
HATCH
EXIT

1
00:00:04,710 --> 00:00:02,629
hello i'm hank so you're spending an

2
00:00:06,230 --> 00:00:04,720
entire year in space which is cool but

3
00:00:07,510 --> 00:00:06,240
you're also very much offering up your

4
00:00:09,110 --> 00:00:07,520
living body for scientific

5
00:00:10,950 --> 00:00:09,120
experimentation here and you are going

6
00:00:13,270 --> 00:00:10,960
to have significant health impacts

7
00:00:19,510 --> 00:00:13,280
because of this research what makes you

8
00:00:25,910 --> 00:00:22,950
well all uh all astronauts that fly in

9
00:00:27,509 --> 00:00:25,920
space are uh human subjects so it's this

10
00:00:28,870 --> 00:00:27,519
is just not about me

11
00:00:30,870 --> 00:00:28,880
it's uh

12
00:00:32,310 --> 00:00:30,880
you know something we all do uh

13
00:00:35,030 --> 00:00:32,320

certainly i'll be up here a little bit

14
00:00:37,030 --> 00:00:35,040
longer um but the reason i'm willing to

15
00:00:38,950 --> 00:00:37,040
do this i think it's important research

16
00:00:41,830 --> 00:00:38,960
that we do and is going to be critical

17
00:00:43,590 --> 00:00:41,840
someday to us uh you know going further

18
00:00:49,510 --> 00:00:43,600
out into space and hopefully tomorrow

19
00:00:53,910 --> 00:00:52,150
hi i'm louis cole i travel the world and

20
00:00:55,110 --> 00:00:53,920
make videos for my youtube channel fun

21
00:00:56,869 --> 00:00:55,120
for louis

22
00:00:59,110 --> 00:00:56,879
and in my adventures i find there's a

23
00:01:00,790 --> 00:00:59,120
lot of obstacles i come across

24
00:01:02,549 --> 00:01:00,800
what's been the biggest obstacle of the

25
00:01:07,590 --> 00:01:02,559
mission that you're on and how did you

26
00:01:10,469 --> 00:01:08,630
well

27
00:01:12,550 --> 00:01:10,479
this is my uh

28
00:01:14,310 --> 00:01:12,560
fourth time in space my second long

29
00:01:16,310 --> 00:01:14,320
duration flight so

30
00:01:19,429 --> 00:01:16,320
i kind of eased into this uh pretty

31
00:01:21,429 --> 00:01:19,439
easily it kind of felt like i had

32
00:01:25,190 --> 00:01:21,439
really never left it's really amazing

33
00:01:27,190 --> 00:01:25,200
how your body remembers the environment

34
00:01:28,870 --> 00:01:27,200
i think though the biggest obstacle or

35
00:01:31,350 --> 00:01:28,880
the biggest challenge will be the the

36
00:01:33,510 --> 00:01:31,360
duration of of this flight you know just

37
00:01:35,030 --> 00:01:33,520
being here for so long never being able

38
00:01:36,550 --> 00:01:35,040

to leave never being able to leave your

39
00:01:38,630 --> 00:01:36,560
place at work so

40
00:01:40,469 --> 00:01:38,640
you know so far it's been a pretty

41
00:01:42,389 --> 00:01:40,479
seamless transition but i you know i

42
00:01:48,069 --> 00:01:42,399
expect as i'm here longer it'll be uh

43
00:01:51,350 --> 00:01:49,990
hi astronaut kelly i'm emily grassley

44
00:01:52,870 --> 00:01:51,360
from the brain scoop standing in front

45
00:01:54,469 --> 00:01:52,880
of our meteorite collection here at the

46
00:01:56,149 --> 00:01:54,479
field museum in chicago

47
00:01:58,069 --> 00:01:56,159
my question for you i know you're

48
00:01:59,910 --> 00:01:58,079
studying your immune system's responses

49
00:02:02,230 --> 00:01:59,920
and functionality while living in space

50
00:02:03,990 --> 00:02:02,240
for a year so considering how much of a

51
00:02:06,069 --> 00:02:04,000
person's healthy immune system has

52
00:02:07,990 --> 00:02:06,079
evolved for millions of years along with

53
00:02:09,430 --> 00:02:08,000
life forms on earth do you have any

