
UNIVERSITY OF
WATERLOO
ONTARIO | CANADA

1
00:00:03,429 --> 00:00:01,429
station

2
00:00:08,230 --> 00:00:03,439
on two this is houston are you ready for

3
00:00:13,110 --> 00:00:09,830
houston this is the international space

4
00:00:15,350 --> 00:00:13,120
station we are ready for the event

5
00:00:17,510 --> 00:00:15,360
university of waterloo this is mission

6
00:00:27,269 --> 00:00:17,520
control in houston texas please call the

7
00:00:31,830 --> 00:00:29,750
station this is fair them handle offer

8
00:00:37,750 --> 00:00:31,840
at the university of waterloo here with

9
00:00:37,760 --> 00:00:43,350
how do you hear me

10
00:00:47,670 --> 00:00:45,750
dr hamdulillah opera i read you loud and

11
00:00:52,950 --> 00:00:47,680
clear welcome on board the international

12
00:00:57,189 --> 00:00:55,670
loud and clear i'm here with students we

13
00:01:00,549 --> 00:00:57,199

are delighted to welcome you to the

14
00:01:04,469 --> 00:01:02,709
i can see them from here we're delighted

15
00:01:06,630 --> 00:01:04,479
to welcome you to the university we have

16
00:01:09,350 --> 00:01:06,640
a group of students who are anxious to

17
00:01:10,630 --> 00:01:09,360
ask you questions so we'll just get on

18
00:01:13,990 --> 00:01:10,640
with it

19
00:01:19,590 --> 00:01:16,950
hi chris my name is rashmi venkatesh my

20
00:01:22,310 --> 00:01:19,600
question is has the sensation of leaving

21
00:01:24,789 --> 00:01:22,320
earth's protective field changed since

22
00:01:27,190 --> 00:01:24,799
your first trip into space and can you

23
00:01:29,830 --> 00:01:27,200
describe your feelings apprehension

24
00:01:37,190 --> 00:01:29,840
wonder or fear as you left earth's

25
00:01:43,030 --> 00:01:40,149
rashmi uh i've been so fortunate to have

26
00:01:45,510 --> 00:01:43,040
flown in space not just once

27
00:01:48,149 --> 00:01:45,520
but three times and on different

28
00:01:51,030 --> 00:01:48,159
spaceships and this time to be able to

29
00:01:53,590 --> 00:01:51,040
stay for months and months

30
00:01:55,670 --> 00:01:53,600
i would say my apprehension was low

31
00:01:59,109 --> 00:01:55,680
i was more concerned about not going to

32
00:02:01,429 --> 00:01:59,119
space than it was about going to space

33
00:02:03,429 --> 00:02:01,439
because there are there are so many

34
00:02:05,350 --> 00:02:03,439
complexities in in trying to safely

35
00:02:08,389 --> 00:02:05,360
leave earth i was also

36
00:02:11,670 --> 00:02:08,399
sort of the pilot of the soyuz spaceship

37
00:02:14,390 --> 00:02:11,680
and so a lot of eagerness to put all of

38
00:02:15,750 --> 00:02:14,400

that training into practice to do all

39
00:02:18,710 --> 00:02:15,760
the things that so many people have

40
00:02:22,550 --> 00:02:18,720
prepared me to do so it was with a great

41
00:02:24,630 --> 00:02:22,560
sense of of buoyant energy and readiness

42
00:02:27,030 --> 00:02:24,640
that i that i left earth's protective

43
00:02:29,190 --> 00:02:27,040
sheath which which is just outside that

44
00:02:33,350 --> 00:02:29,200
window and launched up here to the space

45
00:02:35,910 --> 00:02:33,360
station a couple months ago and

46
00:02:38,630 --> 00:02:35,920
i visited space twice before but this

47
00:02:41,509 --> 00:02:38,640
time to live here the richness of it

48
00:02:43,430 --> 00:02:41,519
the um the ability and the time

49
00:02:45,910 --> 00:02:43,440
to absorb it and wonder about it and

50
00:02:47,750 --> 00:02:45,920
internalize it and think of it is is

51
00:02:48,869 --> 00:02:47,760
magnificent and

52
00:02:50,470 --> 00:02:48,879
so this

53
00:02:51,910 --> 00:02:50,480
this is the difference between

54
00:02:54,150 --> 00:02:51,920
landing somewhere in an airport and

55
00:03:01,589 --> 00:02:54,160
taking off and getting off the plane and

56
00:03:04,630 --> 00:03:03,190
hi chris my name is

57
00:03:05,830 --> 00:03:04,640
my name is andrew robertson i'm

58
00:03:07,910 --> 00:03:05,840
fortunate to be involved in the

59
00:03:09,750 --> 00:03:07,920
university of waterloo research

60
00:03:11,270 --> 00:03:09,760
that is examining the deconditioning

61
00:03:13,270 --> 00:03:11,280
effects of space flight that are similar

62
