it is a

968

00:37:13,190 --> 00:37:10,240

very simple virus in its structure it is

969

00:37:15,030 --> 00:37:13,200

far from a simple virus in its action it

970

00:37:16,069 --> 00:37:15,040

has four main components the surface

971

00:37:18,870 --> 00:37:16,079

antigen

972

00:37:21,750 --> 00:37:18,880

uh and this is hepatitis b s is for

973

00:37:23,829 --> 00:37:21,760

surface antigen is the protein coat on

974

00:37:25,589 --> 00:37:23,839

the outside of the virus that turned out

975

00:37:28,470 --> 00:37:25,599

to be the australia antigen and from

976

00:37:31,430 --> 00:37:28,480

here on out we'll talk about hbsag

977

00:37:34,310 --> 00:37:31,440

rather than the australia antigen

978

00:37:37,510 --> 00:37:34,320

that covers a core protein

979

00:37:40,630 --> 00:37:37,520

which is called hbc for core ag for

980

00:37:44,150 --> 00:37:40,640

antigen and within the capsid formed by

981

00:37:48,829 --> 00:37:44,160

the core protein there is

982

00:37:52,430 --> 00:37:48,839

dna polymerase an enzyme that uh will

983

00:37:55,190 --> 00:37:52,440

uh form the dna polymer a reverse

984

00:37:57,510 --> 00:37:55,200

transcriptase which is an enzyme that

985

00:37:59,750 --> 00:37:57,520

will make dna from rna because it turns

986

00:38:02,710 --> 00:37:59,760

out that although

987

00:38:04,870 --> 00:38:02,720

the hepatitis b virus contains dna there

988

00:38:08,230 --> 00:38:04,880

is a stage in its life cycle in which it

989

00:38:11,030 --> 00:38:08,240

reverse transcribes rna to dna so it's

990

00:38:13,430 --> 00:38:11,040

actually a retrovirus like hiv even

991

00:38:16,069 --> 00:38:13,440

though it contains dna

992

00:38:18,550 --> 00:38:16,079

and the actual dna of the virus itself

993

00:38:21,990 --> 00:38:18,560

which contains four genes

994

00:38:23,030 --> 00:38:22,000

just four genes very simple

995

00:38:25,270 --> 00:38:23,040

however

996

00:38:27,190 --> 00:38:25,280

the way it

997

00:38:29,670 --> 00:38:27,200

behaves and the disease that it causes

998

00:38:32,310 --> 00:38:29,680

is far from simple this is a micrograph

999

00:38:34,390 --> 00:38:32,320

of hbv particles and most of the

1000

00:38:36,069 --> 00:38:34,400

particles you see are not the virus all

1001
00:38:37,030 --> 00:38:36,079
of these particles

1002
00:38:37,750 --> 00:38:37,040
the

1003
00:38:42,630 --> 00:38:37,760
cir

1004
00:38:44,870 --> 00:38:42,640
21 nanometers across

1005
00:38:47,510 --> 00:38:44,880
and the elongated particles that are the

1006
00:38:50,069 --> 00:38:47,520
same diameter but of varying length

1007
00:38:51,910 --> 00:38:50,079
those are all the surface antigen

1008
00:38:52,710 --> 00:38:51,920
those are all

1009
00:38:58,710 --> 00:38:52,720
the

1010
00:39:02,470 --> 00:38:58,720
actually only three whole viruses in

1011
00:39:05,109 --> 00:39:02,480
this image one is here one is there

1012
00:39:07,670 --> 00:39:05,119
and one is there and you can see that

1013
00:39:10,069 --> 00:39:07,680

they contain a uh

1014

00:39:13,030 --> 00:39:10,079

central portion that central portion

1015

00:39:14,710 --> 00:39:13,040

is filled in this case with dna

1016

00:39:16,390 --> 00:39:14,720

now one of the things you see

1017

00:39:18,550 --> 00:39:16,400

immediately in this micrograph is there

1018

00:39:21,589 --> 00:39:18,560

is much much much more of the surface

1019

00:39:24,069 --> 00:39:21,599

antigen than there are of the live or

1020

00:39:27,510 --> 00:39:24,079

the whole virus and that is a

1021

00:39:30,470 --> 00:39:27,520

characteristic of hepatitis infection uh

1022

00:39:33,030 --> 00:39:30,480

the abundance of surface antigen

1023

00:39:35,190 --> 00:39:33,040

relative to the abundance of live virus

1024

00:39:38,310 --> 00:39:35,200

is typically a thousand to one

1025

00:39:40,390 --> 00:39:38,320

and that turns out to be key for one of

1026
00:39:42,550 --> 00:39:40,400
the things that barry did next was which

1027
00:39:44,230 --> 00:39:42,560
was the development of a vaccine barry

1028
00:39:47,030 --> 00:39:44,240
and his team so we'll get to that part

1029
00:39:48,710 --> 00:39:47,040
of the story in just a second

1030
00:39:50,230 --> 00:39:48,720
but the first part of the story the

1031
00:39:51,910 --> 00:39:50,240
first part of the the next part of the

1032
00:39:55,670 --> 00:39:51,920
story is

1033
00:39:57,750 --> 00:39:55,680
the issue of the transmission of

1034
00:40:00,470 --> 00:39:57,760
hepatitis through blood transfusions as

1035
00:40:02,870 --> 00:40:00,480
you can see from the the studies in

1036
00:40:04,790 --> 00:40:02,880
which they found themselves studying

1037
00:40:05,910 --> 00:40:04,800
transfused patients against transfused

1038
00:40:09,270 --> 00:40:05,920

patients

1039

00:40:11,030 --> 00:40:09,280

hepatitis is readily communicated by

1040

00:40:13,349 --> 00:40:11,040

blood transfusions

1041

00:40:16,310 --> 00:40:13,359

before

1042

00:40:19,910 --> 00:40:16,320

this work there was no way of detecting

1043

00:40:22,950 --> 00:40:19,920

hepatitis in the blood system so there

1044

00:40:25,589 --> 00:40:22,960

was no way to test donated blood

1045

00:40:27,349 --> 00:40:25,599

for hepatitis virus

1046

00:40:30,150 --> 00:40:27,359

at the same time there were more than

1047

00:40:32,470 --> 00:40:30,160

150 000 cases a year of post-transfusion

1048

00:40:35,829 --> 00:40:32,480

hepatitis that is hepatitis caused

1049

00:40:37,589 --> 00:40:35,839

specifically by blood transfusion so the

1050

00:40:39,109 --> 00:40:37,599

first application of their discovery was

1051
00:40:40,630 --> 00:40:39,119
screening donated blood all they had to

1052
00:40:42,790 --> 00:40:40,640
do was screen now for the surface

1053
00:40:44,790 --> 00:40:42,800
antigen which was present in such high

1054
00:40:46,470 --> 00:40:44,800
abundance that it was actually very

1055
00:40:48,630 --> 00:40:46,480
readily detectable even though they

1056
00:40:49,750 --> 00:40:48,640
weren't using very sensitive techniques

1057
00:40:51,510 --> 00:40:49,760
there were much more sensitive

1058
00:40:53,510 --> 00:40:51,520
techniques that they could apply they

1059
00:40:55,430 --> 00:40:53,520
were just more expensive more difficult

1060
00:40:59,109 --> 00:40:55,440
to do in the field and so they kept

1061
00:41:01,270 --> 00:40:59,119
