



1
00:00:51,189 --> 00:00:48,709
t-minus ten nine eight remain engine

2
00:01:56,670 --> 00:00:51,199
start we have main engine start four

3
00:02:07,390 --> 00:02:04,149
whoa there she goes sts-48 ori dedicated

4
00:02:10,480 --> 00:02:07,400
entirely to life sciences research we

5
00:02:11,080 --> 00:02:10,490
were pioneers oh excuse me where are my

6
00:02:13,840 --> 00:02:11,090
manners

7
00:02:16,510 --> 00:02:13,850
let me introduce myself Ari jellyfish

8
00:02:16,990 --> 00:02:16,520
here Ari's short for Aurelia my family

9
00:02:19,510 --> 00:02:17,000
name

10
00:02:22,120 --> 00:02:19,520
we jellyfish go back five hundred

11
00:02:23,170 --> 00:02:22,130
million years you know I consider our

12
00:02:27,610 --> 00:02:23,180
finest hour

13
00:02:29,890 --> 00:02:27,620

the Columbia mission in June 1991 yep

14

00:02:31,870 --> 00:02:29,900

there were two thousand four hundred and

15

00:02:34,390 --> 00:02:31,880

seventy eight of us on that flight of

16

00:02:36,759 --> 00:02:34,400

course we were a lot smaller than just

17

00:02:40,290 --> 00:02:36,769

little polyps there was plenty of room

18

00:02:43,120 --> 00:02:40,300

until seven astronauts climbed aboard

19

00:02:46,300 --> 00:02:43,130

but we couldn't go anywhere without them

20

00:02:47,410 --> 00:02:46,310

oh sure it got a little crowded but we

21

00:02:50,979 --> 00:02:47,420

were glad to do it

22

00:02:53,560 --> 00:02:50,989

after all we were making history we were

23

00:02:56,530 --> 00:02:53,570

helping NASA learn more about living in

24

00:02:58,300 --> 00:02:56,540

space oh I know what you're saying and

25

00:03:00,430 --> 00:02:58,310

what's the big deal it looks easy

26

00:03:03,340 --> 00:03:00,440

floating around up there looks like a

27

00:03:06,520 --> 00:03:03,350

barrel of laughs but living in space is

28

00:03:09,360 --> 00:03:06,530

difficult in the early days of space

29

00:03:12,030 --> 00:03:09,370

travel there was so much we didn't know

30

00:03:14,830 --> 00:03:12,040

before humans traveled into space

31

00:03:17,650 --> 00:03:14,840

animals were sent while scientists

32

00:03:19,990 --> 00:03:17,660

checked their responses when the first

33

00:03:22,449 --> 00:03:20,000

animal space travelers returned to Earth

34

00:03:24,750 --> 00:03:22,459

they brought back enough information to

35

00:03:27,880 --> 00:03:24,760

safely send the astronauts into space

36

00:03:30,729 --> 00:03:27,890

but even when NASA sent John Glenn to

37

00:03:32,680 --> 00:03:30,739

orbit the earth in 1962 they still

38

00:03:33,310 --> 00:03:32,690

didn't know exactly how his body would

39

00:03:35,979 --> 00:03:33,320

react

40

00:03:38,140 --> 00:03:35,989

of course as more astronauts were sent

41

00:03:40,150 --> 00:03:38,150

up scientists learn more about the

42

00:03:43,660 --> 00:03:40,160

effects of space travel in relation to

43

00:03:45,940 --> 00:03:43,670

life sciences life sciences well

44

00:03:48,430 --> 00:03:45,950

basically that is the study of living

45

00:03:51,250 --> 00:03:48,440

things how they grow function and

46

00:03:54,190 --> 00:03:51,260

interact scientists knew that more

47

00:03:55,930 --> 00:03:54,200

research needed to be done in space and

48

00:03:59,110 --> 00:03:55,940

that's where I came in

49

00:04:01,680 --> 00:03:59,120

I was part of an important NASA study on

50

00:04:04,449 --> 00:04:01,690