00:03:14,869 --> 00:03:13,280
to accelerated aging

63
00:03:16,229 --> 00:03:14,879

my question is can you tell us about

64
00:03:17,430 --> 00:03:16,239
some of the exercise and other

65
00:03:18,869 --> 00:03:17,440
countermeasures

66
00:03:20,149 --> 00:03:18,879
used

67
00:03:21,830 --> 00:03:20,159
throughout your mission which help to

68
00:03:27,990 --> 00:03:21,840
minimize these changes and prepare your

69
00:03:31,750 --> 00:03:30,070
thanks andrew there are of course as you

70
00:03:32,869 --> 00:03:31,760
well know in your studies a lot of

71
00:03:33,750 --> 00:03:32,879
changes

72
00:03:35,750 --> 00:03:33,760
uh

73
00:03:38,949 --> 00:03:35,760
everything some very obvious the the

74
00:03:40,949 --> 00:03:38,959
fluid shift my my extremely uh skinny

75
00:03:43,670 --> 00:03:40,959
calves that i have right now because of

76
00:03:46,229 --> 00:03:43,680
uh there's no gravity pushing the the

77
00:03:48,710 --> 00:03:46,239
fluids into my legs

78
00:03:50,229 --> 00:03:48,720
some of them are very subtle

79
00:03:52,470 --> 00:03:50,239
my eyes

80
00:03:54,550 --> 00:03:52,480
sting a little more up here because they

81
00:03:56,070 --> 00:03:54,560
don't drain ever so you kind of have

82
00:04:00,309 --> 00:03:56,080
more

83
00:04:02,710 --> 00:04:00,319
often you can still cry in space but

84
00:04:05,589 --> 00:04:02,720
they just the tears don't fall

85
00:04:07,270 --> 00:04:05,599
and so they're subtle things as well

86
00:04:08,710 --> 00:04:07,280
but the biggest ones the ones we have to

87
00:04:11,190 --> 00:04:08,720
worry the most about are preparing

88
00:04:12,710 --> 00:04:11,200

ourselves for coming home and preparing

89
00:04:14,949 --> 00:04:12,720
ourselves to be strong enough if we have

90
00:04:16,469 --> 00:04:14,959
to go outside and fix something

91
00:04:18,150 --> 00:04:16,479
and as you mentioned we use

92
00:04:20,310 --> 00:04:18,160
countermeasures

93
00:04:21,830 --> 00:04:20,320
the two big ones we have are

94
00:04:23,990 --> 00:04:21,840
cardiovascular

95
00:04:25,749 --> 00:04:24,000
and we have both a treadmill and an

96
00:04:26,469 --> 00:04:25,759
exercise bicycle

97
00:04:32,710 --> 00:04:26,479
and

98
00:04:33,909 --> 00:04:32,720
is resistive exercise

99
00:04:36,790 --> 00:04:33,919
and of course

100
00:04:38,150 --> 00:04:36,800
you can do 10 000 push-ups up here

101
00:04:40,550 --> 00:04:38,160
because there's no up

102
00:04:42,790 --> 00:04:40,560
but we have a device a resistive

103
00:04:44,070 --> 00:04:42,800
exercise device where you're pushing

104
00:04:46,310 --> 00:04:44,080
actually against

105
00:04:48,310 --> 00:04:46,320
big cylinders that if the air pulled out

106
00:04:50,390 --> 00:04:48,320
of them like a vacuum so you get a nice

107
00:04:52,950 --> 00:04:50,400
linear push against them and it's a lot

108
00:04:55,270 --> 00:04:52,960
like lifting weights and every single

109
00:04:56,950 --> 00:04:55,280
day we spend two hours on those pieces

110
00:04:59,189 --> 00:04:56,960
of equipment the rest of it we just

111
00:05:00,070 --> 00:04:59,199
float around and you can be as lazy i

112
00:05:01,749 --> 00:05:00,080
mean i

113
00:05:04,469 --> 00:05:01,759

i don't even have to hold up my head up

114
00:05:07,670 --> 00:05:04,479
here but uh for two hours a day we work

115
00:05:11,990 --> 00:05:09,590
then get myself back down and oh i'm

116
00:05:14,070 --> 00:05:12,000
falling all over

117
00:05:17,670 --> 00:05:14,080
i'm right up close for two hours a day

118
00:05:20,150 --> 00:05:17,680
we work hard to keep our bodies in uh

119
00:05:21,670 --> 00:05:20,160
in shape to keep our muscles strong so

120
00:05:23,909 --> 00:05:21,680
that if we have to go outside on a walk

121
00:05:25,430 --> 00:05:23,919
we can operate the space suit and when

122
00:05:26,870 --> 00:05:25,440
we land back on earth again we'll be

123
00:05:30,710 --> 00:05:26,880
able to walk and our bones will be

124
00:05:35,430 --> 00:05:33,189
hi chris my name is amber nicholson my

125
00:05:37,430 --> 00:05:35,440
question is with your unique vantage

126
00:05:39,270 --> 00:05:37,440
point in space are you able to see any

127
00:05:43,909 --> 00:05:39,280