doing the the double diffusion gels for

1062
00:41:05,670 --> 00:41:01,280
a long time because it worked extremely

1063
00:41:09,589 --> 00:41:08,470

but it took three to four years before

1064

00:41:13,750 --> 00:41:09,599

testing

1065

00:41:20,470 --> 00:41:17,910

the surface antigen became adopted why

1066

00:41:23,589 --> 00:41:20,480

again residual skepticism you know these

1067

00:41:26,230 --> 00:41:23,599

guys say that they can stop the uh

1068

00:41:27,430 --> 00:41:26,240

post-transfusion hepatitis but you know

1069

00:41:29,349 --> 00:41:27,440

people have been trying to do that for a

1070

00:41:31,349 --> 00:41:29,359

long time why should we believe them

1071

00:41:33,750 --> 00:41:31,359

there was also an economic motive after

1072

00:41:35,109 --> 00:41:33,760

world war ii with the development of

1073

00:41:38,150 --> 00:41:35,119

better anesthetics and better

1074

00:41:39,829 --> 00:41:38,160

antibiotics there was a huge growth in

1075

00:41:42,870 --> 00:41:39,839

the number of surgeries open heart

1076

00:41:44,630 --> 00:41:42,880

surgery kidney transplants etc

1077

00:41:46,470 --> 00:41:44,640

cancer surgery

1078

00:41:48,950 --> 00:41:46,480

and there was a great demand for blood

1079

00:41:50,550 --> 00:41:48,960

and so there was both a non-profit blood

1080

00:41:52,790 --> 00:41:50,560

bank industry and there was also a

1081

00:41:54,870 --> 00:41:52,800

for-profit blood bank industry and of

1082

00:41:56,710 --> 00:41:54,880

course they all have their economic

1083

00:41:58,230 --> 00:41:56,720

models and if somebody says you're going

1084

00:41:59,510 --> 00:41:58,240

to have to start throwing away an awful

1085

00:42:01,670 --> 00:41:59,520

lot of your blood plus you're going to

1086

00:42:04,150 --> 00:42:01,680

have to do all these tests suddenly that

1087

00:42:05,829 --> 00:42:04,160

affects the economics and so

1088

00:42:06,710 --> 00:42:05,839

it really took

1089

00:42:08,470 --> 00:42:06,720

uh

1090

00:42:10,309 --> 00:42:08,480

the university of pennsylvania hospital

1091

00:42:11,670 --> 00:42:10,319

which which was the first to institute

1092

00:42:13,109 --> 00:42:11,680

this because barry of course was

1093

00:42:14,710 --> 00:42:13,119

associated with the university of

1094

00:42:16,710 --> 00:42:14,720

pennsylvania

1095

00:42:18,230 --> 00:42:16,720

it really took them instituting it

1096

00:42:21,190 --> 00:42:18,240

demonstrating

1097

00:42:23,750 --> 00:42:21,200

that they greatly reduced the uh

1098

00:42:26,550 --> 00:42:23,760

incidence of post-transfusion hepatitis

1099

00:42:28,470 --> 00:42:26,560

before others other hospitals had to

1100

00:42:30,710 --> 00:42:28,480

adopt it because if they didn't adopt it

1101

00:42:32,630 --> 00:42:30,720

they would get into the the situation if

1102

00:42:35,109 --> 00:42:32,640

they could be sued for malpractice if

1103

00:42:37,270 --> 00:42:35,119

there was a well-demonstrated mechanism

1104

00:42:38,950 --> 00:42:37,280

of preventing it so that took about

1105

00:42:41,030 --> 00:42:38,960

three to four years and that finally

1106

00:42:43,109 --> 00:42:41,040

happened and it greatly reduced the

1107

00:42:45,190 --> 00:42:43,119

transmission of hpv and blood

1108

00:42:47,750 --> 00:42:45,200

transfusions and then that

1109

00:42:49,349 --> 00:42:47,760

process continued when hcv was

1110

00:42:50,550 --> 00:42:49,359

discovered

1111

00:42:52,630 --> 00:42:50,560

in the

1112

00:42:54,309 --> 00:42:52,640

1980s

1113

00:42:56,550 --> 00:42:54,319

so but the next step was to develop a

1114

00:42:57,670 --> 00:42:56,560

vaccine to prevent the infection by

1115

00:43:01,030 --> 00:42:57,680

other roots

1116

00:43:03,190 --> 00:43:01,040

hbv is extremely infectious

1117

00:43:04,470 --> 00:43:03,200

it is readily transmitted it's more

1118

00:43:07,349 --> 00:43:04,480

infectious

1119

00:43:09,190 --> 00:43:07,359

than hiv it's transmitted mother to

1120

00:43:10,550 --> 00:43:09,200

child at birth

1121

00:43:12,470 --> 00:43:10,560

it's transmitted sexually through

1122

00:43:14,550 --> 00:43:12,480

contaminated needles

1123

00:43:15,910 --> 00:43:14,560

sharing common personal items there are

1124

00:43:17,829 --> 00:43:15,920

even cases

1125

00:43:19,190 --> 00:43:17,839

of it being transmitted by sharing a

1126

00:43:21,270 --> 00:43:19,200

toothbrush

1127

00:43:22,870 --> 00:43:21,280

blood to blood transmission is the

1128

00:43:24,829 --> 00:43:22,880

transmission mode

1129

00:43:26,790 --> 00:43:24,839

somebody has bleeding gums they use a

1130

00:43:29,030 --> 00:43:26,800

toothbrush somebody else uses that

1131

00:43:30,950 --> 00:43:29,040

toothbrush they also have bleeding gums

1132

00:43:33,670 --> 00:43:30,960

you can have blood to blood transmission

1133

00:43:35,589 --> 00:43:33,680

there was a case in a hospital

1134

00:43:37,349 --> 00:43:35,599

early on in the days of

1135

00:43:40,150 --> 00:43:37,359

development of computers in which they

1136

00:43:42,230 --> 00:43:40,160

installed an ibm punch card system and

1137

00:43:45,430 --> 00:43:42,240

it was transmitted through paper cuts

1138

00:43:47,510 --> 00:43:45,440

from the ibm punch cards so it's it is a

1139

00:43:49,670 --> 00:43:47,520

very very infectious

1140

00:43:51,030 --> 00:43:49,680

uh agent

1141

00:43:53,109 --> 00:43:51,040

it infects about one quarter of the

1142

00:43:55,829 --> 00:43:53,119

world's population even today about two

1143

00:43:58,150 --> 00:43:55,839

billion people it's endemic in china and

1144

00:43:59,750 --> 00:43:58,160

it also causes most primary cancers of

1145

00:44:02,950 --> 00:43:59,760

the liver which kills about a million

1146

00:44:03,990 --> 00:44:02,960

and a half people uh annually

1147

00:44:06,470 --> 00:44:04,000

and

1148

00:44:08,950 --> 00:44:06,480

in doing their research what

1149

00:44:12,309 --> 00:44:08,960

barry and his team found was that the

1150

00:44:14,950 --> 00:44:12,319

surface antigen was the protective agent

1151
00:44:16,790 --> 00:44:14,960
that is that if you inoculated somebody

1152
00:44:18,790 --> 00:44:16,800
with a very small amount of the surface

1153
00:44:21,109 --> 00:44:18,800
antigen that person would develop

1154
00:44:23,109 --> 00:44:21,119