the effects of microgravity a

51
00:04:06,640 --> 00:04:04,459
microgravity as the word scientists used

52
00:04:10,610 --> 00:04:06,650
to describe what happens to objects in a

53
00:04:14,479 --> 00:04:10,620
freefall orbit in other words they float

54
00:04:17,000 --> 00:04:14,489
let me explain here on earth we feel the

55
00:04:19,430 --> 00:04:17,010
effects of gravity almost everywhere you

56
00:04:21,860 --> 00:04:19,440
can experience a similar environment to

57
00:04:24,740 --> 00:04:21,870
microgravity if you go underwater like

58
00:04:27,219 --> 00:04:24,750
me unfortunately you can't stay

59
00:04:29,990 --> 00:04:27,229
underwater for long periods of time you

60
00:04:32,930 --> 00:04:30,000
can experience microgravity on a

61
00:04:34,939 --> 00:04:32,940
roller-coaster ride like this or train

62
00:04:37,610 --> 00:04:34,949
like the astronauts do and NASA's

63
00:04:41,060 --> 00:04:37,620

special training airplane the kc-135

64

00:04:43,610 --> 00:04:41,070

that flies up and down but the problem

65

00:04:47,530 --> 00:04:43,620

is that simulated microgravity only

66

00:04:50,210 --> 00:04:47,540

lasts 15 or 20 seconds in space

67

00:04:52,969 --> 00:04:50,220

microgravity lasts for as long as you're

68

00:04:55,640 --> 00:04:52,979

in orbit you drift all over the place

69

00:04:58,280 --> 00:04:55,650

and it's hard to tell if up is really up

70

00:05:00,379 --> 00:04:58,290

and down is really down so it's

71

00:05:03,920 --> 00:05:00,389

difficult to predict how body functions

72

00:05:05,800 --> 00:05:03,930

will react that's why scientists conduct

73

00:05:09,560 --> 00:05:05,810

experiments to learn more about

74

00:05:11,060 --> 00:05:09,570

microgravity when they decided to use

75

00:05:14,140 --> 00:05:11,070

jellyfish for the microgravity

76
00:05:18,140 --> 00:05:14,150
experiment everybody asked why jellyfish

77
00:05:20,750 --> 00:05:18,150
hey why not you know we are similar to

78
00:05:22,909 --> 00:05:20,760
you in a lot of ways and one of our best

79
00:05:25,390 --> 00:05:22,919
friends a scientist knew we were special

80
00:05:28,520 --> 00:05:25,400
and could contribute a lot to science

81
00:05:30,790 --> 00:05:28,530
dr. Dorothy Spangenberg is the real

82
00:05:33,469 --> 00:05:30,800
expert who made it all happen for us

83
00:05:34,010 --> 00:05:33,479
she's been hanging around with us for

84
00:05:36,950 --> 00:05:34,020
years

85
00:05:40,580 --> 00:05:36,960
she knows everything about me raised me

86
00:05:42,529 --> 00:05:40,590
from a little pollen dr. Spangenberg and

87
00:05:44,980 --> 00:05:42,539
her students worked with us for years

88
00:05:47,810 --> 00:05:44,990

before we actually flew in space

89

00:05:50,360 --> 00:05:47,820

she began her research more than two

90

00:05:53,300 --> 00:05:50,370

decades ago collecting us along the

91

00:05:55,339 --> 00:05:53,310

Texas coast and people from all around

92

00:05:58,129 --> 00:05:55,349

the world sent her different types of

93

00:06:01,430 --> 00:05:58,139

jellyfish to study that's why they call

94

00:06:03,890 --> 00:06:01,440

her the jellyfish lady and the more she

95

00:06:05,839 --> 00:06:03,900

learned about us the more she knew NASA

96

00:06:08,870 --> 00:06:05,849

could learn a lot from us because of our

97

00:06:10,550 --> 00:06:08,880

similarities to humans but you should

98

00:06:11,210 --> 00:06:10,560