evidence of environmental degradation on

128
00:05:49,189 --> 00:05:46,150
hi amber we sure are

129
00:05:50,710 --> 00:05:49,199
some very visual examples like

130
00:05:53,270 --> 00:05:50,720
the arrow sea

131
00:05:55,590 --> 00:05:53,280
which because of irrigation changes uh

132
00:05:57,189 --> 00:05:55,600
an entire inland sea is basically dried

133
00:05:58,950 --> 00:05:57,199
up to nothing and from the first

134
00:06:01,430 --> 00:05:58,960
astronauts who flew and took pictures of

135
00:06:03,830 --> 00:06:01,440
it to us taking pictures of it now

136
00:06:05,510 --> 00:06:03,840
the the dis difference is striking all

137
00:06:06,550 --> 00:06:05,520
the major cities of the world the really

138
00:06:09,029 --> 00:06:06,560

big ones

139
00:06:11,830 --> 00:06:09,039
normally are gray smears

140
00:06:13,430 --> 00:06:11,840
the big city mexico city la

141
00:06:15,029 --> 00:06:13,440
the cities in china

142
00:06:16,790 --> 00:06:15,039
just because of the smog and pollution

143
00:06:18,150 --> 00:06:16,800
they create and you hardly could even

144
00:06:19,510 --> 00:06:18,160
see them and

145
00:06:21,830 --> 00:06:19,520
they they have trouble looking up at the

146
00:06:23,990 --> 00:06:21,840
sky as a result so you see that and we

147
00:06:26,390 --> 00:06:24,000
also see the glaciers and we've been

148
00:06:28,309 --> 00:06:26,400
taking a lot of pictures in patagonia of

149
00:06:30,870 --> 00:06:28,319
uh of the glaciers as they exist right

150
00:06:33,270 --> 00:06:30,880
now and uh and compare them to historic

151
00:06:35,029 --> 00:06:33,280
photographs so it's

152
00:06:36,710 --> 00:06:35,039
and when there's a volcanic eruption and

153
00:06:38,710 --> 00:06:36,720
we look at the horizon you can see the

154
00:06:40,550 --> 00:06:38,720
particulate in the upper atmosphere so

155
00:06:42,629 --> 00:06:40,560
it's a wonderful vantage point for

156
00:06:44,870 --> 00:06:42,639
long-term monitoring of the earth's

157
00:06:50,550 --> 00:06:44,880
atmosphere and the health of the planet

158
00:06:55,110 --> 00:06:52,870
hi chris my name is sakshi jin my

159
00:06:56,629 --> 00:06:55,120
question is in march you'll take on the

160
00:06:58,790 --> 00:06:56,639
responsibility is commanding the

161
00:07:00,710 --> 00:06:58,800
international space station how are you

162
00:07:02,230 --> 00:07:00,720
preparing for this role and how will you

163
00:07:07,749 --> 00:07:02,240

handle the stress that comes with the

164
00:07:12,469 --> 00:07:10,629
uh sakshi stress is is kind of a

165
00:07:14,390 --> 00:07:12,479
human emotion

166
00:07:15,670 --> 00:07:14,400
it doesn't really come with a position

167
00:07:17,670 --> 00:07:15,680
it's internal

168
00:07:18,710 --> 00:07:17,680
and in the way i try i try and avoid

169
00:07:20,309 --> 00:07:18,720
stress

170
00:07:21,830 --> 00:07:20,319
and the way i avoid it is to try and

171
00:07:23,430 --> 00:07:21,840
never be in a position where i don't

172
00:07:25,749 --> 00:07:23,440
know what i'm doing or where i'm asked

173
00:07:27,589 --> 00:07:25,759
to do something i'm not qualified for

174
00:07:29,909 --> 00:07:27,599
so in truth i started training to

175
00:07:31,670 --> 00:07:29,919
command the space station when i was 14

176
00:07:33,670 --> 00:07:31,680
i was in the air cadets and i went to a

177
00:07:35,909 --> 00:07:33,680
junior leaders course and they taught me

178
00:07:38,390 --> 00:07:35,919
the basic precepts of leadership at 14

179
00:07:40,629 --> 00:07:38,400
years old as a as a young canadian

180
00:07:41,909 --> 00:07:40,639
and since that i've watched leaders and

181
00:07:43,430 --> 00:07:41,919
you can learn something from every

182
00:07:45,909 --> 00:07:43,440
leader from you can learn a lot from the

183
00:07:48,150 --> 00:07:45,919
bad ones and a lot from the good ones

184
00:07:50,469 --> 00:07:48,160
and i've also through the military and

185
00:07:53,430 --> 00:07:50,479
then in my 20 years as an astronaut been

186
00:07:54,950 --> 00:07:53,440
given increasing opportunities to manage

187
00:07:55,749 --> 00:07:54,960
and to lead people

188
00:08:03,589 --> 00:07:55,759

and

189
00:08:04,790 --> 00:08:03,599
