
esa

1
00:00:11,110 --> 00:00:06,950
station houston onto

2
00:00:15,350 --> 00:00:13,270
we are ready for the event

3
00:00:25,990 --> 00:00:15,360
lisa this is mission control houston

4
00:00:28,710 --> 00:00:27,910
andre and

5
00:00:31,910 --> 00:00:28,720
don

6
00:00:33,910 --> 00:00:31,920
this is isa international space station

7
00:00:37,510 --> 00:00:33,920
we are ready for the event how do you

8
00:00:42,709 --> 00:00:40,150
hi frank good to uh to hear your voice

9
00:00:54,630 --> 00:00:42,719
and hello at eic everybody we can hear

10
00:00:59,670 --> 00:00:57,350
and we have a great picture here andre

11
00:01:01,830 --> 00:00:59,680
and don thank you very much for joining

12
00:01:04,390 --> 00:01:01,840
us today it's wonderful to see you all

13
00:01:07,750 --> 00:01:04,400

floating and smiling there in uh in the

14
00:01:10,149 --> 00:01:07,760
space station uh the first question may

15
00:01:11,910 --> 00:01:10,159
be from from my side to all these people

16
00:01:14,550 --> 00:01:11,920
here and then eic that were here and

17
00:01:16,149 --> 00:01:14,560
they visited our columbus module and and

18
00:01:18,070 --> 00:01:16,159
all kinds of things and a lot of

19
00:01:20,310 --> 00:01:18,080
questions in microgravity can you

20
00:01:24,870 --> 00:01:20,320
demonstrate a little bit to us what it

21
00:01:29,749 --> 00:01:27,590
well actually we can and uh don

22
00:01:31,350 --> 00:01:29,759
prepared a great experiment

23
00:01:33,109 --> 00:01:31,360
which we will now demonstrate i mean

24
00:01:43,510 --> 00:01:33,119
this is all for science so we really do

25
00:01:48,310 --> 00:01:46,389
so normally we let some things float etc

26
00:01:49,830 --> 00:01:48,320
but now we're going to really

27
00:02:33,750 --> 00:01:49,840
demonstrate

28
00:02:38,710 --> 00:02:36,630
okay we all know that pendulums are a

29
00:02:40,550 --> 00:02:38,720
gravity machine and they need gravity to

30
00:02:43,830 --> 00:02:40,560
work and i have an example here of a

31
00:02:47,110 --> 00:02:43,840
pendulum where we put a long spring on

32
00:02:49,430 --> 00:02:47,120
the end of the pendulum and the spring

33
00:02:52,869 --> 00:02:49,440
can replace the effect of gravity go

34
00:02:56,710 --> 00:02:54,150
so now

35
00:02:57,910 --> 00:02:56,720
this spring is giving a force

36
00:03:00,470 --> 00:02:57,920
that is

37
00:03:01,750 --> 00:03:00,480
like gravity for small angle

38
00:03:03,589 --> 00:03:01,760

displacement and small angle

39
00:03:05,190 --> 00:03:03,599
displacement is where the sine of theta

40
00:03:08,309 --> 00:03:05,200
equals theta and of course that's when

41
00:03:10,149 --> 00:03:08,319
theta's measured in radians and so here

42
00:03:12,470 --> 00:03:10,159
here we have an example where a pendulum

43
00:03:14,790 --> 00:03:12,480
which simply will not work in gravity

44
00:03:17,270 --> 00:03:14,800
you affix a spring to the end of it and

45
00:03:19,270 --> 00:03:17,280
now all of a sudden it will work and it

46
00:03:22,710 --> 00:03:19,280
works according to the pendulum equation

47
00:03:25,509 --> 00:03:22,720
where the period is mass independent and

48
00:03:28,470 --> 00:03:25,519
it depends on the length of the pendulum

49
00:03:30,630 --> 00:03:28,480
so that's one demonstration here in a

50
00:03:33,910 --> 00:03:30,640
weightless environment but now let me

51
00:03:35,670 --> 00:03:33,920