hear this from someone who saw us in

99

00:06:14,390 --> 00:06:11,220

action

100

00:06:15,670 --> 00:06:14,400

dr. millie hughes-fulford thanks for the

101

00:06:19,700 --> 00:06:15,680

introduction airy

102

00:06:22,370 --> 00:06:19,710

hi my name is dr. Miller use broker I

103

00:06:25,580 --> 00:06:22,380

was a payload specialist on Space Lab

104

00:06:28,430 --> 00:06:25,590

life sciences I'm here today from the

105

00:06:30,560 --> 00:06:28,440

Monterey aquarium in minor in California

106

00:06:33,430 --> 00:06:30,570

for another team of researchers are

107

00:06:35,480 --> 00:06:33,440

learning more about jellyfish everyday

108

00:06:37,850 --> 00:06:35,490

jellyfish are among the simplest

109

00:06:41,810 --> 00:06:37,860

organisms but they have neurons are

110

00:06:44,840 --> 00:06:41,820

nerve cells similar to humans they have

111

00:06:47,300 --> 00:06:44,850

sensors called gravity receptors located

112

00:06:49,370 --> 00:06:47,310

in their arms that help them maintain

113

00:06:50,020 --> 00:06:49,380

their balance and know where they're

114

00:06:55,910 --> 00:06:50,030

going

115

00:06:58,220 --> 00:06:55,920

think of it as a built-in compass the

116

00:07:03,740 --> 00:06:58,230

gravity receptors tell them up this up

117

00:07:06,020 --> 00:07:03,750

and down is down humans have this - to

118

00:07:08,330 --> 00:07:06,030

help us maintain our balance there are

119

00:07:12,560 --> 00:07:08,340

gravity receptors located in our inner

120

00:07:15,530 --> 00:07:12,570

ear have you ever ridden an amusement

121

00:07:16,850 --> 00:07:15,540

park ride that spins you around when you

122

00:07:19,940 --> 00:07:16,860

get off you feel like you're going to

123

00:07:23,150 --> 00:07:19,950

fall down right that's because the

124

00:07:25,310 --> 00:07:23,160

motion affects your inner ear even after

125

00:07:29,750 --> 00:07:25,320

you stop moving fluids in your inner ear

126

00:07:31,520 --> 00:07:29,760

keep moving this makes you dizzy this

127

00:07:34,850 --> 00:07:31,530

type of motion sickness affects

128

00:07:37,070 --> 00:07:34,860

astronauts in space as well by learning

129

00:07:39,620 --> 00:07:37,080

more about the development and function

130

00:07:42,890 --> 00:07:39,630

of gravity receptors scientists hope to

131

00:07:45,350 --> 00:07:42,900

fight the effects of space sickness by

132

00:07:47,180 --> 00:07:45,360

sending jellyfish up in space we hope to

133

00:07:50,780 --> 00:07:47,190

find out if they would react differently

134

00:07:55,159 --> 00:07:50,790

in microgravity that on earth would they

135

00:07:57,200 --> 00:07:55,169

know up is up and down is down and there

136

00:08:00,200 --> 00:07:57,210

are even more ways jellyfish help us

137

00:08:02,390 --> 00:08:00,210

learn about living in space astronauts

138

00:08:03,980 --> 00:08:02,400

returning to earth also suffer from a

139

00:08:08,040 --> 00:08:03,990

calcium deficiency

140

00:08:10,869 --> 00:08:08,050

we need calcium to keep our bones strong

141

00:08:14,589 --> 00:08:10,879

extended calcium deficiency causes

142

00:08:18,459 --> 00:08:14,599

osteoporosis a bone disease and many gun

143

00:08:20,800 --> 00:08:18,469

diseases as well each jellyfish gravity

144

00:08:23,529 --> 00:08:20,810

receptor has a sack of calcium sulfate

145

00:08:26,830 --> 00:08:23,539