preparing for that for about four or

190
00:08:06,710 --> 00:08:04,800
five years

191
00:08:08,790 --> 00:08:06,720
working with the people on the ground

192
00:08:10,150 --> 00:08:08,800
and on the crew preparing myself

193
00:08:12,950 --> 00:08:10,160
thinking through everything that might

194
00:08:15,029 --> 00:08:12,960
happen so that when the time comes not

195
00:08:16,950 --> 00:08:15,039
only am i not stressed about it but i'm

196
00:08:18,710 --> 00:08:16,960
eagerly looking forward to it this is

197
00:08:20,150 --> 00:08:18,720
something i've really worked hard to be

198
00:08:22,390 --> 00:08:20,160
prepared for

199
00:08:24,629 --> 00:08:22,400
an unprecedented opportunity personally

200
00:08:27,189 --> 00:08:24,639
and professionally and and nationally

201
00:08:29,589 --> 00:08:27,199
and i'm just uh really pleased that i'm

202
00:08:31,189 --> 00:08:29,599
in a position and really happy to to

203
00:08:36,870 --> 00:08:31,199
have the chance to pick up the reins

204
00:08:40,389 --> 00:08:38,870
hi chris my name is robert henderson and

205
00:08:42,230 --> 00:08:40,399
my question is what is the most

206
00:08:44,070 --> 00:08:42,240
difficult experiment being conducted on

207
00:08:51,350 --> 00:08:44,080
the iss during your mission and what

208
00:08:56,470 --> 00:08:52,630
we have we're running i think you know

209
00:08:58,389 --> 00:08:56,480
robert about 130 experiments on board um

210
00:08:59,990 --> 00:08:58,399
difficulty is probably the ones that you

211
00:09:01,430 --> 00:09:00,000
know that affect us personally some of

212
00:09:03,269 --> 00:09:01,440
the complex ones are running on their

213
00:09:05,190 --> 00:09:03,279

own um

214
00:09:07,350 --> 00:09:05,200
i set up and ran robonaut today and the

215
00:09:09,590 --> 00:09:07,360
alpha magnetic spectrometer is running

216
00:09:10,949 --> 00:09:09,600
but one from the university of waterloo

217
00:09:12,230 --> 00:09:10,959
there's a canadian experiment running

218
00:09:13,750 --> 00:09:12,240
down here in the corner that i'm taking

219
00:09:15,509 --> 00:09:13,760
care of one from the university of

220
00:09:17,509 --> 00:09:15,519
waterloo has some complexity to it i

221
00:09:20,790 --> 00:09:17,519
think dr houston was talking to you

222
00:09:23,670 --> 00:09:20,800
about it but we take these leg cuffs and

223
00:09:26,790 --> 00:09:23,680
i'm going to float the microphone

224
00:09:28,150 --> 00:09:26,800
we take these leg cuffs and uh have to

225
00:09:30,790 --> 00:09:28,160
put them on our

226
00:09:33,030 --> 00:09:30,800
on our upper cat upper thighs here and

227
00:09:36,230 --> 00:09:33,040
get it all just right and attached and

228
00:09:37,509 --> 00:09:36,240
then pump them up and then uh when

229
00:09:39,509 --> 00:09:37,519
everything's just right we have all the

230
00:09:41,910 --> 00:09:39,519
medical data attached to our body then

231
00:09:44,310 --> 00:09:41,920
release them and it's it's almost the

232
00:09:45,990 --> 00:09:44,320
same as coming from weightlessness and

233
00:09:48,230 --> 00:09:46,000
suddenly putting gravity back so that

234
00:09:50,470 --> 00:09:48,240
the blood that was trapped now suddenly

235
00:09:52,310 --> 00:09:50,480
can flush down into the legs and it

236
00:09:54,550 --> 00:09:52,320
takes a lot of setup of course to get

237
00:09:56,389 --> 00:09:54,560
all of the biomedical sensing equipment

238
00:09:58,870 --> 00:09:56,399

attached to our body and then get all

239
00:10:00,389 --> 00:09:58,880
the the all the parameters i mean dr

240
00:10:02,790 --> 00:10:00,399
houston and his team have been working

241
00:10:04,389 --> 00:10:02,800
on it for years to get to the moment

242
00:10:05,670 --> 00:10:04,399
where i can get all this equipment set

243
00:10:08,069 --> 00:10:05,680
up running properly in the right

244
00:10:10,230 --> 00:10:08,079
position and then have my body go

245
00:10:12,389 --> 00:10:10,240
through this sudden change so that then

246
00:10:14,069 --> 00:10:12,399
we can study how the body regulates

247
00:10:16,389 --> 00:10:14,079
blood pressure how it regulates the

248
00:10:18,310 --> 00:10:16,399
blood flow and use that of course for