change the spring just a little bit and

52
00:03:59,190 --> 00:03:35,680
we'll change the behavior of the

53
00:04:02,789 --> 00:04:00,869
now the spring instead of pulling the

54
00:04:05,270 --> 00:04:02,799
pendulum

55
00:04:08,309 --> 00:04:05,280
along its length it's perpend it's

56
00:04:11,350 --> 00:04:08,319
perpendicular to the length

57
00:04:15,030 --> 00:04:12,949
okay

58
00:04:17,110 --> 00:04:15,040
it's perpendicular to the length and

59
00:04:19,430 --> 00:04:17,120
that changes the dynamics it's no longer

60
00:04:23,670 --> 00:04:19,440
a pendulum with a pendulum equation it's

61
00:04:25,830 --> 00:04:23,680
now a simple harmonic oscillator and the

62
00:04:29,830 --> 00:04:25,840
the frequency or the period of vibration

63
00:04:36,310 --> 00:04:29,840

is now mass dependent so so this was a

64
00:04:41,110 --> 00:04:39,590
a simple demonstration that shows

65
00:04:43,189 --> 00:04:41,120
an apparatus that we're all familiar

66
00:04:45,749 --> 00:04:43,199
with on earth a pendulum but it won't

67
00:04:47,990 --> 00:04:45,759
work in a weightless environment you add

68
00:04:51,110 --> 00:04:48,000
a spring force to it and it becomes a

69
00:04:52,629 --> 00:04:51,120
pendulum again but then you change the

70
00:04:54,950 --> 00:04:52,639
spring angle

71
00:04:57,189 --> 00:04:54,960
90 degrees and all of a sudden it

72
00:04:59,030 --> 00:04:57,199
changes its behavior so it's a mass

73
00:05:04,150 --> 00:04:59,040
dependent period it becomes a simple

74
00:05:08,469 --> 00:05:06,070
well thank you very much for this very

75
00:05:10,469 --> 00:05:08,479
interesting

76
00:05:12,230 --> 00:05:10,479
demonstration that that you have given

77
00:05:14,230 --> 00:05:12,240
uh for things that only can work in

78
00:05:15,990 --> 00:05:14,240
microgravity and zhan i think you have

79
00:05:17,749 --> 00:05:16,000
the next question for don

80
00:05:19,990 --> 00:05:17,759
sure first can i say that was just so

81
00:05:22,469 --> 00:05:20,000
cool and thank you so much for taking

82
00:05:24,390 --> 00:05:22,479
the time to speak with us um this is uh

83
00:05:27,350 --> 00:05:24,400
zahan barmel from

84
00:05:28,469 --> 00:05:27,360
the youtube team um i have a question in

85
00:05:30,469 --> 00:05:28,479
two parts

86
00:05:32,629 --> 00:05:30,479
part one can you tell us what is the

87
00:05:35,270 --> 00:05:32,639
best thing about working on board the

88
00:05:37,670 --> 00:05:35,280

international space station and part two

89
00:05:39,990 --> 00:05:37,680
can you give us some idea of what

90
00:05:43,909 --> 00:05:40,000
typical research you carry out on board

91
00:05:49,990 --> 00:05:46,870
well the best thing is that uh if you're

92
00:05:52,150 --> 00:05:50,000
normally working in science then you you

93
00:05:53,990 --> 00:05:52,160
you're concentrating on one field the

94
00:05:55,189 --> 00:05:54,000
nice thing of being an astronaut is that

95
00:05:56,870 --> 00:05:55,199
you do

96
00:05:58,309 --> 00:05:56,880
research in all kinds of fields and

97
00:06:01,909 --> 00:05:58,319
that's a

98
00:06:04,710 --> 00:06:01,919
big variation uh which is new the newest

99
00:06:05,830 --> 00:06:04,720
ideas uh so that's a nice feeling that

100
00:06:08,230 --> 00:06:05,840
you're working

101
00:06:09,510 --> 00:06:08,240
for example one day you're doing biology

102
00:06:11,110 --> 00:06:09,520
experiment