antibodies to the surface antigen if

1155
00:44:26,150 --> 00:44:23,119
that person was later exposed to the

1156
00:44:29,270 --> 00:44:26,160
live virus those antibodies would attack

1157
00:44:31,829 --> 00:44:29,280
the virus and provide protection

1158
00:44:34,710 --> 00:44:31,839
and here's where that thousand to one

1159
00:44:36,870 --> 00:44:34,720
ratio of surface antigen to live virus

1160
00:44:39,910 --> 00:44:36,880
comes in because they could collect 300

1161
00:44:42,550 --> 00:44:39,920
milliliters for example of serum from an

1162
00:44:45,510 --> 00:44:42,560
infected patient and that could be used

1163
00:44:47,670 --> 00:44:45,520

to after processing to inoculate many

1164

00:44:49,990 --> 00:44:47,680

many individuals you didn't need a lot

1165

00:44:52,069 --> 00:44:50,000

of the surface antigen to generate the

1166

00:44:54,230 --> 00:44:52,079

antibody response

1167

00:44:56,710 --> 00:44:54,240

so they developed a vaccine based on

1168

00:44:59,270 --> 00:44:56,720

that actually using the blood products

1169

00:45:01,190 --> 00:44:59,280

from infected individuals separating out

1170

00:45:03,910 --> 00:45:01,200

the live virus from the surface antigen

1171

00:45:06,390 --> 00:45:03,920

purifying the surface antigen adding

1172

00:45:09,349 --> 00:45:06,400

some boosting agents and then

1173

00:45:11,670 --> 00:45:09,359

using that as the vaccine it is the

1174

00:45:14,550 --> 00:45:11,680

first and only vaccine that has ever

1175

00:45:16,790 --> 00:45:14,560

been developed by that method

1176
00:45:18,470 --> 00:45:16,800
and fundamentally it's the same vaccine

1177
00:45:19,910 --> 00:45:18,480
that's being used today although it's no

1178
00:45:22,230 --> 00:45:19,920
longer made from blood products it's

1179
00:45:24,470 --> 00:45:22,240
made by recombinant techniques cloning

1180
00:45:27,030 --> 00:45:24,480
the gene for the surface antigen into e

1181
00:45:28,390 --> 00:45:27,040
coli basically

1182
00:45:31,349 --> 00:45:28,400
so

1183
00:45:34,390 --> 00:45:31,359
the blood derived product

1184
00:45:35,910 --> 00:45:34,400
was effective and safe

1185
00:45:38,390 --> 00:45:35,920
but there was still some reluctance to

1186
00:45:39,670 --> 00:45:38,400
use it because in principle if you're

1187
00:45:41,990 --> 00:45:39,680
using a blood product there could be

1188
00:45:43,910 --> 00:45:42,000

live virus the recombinant technique

1189

00:45:47,990 --> 00:45:43,920

that was developed in the early 1980s

1190

00:45:49,750 --> 00:45:48,000

fixed that and the vi the vaccine is now

1191

00:45:50,790 --> 00:45:49,760

one of the most widely used vaccines in

1192

00:45:52,550 --> 00:45:50,800

the world

1193

00:45:54,710 --> 00:45:52,560

over a billion doses have been

1194

00:45:56,109 --> 00:45:54,720

administered since the modern vaccine

1195

00:45:58,790 --> 00:45:56,119

became available

1196

00:46:00,230 --> 00:45:58,800

177 countries as of a couple years ago

1197

00:46:02,470 --> 00:46:00,240

maybe higher now have national

1198

00:46:04,550 --> 00:46:02,480

vaccination programs it's the first

1199

00:46:06,309 --> 00:46:04,560

vaccine that prevents a cancer there's

1200

00:46:08,150 --> 00:46:06,319

really a major human cancer there's

1201
00:46:10,230 --> 00:46:08,160
really only a second now

1202
00:46:11,829 --> 00:46:10,240
the vaccine against

1203
00:46:13,430 --> 00:46:11,839
cervical cancer

1204
00:46:14,710 --> 00:46:13,440
which

1205
00:46:16,470 --> 00:46:14,720
prevents infection by the human

1206
00:46:18,870 --> 00:46:16,480
papilloma virus

1207
00:46:20,230 --> 00:46:18,880
it's second only to smoking prevention

1208
00:46:21,510 --> 00:46:20,240
only to

1209
00:46:23,349 --> 00:46:21,520
smoking prevention as a cancer

1210
00:46:26,069 --> 00:46:23,359
prevention program

1211
00:46:27,670 --> 00:46:26,079
it saved millions of lives and had many

1212
00:46:29,030 --> 00:46:27,680
other highly beneficial effects there's

1213
00:46:30,790 --> 00:46:29,040

a story i'd love to tell you but i

1214

00:46:33,030 --> 00:46:30,800

notice i'm running out of time so i'm

1215

00:46:35,430 --> 00:46:33,040

going to move on

1216

00:46:37,349 --> 00:46:35,440

this is barry at oxford university

1217

00:46:38,710 --> 00:46:37,359

in 1973

1218

00:46:41,030 --> 00:46:38,720

the

1219

00:46:43,190 --> 00:46:41,040

chart behind him actually traces out all

1220

00:46:45,270 --> 00:46:43,200

the details of this story i've obviously

1221

00:46:47,109 --> 00:46:45,280

just summarized some of the highlights

1222

00:46:49,990 --> 00:46:47,119

in the story but the story was a very

1223

00:46:52,790 --> 00:46:50,000

very intricate story involving field

1224

00:46:55,349 --> 00:46:52,800

work and populations all over the world

1225

00:46:57,750 --> 00:46:55,359

and that chart is kind of the outline of

1226

00:46:59,950 --> 00:46:57,760

barry's book

1227

00:47:02,790 --> 00:46:59,960

here he is receiving the nobel prize

1228

00:47:04,390 --> 00:47:02,800

1976 with the king of sweden

1229

00:47:06,230 --> 00:47:04,400

it was a remarkable collection of

1230

00:47:08,870 --> 00:47:06,240

individuals

1231

00:47:11,750 --> 00:47:08,880

that year burton richter who

1232

00:47:13,829 --> 00:47:11,760

got the prize in physics barry's

1233

00:47:14,870 --> 00:47:13,839

high school mate although at a different

1234

00:47:17,510 --> 00:47:14,880

time

1235

00:47:18,790 --> 00:47:17,520

saw bello got the prize in literature

1236

00:47:20,550 --> 00:47:18,800

sam ting

1237

00:47:22,069 --> 00:47:20,560

of

1238

00:47:24,390 --> 00:47:22,079

the the instrument that was just brought

1239

00:47:25,829 --> 00:47:24,400

up to the international space station

1240

00:47:28,309 --> 00:47:25,839

milton friedman got the prize in

1241

00:47:29,510 --> 00:47:28,319

economics william lipscombe a very

1242

00:47:32,150 --> 00:47:29,520

famous chemist got the prize in

1243

00:47:35,030 --> 00:47:32,160

chemistry and carlton gadgesec who

1244

00:47:37,829 --> 00:47:35,040

was the co-winner of the prize in

1245

00:47:42,470 --> 00:47:37,839

physiology or medicine along with barry

1246

00:47:42,480 --> 00:47:47,190

kuru disease in the virginian islands

1247

00:47:51,430 --> 00:47:48,710

there were a lot of happy people at the

1248

00:47:53,910 --> 00:47:51,440