249
00:10:20,150 --> 00:10:18,320
astronaut health but also for the health

250
00:10:22,470 --> 00:10:20,160
of everybody at earth who has blood

251
00:10:24,069 --> 00:10:22,480
pressure regulation problems so one like

252
00:10:26,310 --> 00:10:24,079
this with a lot of equipment they have a

253
00:10:31,590 --> 00:10:26,320
lot of complexity but also they have a

254
00:10:36,630 --> 00:10:34,150
uh hi chris

255
00:10:41,030 --> 00:10:36,640
hi chris

256
00:10:46,470 --> 00:10:41,040
question is how does internet work on

257
00:10:51,430 --> 00:10:49,350
uh it works really slowly alex

258
00:10:53,990 --> 00:10:51,440
if at all um

259
00:10:55,350 --> 00:10:54,000
we don't really have internet uh or just

260
00:10:57,910 --> 00:10:55,360
barely have internet on the space

261
00:11:00,310 --> 00:10:57,920
station but we have multiple links to

262
00:11:01,750 --> 00:11:00,320
the ground some direct just like a vhf

263
00:11:06,310 --> 00:11:01,760

radio

264
00:11:08,790 --> 00:11:06,320
data rate uh communications through

265
00:11:11,190 --> 00:11:08,800
different bands of the spectrum not just

266
00:11:13,829 --> 00:11:11,200
vhf very high frequency or uhf but we

267
00:11:16,470 --> 00:11:13,839
also have s band and ku band

268
00:11:18,470 --> 00:11:16,480
complex answer but when we have ku bands

269
00:11:20,710 --> 00:11:18,480
it's a high enough data rate that we can

270
00:11:22,790 --> 00:11:20,720
bounce our signal off a geostationary

271
00:11:25,110 --> 00:11:22,800
satellite down to earth through all the

272
00:11:26,949 --> 00:11:25,120
ground relay sites down to mission

273
00:11:29,269 --> 00:11:26,959
control in houston and then they take

274
00:11:30,550 --> 00:11:29,279
that signal and they hook it up to a

275
00:11:32,630 --> 00:11:30,560
computer that's sitting there like a

276
00:11:34,630 --> 00:11:32,640
mirror computer site down in mission

277
00:11:36,470 --> 00:11:34,640
control so that when i tap on my

278
00:11:39,590 --> 00:11:36,480
keyboard up here it goes through that

279
00:11:41,670 --> 00:11:39,600
long long trail all the way down to that

280
00:11:43,910 --> 00:11:41,680
ghost computer on the ground and that

281
00:11:46,150 --> 00:11:43,920
way i can access the internet and that's

282
00:11:48,470 --> 00:11:46,160
how i can send messages on twitter and

283
00:11:51,190 --> 00:11:48,480
and do very slow functions it's slow

284
00:11:54,150 --> 00:11:51,200
slower than dial up so i can't watch

285
00:11:56,790 --> 00:11:54,160
videos or anything but it's good enough

286
00:11:58,629 --> 00:11:56,800
for just verbal and twitter kind of data

287
00:12:00,629 --> 00:11:58,639
communication and it's been a wonderful

288
00:12:02,069 --> 00:12:00,639

boon for for me to be able to help

289
00:12:06,870 --> 00:12:02,079
communicate this experience to the

290
00:12:11,350 --> 00:12:09,430
hi chris my name is michael goldring my

291
00:12:13,110 --> 00:12:11,360
question is did the transition from test

292
00:12:19,190 --> 00:12:13,120
piloting fighter jets make space flight

293
00:12:21,910 --> 00:12:20,550
yeah astronauts come from a lot of

294
00:12:24,389 --> 00:12:21,920
different backgrounds

295
00:12:27,269 --> 00:12:24,399
i was a engineer i of course i was an

296
00:12:29,030 --> 00:12:27,279
engineer at the university of waterloo

297
00:12:31,430 --> 00:12:29,040
i was a fighter pilot and then i went to

298
00:12:34,150 --> 00:12:31,440
test pilot school and i worked as a test

299
00:12:35,350 --> 00:12:34,160
pilot for several years

300
00:12:37,350 --> 00:12:35,360
and

301
00:12:38,710 --> 00:12:37,360
an aerospace vehicle just like the

302
00:12:40,470 --> 00:12:38,720
aerospace program that's at the

303
00:12:42,150 --> 00:12:40,480
university of waterloo

304
00:12:43,509 --> 00:12:42,160
trying to understand you know if you

305
00:12:45,750 --> 00:12:43,519
make the engine twice as big or the

306
00:12:47,670 --> 00:12:45,760
wings twice as long or or whatever what

307
00:12:49,910 --> 00:12:47,680
happens how's the vehicle work how do

308
00:12:51,990 --> 00:12:49,920
you build a control system

309
00:12:53,590 --> 00:12:52,000
uh with all the appropriate filtering so