103
00:06:12,550 --> 00:06:11,120
the next day

104
00:06:14,390 --> 00:06:12,560
there's a combustion experiment done

105
00:06:16,469 --> 00:06:14,400
with a lot of combustion experiments for

106
00:06:19,590 --> 00:06:16,479
example then you are a subject or an

107
00:06:21,510 --> 00:06:19,600
operator for human physiology experiment

108
00:06:24,390 --> 00:06:21,520
then there is something with earth

109
00:06:26,230 --> 00:06:24,400
observation or even robotics we have

110
00:06:27,510 --> 00:06:26,240
been working with

111
00:06:30,150 --> 00:06:27,520
robonaut

112
00:06:32,469 --> 00:06:30,160
so so it's technology it's life science

113
00:06:34,629 --> 00:06:32,479

it's material science and that is one of

114
00:06:36,230 --> 00:06:34,639
the very nice aspects of being an

115
00:06:39,189 --> 00:06:36,240
astronaut to be in all these different

116
00:06:41,270 --> 00:06:39,199
fields i guess this answers also the

117
00:06:53,430 --> 00:06:41,280
the second part of the question straight

118
00:07:04,469 --> 00:06:56,710
hello

119
00:07:11,830 --> 00:07:06,390
the plants undergo the same stress of

120
00:07:17,430 --> 00:07:14,710
plants and humans have significant

121
00:07:19,510 --> 00:07:17,440
different physiologies and the

122
00:07:22,309 --> 00:07:19,520
environment on space station is designed

123
00:07:24,469 --> 00:07:22,319
for humans and so plants don't

124
00:07:27,189 --> 00:07:24,479
necessarily do very well

125
00:07:29,749 --> 00:07:27,199
in this environment they they are under

126
00:07:32,550 --> 00:07:29,759
stress but different kinds of stresses

127
00:07:34,629 --> 00:07:32,560
than what human beings have and it's

128
00:07:37,029 --> 00:07:34,639
actually quite challenging to raise a

129
00:07:39,029 --> 00:07:37,039
plant in a weightless environment as as

130
00:07:42,150 --> 00:07:39,039
i've been uh

131
00:07:44,629 --> 00:07:42,160
working on in some of my off-duty time

132
00:07:47,430 --> 00:07:44,639
now you can design a complex piece of

133
00:07:50,390 --> 00:07:47,440
equipment which inside of the equipment

134
00:07:53,110 --> 00:07:50,400
provides the environment that is

135
00:07:55,749 --> 00:07:53,120
conducive for plants to grow but if you

136
00:07:57,029 --> 00:07:55,759
just want plants to grow as the

137
00:07:58,790 --> 00:07:57,039
equivalent of a potted plant in the

138
00:08:01,270 --> 00:07:58,800

corner of a room

139
00:08:10,230 --> 00:08:01,280
that's a tough thing to have in a

140
00:08:15,110 --> 00:08:12,790
hello my name is maria willis and my

141
00:08:17,749 --> 00:08:15,120
question is how long could an astronaut

142
00:08:22,710 --> 00:08:17,759
stay on the iss and respect a full

143
00:08:27,029 --> 00:08:25,350
now that's a very interesting question

144
00:08:28,150 --> 00:08:27,039
people have been in space for a long

145
00:08:31,110 --> 00:08:28,160
time

146
00:08:32,790 --> 00:08:31,120
a russian doctor poliakoff has been in

147
00:08:35,350 --> 00:08:32,800
space in one go

148
00:08:37,990 --> 00:08:35,360
more than a year and he was in good

149
00:08:40,469 --> 00:08:38,000
shape when he came back we do a lot of

150
00:08:42,709 --> 00:08:40,479
effort to stay in shape so we do sports

151
00:08:45,269 --> 00:08:42,719
every day to keep our muscles and bones

152
00:08:47,190 --> 00:08:45,279
in a good condition now of course there

153