fox chase cancer center

1249

00:47:56,710 --> 00:47:53,920

and that is genes that is barry's wife

1250

00:47:56,720 --> 00:48:00,470

china

1251

00:48:05,670 --> 00:48:03,430

hepatitis is

1252

00:48:07,510 --> 00:48:05,680

an extremely serious problem in china it

1253

00:48:10,069 --> 00:48:07,520

was at the time and it remains a very

1254

00:48:12,230 --> 00:48:10,079

serious problem in china today

1255

00:48:13,990 --> 00:48:12,240

in the mid 1970s

1256

00:48:15,589 --> 00:48:14,000

china's population was about a billion

1257

00:48:17,510 --> 00:48:15,599

and they had the highest incidence in

1258

00:48:19,750 --> 00:48:17,520

the world of hpv infection and the

1259

00:48:22,309 --> 00:48:19,760

highest incidence of primary cancer of

1260

00:48:24,150 --> 00:48:22,319

the liver uh the the

1261

00:48:26,870 --> 00:48:24,160

proportions of populations in different

1262

00:48:28,230 --> 00:48:26,880

parts of china that were infected with

1263

00:48:30,790 --> 00:48:28,240

hepatitis b

1264

00:48:31,910 --> 00:48:30,800

at the time was in the mid teens

1265

00:48:34,230 --> 00:48:31,920

typically

1266

00:48:36,390 --> 00:48:34,240

that is the mid teens 15 16 percent of

1267

00:48:39,990 --> 00:48:36,400

the entire population in some areas of

1268

00:48:41,270 --> 00:48:40,000

china that remains the case today

1269

00:48:43,510 --> 00:48:41,280

the prize

1270

00:48:45,270 --> 00:48:43,520

as well the same year of the fall of the

1271

00:48:47,109 --> 00:48:45,280

gang of four

1272

00:48:48,710 --> 00:48:47,119

led to an invitation for barry to visit

1273

00:48:51,190 --> 00:48:48,720

china probably wouldn't have happened

1274

00:48:53,270 --> 00:48:51,200

before either of those two events

1275

00:48:54,870 --> 00:48:53,280

at this time western visitors were still

1276

00:48:58,950 --> 00:48:54,880

rare and foreign technologies were

1277

00:49:03,670 --> 00:49:00,069

he

1278

00:49:05,510 --> 00:49:03,680

basically was led on a tour of china

1279

00:49:07,990 --> 00:49:05,520

went to many of the major cities spoke

1280

00:49:09,349 --> 00:49:08,000

to audiences in the thousands and

1281

00:49:11,190 --> 00:49:09,359

basically

1282

00:49:13,829 --> 00:49:11,200

told them about the development of the

1283

00:49:16,069 --> 00:49:13,839

vaccine what they could do to address

1284

00:49:18,069 --> 00:49:16,079

this tremendously serious problem in

1285

00:49:20,390 --> 00:49:18,079

their country he helped them acquire the

1286

00:49:23,510 --> 00:49:20,400

rights to manufacture the vaccine and to

1287

00:49:26,549 --> 00:49:23,520

begin a nationwide vaccination program

1288

00:49:28,790 --> 00:49:26,559

in 1978 he did a similar visit to taiwan

1289

00:49:31,270 --> 00:49:28,800

which had a similar impact and he later

1290

00:49:33,349 --> 00:49:31,280

referred to the 1977 trip as the most

1291

00:49:35,910 --> 00:49:33,359

important field trip of my life a life

1292

00:49:37,990 --> 00:49:35,920

that has included many field trips he

1293

00:49:39,910 --> 00:49:38,000

has since been very widely honored for

1294

00:49:43,670 --> 00:49:39,920

his contributions to health care in

1295

00:49:46,710 --> 00:49:43,680

china and to asia more generally

1296

00:49:47,670 --> 00:49:46,720

here uh he and jean are

1297

00:49:52,870 --> 00:49:47,680

uh

1298

00:49:55,990 --> 00:49:52,880

this is a tree planting ceremony part of

1299

00:49:58,790 --> 00:49:56,000

a very long trip uh on which he was

1300

00:50:02,190 --> 00:49:58,800

lavished with praise for the positive

1301
00:50:05,430 --> 00:50:02,200
impact he had in china and here he is in

1302
00:50:08,870 --> 00:50:05,440
2009 right here in san francisco at the

1303
00:50:10,870 --> 00:50:08,880
chinese hospital at a uh an event he was

1304
00:50:12,150 --> 00:50:10,880
being awarded the third annual hepbe

1305
00:50:18,710 --> 00:50:12,160
super

1306
00:50:23,190 --> 00:50:18,720
award and the award included a cape with

1307
00:50:27,190 --> 00:50:25,349
by the san francisco hippie free

1308
00:50:29,030 --> 00:50:27,200
organization and the chinese hospital of

1309
00:50:29,829 --> 00:50:29,040
san francisco

1310
00:50:31,430 --> 00:50:29,839
uh

1311
00:50:33,430 --> 00:50:31,440
very quickly because i can see that i'm

1312
00:50:35,670 --> 00:50:33,440
running out of time

1313
00:50:37,270 --> 00:50:35,680

somewhat later in his career he went

1314

00:50:39,670 --> 00:50:37,280

back to

1315

00:50:41,750 --> 00:50:39,680

oxford to ballyall college the college

1316

00:50:43,750 --> 00:50:41,760

where he had gotten his phd he had been

1317

00:50:46,630 --> 00:50:43,760

there earlier he served as eastman

1318

00:50:49,030 --> 00:50:46,640

professor in 1983. ballial is one of

1319

00:50:50,950 --> 00:50:49,040

oxford oldest colleges it's known

1320

00:50:53,190 --> 00:50:50,960

particularly for political science and

1321

00:50:56,150 --> 00:50:53,200

philosophy it's not terribly well known

1322

00:50:58,870 --> 00:50:56,160

for science uh he was the first american

1323

00:51:00,950 --> 00:50:58,880

to be elected master also the first

1324

00:51:03,829 --> 00:51:00,960

scientist if you don't count a 14th

1325

00:51:07,190 --> 00:51:03,839

century alchemist

1326

00:51:09,030 --> 00:51:07,200

and he served for five years he said

1327

00:51:10,630 --> 00:51:09,040

that the master of the college had no

1328

00:51:13,190 --> 00:51:10,640

power but a great deal of influence and

1329

00:51:15,109 --> 00:51:13,200

then an interesting observation learning

1330

00:51:17,349 --> 00:51:15,119

how to lead without actual power came in

1331

00:51:19,910 --> 00:51:17,359

good use in later years when for example

1332

00:51:22,069 --> 00:51:19,920

at the nasa astrobiology institute i had

1333

00:51:24,630 --> 00:51:22,079

considerable administrative power but

1334

00:51:27,270 --> 00:51:24,640

only rarely had need to use it this is

1335

00:51:29,109 --> 00:51:27,280

barry and his bally all robes taken just

1336

00:51:31,190 --> 00:51:29,119

in february of this year just a couple

1337

00:51:33,430 --> 00:51:31,200

of months before he passed away

1338

00:51:35,349 --> 00:51:33,440

along with some friends that you can see

1339

00:51:37,270 --> 00:51:35,359

above him this was taken in ben franklin