310
00:12:55,910 --> 00:12:53,600
the vehicle will have the right handling

311
00:12:58,069 --> 00:12:55,920
qualities all of that has been directly

312
00:13:00,629 --> 00:12:58,079
applicable to flying the shuttle and to

313
00:13:02,150 --> 00:13:00,639

flying the soyuz and then the complexity

314
00:13:04,829 --> 00:13:02,160
of a big

315
00:13:07,750 --> 00:13:04,839
spaceship like this one it's really just

316
00:13:10,389 --> 00:13:07,760
a super expanded version of some of the

317
00:13:12,710 --> 00:13:10,399
airplanes i flew as a test pilot so i

318
00:13:13,670 --> 00:13:12,720
think for anyone who wants to fly in

319
00:13:15,910 --> 00:13:13,680
space

320
00:13:17,590 --> 00:13:15,920
flying is a big part of that

321
00:13:20,150 --> 00:13:17,600
there's all the technical side of it but

322
00:13:22,150 --> 00:13:20,160
i think it was a very good grounding if

323
00:13:26,310 --> 00:13:22,160
you can use that word for

324
00:13:30,710 --> 00:13:28,790
hi chris my name is priyanka patel my

325
00:13:33,030 --> 00:13:30,720
question is what feature on earth's

326
00:13:40,470 --> 00:13:33,040
surface that's natural or man-made are

327
00:13:51,350 --> 00:13:41,430
the

328
00:13:53,430 --> 00:13:51,360
highest clouds that are that exist that

329
00:13:56,069 --> 00:13:53,440
you can see visually can barely ever see

330
00:13:57,670 --> 00:13:56,079
them from the ground but um if you get

331
00:13:59,750 --> 00:13:57,680
just the right angle between the sun and

332
00:14:01,269 --> 00:13:59,760
the earth and they happen to be there uh

333
00:14:02,470 --> 00:14:01,279
you can see them and i thought you were

334
00:14:05,110 --> 00:14:02,480
i was gonna have to be some sort of

335
00:14:06,790 --> 00:14:05,120
scientist or or super photographer to be

336
00:14:08,389 --> 00:14:06,800
ever able to take a good picture of a

337
00:14:09,509 --> 00:14:08,399
noctilucent cloud

338
00:14:11,509 --> 00:14:09,519

some people think they're a good

339
00:14:13,189 --> 00:14:11,519
indication of climate change as we can

340
00:14:16,150 --> 00:14:13,199
track the changes of these noctilucent

341
00:14:18,310 --> 00:14:16,160
clouds but about a month ago one night

342
00:14:20,310 --> 00:14:18,320
just coming up in australia they were as

343
00:14:22,069 --> 00:14:20,320
clear as a bell and i grabbed a camera

344
00:14:24,949 --> 00:14:22,079
and used what training i had and got

345
00:14:27,590 --> 00:14:24,959
some i was shocked they were just so

346
00:14:29,189 --> 00:14:27,600
crystal clear these these ethereal

347
00:14:31,350 --> 00:14:29,199
clouds that normally are completely

348
00:14:32,949 --> 00:14:31,360
invisible but that are a vital part of

349
00:14:34,550 --> 00:14:32,959
our earth's upper atmosphere and i

350
00:14:36,550 --> 00:14:34,560
managed to to be able to see them with

351
00:14:38,389 --> 00:14:36,560
my own eyes and get clear pictures of

352
00:14:40,470 --> 00:14:38,399
them and those pictures may well be one

353
00:14:42,550 --> 00:14:40,480
of the most enduring legacies of our

354
00:14:44,710 --> 00:14:42,560
time up here is the science that comes

355
00:14:50,230 --> 00:14:44,720
along with that surprising thing i saw

356
00:14:55,110 --> 00:14:52,949
hi chris my name is nancy zoomteens my

357
00:14:57,269 --> 00:14:55,120
question is do you have any advice

358
00:14:59,030 --> 00:14:57,279
besides advanced education for those

359
00:15:04,629 --> 00:14:59,040
aspiring to become canada's future

360
00:15:09,430 --> 00:15:07,509
hi nancy uh yes uh in fact you should

361
00:15:11,829 --> 00:15:09,440
ask jeremy after because jeremy asked me

362
00:15:14,550 --> 00:15:11,839
that same question about 14 years ago or

363
00:15:17,269 --> 00:15:14,560

13 years ago

364
00:15:19,509 --> 00:15:17,279
number one is you need a healthy body

365
00:15:21,990 --> 00:15:19,519
because we we don't want to take a big

366
00:15:23,430 --> 00:15:22,000
risk on health up here so not only

367
00:15:25,030 --> 00:15:23,440
hopefully you're born with a body that's

368
00:15:26,870 --> 00:15:25,040
healthy enough but also you need to take

369
00:15:28,790 --> 00:15:26,880
care of it so you don't have to go crazy

