



1  
00:00:22,249 --> 00:00:19,429  
in 1969 I was either preparing for going

2  
00:00:25,819 --> 00:00:22,259  
to graduate school or in graduate school

3  
00:00:30,919 --> 00:00:25,829  
the Apollo program affected me in that

4  
00:00:33,020 --> 00:00:30,929  
it added to an already existing need

5  
00:00:35,720 --> 00:00:33,030  
that I felt personally that I needed to

6  
00:00:39,020 --> 00:00:35,730  
get as much education as I possibly

7  
00:00:43,579 --> 00:00:39,030  
could the way that the Apollo program

8  
00:00:46,039 --> 00:00:43,589  
affected me is that I was in awe of the

9  
00:00:52,070 --> 00:00:46,049  
people that were involved in the moon

10  
00:00:55,250 --> 00:00:52,080  
landing and I could see that the

11  
00:00:59,210 --> 00:00:55,260  
activity surrounding that had required

12  
00:01:05,620 --> 00:00:59,220  
an awful lot of expertise and competence

13  
00:01:09,530 --> 00:01:05,630

dedication a lot of courage and and and

14

00:01:11,480 --> 00:01:09,540

capability I just realized that in order

15

00:01:13,270 --> 00:01:11,490

to be a part of something like that and

16

00:01:16,130 --> 00:01:13,280

I didn't anticipate that I ever would

17

00:01:18,200 --> 00:01:16,140

but if I ever did want to be a part of

18

00:01:19,880 --> 00:01:18,210

something like that I would have to have

19

00:01:25,220 --> 00:01:19,890

as much education that possibly could

20

00:01:29,390 --> 00:01:25,230

kid and so being from from the Detroit

21

00:01:30,890 --> 00:01:29,400

which had just been rioting and where we

22

00:01:34,460 --> 00:01:30,900

had been in these discussions already

23

00:01:37,280 --> 00:01:34,470

about the need for education that that

24

00:01:39,580 --> 00:01:37,290

feeling was there but but observing the

25

00:01:41,990 --> 00:01:39,590

moon landing enhanced it within me

26

00:01:44,170 --> 00:01:42,000

considerably that that there was an

27

00:01:52,080 --> 00:01:44,180

awful lot of technical competence that

28

00:01:57,840 --> 00:01:54,749

the moon landing I probably indirectly

29

00:01:59,249 --> 00:01:57,850

inspired me to continue on the study I

30

00:02:01,830 --> 00:01:59,259

there were other things that had

31

00:02:04,139 --> 00:02:01,840

inspired me prior to to the moon landing

32

00:02:08,070 --> 00:02:04,149

the moon landing sort of added to

33

00:02:11,369 --> 00:02:08,080

something I thought was a a great need

34

00:02:14,369 --> 00:02:11,379

I felt that particularly as a black man

35

00:02:17,809 --> 00:02:14,379

in the United States there was a deficit

36

00:02:22,050 --> 00:02:17,819

in technical people who were performing

37

00:02:23,880 --> 00:02:22,060

technically scientifically that and I

38

00:02:25,949 --> 00:02:23,890

felt that I I thought I had a

39

00:02:29,250 --> 00:02:25,959

responsibility since I felt I did have

40

00:02:30,780 --> 00:02:29,260

the capacity to to do science I had a

41

00:02:35,670 --> 00:02:30,790

responsibility to do as far as I could

42

00:02:40,830 --> 00:02:37,610

the perspective of both

43

00:02:43,920 --> 00:02:40,840

african-americans was not so much you

44

00:02:47,910 --> 00:02:43,930

know our violent or we nonviolent that

45

00:02:51,050 --> 00:02:47,920

wasn't the issue the issue was more or

46

00:02:56,190 --> 00:02:51,060

less trying to gain a modicum of respect

47

00:03:01,320 --> 00:02:56,200

trying to get somewhere is in terms of

48

00:03:04,170 --> 00:03:01,330

Education in terms of income in terms of

49

00:03:06,240 --> 00:03:04,180