00:08:49,590 --> 00:08:47,200
is there is some deterioration in

154
00:08:51,030 --> 00:08:49,600
weightlessness you still have some

155
00:08:54,389 --> 00:08:51,040
muscle atrophy

156
00:08:57,030 --> 00:08:54,399
some bone mineral density loss and of

157
00:08:59,110 --> 00:08:57,040
course there's the radiation now so far

158
00:09:01,190 --> 00:08:59,120
all the astronauts

159
00:09:02,790 --> 00:09:01,200
get back into normal shape although it

160
00:09:04,550 --> 00:09:02,800
takes a long time for example for the

161
00:09:06,949 --> 00:09:04,560
bones it can take a very long time

162
00:09:09,269 --> 00:09:06,959
before your your bones are back

163
00:09:11,590 --> 00:09:09,279

the effects of radiation are cumulative

164
00:09:13,750 --> 00:09:11,600
so that is something that you cannot

165
00:09:15,910 --> 00:09:13,760
turn back but this is not different than

166
00:09:19,190 --> 00:09:15,920
for people who work in certain areas on

167
00:09:21,269 --> 00:09:19,200
the ground involving radiation so in

168
00:09:23,350 --> 00:09:21,279
general with the help of all the medical

169
00:09:24,710 --> 00:09:23,360
people on the ground and the sports that

170
00:09:30,070 --> 00:09:24,720
we do

171
00:09:31,829 --> 00:09:30,080
things to get back in shape all the

172
00:09:40,710 --> 00:09:31,839
astronauts get back in normal shape

173
00:09:44,389 --> 00:09:42,790
hello my name is muhammad and my

174
00:09:46,230 --> 00:09:44,399
question is

175
00:09:48,310 --> 00:09:46,240
what do you think about the future of

176
00:09:51,269 --> 00:09:48,320
space exploration i mean

177
00:09:53,110 --> 00:09:51,279
space exploration is very expensive and

178
00:09:54,870 --> 00:09:53,120
uh with the current economic situations

179
00:09:56,710 --> 00:09:54,880
all over the world i would like to know

180
00:10:02,829 --> 00:09:56,720
what's the future of my generation in

181
00:10:07,910 --> 00:10:05,670
uh good question first off space

182
00:10:10,470 --> 00:10:07,920
exploration compared to what we spend

183
00:10:12,790 --> 00:10:10,480
our money on socially in the form of

184
00:10:15,110 --> 00:10:12,800
governments is small

185
00:10:16,710 --> 00:10:15,120
it's a it's a small amount of our social

186
00:10:19,590 --> 00:10:16,720
resources that we're currently devoting

187
00:10:22,949 --> 00:10:19,600
to space now

188
00:10:25,190 --> 00:10:22,959

my generation has forged out the current

189
00:10:27,590 --> 00:10:25,200
space program that you see and of course

190
00:10:30,870 --> 00:10:27,600
there is a generation before me that

191
00:10:33,910 --> 00:10:30,880
forged their version out and what the

192
00:10:37,190 --> 00:10:33,920
future of space exploration will be for

193
00:10:39,829 --> 00:10:37,200
humans and robots is going to depend on

194
00:10:41,990 --> 00:10:39,839
you and what your generation decides

195
00:10:44,790 --> 00:10:42,000
that you want to do

196
00:10:48,949 --> 00:10:44,800
so one of my favorite quotes is the best

197
00:10:51,590 --> 00:10:48,959
is yet to be and uh that we will see

198
00:10:54,150 --> 00:10:51,600
with space exploration and it will

199
00:10:56,790 --> 00:10:54,160
depend on what you and your generation

200
00:11:07,990 --> 00:10:56,800
decides that you want to make out of

201
00:11:13,430 --> 00:11:10,710
hello my name is marina lopez and my

202
00:11:16,069 --> 00:11:13,440