370
00:15:30,949 --> 00:15:28,800
but exercise enough to stay in shape and

371
00:15:32,949 --> 00:15:30,959
don't eat bad things and and keep your

372
00:15:35,189 --> 00:15:32,959
body in shape number two is an advanced

373
00:15:36,870 --> 00:15:35,199
education and not so much for the

374
00:15:38,790 --> 00:15:36,880
education i mean

375
00:15:41,110 --> 00:15:38,800
a technical education is important but

376
00:15:43,030 --> 00:15:41,120
to proven ability to learn complex

377
00:15:44,870 --> 00:15:43,040
things and of course you're doing that

378
00:15:45,829 --> 00:15:44,880
at the university of waterloo tremendous

379
00:15:48,230 --> 00:15:45,839
school

380
00:15:51,030 --> 00:15:48,240
then the third thing is an ability to

381
00:15:52,710 --> 00:15:51,040
make good decisions when consequences

382
00:15:55,430 --> 00:15:52,720
matter

383
00:15:58,150 --> 00:15:55,440
and uh where you the the result of your

384
00:16:00,389 --> 00:15:58,160
decisions either is life or death or big

385
00:16:02,710 --> 00:16:00,399
financial consequences or something like

386
00:16:04,230 --> 00:16:02,720
that and when when canada and all the

387
00:16:05,910 --> 00:16:04,240
other countries are choosing astronauts

388
00:16:08,470 --> 00:16:05,920

that's what they're looking for very

389
00:16:10,870 --> 00:16:08,480
healthy people have proven they can

390
00:16:12,629 --> 00:16:10,880
learn complex things at a high level but

391
00:16:14,710 --> 00:16:12,639
who can also make good decisions when

392
00:16:16,790 --> 00:16:14,720
they have to and

393
00:16:18,230 --> 00:16:16,800
and and then that just gets it down to

394
00:16:19,990 --> 00:16:18,240
500 people or so and then they're

395
00:16:21,189 --> 00:16:20,000
looking for all the other things what

396
00:16:24,230 --> 00:16:21,199
else have you done interesting in your

397
00:16:25,990 --> 00:16:24,240
life other languages that you speak um

398
00:16:28,230 --> 00:16:26,000
what what else do you bring to the table

399
00:16:29,189 --> 00:16:28,240
can you can you play guitar can you uh

400
00:16:31,430 --> 00:16:29,199
are you going to be an interesting

401
00:16:33,430 --> 00:16:31,440
person to go to mars with or not

402
00:16:35,030 --> 00:16:33,440
so uh but but you guys are on the right

403
00:16:37,670 --> 00:16:35,040
track at the university of waterloo

404
00:16:38,629 --> 00:16:37,680
that's a premier school in canada and

405
00:16:40,470 --> 00:16:38,639
the things that you're doing and

406
00:16:43,030 --> 00:16:40,480
learning there are sitting on the right

407
00:16:48,470 --> 00:16:43,040
track not only to fly in space but

408
00:16:53,430 --> 00:16:51,350
hi chris my name is james allen and my

409
00:16:54,629 --> 00:16:53,440
question is in your opinion what is the

410
00:16:56,389 --> 00:16:54,639
greatest contribution that the

411
00:16:58,710 --> 00:16:56,399
international space station provides to

412
00:17:03,590 --> 00:16:58,720
the world and is asteroid watch a part

413
00:17:06,789 --> 00:17:04,870

we'll be we'll be watching for the

414
00:17:08,309 --> 00:17:06,799
asteroid a little later today

415
00:17:11,270 --> 00:17:08,319
we weren't in a position to see that

416
00:17:12,470 --> 00:17:11,280
meteorite do all that damage in russia

417
00:17:13,750 --> 00:17:12,480
um

418
00:17:15,429 --> 00:17:13,760
it's going to be very hard to see the

419
00:17:17,270 --> 00:17:15,439
asteroid they did the math and it's

420
00:17:18,789 --> 00:17:17,280
going to be less than a pixel for us to

421
00:17:20,309 --> 00:17:18,799
take a picture so we may with a time

422
00:17:21,510 --> 00:17:20,319
lapse see it go by

423
00:17:24,630 --> 00:17:21,520
but

424
00:17:26,309 --> 00:17:24,640
uh for the space station itself

425
00:17:27,909 --> 00:17:26,319
uh of course with all the experiments

426
00:17:29,909 --> 00:17:27,919
going on it's very hard to predict what

427
00:17:32,150 --> 00:17:29,919
an experiment will have a breakthrough

428
00:17:33,830 --> 00:17:32,160
but i'm hoping that over its 20 or 30

429
00:17:36,070 --> 00:17:33,840
year life of the station from way back

430
00:17:37,270 --> 00:17:36,080