just being able to survive a violence

50

00:03:10,589 --> 00:03:06,250

was not something I'm certain it wasn't

51  
00:03:15,750 --> 00:03:10,599  
aligned with but it was not something

52  
00:03:18,600 --> 00:03:15,760  
that was was totally out out of the

53  
00:03:20,190 --> 00:03:18,610  
picture because violence we felt was a

54  
00:03:22,319 --> 00:03:20,200  
part of the scene

55  
00:03:25,789 --> 00:03:22,329  
generally anyway I mean it was violence

56  
00:03:28,910 --> 00:03:25,799  
coming from all directions either from

57  
00:03:31,559 --> 00:03:28,920  
just from the general social fabric

58  
00:03:33,780 --> 00:03:31,569  
where people were generally felt

59  
00:03:36,720 --> 00:03:33,790  
violently oppressed in terms of not

60  
00:03:39,539 --> 00:03:36,730  
being able to survive and then there was

61  
00:03:42,150 --> 00:03:39,549  
a whole self-defense aspect of should I

62  
00:03:44,400 --> 00:03:42,160  
defend myself or not so violence was

63  
00:03:51,050 --> 00:03:44,410

more or less in a moment into the fabric

64

00:03:57,120 --> 00:03:51,060

of the society as a as a philosophy as a

65

00:03:59,580 --> 00:03:57,130

sort of as a mechanism of moving ahead

66

00:04:02,210 --> 00:03:59,590

the nonviolent philosophy of Martin

67

00:04:06,479 --> 00:04:02,220

Luther King was of course extremely

68

00:04:11,280 --> 00:04:06,489

correct I mean it was it was a one way

69

00:04:14,909 --> 00:04:11,290

of suffering without responding and I

70

00:04:18,170 --> 00:04:14,919

think that sort of awakened the United

71

00:04:22,050 --> 00:04:18,180

States conscious on the other hand the

72

00:04:25,740 --> 00:04:22,060

self-defense teachings of people like

73

00:04:28,170 --> 00:04:25,750

Malcolm X at the time was was something

74

00:04:31,879 --> 00:04:28,180

that was was being taught to or spoken

75

00:04:34,950 --> 00:04:31,889

to American black Americans in terms of

76  
00:04:37,800 --> 00:04:34,960  
maintaining their manhood or standing up

77  
00:04:39,750 --> 00:04:37,810  
for what they believed in but not going

78  
00:04:42,060 --> 00:04:39,760  
out and doing things but more or less

79  
00:04:45,600 --> 00:04:42,070  
protecting themselves so and you know

80  
00:04:48,270 --> 00:04:45,610  
then as a country we as a country

81  
00:04:49,480 --> 00:04:48,280  
believe in self-defense and so that that

82  
00:04:52,360 --> 00:04:49,490  
kind of thinking

83  
00:04:55,510 --> 00:04:52,370  
I thought was was not even germane to

84  
00:04:56,980 --> 00:04:55,520  
the old subject other than we all want

85  
00:04:59,080 --> 00:04:56,990  
the country to be held together no one

86  
00:05:00,249 --> 00:04:59,090  
believes we don't want anti Archy we

87  
00:05:03,309 --> 00:05:00,259  
don't want people to go around being

88  
00:05:06,100 --> 00:05:03,319

violent but I thought the arguments of

89

00:05:08,020 --> 00:05:06,110

the discussion got lost in the

90

00:05:11,159 --> 00:05:08,030

nonviolent versus Ryan the real

91

00:05:13,719 --> 00:05:11,169

discussion was human rights versus

92

00:05:15,490 --> 00:05:13,729

suffering and that sort of thing those

93

00:05:17,830 --> 00:05:15,500

that's where the arguments should have

94

00:05:20,439 --> 00:05:17,840

been and not necessarily nonviolent

95

00:05:23,469 --> 00:05:20,449

versus violent so I thought I think that

96

00:05:25,990 --> 00:05:23,479

that was kind of a moot moot point so I

97

00:05:32,090 --> 00:05:26,000

never did address the issue of violence

98

00:05:38,540 --> 00:05:35,960