1340

00:51:39,030 --> 00:51:37,280

hall in philadelphia

1341

00:51:40,870 --> 00:51:39,040

ben franklin hall is the home of the

1342

00:51:44,230 --> 00:51:40,880

american philosophical society which

1343

00:51:45,990 --> 00:51:44,240

barry was president of from 2005 i

1344

00:51:50,950 --> 00:51:46,000

believe

1345

00:51:55,630 --> 00:51:53,750

so we come to barry in astrobiology

1346

00:51:57,510 --> 00:51:55,640

i put in a couple of slides about

1347

00:51:59,190 --> 00:51:57,520

astrobiology just in case there was

1348

00:52:01,349 --> 00:51:59,200

anybody in the audience who didn't know

1349

00:52:03,589 --> 00:52:01,359

what it was

1350

00:52:05,190 --> 00:52:03,599

i don't think there are many such people

1351
00:52:06,230 --> 00:52:05,200
in this audience

1352
00:52:08,950 --> 00:52:06,240
so

1353
00:52:10,630 --> 00:52:08,960
you know astrobiology biology's three

1354
00:52:13,109 --> 00:52:10,640
questions

1355
00:52:15,030 --> 00:52:13,119
it involves four areas of science the

1356
00:52:18,069 --> 00:52:15,040
understanding of the nature of life on

1357
00:52:20,870 --> 00:52:18,079
earth it's diversity it's ubiquity we

1358
00:52:22,870 --> 00:52:20,880
find it basically everywhere we can

1359
00:52:24,950 --> 00:52:22,880
um

1360
00:52:26,950 --> 00:52:24,960
computers awfully touchy

1361
00:52:28,069 --> 00:52:26,960
and it's antiquity we find it in

1362
00:52:30,470 --> 00:52:28,079
evidence of it in three and a half

1363
00:52:33,190 --> 00:52:30,480

billion year old stromatolites

1364

00:52:35,670 --> 00:52:33,200

the other another area is the

1365

00:52:38,390 --> 00:52:35,680

environments that we are discovering on

1366

00:52:40,390 --> 00:52:38,400

other planets in this planetary system

1367

00:52:42,790 --> 00:52:40,400

in our solar system and on planets

1368

00:52:44,309 --> 00:52:42,800

around other stars and the prevalence of

1369

00:52:47,030 --> 00:52:44,319

the raw ingredients for life in

1370

00:52:48,549 --> 00:52:47,040

interstellar space and in meteorites

1371

00:52:51,270 --> 00:52:48,559

being delivered to these habitable

1372

00:52:54,470 --> 00:52:51,280

planets so these are four

1373

00:52:56,470 --> 00:52:54,480

very diverse areas it requires uh the

1374

00:52:58,390 --> 00:52:56,480

expertise of people in the biological

1375

00:53:00,790 --> 00:52:58,400

sciences the geological sciences and the

1376
00:53:02,870 --> 00:53:00,800
astronomical sciences a highly highly

1377
00:53:04,950 --> 00:53:02,880
interdisciplinary field and you can see

1378
00:53:07,670 --> 00:53:04,960
from barry's background why such a

1379
00:53:09,750 --> 00:53:07,680
highly interdisciplinary field with such

1380
00:53:12,069 --> 00:53:09,760
amazing questions

1381
00:53:15,589 --> 00:53:12,079
would be attractive

1382
00:53:17,430 --> 00:53:15,599
so nasa comes a colon in 1997 barry was

1383
00:53:19,270 --> 00:53:17,440
invited to join stanford's program on

1384
00:53:22,790 --> 00:53:19,280
human biology where he taught medical

1385
00:53:24,470 --> 00:53:22,800
anthropology and the scientific process

1386
00:53:25,589 --> 00:53:24,480
turns out that somebody in the audience

1387
00:53:28,309 --> 00:53:25,599
mal cohn

1388
00:53:31,510 --> 00:53:28,319

uh was teaching at stanford at the time

1389

00:53:34,790 --> 00:53:31,520

new barry from philadelphia and malin

1390

00:53:36,870 --> 00:53:34,800

basically introduced barry to nasa and

1391

00:53:38,309 --> 00:53:36,880

introduced nasa to barry

1392

00:53:40,549 --> 00:53:38,319

so barry was invited to attend the

1393

00:53:42,630 --> 00:53:40,559

astrobiology roadmap workshop at ames in

1394

00:53:45,589 --> 00:53:42,640

july 1998

1395

00:53:48,470 --> 00:53:45,599

and astrobiology intrigued him what a

1396

00:53:49,349 --> 00:53:48,480

surprise

1397

00:53:51,190 --> 00:53:49,359

and

1398

00:53:53,190 --> 00:53:51,200

he noted that nasa was applying

1399

00:53:54,549 --> 00:53:53,200

scientific principles and process to

1400

00:53:57,510 --> 00:53:54,559

questions that had been of interest to

1401
00:53:59,349 --> 00:53:57,520
philosophers the religious ethicists etc

1402
00:54:01,750 --> 00:53:59,359
for countless generations

1403
00:54:06,870 --> 00:54:01,760
later in 1998 he co-chaired another ames

1404
00:54:11,109 --> 00:54:08,630
on the international space station and

1405
00:54:13,430 --> 00:54:11,119
in 1999 at dan golden's invitation he

1406
00:54:15,430 --> 00:54:13,440
became the founding director of the nasa

1407
00:54:17,190 --> 00:54:15,440
astrobiology institute

1408
00:54:18,790 --> 00:54:17,200
there he is with dan

1409
00:54:22,230 --> 00:54:18,800
and barry of course served for three

1410
00:54:26,790 --> 00:54:24,710
this is also from barry i understood

1411
00:54:28,549 --> 00:54:26,800
that my mandate was to establish a basic

1412
00:54:31,109 --> 00:54:28,559
science organization that could discover

1413
00:54:32,630 --> 00:54:31,119

and understand natural phenomena that

1414

00:54:33,910 --> 00:54:32,640

related to early life into life

1415

00:54:36,230 --> 00:54:33,920

elsewhere

1416

00:54:38,150 --> 00:54:36,240

at an introductory address to members of

1417

00:54:39,750 --> 00:54:38,160

the institute's executive council i told

1418

00:54:41,190 --> 00:54:39,760

them that i did not expect them to do

1419

00:54:43,030 --> 00:54:41,200

exactly what they said they would do in

1420

00:54:44,950 --> 00:54:43,040

their applications since in a

1421

00:54:46,710 --> 00:54:44,960

fast-moving field observations made

1422

00:54:48,309 --> 00:54:46,720

after the application had been written

1423

00:54:53,829 --> 00:54:48,319

could greatly change the path of

1424

00:54:57,109 --> 00:54:54,870

again

1425

00:54:58,230 --> 00:54:57,119

you can see exactly where that

1426
00:55:00,790 --> 00:54:58,240
came from

1427
00:55:03,510 --> 00:55:00,800
look at his own career he started off

1428
00:55:05,750 --> 00:55:03,520
looking for genetic polymorphisms and

1429
00:55:07,750 --> 00:55:05,760
discovered the source of of one of the

1430
00:55:09,910 --> 00:55:07,760
most serious diseases

1431
00:55:10,950 --> 00:55:09,920
that inflicts mankind

1432
00:55:13,270 --> 00:55:10,960
not

1433
00:55:14,549 --> 00:55:13,280
what was expected

1434
00:55:16,870 --> 00:55:14,559
this is barry

1435