54
00:02:11,830 --> 00:02:09,440
predictions for how humans could

55
00:02:13,830 --> 00:02:11,840
maintain a well-balanced microbiome

56
00:02:16,229 --> 00:02:13,840
while living in space without things

57
00:02:18,070 --> 00:02:16,239
like plants animals or microbes gleaned

58
00:02:22,630 --> 00:02:18,080
from life forms on earth

59
00:02:25,990 --> 00:02:24,470
you know that's a good question i i do

60
00:02:28,390 --> 00:02:26,000
know that one of the studies i'm

61
00:02:29,750 --> 00:02:28,400
participating in is this microbiome

62
00:02:30,790 --> 00:02:29,760
research

63
00:02:32,710 --> 00:02:30,800

um

64
00:02:34,309 --> 00:02:32,720
you know we do get some you know fresh

65
00:02:36,630 --> 00:02:34,319
fruits and vegetables up here in our

66
00:02:38,309 --> 00:02:36,640
diet is uh you know not exactly the same

67
00:02:40,070 --> 00:02:38,319
it is on earth but

68
00:02:41,110 --> 00:02:40,080
i really hadn't considered that you know

69
00:02:42,949 --> 00:02:41,120
what the

70
00:02:45,030 --> 00:02:42,959
impact uh

71
00:02:47,750 --> 00:02:45,040
to living here

72
00:02:50,390 --> 00:02:47,760
on the the microbiome of our our bodies

73
00:02:51,830 --> 00:02:50,400
is um but i guess you know there is some

74
00:02:55,110 --> 00:02:51,840
and certainly that's why we're doing the

75
00:02:57,270 --> 00:02:55,120
research so hopefully uh you know this

76
00:02:59,270 --> 00:02:57,280
experiment will will find those answers

77
00:03:00,149 --> 00:02:59,280
i i don't have a personal hypothesis but

78
00:03:02,229 --> 00:03:00,159
i'm sure

79
00:03:05,030 --> 00:03:02,239
you know the experimenters do and if you

80
00:03:06,229 --> 00:03:05,040
want more information i'm sure your nasa

81
00:03:12,550 --> 00:03:06,239
contact

82
00:03:16,790 --> 00:03:14,790
hey mr kelly kyle hill here from because

83
00:03:18,710 --> 00:03:16,800
science on the nerdist channel in los

84
00:03:20,470 --> 00:03:18,720
angeles i'm wondering surveying the

85
00:03:22,790 --> 00:03:20,480
popular culture landscape and what you

86
00:03:23,990 --> 00:03:22,800
know of our future space missions what

87
00:03:26,390 --> 00:03:24,000
do you think will be the thing that

88
00:03:29,110 --> 00:03:26,400

inspires the next generation of

89
00:03:36,390 --> 00:03:29,120
astronauts to be the first generation of

90
00:03:41,030 --> 00:03:38,550
well you know i hope uh

91
00:03:43,589 --> 00:03:41,040
kids get inspiration from

92
00:03:44,630 --> 00:03:43,599
uh the space program like they do other

93
00:03:46,229 --> 00:03:44,640
places

94
00:03:47,830 --> 00:03:46,239
uh you know hopefully what we're doing

95
00:03:49,270 --> 00:03:47,840
here inspires

96
00:03:51,910 --> 00:03:49,280
kids to study

97
00:03:53,670 --> 00:03:51,920
uh stem education science technology

98
00:03:55,910 --> 00:03:53,680
engineering math subjects because those

99
00:03:57,990 --> 00:03:55,920
are critical uh to our future not only

100
00:03:59,990 --> 00:03:58,000
our space program but to our economy as

101
00:04:01,589 --> 00:04:00,000
a whole so you know i hope they get some

102
00:04:03,350 --> 00:04:01,599
inspiration from what we're doing here i

103
00:04:05,750 --> 00:04:03,360
hope they also get inspiration from you

104
00:04:08,070 --> 00:04:05,760
know their friends and family and uh you

105
00:04:09,990 --> 00:04:08,080
know people that they uh

106
00:04:11,270 --> 00:04:10,000
learn from their teachers

107
00:04:13,030 --> 00:04:11,280
um

108
00:04:14,710 --> 00:04:13,040
you know whatever role models they may

109