on the one hand it was quite frightening

99

00:05:44,390 --> 00:05:38,550

I felt a little bit insulated being a

100

00:05:48,770 --> 00:05:44,400

student in 1969 at Rutgers was at times

101

00:05:50,750 --> 00:05:48,780

of somewhat disturbing it's not quite

102

00:05:55,640 --> 00:05:50,760

frightening but some were disturbing but

103

00:05:58,430 --> 00:05:55,650

the atmosphere in 1969 whether when you

104

00:06:01,880 --> 00:05:58,440

know much of the protestations against

105

00:06:08,530 --> 00:06:01,890

the war were really becoming really

106

00:06:13,270 --> 00:06:08,540

quite pronounced my perspective was that

107

00:06:20,660 --> 00:06:13,280

my colleagues I could feel some of the

108

00:06:23,030 --> 00:06:20,670

fear some of the sort of not knowing

109

00:06:25,190 --> 00:06:23,040

what the future was was going to be like

110

00:06:27,530 --> 00:06:25,200

among some of these colleagues I could

111

00:06:30,470 --> 00:06:27,540

feel some of that I I cared about some

112

00:06:32,930 --> 00:06:30,480

of these people and so I could feel I

113

00:06:35,000 --> 00:06:32,940

can empathize with with them through

114

00:06:37,430 --> 00:06:35,010

them I had a certain amount of fear

115

00:06:40,190 --> 00:06:37,440

about the future whether or not there

116

00:06:42,620 --> 00:06:40,200

was going to be a future for me I

117

00:06:46,070 --> 00:06:42,630

thought I felt fairly secure as long as

118

00:06:51,200 --> 00:06:46,080

I was able to to succeed in my studies

119

00:06:53,030 --> 00:06:51,210

but as far as my compatriots was

120

00:06:54,830 --> 00:06:53,040

concerned they were in and out some of

121

00:06:57,830 --> 00:06:54,840

them were involved in the protests the

122

00:07:00,500 --> 00:06:57,840

campus protest in some cases they

123

00:07:03,280 --> 00:07:00,510

weren't probably studying their

124

00:07:06,860 --> 00:07:03,290

cumulative exams which prepares them for

125

00:07:08,870 --> 00:07:06,870

their degree which qualifies them for

126

00:07:11,420 --> 00:07:08,880

the degree and and in some cases not

127

00:07:14,300 --> 00:07:11,430

passing their exams on time there was so

128

00:07:16,400 --> 00:07:14,310

there was a certain amount of doubt with

129

00:07:17,630 --> 00:07:16,410

respect to these fellows in terms of on

130

00:07:20,300 --> 00:07:17,640

the one hand whether they were going to

131

00:07:23,330 --> 00:07:20,310

be around long enough to to complete

132

00:07:25,160 --> 00:07:23,340

their their degrees and because of the

133

00:07:26,810 --> 00:07:25,170

draft they were going to be able to

134

00:07:29,480 --> 00:07:26,820

successfully pass their coursework

135

00:07:32,570 --> 00:07:29,490

because they were involved in in protest

136

00:07:34,880 --> 00:07:32,580

and so on being on in graduate school we

137

00:07:36,680 --> 00:07:34,890

didn't see as much of that although we

138

00:07:38,060 --> 00:07:36,690

did see quite a bit of it in my office

139

00:07:40,850 --> 00:07:38,070

there were students that came through

140

00:07:42,530 --> 00:07:40,860

but it wasn't as heavy heavily

141

00:07:43,550 --> 00:07:42,540

concentrated in a graduate offices it

142

00:07:44,220 --> 00:07:43,560

would have been in an undergraduate

143

00:07:48,440 --> 00:07:44,230

office

144

00:07:52,170 --> 00:07:48,450

but there was definitely an air of of

145

00:07:55,140 --> 00:07:52,180

fear and uncertainty many of the

146

00:07:58,110 --> 00:07:55,150

students were subject to the draft

147

00:07:59,640 --> 00:07:58,120