00:55:20,069 --> 00:55:16,880
with the nai executive council some

1436
00:55:22,950 --> 00:55:20,079
years later in 2009 when he was a

1437
00:55:24,710 --> 00:55:22,960
distinguished scientist with both the

1438
00:55:27,190 --> 00:55:24,720

astrobiology institute and the nasa

1439

00:55:29,030 --> 00:55:27,200

lunar science institute

1440

00:55:30,630 --> 00:55:29,040

and

1441

00:55:33,190 --> 00:55:30,640

we were having an executive council

1442

00:55:36,710 --> 00:55:33,200

meeting in yellowstone national park

1443

00:55:39,430 --> 00:55:36,720

uh barry continued his um

1444

00:55:40,710 --> 00:55:39,440

his uh focus on getting out into the

1445

00:55:43,670 --> 00:55:40,720

field this is

1446

00:55:45,750 --> 00:55:43,680

barry up in the high arctic on devon

1447

00:55:47,510 --> 00:55:45,760

island at the nasa hot and mars project

1448

00:55:50,150 --> 00:55:47,520

in 2000

1449

00:55:52,309 --> 00:55:50,160

this is barry at the iron mountain mine

1450

00:55:54,789 --> 00:55:52,319

near reading california in september

1451

00:55:56,390 --> 00:55:54,799

2002 barry was claustrophobic and he

1452

00:55:57,829 --> 00:55:56,400

went down into the mine

1453

00:56:00,309 --> 00:55:57,839

and he first had to overcome his

1454

00:56:03,430 --> 00:56:00,319

claustrophobia in order to

1455

00:56:04,950 --> 00:56:03,440

actually do it but he was determined to

1456

00:56:09,190 --> 00:56:04,960

see what things were all about in the

1457

00:56:12,710 --> 00:56:11,430

one of the things that developed after

1458

00:56:14,230 --> 00:56:12,720

barry

1459

00:56:15,829 --> 00:56:14,240

left the nai

1460

00:56:17,829 --> 00:56:15,839

was a partnership with the american

1461

00:56:19,990 --> 00:56:17,839

philosophical society after he became

1462

00:56:22,230 --> 00:56:20,000

the partner the american philosophical

1463

00:56:24,230 --> 00:56:22,240

society had a

1464

00:56:26,069 --> 00:56:24,240

fund called a program called the lewis

1465

00:56:29,670 --> 00:56:26,079

and clark program

1466

00:56:31,270 --> 00:56:29,680

for field research which supported young

1467

00:56:34,069 --> 00:56:31,280

investigators going all over the world

1468

00:56:36,789 --> 00:56:34,079

and we formed in partnership with barry

1469

00:56:39,829 --> 00:56:36,799

a specific

1470

00:56:42,630 --> 00:56:39,839

version of this program for astrobiology

1471

00:56:45,030 --> 00:56:42,640

which has sent astrobiology graduate

1472

00:56:48,069 --> 00:56:45,040

students and post-docs

1473

00:56:49,589 --> 00:56:48,079

early career researchers in general to

1474

00:56:51,190 --> 00:56:49,599

many many different places in the world

1475

00:56:52,470 --> 00:56:51,200

these are just a few and i'm not going

1476
00:56:56,710 --> 00:56:52,480
to

1477
00:56:59,510 --> 00:56:56,720
of the many things that emerged

1478
00:57:01,990 --> 00:56:59,520
from barry's tenure as director and the

1479
00:57:05,430 --> 00:57:02,000
things that followed afterward

1480
00:57:07,430 --> 00:57:05,440
barry was also very concerned with uh

1481
00:57:09,349 --> 00:57:07,440
the study of

1482
00:57:11,349 --> 00:57:09,359
human behavior human behavior was an

1483
00:57:13,109 --> 00:57:11,359
essential element of susceptibility to

1484
00:57:14,789 --> 00:57:13,119
disease it was that third component in

1485
00:57:16,309 --> 00:57:14,799
addition to the environment

1486
00:57:18,710 --> 00:57:16,319
and to

1487
00:57:20,309 --> 00:57:18,720
genetic predisposition

1488
00:57:22,870 --> 00:57:20,319

and

1489

00:57:26,390 --> 00:57:22,880

barry brought an anthropologist into the

1490

00:57:29,510 --> 00:57:26,400

nai lisa faithhorn here she is at

1491

00:57:31,750 --> 00:57:29,520

the nai general meeting in 2001 because

1492

00:57:34,789 --> 00:57:31,760

barry wanted a card-carrying

1493

00:57:37,109 --> 00:57:34,799

anthropologist to study these teams that

1494

00:57:38,230 --> 00:57:37,119

were now supposed to be competing for

1495

00:57:39,510 --> 00:57:38,240

membership

1496

00:57:41,910 --> 00:57:39,520

in this institute but then they were

1497

00:57:44,150 --> 00:57:41,920

supposed to become cooperative and

1498

00:57:46,470 --> 00:57:44,160

collaborative afterward and then five

1499

00:57:48,630 --> 00:57:46,480

years after that when their agreements

1500

00:57:50,309 --> 00:57:48,640

expired they became competitors again

1501
00:57:52,309 --> 00:57:50,319
and barry wanted to understand how that

1502
00:57:54,870 --> 00:57:52,319
was all going to work and he figured who

1503
00:57:57,430 --> 00:57:54,880
better to figure out observe how that's

1504
00:57:59,109 --> 00:57:57,440
going to work than an anthropologist so

1505
00:58:00,230 --> 00:57:59,119
we had an anthropologist and lisa

1506
00:58:01,190 --> 00:58:00,240
remains

1507
00:58:19,750 --> 00:58:01,200
a

1508
00:58:21,349 --> 00:58:19,760
directory uh

1509
00:58:25,030 --> 00:58:21,359
10 years ago

1510
00:58:26,950 --> 00:58:25,040
well before facebook was on the scene

1511
00:58:29,910 --> 00:58:26,960
he introduced the concept of focus

1512
00:58:30,630 --> 00:58:29,920
groups bringing communities together

1513
00:58:33,430 --> 00:58:30,640

in

1514

00:58:35,990 --> 00:58:33,440

focus groups and he established a virus

1515

00:58:38,870 --> 00:58:36,000

focus group to bring virology into

1516

00:58:40,870 --> 00:58:38,880

astrobiology where it had not been a

1517

00:58:41,750 --> 00:58:40,880

prominent part

1518

00:58:44,870 --> 00:58:41,760

he

1519

00:58:46,630 --> 00:58:44,880

clearly had a great importance a great

1520

00:58:49,270 --> 00:58:46,640

sense of the importance of international

1521

00:58:51,190 --> 00:58:49,280

collaboration so the international

1522

00:58:53,670 --> 00:58:51,200

partners program was also something that

1523

00:58:56,710 --> 00:58:53,680

barry gave a great deal of emphasis to

1524

00:58:59,190 --> 00:58:56,720

this is a picture taken at the signing

1525

00:59:01,430 --> 00:58:59,200

of the partnership agreement between the

1526
00:59:02,309 --> 00:59:01,440
nai and the astrobiology society of

1527
00:59:05,109 --> 00:59:02,319
britain

1528
00:59:08,270 --> 00:59:05,119
in london this was taken at the u.s

1529
00:59:12,230 --> 00:59:08,280
embassy in london in uh

1530
00:59:14,069 --> 00:59:12,240
2002 i believe or 2001.