00:04:16,550 --> 00:04:14,720
have because that

110
00:04:21,270 --> 00:04:16,560
is our future and you know kids are our

111
00:04:24,070 --> 00:04:22,790
hi scott i'm henry reich from the

112
00:04:25,670 --> 00:04:24,080
youtube channel's minute physics and

113
00:04:27,350 --> 00:04:25,680

minute earth i've always been fascinated

114
00:04:29,030 --> 00:04:27,360
by the instability of rotation around

115
00:04:31,030 --> 00:04:29,040
the intermediate axis of an object for

116
00:04:32,870 --> 00:04:31,040
example if you rotate around the axis of

117
00:04:35,670 --> 00:04:32,880
large angular inertia it's a stable

118
00:04:38,469 --> 00:04:35,680
rotation if you rotate around the

119
00:04:41,270 --> 00:04:38,479
the very smallest axis of inertia it is

120
00:04:43,830 --> 00:04:41,280
also a stable rotation but if you try to

121
00:04:45,030 --> 00:04:43,840
rotate around the intermediate axis of

122
00:04:46,790 --> 00:04:45,040
rotation

123
00:04:48,629 --> 00:04:46,800
it's unstable you see these things flip

124
00:04:50,150 --> 00:04:48,639
back and forth back and forth and back

125
00:04:51,270 --> 00:04:50,160
and forth you can see this is obviously

126
00:04:52,390 --> 00:04:51,280
a challenge here on earth because you

127
00:04:53,830 --> 00:04:52,400
have to throw things through the air and

128
00:04:55,350 --> 00:04:53,840
it's a mess and i was wondering if you

129
00:04:57,110 --> 00:04:55,360
might be able to do a demo for us on the

130
00:05:02,870 --> 00:04:57,120
iss thanks for your time and i hope you

131
00:05:06,150 --> 00:05:04,070
yeah i guess what you're talking about

132
00:05:08,310 --> 00:05:06,160
is how this leather man tool is wrote

133
00:05:11,749 --> 00:05:08,320
it'll rotate along one axis and then

134
00:05:15,670 --> 00:05:14,150
so i hope that was a good demonstration

135
00:05:17,350 --> 00:05:15,680
i'll do it again here real quick as we

136
00:05:30,790 --> 00:05:17,360
go to the next

137
00:05:35,510 --> 00:05:33,029
hello scott my name is michael stevens

138
00:05:37,350 --> 00:05:35,520

from the youtube channel vsauce

139
00:05:40,150 --> 00:05:37,360
i'm asking this question from toronto

140
00:05:42,950 --> 00:05:40,160
ontario and my question is about cosmic

141
00:05:45,430 --> 00:05:42,960
ray visuals i've heard that up in space

142
00:05:47,749 --> 00:05:45,440
stray cosmic rays can cause you to see

143
00:05:53,350 --> 00:05:47,759
flashes of light has that ever happened

144
00:05:57,510 --> 00:05:54,870
you know the first time i saw those was

145
00:06:00,469 --> 00:05:57,520
on my hubble space telescope mission in

146
00:06:02,230 --> 00:06:00,479
1999 the hubble flies a lot higher than

147
00:06:04,550 --> 00:06:02,240
the space station so we can see a lot

148
00:06:06,390 --> 00:06:04,560
more of those cosmic rays

149
00:06:08,390 --> 00:06:06,400
i would see you know on order of maybe

150
00:06:10,710 --> 00:06:08,400
like 50 an hour

151
00:06:12,870 --> 00:06:10,720
uh but the space station is is lower and

152
00:06:13,830 --> 00:06:12,880
a little bit more protected from those

153
00:06:15,909 --> 00:06:13,840
um

154
00:06:17,670 --> 00:06:15,919
and you see them much less frequently

155
00:06:20,550 --> 00:06:17,680
although i'll see you know maybe a few

156
00:06:23,270 --> 00:06:20,560
each night uh

157
00:06:25,430 --> 00:06:23,280
in my previous experience with hubble

158
00:06:27,670 --> 00:06:25,440
they were very much more distinct and

159
00:06:29,670 --> 00:06:27,680
would kind of look like they were just

160
00:06:31,510 --> 00:06:29,680