question in microgravity the human

203
00:11:18,389 --> 00:11:16,079
body's sufficient changes but if you

204
00:11:20,870 --> 00:11:18,399
know what could happen to a pregnant

205
00:11:26,630 --> 00:11:20,880
woman and her baby in the pregnancy at

206
00:11:30,710 --> 00:11:29,030
a very interesting question uh which i

207
00:11:32,630 --> 00:11:30,720
cannot give you the answer straight away

208
00:11:34,389 --> 00:11:32,640
because uh we didn't have such a

209
00:11:36,710 --> 00:11:34,399
situation luckily

210
00:11:39,430 --> 00:11:36,720
uh because uh this is a strange

211
00:11:42,389 --> 00:11:39,440
environment and uh we can

212
00:11:45,190 --> 00:11:42,399
not afford to do some kind of an

213
00:11:46,630 --> 00:11:45,200

experiment like this uh uh

214
00:11:49,509 --> 00:11:46,640
at least

215
00:11:51,990 --> 00:11:49,519
with humans so because we know from uh

216
00:11:53,910 --> 00:11:52,000
from lower vertebrate experiments that

217
00:11:56,629 --> 00:11:53,920
have been done that there is an effect

218
00:11:59,590 --> 00:11:56,639
of gravity on the development of embryos

219
00:12:01,110 --> 00:11:59,600
so this this might be something uh uh

220
00:12:03,670 --> 00:12:01,120
dangerous uh

221
00:12:06,230 --> 00:12:03,680
at least in the the present time for uh

222
00:12:08,389 --> 00:12:06,240
for humans to uh to try out so this is

223
00:12:11,269 --> 00:12:08,399
something that maybe in the far future

224
00:12:13,430 --> 00:12:11,279
this might be a an issue that is uh

225
00:12:15,269 --> 00:12:13,440
that is getting important but at the

226
00:12:18,230 --> 00:12:15,279
moment we don't do this with humans

227
00:12:20,550 --> 00:12:18,240
although the experiments with animals uh

228
00:12:21,269 --> 00:12:20,560
are very interesting uh because like

229
00:12:26,629 --> 00:12:21,279
with

230
00:12:30,230 --> 00:12:26,639
also in uh in the animal development

231
00:12:32,870 --> 00:12:30,240
that there is an effect of uh of gravity

232
00:12:35,670 --> 00:12:32,880
uh on the development of the cells now

233
00:12:37,990 --> 00:12:35,680
this is interesting because the baby the

234
00:12:39,910 --> 00:12:38,000
embryo itself

235
00:12:49,269 --> 00:12:39,920
in

236
00:12:58,790 --> 00:12:49,279
apparently even on on those cells

237
00:13:02,310 --> 00:13:01,030
hi my name is luis alvarez and i

238
00:13:04,629 --> 00:13:02,320

wondered

239
00:13:08,150 --> 00:13:04,639
if there has been any discovery made in

240
00:13:14,550 --> 00:13:08,160
the iss in microgravity conditions which

241
00:13:18,550 --> 00:13:16,310
the

242
00:13:21,350 --> 00:13:18,560
benefits of science

243
00:13:24,629 --> 00:13:21,360
and technology

244
00:13:27,110 --> 00:13:24,639
come slowly and incrementally

245
00:13:29,269 --> 00:13:27,120
and these are endeavors that you work on

246
00:13:30,710 --> 00:13:29,279
over long periods of time and over these

247
00:13:32,230 --> 00:13:30,720
long periods of time you will see the

248
00:13:35,670 --> 00:13:32,240
benefit come out

249
00:13:37,990 --> 00:13:35,680
and this applies to both science and

250
00:13:40,150 --> 00:13:38,000
engineering and technology development

251
00:13:42,870 --> 00:13:40,160
on earth as well as what we see here in

252
00:13:44,230 --> 00:13:42,880
space and i think the the best thing to

253
00:13:48,949 --> 00:13:44,240
say about

254
00:13:52,470 --> 00:13:48,959