1531
00:59:16,069 --> 00:59:14,079
here's barry barry with david wynn

1532
00:59:17,750 --> 00:59:16,079
williams a member of the british

1533
00:59:19,670 --> 00:59:17,760
antarctic survey who was tragically

1534
00:59:22,870 --> 00:59:19,680
killed in a bicycling accident a few

1535
00:59:25,270 --> 00:59:22,880
years after this picture was taken

1536
00:59:28,230 --> 00:59:25,280
barry also appreciated the contributions

1537
00:59:30,549 --> 00:59:28,240
that all people from all walks of life

1538
00:59:35,190 --> 00:59:30,559

have to make

1539

00:59:37,910 --> 00:59:35,200

to science uh he started the minority

1540

00:59:39,750 --> 00:59:37,920

institution research support program and

1541

00:59:42,150 --> 00:59:39,760

here is a picture taken at the

1542

00:59:44,789 --> 00:59:42,160

astrobiology science conference in 2006

1543

00:59:46,950 --> 00:59:44,799

there's barry with a few of us

1544

00:59:49,030 --> 00:59:46,960

uh and

1545

00:59:50,230 --> 00:59:49,040

with a number of

1546

00:59:56,069 --> 00:59:50,240

the

1547

00:59:57,349 --> 00:59:56,079

minority institution research support

1548

01:00:01,829 --> 00:59:57,359

program

1549

01:00:04,309 --> 01:00:01,839

barry was also a great fan of involving

1550

01:00:05,109 --> 01:00:04,319

ordinary citizens in science

1551

01:00:07,430 --> 01:00:05,119

he was

1552

01:00:08,870 --> 01:00:07,440

citizen science projects were a passion

1553

01:00:10,230 --> 01:00:08,880

of his in fact this is what he was

1554

01:00:13,030 --> 01:00:10,240

speaking about

1555

01:00:16,470 --> 01:00:13,040

at the meeting which he passed away here

1556

01:00:19,990 --> 01:00:18,470

as barry said people keep saying that

1557

01:00:22,309 --> 01:00:20,000

basic research is just a fishing

1558

01:00:23,910 --> 01:00:22,319

expedition i never understood why people

1559

01:00:26,950 --> 01:00:23,920

objected to that after all that's the

1560

01:00:31,750 --> 01:00:29,990

barry caught a lot of fish in his career

1561

01:00:33,510 --> 01:00:31,760

uh we now have the blumberg center for

1562

01:00:35,750 --> 01:00:33,520

science innovation which is the home of

1563

01:00:37,750 --> 01:00:35,760

the nasa lunar science institute

1564

01:00:39,510 --> 01:00:37,760

uh just at the head of the parade

1565

01:00:41,670 --> 01:00:39,520

grounds

1566

01:00:43,750 --> 01:00:41,680

barry with his wife

1567

01:00:45,990 --> 01:00:43,760

jean

1568

01:00:48,549 --> 01:00:46,000

barry passed away within a day of his

1569

01:00:52,390 --> 01:00:48,559

57th anniversary

1570

01:00:53,510 --> 01:00:52,400

which was very poignant for everyone

1571

01:00:57,910 --> 01:00:53,520

barry

1572

01:00:59,990 --> 01:00:57,920

was just such a genuinely

1573

01:01:02,069 --> 01:01:00,000

warm human being

1574

01:01:04,470 --> 01:01:02,079

genuine is the right word to describe

1575

01:01:06,309 --> 01:01:04,480

barry there wasn't a false bone in his

1576

01:01:08,390 --> 01:01:06,319

body

1577

01:01:09,510 --> 01:01:08,400

he was warm he was humble he was

1578

01:01:13,190 --> 01:01:09,520

generous

1579

01:01:17,510 --> 01:01:15,430

most a lot of people in this room knew

1580

01:01:21,430 --> 01:01:17,520

him and

1581

01:01:26,950 --> 01:01:23,510

those who know his family

1582

01:01:29,750 --> 01:01:26,960

know that his family his kids their kids

1583

01:01:30,710 --> 01:01:29,760

are really really nice people

1584

01:01:32,870 --> 01:01:30,720

and

1585

01:01:36,470 --> 01:01:32,880

in this case this is just one really

1586

01:01:40,549 --> 01:01:37,510

so

1587

01:01:42,549 --> 01:01:40,559

we all have wonderful wonderful memories

1588

01:01:53,510 --> 01:01:42,559

of barry

1589

01:02:09,990 --> 01:01:55,109

if you have a question you have to raise

1590

01:02:14,630 --> 01:02:12,789

carl you met uh quoted extensively from

1591

01:02:16,390 --> 01:02:14,640

a book that barry wrote which i was

1592

01:02:19,109 --> 01:02:16,400

unaware of could you give us the title

1593

01:02:20,549 --> 01:02:19,119

and where one could get a copy

1594

01:02:22,870 --> 01:02:20,559

i sure can

1595

01:02:24,230 --> 01:02:22,880

it is published by princeton university

1596

01:02:27,829 --> 01:02:24,240

press

1597

01:02:30,230 --> 01:02:27,839

i presume you know i didn't check to

1598

01:02:31,910 --> 01:02:30,240

verify that it's still in print i bought

1599

01:02:33,510 --> 01:02:31,920

it in the princeton university bookstore

1600

01:02:34,870 --> 01:02:33,520

some years ago

1601

01:02:37,349 --> 01:02:34,880

but there it is it's the hunt for a

1602

01:02:39,750 --> 01:02:37,359

killer virus hepatitis b by baruch s

1603

01:02:41,990 --> 01:02:39,760

bloomberg princeton university press

1604

01:02:49,990 --> 01:02:42,000

2002.

1605

01:02:54,309 --> 01:02:52,549

let's get a microphone to you

1606

01:02:55,990 --> 01:02:54,319