white flashes of light like a firework

161
00:06:33,830 --> 00:06:31,520
that was kind of radial towards the

162
00:06:35,029 --> 00:06:33,840
center of my eye now they seem a little

163
00:06:36,230 --> 00:06:35,039

bit different

164
00:06:38,309 --> 00:06:36,240
and i don't know if that's because of

165
00:06:40,870 --> 00:06:38,319
the altitude we're at but a little bit

166
00:06:43,830 --> 00:06:40,880
more not as uh

167
00:06:46,550 --> 00:06:43,840
well-defined not uh

168
00:06:48,390 --> 00:06:46,560
and and kind of more random in in you

169
00:06:49,189 --> 00:06:48,400
know how they uh

170
00:06:51,510 --> 00:06:49,199
uh

171
00:06:53,909 --> 00:06:51,520
streak across my field of view i guess i

172
00:06:55,110 --> 00:06:53,919
should say but um

173
00:06:56,710 --> 00:06:55,120
you know i was thinking about it last

174
00:06:58,309 --> 00:06:56,720
night when i saw one

175
00:07:00,629 --> 00:06:58,319
thinking about hey not only is this

176
00:07:07,990 --> 00:07:00,639
thing going across my visual field but

177
00:07:11,110 --> 00:07:09,749
hey scottis destin from smarter everyday

178
00:07:12,150 --> 00:07:11,120
enjoyed working with you hope to do it

179
00:07:13,749 --> 00:07:12,160
again drop me an email if you're

180
00:07:15,510 --> 00:07:13,759
interested quick question what kind of

181
00:07:17,350 --> 00:07:15,520
watch do you wear i know you have two

182
00:07:19,670 --> 00:07:17,360
but i don't know why what features are

183
00:07:23,430 --> 00:07:19,680
important on an astronaut's watch stay

184
00:07:28,870 --> 00:07:26,790
hey dustin uh good to hear from you um

185
00:07:31,909 --> 00:07:28,880
so normally the watch i wear up here is

186
00:07:36,309 --> 00:07:34,710
because uh one reason the omega is good

187
00:07:39,430 --> 00:07:36,319
is because it has a very loud alarm it

188
00:07:41,350 --> 00:07:39,440

has a light that is very bright it's one

189
00:07:43,430 --> 00:07:41,360
that was designed for space the light

190
00:07:45,749 --> 00:07:43,440
you could almost use as a flashlight and

191
00:07:47,430 --> 00:07:45,759
if it's really dark

192
00:07:49,189 --> 00:07:47,440
like in the evenings

193
00:07:50,629 --> 00:07:49,199
today i'm wearing a breitling that my

194
00:07:52,869 --> 00:07:50,639
brother gave me because i was just

195
00:07:53,830 --> 00:07:52,879
talking to him on the today show

196
00:07:55,749 --> 00:07:53,840
so

197
00:07:57,110 --> 00:07:55,759
but i normally don't wear this watch

198
00:07:59,670 --> 00:07:57,120
during the working day and the other one

199
00:08:00,950 --> 00:07:59,680
is a sleep study watch that misha and i

200
00:08:03,189 --> 00:08:00,960
have to wear the whole time we're up

201
00:08:04,710 --> 00:08:03,199
here which measures acceleration in

202
00:08:07,909 --> 00:08:04,720
other words whether you're moving around

203
00:08:09,670 --> 00:08:07,919
or not and light so it can tell you know

204
00:08:15,110 --> 00:08:09,680
pretty accurately when we're asleep and

205
00:08:18,790 --> 00:08:16,950
hey this is hank again so imagine when

206
00:08:20,469 --> 00:08:18,800
the thrust of that last rocket stops and

207
00:08:23,110 --> 00:08:20,479
you become weightless for the first time

208
00:08:24,150 --> 00:08:23,120
of the journey it feels initially like

209
00:08:25,110 --> 00:08:24,160
you're falling because that's what

210
00:08:26,869 --> 00:08:25,120
you're doing you're really falling

211
00:08:28,390 --> 00:08:26,879
around the earth and missing it for a

212
00:08:29,670 --> 00:08:28,400
year it's that moment when the airplane