in 78 or i'm sorry in 98 when it was

431
00:17:38,630 --> 00:17:37,280
first launched

432
00:17:40,310 --> 00:17:38,640
um

433
00:17:41,750 --> 00:17:40,320
i'm hoping that there is some science

434
00:17:43,190 --> 00:17:41,760
that happens on here that is truly

435
00:17:45,270 --> 00:17:43,200
breakthrough we sure are setting

436
00:17:47,110 --> 00:17:45,280
ourselves up for it uh mounted to the

437
00:17:49,590 --> 00:17:47,120
top is the alpha magnetic spectrometer

438
00:17:51,350 --> 00:17:49,600

which is collecting uh matter in any

439
00:17:53,029 --> 00:17:51,360
matter and high energy particles from

440
00:17:54,630 --> 00:17:53,039
the universe trying to understand the

441
00:17:57,190 --> 00:17:54,640
fundament of what the universe is made

442
00:17:59,350 --> 00:17:57,200
of i'm studying the human physiology

443
00:18:00,870 --> 00:17:59,360
that you can't study on earth when you

444
00:18:03,190 --> 00:18:00,880
take away gravity

445
00:18:05,590 --> 00:18:03,200
but one of the main legacies may be

446
00:18:07,510 --> 00:18:05,600
that when when one of you goes to mars

447
00:18:09,909 --> 00:18:07,520
you will be on a spaceship

448
00:18:12,150 --> 00:18:09,919
that has functioning pumps is made of

449
00:18:13,750 --> 00:18:12,160
the right material has a closed

450
00:18:15,830 --> 00:18:13,760
environmental system

451
00:18:17,990 --> 00:18:15,840
recycling water and air

452
00:18:19,909 --> 00:18:18,000
has all the systems that work the hull

453
00:18:21,510 --> 00:18:19,919
is made of the right metal all of those

454
00:18:23,190 --> 00:18:21,520
things because of what we learned here

455
00:18:24,070 --> 00:18:23,200
on the space station when the first

456
00:18:25,990 --> 00:18:24,080
people

457
00:18:28,310 --> 00:18:26,000
sailed out of sight of land

458
00:18:30,710 --> 00:18:28,320
it wasn't their first trip they had

459
00:18:32,549 --> 00:18:30,720
sailed and learned how to build space

460
00:18:34,390 --> 00:18:32,559
sailing ships how to what oak come you

461
00:18:35,909 --> 00:18:34,400
needed how the sail should be built how

462
00:18:38,150 --> 00:18:35,919
do you keep people healthy in a long

463
00:18:40,470 --> 00:18:38,160

sailing voyage before they ever started

464
00:18:42,710 --> 00:18:40,480
leaving sight of land and they owed

465
00:18:44,390 --> 00:18:42,720
their legacy to the early sailing ships

466
00:18:45,909 --> 00:18:44,400
and for those of you that leave earth to

467
00:18:47,990 --> 00:18:45,919
go somewhere else you're going to owe

468
00:18:49,669 --> 00:18:48,000
your legacy to both the science and the

469
00:18:55,110 --> 00:18:49,679
engineering that is the international

470
00:18:59,430 --> 00:18:57,590
hello chris ian mckenzie i'd like to

471
00:19:02,150 --> 00:18:59,440
thank you on behalf of the university of

472
00:19:04,310 --> 00:19:02,160
waterloo and particularly the students

473
00:19:06,310 --> 00:19:04,320
who participated in this event today and

474
00:19:21,669 --> 00:19:06,320
we look forward to seeing you at the

475
00:19:25,750 --> 00:19:23,669
dr mckenzie thank you very much thanks

476
00:19:27,029 --> 00:19:25,760
everybody for the great questions i'm

477
00:19:29,190 --> 00:19:27,039
sorry if i didn't get to everyone's

478
00:19:31,190 --> 00:19:29,200
questions but jeremy's there and he will

479
00:19:34,630 --> 00:19:31,200
be able to answer waterloo is a great

480
00:19:36,710 --> 00:19:34,640
school um my wife worked in in waterloo

481
00:19:39,590 --> 00:19:36,720
i studied at the university my son was

482
00:19:41,510 --> 00:19:39,600
born there it's a great part of canada

483
00:19:43,909 --> 00:19:41,520
and i very much look forward to coming

484
00:19:45,669 --> 00:19:43,919
and visiting and really trying to take

485
00:19:48,470 --> 00:19:45,679
the time to tell you about this

486
00:19:50,230 --> 00:19:48,480
experience when i get back to earth

487
00:19:52,470 --> 00:19:50,240
landing in may and back to canada this

488
00:19:54,950 --> 00:19:52,480

summer so thank you very much thank you

489
00:19:56,549 --> 00:19:54,960
jeremy and everybody for supporting and

490
00:20:03,990 --> 00:19:56,559
we'll talk to you all later bye from the