crystals Johnston's our inner ear has

146

00:08:29,110 --> 00:08:26,840

calcium containing crystals on SLS one

147

00:08:32,110 --> 00:08:29,120

we wondered if jellyfish would suffer a

148

00:08:33,880 --> 00:08:32,120

calcium deficiency - but these weren't

149

00:08:36,730 --> 00:08:33,890

the only reasons the jellyfish were

150

00:08:40,149 --> 00:08:36,740

chosen to fly with us it was their small

151
00:08:42,219 --> 00:08:40,159
size that made the difference we wanted

152
00:08:44,829 --> 00:08:42,229
a small animal we could study as it

153
00:08:47,410 --> 00:08:44,839
developed in space did you know that

154
00:08:50,740 --> 00:08:47,420
more than a hundred jellyfish polyps can

155
00:08:53,170 --> 00:08:50,750
fit on a dime the jellyfish is also

156
00:08:57,819 --> 00:08:53,180
easier to study because it develops and

157
00:09:01,630 --> 00:08:57,829
distinct individual phases from polyp to

158
00:09:05,410 --> 00:09:01,640
affero and finally to Medusa the type

159
00:09:08,199 --> 00:09:05,420
most commonly seen in the ocean it takes

160
00:09:10,420 --> 00:09:08,209
from six to eight days for a jellyfish

161
00:09:13,990 --> 00:09:10,430
polyp to develop into an adult defero

162
00:09:16,930 --> 00:09:14,000
and we know it takes nine months for a

163
00:09:18,970 --> 00:09:16,940

human baby to develop and about two

164

00:09:21,880 --> 00:09:18,980

years for baby elephant to develop into

165

00:09:24,100 --> 00:09:21,890

maturity can you imagine if we filled

166

00:09:29,410 --> 00:09:24,110

the orbiter with baby elephants for the

167

00:09:32,829 --> 00:09:29,420

study holy cow or should i say holy

168

00:09:34,930 --> 00:09:32,839

elephants what a mess we were certainly

169

00:09:37,569 --> 00:09:34,940

a lot easier to work with than baby

170

00:09:40,810 --> 00:09:37,579

elephants however we still needed

171

00:09:42,819 --> 00:09:40,820

special preparation for space travel we

172

00:09:46,689 --> 00:09:42,829

underwent months of training with the

173

00:09:48,699 --> 00:09:46,699

astronauts they studied our appearance

174

00:09:50,889 --> 00:09:48,709

and development so they would know just

175

00:09:55,329 --> 00:09:50,899

what to look for when we were in space

176

00:09:58,090 --> 00:09:55,339

and when launch day finally came we were

177

00:10:00,519 --> 00:09:58,100

ready of course I was back in the

178

00:10:02,710 --> 00:10:00,529

payload Bay to get a bird's-eye view of

179

00:10:05,079 --> 00:10:02,720

all the action let me introduce you to

180

00:10:07,660 --> 00:10:05,089

another member of the flight dr. Tammy

181

00:10:10,540 --> 00:10:07,670

Jernigan thanks Harry

182

00:10:12,519 --> 00:10:10,550

hi I'm dr. Tammy Jernigan I'm in the

183

00:10:15,069 --> 00:10:12,529

Space Lab trainer here at the Johnson

184

00:10:17,069 --> 00:10:15,079

Space Center in Houston Texas I was a

185

00:10:19,960 --> 00:10:17,079

mission specialist on SLS one

186

00:10:21,699 --> 00:10:19,970

coordinating all the payload operations

187

00:10:25,900 --> 00:10:21,709

carrying out the mission objectives in

188

00:10:28,300 --> 00:10:25,910

this case working with jellyfish when

189

00:10:30,910 --> 00:10:28,310

people travel in space we have to take

190

00:10:32,980 --> 00:10:30,920

our environment with us we have oxygen

191

00:10:34,710 --> 00:10:32,990

food and everything else we need to

192