213
00:08:30,950 --> 00:08:29,680

drops in the turbulence or you're at the

214
00:08:32,949 --> 00:08:30,960
top of the roller coaster and you feel

215
00:08:34,310 --> 00:08:32,959
that feeling in your stomach that's what

216
00:08:36,630 --> 00:08:34,320
i imagine it feels like when does that

217
00:08:42,550 --> 00:08:36,640
feeling stop or does it stop or do you

218
00:08:47,670 --> 00:08:45,350
well on on launch it it stops pretty

219
00:08:49,110 --> 00:08:47,680
quickly you know

220
00:08:51,110 --> 00:08:49,120
i think some people don't even ever

221
00:08:54,710 --> 00:08:51,120
experience it i don't really feel that

222
00:08:56,949 --> 00:08:54,720
way for long on launch after the engines

223
00:08:58,710 --> 00:08:56,959
uh cut off and you first experience uh

224
00:09:00,550 --> 00:08:58,720
microgravity

225
00:09:02,230 --> 00:09:00,560
you know however you know i can go in my

226
00:09:03,829 --> 00:09:02,240
crew quarters at night when it's dark

227
00:09:05,430 --> 00:09:03,839
and i'm getting ready to go to sleep and

228
00:09:06,710 --> 00:09:05,440
close my eyes

229
00:09:08,389 --> 00:09:06,720
and

230
00:09:10,630 --> 00:09:08,399
you know convince myself

231
00:09:12,790 --> 00:09:10,640
i do have a feeling of falling but it

232
00:09:14,230 --> 00:09:12,800
takes a little bit of effort but we are

233
00:09:15,590 --> 00:09:14,240
we're you know that's why everything

234
00:09:17,509 --> 00:09:15,600
floats here is because

235
00:09:19,350 --> 00:09:17,519
no it's not because we're so far away

236
00:09:20,949 --> 00:09:19,360
from earth and the gravity is low it's

237
00:09:22,630 --> 00:09:20,959
because we're all in free fall around

238
00:09:23,350 --> 00:09:22,640

the earth at the same time

239
00:09:24,310 --> 00:09:23,360
so

240
00:09:25,829 --> 00:09:24,320
i can

241
00:09:27,829 --> 00:09:25,839
convince myself

242
00:09:29,509 --> 00:09:27,839
that i feel that although i don't feel

243
00:09:34,550 --> 00:09:29,519
it right this second as i'm talking to

244
00:09:39,190 --> 00:09:36,949
hi i'm louis cole i travel the world

245
00:09:41,030 --> 00:09:39,200
filming videos for my youtube channel

246
00:09:43,030 --> 00:09:41,040
and doing what you're doing staying up

247
00:09:44,630 --> 00:09:43,040
on the international space station is

248
00:09:46,630 --> 00:09:44,640
the biggest adventure i could imagine

249
00:09:48,470 --> 00:09:46,640
and i'm sure it has been for you but if

250
00:09:51,350 --> 00:09:48,480
you could travel to anywhere else and

251
00:09:57,590 --> 00:09:51,360
space any solar system or planet

252
00:10:02,150 --> 00:10:00,070
you know people normally ask you know

253
00:10:04,150 --> 00:10:02,160
if you could travel to any other place

254
00:10:05,509 --> 00:10:04,160
in our solar system and then i generally

255
00:10:07,829 --> 00:10:05,519
say mars

256
00:10:08,550 --> 00:10:07,839
but the way you pose the question i

257
00:10:10,710 --> 00:10:08,560
think

258
00:10:12,230 --> 00:10:10,720
if i could go anywhere it would probably

259
00:10:15,350 --> 00:10:12,240
be to

260
00:10:18,630 --> 00:10:15,360
a planet that astronomers and scientists

261
00:10:20,550 --> 00:10:18,640
have just determined is most like earth

262
00:10:22,310 --> 00:10:20,560
and uh you know to see what's really

263
00:10:23,509 --> 00:10:22,320

there you know if there are living

264
00:10:26,389 --> 00:10:23,519
creatures

265
00:10:28,550 --> 00:10:26,399
or you know just how that planet is

266
00:10:32,949 --> 00:10:28,560
evolved and how similar it really is to