about the benefit of exploring space

255
00:13:56,310 --> 00:13:52,480
can be from its effect on human beings

256
00:13:59,430 --> 00:13:56,320
to be able to see our planet from a view

257
00:14:00,870 --> 00:13:59,440
outside of a planet looking in or

258
00:14:03,590 --> 00:14:00,880
looking down

259
00:14:06,150 --> 00:14:03,600
and to be able to understand

260
00:14:09,110 --> 00:14:06,160
our place in our solar system and maybe

261
00:14:12,389 --> 00:14:09,120
even the universe and i i think this is

262
00:14:15,590 --> 00:14:12,399
one of the the most outreaching effects

263
00:14:17,750 --> 00:14:15,600

of human beings going into space and i i

264
00:14:20,230 --> 00:14:17,760
like to to sum up the purpose or the

265
00:14:21,110 --> 00:14:20,240
value of exploration from a ts eliot

266
00:14:23,590 --> 00:14:21,120
quote

267
00:14:26,150 --> 00:14:23,600
where uh uh he

268
00:14:28,470 --> 00:14:26,160
uh paraphrases the value of exploration

269
00:14:29,829 --> 00:14:28,480
is to be able to go and when you come

270
00:14:38,790 --> 00:14:29,839
back you know

271
00:14:41,990 --> 00:14:40,310
great and thank you very much for all

272
00:14:43,350 --> 00:14:42,000
these uh interesting questions

273
00:14:44,710 --> 00:14:43,360
you have another question i think for

274
00:14:47,350 --> 00:14:44,720
the crew up there

275
00:14:48,470 --> 00:14:47,360
i have one more question um so one of

276
00:14:51,030 --> 00:14:48,480
our goals

277
00:14:53,990 --> 00:14:51,040
running space lab is to showcase some of

278
00:14:56,949 --> 00:14:54,000
the best space and science related video

279
00:14:59,910 --> 00:14:56,959
content on our channel and so my

280
00:15:05,269 --> 00:14:59,920
question to you is uh what is your

281
00:15:09,030 --> 00:15:07,030
well that's an interesting one because

282
00:15:11,189 --> 00:15:09,040
there are so many uh

283
00:15:13,590 --> 00:15:11,199
in all kind of fields

284
00:15:16,790 --> 00:15:13,600
the funny ones uh the the interesting

285
00:15:18,310 --> 00:15:16,800
ones uh there's a lot of nice video

286
00:15:20,870 --> 00:15:18,320
tubes from

287
00:15:21,750 --> 00:15:20,880
video films uh from dawn with with all

288
00:15:24,150 --> 00:15:21,760

his

289
00:15:26,069 --> 00:15:24,160
science experiments i know very well one

290
00:15:27,670 --> 00:15:26,079
of the first that i liked very much was

291
00:15:30,069 --> 00:15:27,680
actually uh something that had to do

292
00:15:32,870 --> 00:15:30,079
with nature which was battle at kruger

293
00:15:35,670 --> 00:15:32,880
uh and uh that was uh very interesting

294
00:15:38,550 --> 00:15:35,680
which i've watched a lot but nowadays

295
00:15:41,110 --> 00:15:38,560
uh the choice is so big that uh it's

296
00:15:43,509 --> 00:15:41,120
it's a pretty impossible to uh to

297
00:15:53,350 --> 00:15:43,519
mention a special

298
00:15:57,749 --> 00:15:56,150
from uh this uh discussion as well does

299
00:15:59,350 --> 00:15:57,759
anybody in the room has a science

300
00:16:01,990 --> 00:15:59,360
related question because it's really

301
00:16:05,749 --> 00:16:02,000
youtube and science and so anybody has a

302
00:16:09,189 --> 00:16:07,670
nobody dares to ask a question to the

303
00:16:12,069 --> 00:16:09,199
space station come on guys it's your

304
00:16:13,189 --> 00:16:12,079
chance what's an okay science related

305
00:16:16,550 --> 00:16:13,199