I myself was insulated from that I had

148

00:08:04,140 --> 00:07:59,650

already served my time in the military

149

00:08:06,480 --> 00:08:04,150

and so I could concentrate pretty much

150

00:08:09,840 --> 00:08:06,490

on on my studies but there were some

151  
00:08:14,700 --> 00:08:09,850  
fellows who were subject to the draft

152  
00:08:19,500 --> 00:08:14,710  
and who were in the lottery and who who

153  
00:08:21,630 --> 00:08:19,510  
needed to to concentrate on their

154  
00:08:23,280 --> 00:08:21,640  
studies on the one hand but on the other

155  
00:08:24,570 --> 00:08:23,290  
hand who were there when they were

156  
00:08:26,090 --> 00:08:24,580  
opposed to the war although there were

157  
00:08:28,500 --> 00:08:26,100  
some that were not opposed to the war

158  
00:08:30,840 --> 00:08:28,510  
those that were posed in the war felt

159  
00:08:34,350 --> 00:08:30,850  
that they had to express that opposition

160  
00:08:37,290 --> 00:08:34,360  
and they were uncertain about their

161  
00:08:39,500 --> 00:08:37,300  
futures because of the possibility of

162  
00:08:43,230 --> 00:08:39,510  
being or going away to the military and

163  
00:08:46,230 --> 00:08:43,240

on the one hand also uncertain about

164

00:08:47,850 --> 00:08:46,240

their futures from the standpoint of not

165

00:08:49,500 --> 00:08:47,860

putting enough time into their studies

166

00:08:52,230 --> 00:08:49,510

and preparing for the necessary

167

00:08:54,780 --> 00:08:52,240

qualifying exams and so there was a

168

00:08:56,730 --> 00:08:54,790

considerable amount of apprehension and

169

00:08:59,550 --> 00:08:56,740

uncertainty although this was a graduate

170

00:09:01,800 --> 00:08:59,560

school and it wasn't as concentrated in

171

00:09:03,810 --> 00:09:01,810

our area as it was in the undergraduate

172

00:09:06,990 --> 00:09:03,820

part of the university although the

173

00:09:12,650 --> 00:09:07,000

whole campus was generally embroiled in

174

00:09:17,749 --> 00:09:15,410

without the Apollo program we would not

175

00:09:20,199 --> 00:09:17,759

have be able to to do the routine

176

00:09:24,889 --> 00:09:20,209

science that were capable of doing today

177

00:09:26,389 --> 00:09:24,899

and in in microgravity we can the

178

00:09:28,790 --> 00:09:26,399

mission that I was mission scientists

179

00:09:33,170 --> 00:09:28,800

for for example and not just that when

180

00:09:36,350 --> 00:09:33,180

you SMP the USML all of them have have

181

00:09:40,960 --> 00:09:36,360

done routine science they have been able

182

00:09:44,949 --> 00:09:40,970

to launch routinely grow crystals to

183

00:09:47,389 --> 00:09:44,959

grow grow protein crystals that were

184

00:09:50,650 --> 00:09:47,399

they gave much better resolution than

185

00:09:53,809 --> 00:09:50,660

the the crystals that are currently

186

00:09:55,790 --> 00:09:53,819

grown on the ground some of them that

187

00:09:57,680 --> 00:09:55,800

not all of them but some of them a great

188

00:09:59,840 --> 00:09:57,690

percentage of them gain much better

189

00:10:02,470 --> 00:09:59,850

resolution which allows a drug design a

190

00:10:05,170 --> 00:10:02,480

pharmaceutical drug design and a much

191

00:10:07,699 --> 00:10:05,180

higher percentage of drugs can be

192

00:10:09,680 --> 00:10:07,709

produced crystal growth of

193

00:10:11,389 --> 00:10:09,690

semiconductors where the defect

194

00:10:14,090 --> 00:10:11,399

densities you know we're trying to

195

00:10:15,800 --> 00:10:14,100