he said to me it's typical barry that

1607

01:02:57,190 --> 01:02:56,000

more members of my family have climbed

1608

01:03:01,510 --> 01:02:57,200

mount katahdin than read my

1609

01:03:05,670 --> 01:03:03,309

i tell you i really wish i had read his

1610

01:03:07,750 --> 01:03:05,680

autobiography as carefully before he

1611

01:03:09,829 --> 01:03:07,760

passed away as i have since because i

1612

01:03:19,190 --> 01:03:09,839

now have so many questions i want to ask

1613

01:03:24,230 --> 01:03:20,630

thank you carl you mentioned that

1614

01:03:26,390 --> 01:03:24,240

there's a an archive of video i assume

1615

01:03:28,390 --> 01:03:26,400

interviews with barry yes

1616

01:03:31,430 --> 01:03:28,400

where is that google

1617

01:03:34,069 --> 01:03:31,440

web of stories

1618

01:03:36,230 --> 01:03:34,079

and then when you get to their home page

1619

01:03:38,630 --> 01:03:36,240

just search in their search engine on

1620

01:03:40,710 --> 01:03:38,640

bloomberg and you'll come to it it's six

1621

01:03:42,710 --> 01:03:40,720

or seven hours broken up into eighty

1622

01:03:44,390 --> 01:03:42,720

individual segments each a few minutes

1623

01:03:46,710 --> 01:03:44,400

long and basically it's an

1624

01:03:48,950 --> 01:03:46,720

extemporaneous version of his book he

1625

01:03:51,750 --> 01:03:48,960

takes you from his early childhood right

1626
01:03:54,150 --> 01:03:51,760
through his career at nai talks about

1627
01:03:56,870 --> 01:03:54,160
all the things that i've talked about

1628
01:03:57,670 --> 01:03:56,880
google web of stories web of stories

1629
01:03:59,589 --> 01:03:57,680
just

1630
01:04:02,789 --> 01:03:59,599
great type web of stories into the

1631
01:04:04,390 --> 01:04:02,799
search engine and you'll and and then

1632
01:04:05,829 --> 01:04:04,400
search on bloomberg

1633
01:04:07,910 --> 01:04:05,839
in their

1634
01:04:11,349 --> 01:04:07,920
search window and you'll be there in 30

1635
01:04:11,359 --> 01:04:16,630
any further questions

1636
01:04:19,910 --> 01:04:18,150
all right

1637
01:04:22,390 --> 01:04:19,920
carl thank you so much for doing this

1638
01:04:23,349 --> 01:04:22,400

it's just amazing to hear this back

1639

01:04:24,789 --> 01:04:23,359

story

1640

01:04:26,710 --> 01:04:24,799

and i think

1641

01:04:29,029 --> 01:04:26,720

more of us aren't able to speak right

1642

01:04:30,710 --> 01:04:29,039

now because we're so choked up with our

1643

01:04:32,870 --> 01:04:30,720

own memories of barry

1644

01:04:34,309 --> 01:04:32,880

but i'm going to try to push past that

1645

01:04:36,870 --> 01:04:34,319

because i want to say something that i

1646

01:04:38,630 --> 01:04:36,880

think is really important to this crowd

1647

01:04:40,870 --> 01:04:38,640

and in fact for everybody in this crowd

1648

01:04:43,349 --> 01:04:40,880

to take back to everyone you know

1649

01:04:45,349 --> 01:04:43,359

and that is that because of barry's

1650

01:04:47,990 --> 01:04:45,359

passing

1651

01:04:51,510 --> 01:04:48,000

several of us wanted to learn more about

1652

01:04:54,390 --> 01:04:51,520

what to do when a loved one has

1653

01:04:56,470 --> 01:04:54,400

a heart attack and so we purchased at

1654

01:04:59,190 --> 01:04:56,480

the lunar science institute

1655

01:05:00,069 --> 01:04:59,200

one of those aed devices

1656

01:05:01,990 --> 01:05:00,079

and

1657

01:05:04,950 --> 01:05:02,000

in order to learn how to use that we all

1658

01:05:06,870 --> 01:05:04,960

took a cpr course just last friday

1659

01:05:08,870 --> 01:05:06,880

and what we were surprised to learn is

1660

01:05:11,829 --> 01:05:08,880

that there have been some changes that

1661

01:05:14,150 --> 01:05:11,839

the red cross now advises in the way you

1662

01:05:16,069 --> 01:05:14,160

give cpr and when you give it and

1663

01:05:18,150 --> 01:05:16,079

without going into what those details

1664

01:05:21,029 --> 01:05:18,160

are i would just like to urge every

1665

01:05:23,029 --> 01:05:21,039

single person here to get retrained

1666

01:05:25,349 --> 01:05:23,039

right now even if you think you know

1667

01:05:27,589 --> 01:05:25,359

what to do i can promise you some things

1668

01:05:30,069 --> 01:05:27,599

have changed just in the last year

1669

01:05:33,589 --> 01:05:30,079

and for those of us that were so close

1670

01:05:36,789 --> 01:05:33,599

to him we all wonder and wish we knew

1671

01:05:40,069 --> 01:05:36,799

what we know now when he had passed

1672

01:05:42,230 --> 01:05:40,079

so i really just can't emphasize enough

1673

01:05:51,270 --> 01:05:42,240

that you know you need to get cpr

1674

01:05:56,390 --> 01:05:54,069

okay well this is a great uh colloquium

1675

01:06:03,109 --> 01:05:56,400

carl i think we should give our speaker

1676

01:06:07,430 --> 01:06:03,750

you

1677

01:06:09,349 --> 01:06:07,440

barry's story and i think we have some