question

306
00:16:18,389 --> 00:16:16,560
uh yes uh hello my name is jaime costa

307
00:16:21,350 --> 00:16:18,399
and i'd like to ask

308
00:16:24,389 --> 00:16:21,360
what can you hear from the iss if you

309
00:16:25,509 --> 00:16:24,399
can hear something like some uh

310
00:16:28,310 --> 00:16:25,519
uh

311
00:16:31,350 --> 00:16:28,320
impact maybe on on some sort of

312
00:16:33,269 --> 00:16:31,360
vibrations i don't know

313
00:16:38,470 --> 00:16:33,279

so yes a good question related to all

314
00:16:43,670 --> 00:16:40,790
well well inside station there's a lot

315
00:16:45,749 --> 00:16:43,680
of machinery there are fans and motors

316
00:16:48,069 --> 00:16:45,759
and things like that so you you hear a

317
00:16:49,269 --> 00:16:48,079
lot of machinery kind of noises

318
00:16:51,189 --> 00:16:49,279
but what's

319
00:16:52,389 --> 00:16:51,199
really amazing

320
00:16:55,829 --> 00:16:52,399
is

321
00:16:58,230 --> 00:16:55,839
to go in the columbus module

322
00:17:01,430 --> 00:16:58,240
and and it's best to do this

323
00:17:03,110 --> 00:17:01,440
when it's uh crew sleep time because

324
00:17:04,789 --> 00:17:03,120
everything's quiet the lights are turned

325
00:17:07,590 --> 00:17:04,799
out and you just

326
00:17:09,590 --> 00:17:07,600
sort of float in the columbus module and

327
00:17:11,909 --> 00:17:09,600
you can hear all this groaning and

328
00:17:15,270 --> 00:17:11,919
creaking and popping it sounds like an

329
00:17:17,750 --> 00:17:15,280
old wooden sailing ship maybe maybe what

330
00:17:19,829 --> 00:17:17,760
columbus's ship might have sounded like

331
00:17:21,990 --> 00:17:19,839
and and you hear all this groaning and

332
00:17:24,949 --> 00:17:22,000
creaking and popping and you wonder

333
00:17:26,870 --> 00:17:24,959
what's making all of that noise uh

334
00:17:29,669 --> 00:17:26,880
because of course we're surrounded by a

335
00:17:33,510 --> 00:17:29,679
near vacuum in space and and acoustical

336
00:17:36,390 --> 00:17:33,520
uh propagation won't go in a vacuum

337
00:17:38,789 --> 00:17:36,400
so what's making that noise and

338
00:17:41,029 --> 00:17:38,799

uh andre and i were talking about that

339
00:17:42,950 --> 00:17:41,039
we're not sure but we think it's a micro

340
00:17:44,230 --> 00:17:42,960
meteorite shielding on the outside of

341
00:17:46,390 --> 00:17:44,240
columbus it's designed a little

342
00:17:48,630 --> 00:17:46,400
differently than the rest of the station

343
00:17:50,630 --> 00:17:48,640
and we think that it's

344
00:17:52,789 --> 00:17:50,640
groaning and creaking through thermal

345
00:17:55,270 --> 00:17:52,799
stress as it undergoes heating and

346
00:18:03,270 --> 00:17:55,280
cooling cycles with day and night but

347
00:18:07,590 --> 00:18:05,110
don and andre thank you very much for

348
00:18:09,590 --> 00:18:07,600
this very interesting video conference

349
00:18:11,430 --> 00:18:09,600
live from space i think everybody here

350
00:18:13,029 --> 00:18:11,440
was excited to see you was excited to

351
00:18:14,950 --> 00:18:13,039
listen to your answers to the

352
00:18:16,630 --> 00:18:14,960
interesting question can i hear a big

353
00:18:41,029 --> 00:18:16,640
cheer from the audience for john and

354
00:18:44,710 --> 00:18:43,190
okay that was great thank you very much

355
00:18:49,350 --> 00:18:44,720
and it was a pleasure good luck with all