miniaturize these we're talking about

196

00:10:18,139 --> 00:10:15,810

miniature ation minute miniaturization

197

00:10:19,990 --> 00:10:18,149

of all of these components electronic

198

00:10:24,139 --> 00:10:20,000

components and photonic components and

199

00:10:25,790 --> 00:10:24,149

and and and and computers and so on we'd

200

00:10:28,809 --> 00:10:25,800

like to minimize the amount of defects

201  
00:10:31,490 --> 00:10:28,819  
well on the ground we do processing your

202  
00:10:33,769 --> 00:10:31,500  
defect densities are fairly high and

203  
00:10:36,819 --> 00:10:33,779  
crystal growth if you can now we know

204  
00:10:40,550 --> 00:10:36,829  
that certain fluid flows and and those

205  
00:10:44,269 --> 00:10:40,560  
types of convective effects that take

206  
00:10:46,790 --> 00:10:44,279  
place on the ground are generally absent

207  
00:10:47,960 --> 00:10:46,800  
in microgravity when we come to when he

208  
00:10:51,559 --> 00:10:47,970  
said microgravity we're talking about

209  
00:10:54,650 --> 00:10:51,569  
one millionth of the gravity on that we

210  
00:10:57,170 --> 00:10:54,660  
experience here on the ground we have

211  
00:10:59,569 --> 00:10:57,180  
these very small flows and we can

212  
00:11:01,220 --> 00:10:59,579  
minimize on the minimizer your defect

213  
00:11:03,199 --> 00:11:01,230

densities and so we're talk about

214

00:11:06,400 --> 00:11:03,209

miniaturization then that says that most

215

00:11:08,569 --> 00:11:06,410

of our material is going to be very good

216

00:11:11,809 --> 00:11:08,579

for electronics and photonic

217

00:11:14,720 --> 00:11:11,819

applications and so without the Apollo

218

00:11:16,970 --> 00:11:14,730

program without the ability to launch

219

00:11:19,790 --> 00:11:16,980

routinely we would not have these data

220

00:11:21,500 --> 00:11:19,800

points we would not have these or this

221

00:11:24,170 --> 00:11:21,510

information combustion we know how

222

00:11:26,269 --> 00:11:24,180

combustion works now much better than we

223

00:11:27,889 --> 00:11:26,279

ever did we've seen

224

00:11:30,559 --> 00:11:27,899

how things like surface tension driven

225

00:11:33,650 --> 00:11:30,569

convection works that is without the

226

00:11:36,379 --> 00:11:33,660

influence of buoyancy forces we've seen

227

00:11:38,860 --> 00:11:36,389

how many things work in microgravity

228

00:11:43,040 --> 00:11:38,870

environment as a result of being able to

229

00:11:45,470 --> 00:11:43,050

to leave the the confines of this

230

00:11:50,299 --> 00:11:45,480

gravitational field that we're in and so

231

00:11:52,189 --> 00:11:50,309

the Apollo program was extremely

232

00:11:56,030 --> 00:11:52,199

important and giving us his launch

233

00:12:02,380 --> 00:11:56,040

capability and then to permit us to do

234

00:12:07,299 --> 00:12:04,329

I would say Justin

235

00:12:10,030 --> 00:12:07,309

believable accomplishment I feel that it

236

00:12:15,629 --> 00:12:10,040

was true then and it's sure not to care

237

00:12:20,679 --> 00:12:15,639

the dedication and the commitment the

238

00:12:22,929 --> 00:12:20,689

just the courage that it took to not

239

00:12:26,470 --> 00:12:22,939

just the guy people that flew with the

240

00:12:28,509 --> 00:12:26,480

people who did the calculations and said

241

00:12:29,889 --> 00:12:28,519

that these numbers have to work but

242

00:12:31,360 --> 00:12:29,899

we're going to lose all these people

243

00:12:34,090 --> 00:12:31,370

we're gonna lose all these equipment and