00:10:38,019 --> 00:10:34,720

protect us from the elements of space

193

00:10:39,730 --> 00:10:38,029

when jellyfish travel in space they need

194

00:10:43,030 --> 00:10:39,740

to take their environment with them as

195

00:10:45,340 --> 00:10:43,040

well the jellyfish on board sos1

196

00:10:47,829 --> 00:10:45,350

were placed in specially prepared bags

197

00:10:50,939 --> 00:10:47,839

filled with saltwater and carried in an

198

00:10:53,110 --> 00:10:50,949

incubator to stabilize their environment

199

00:10:55,389 --> 00:10:53,120

just before we launched

200

00:10:57,730 --> 00:10:55,399

dr. Spangenberg and her students poured

201
00:11:00,009 --> 00:10:57,740
an iodine mixture into some of the bags

202
00:11:02,740 --> 00:11:00,019
to encourage the jellyfish's development

203
00:11:04,809 --> 00:11:02,750
after all this planning we wanted to be

204
00:11:08,590 --> 00:11:04,819
absolutely certain that the polyps would

205
00:11:10,720 --> 00:11:08,600
develop by the time sls one settled into

206
00:11:12,460 --> 00:11:10,730
orbit and we had begun our experiments

207
00:11:15,639 --> 00:11:12,470
the jellyfish had passed their first

208
00:11:18,249 --> 00:11:15,649
important test with flying colors they

209
00:11:20,379 --> 00:11:18,259
survived the launch proving a smaller

210
00:11:24,100 --> 00:11:20,389
organism can withstand the forces of

211
00:11:27,369 --> 00:11:24,110
liftoff to help the jellyfish polyps

212
00:11:30,090 --> 00:11:27,379
develop into a fire we added the iodine

213
00:11:32,590 --> 00:11:30,100

mixture to another group of jellyfish

214

00:11:35,499 --> 00:11:32,600

while we conducted experiments in the

215

00:11:37,569 --> 00:11:35,509

orbiter simultaneous research was taking

216

00:11:41,199 --> 00:11:37,579

place on the ground by dr. Spangenberg

217

00:11:44,230 --> 00:11:41,209

and her students the earth research is

218

00:11:47,799 --> 00:11:44,240

called the control a setup that doesn't

219

00:11:50,079 --> 00:11:47,809

have the variable being tested every

220

00:11:51,879 --> 00:11:50,089

experiment should have a control because

221

00:11:54,910 --> 00:11:51,889

it gives you something to compare your

222

00:11:58,090 --> 00:11:54,920

results against both groups of jellyfish

223

00:12:00,189 --> 00:11:58,100

were videotape as they swam in hopes of

224

00:12:03,369 --> 00:12:00,199

recording any changes in their movement

225

00:12:06,389 --> 00:12:03,379

or behavior one of the most exciting

226

00:12:08,799 --> 00:12:06,399

changes happened almost right away

227

00:12:11,499 --> 00:12:08,809

remember how the jellyfish used their

228

00:12:14,860 --> 00:12:11,509

arms to pulse up and float down to feed

229

00:12:17,889 --> 00:12:14,870

on earth in microgravity the jellyfish

230

00:12:21,280 --> 00:12:17,899

moved in circles but they were still

231

00:12:23,079 --> 00:12:21,290

able to pulse and swim easily in fact

232

00:12:24,129 --> 00:12:23,089

despite being in a microgravity

233

00:12:26,559 --> 00:12:24,139

environment

234

00:12:28,309 --> 00:12:26,569

the jellyfish polyps appeared to develop

235

00:12:31,259 --> 00:12:28,319

normally

236

00:12:33,319 --> 00:12:31,269

after nine days in orbit we began to

237

00:12:36,569 --> 00:12:33,329

prepare the jellyfish for the trip home

238

00:12:39,359 --> 00:12:36,579

one group was secured in the locker to

239

00:12:41,909 --> 00:12:39,369

be immediately studied after landing the

240

00:12:44,400 --> 00:12:41,919

second group was preserved in a special

241

00:12:46,280 --> 00:12:44,410

liquid to be studied and compared to the

242

00:12:49,590 --> 00:12:46,290

jellyfish used in dr. Spangenberg

243

00:12:52,409 --> 00:12:49,600

simultaneous earth experiment the

244

00:12:54,359 --> 00:12:52,419

information we gathered on SLS one will

245

00:12:56,280 --> 00:12:54,369

help us to learn how to fight the

246

00:12:58,889 --> 00:12:56,290

negative effects of space travel and

247

00:13:01,379 --> 00:12:58,899

paved the way for astronauts to stay in

248

00:13:03,419 --> 00:13:01,389

space for months or even years at a time

249

00:13:06,689 --> 00:13:03,429

pretty exciting right

250

00:13:10,199 --> 00:13:06,699

Airi you said it Tammy boy those nine

251
00:13:11,159 --> 00:13:10,209
days just flew by but this isn't the end

252
00:13:14,729 --> 00:13:11,169
of our story

253
00:13:17,429 --> 00:13:14,739
uh-uh once we landed dr Spangenberg

254
00:13:19,769 --> 00:13:17,439
spent more than a year studying and

255
00:13:23,220 --> 00:13:19,779
comparing us to our earthbound jellyfish

256
00:13:26,309 --> 00:13:23,230
and her results surprised everyone after

257
00:13:28,259 --> 00:13:26,319
swimming in circles in space some of us

258
00:13:31,109 --> 00:13:28,269
still swam a little funny after we

259
00:13:34,159 --> 00:13:31,119
returned to earth however most of us

260
00:13:36,509 --> 00:13:34,169
went back to our old ways pretty quickly

261
00:13:38,909 --> 00:13:36,519
scientists believe that our gravity

262
00:13:41,840 --> 00:13:38,919
receptors function differently which

263
00:13:45,029 --> 00:13:41,850

made us more sensitive to microgravity

264

00:13:48,809 --> 00:13:45,039

the exciting news is that we can develop

265

00:13:50,909 --> 00:13:48,819

from a polyp to an F IRA in space when

266

00:13:52,949 --> 00:13:50,919

they studied our cells they found most

267

00:13:56,009 --> 00:13:52,959

of us were completely normal

268

00:13:58,409 --> 00:13:56,019

oh I hear you you're saying hey what

269

00:14:01,169 --> 00:13:58,419

does this mean to me well the more

270

00:14:04,349 --> 00:14:01,179

scientists on earth understand how cells

271

00:14:06,389 --> 00:14:04,359

the basic unit of life develop the more

272

00:14:09,319 --> 00:14:06,399

they can learn about human bodies and

273

00:14:11,939 --> 00:14:09,329

their responses on earth and in space

274

00:14:14,609 --> 00:14:11,949

they'll also learn more about the human

275

00:14:17,159 --> 00:14:14,619

immune system and how it fights diseases

276

00:14:20,699 --> 00:14:17,169

they'll learn more about your body and

277

00:14:22,979 --> 00:14:20,709

the amazing things it can do just think

278

00:14:25,470 --> 00:14:22,989

we can learn all this from a little

279

00:14:27,840 --> 00:14:25,480

jellyfish it just goes to prove that

280

00:14:30,229 --> 00:14:27,850

science is like a puzzle it takes many

281

00:14:33,929 --> 00:14:30,239

pieces to finally get the big picture

282

00:14:35,579 --> 00:14:33,939

this mission was such a success NASA is

283

00:14:36,670 --> 00:14:35,589

already planning to send more jellyfish

284

00:14:39,879 --> 00:14:36,680

up in the future

285

00:14:42,429 --> 00:14:39,889

by bringing together more pieces of the

286

00:14:44,920 --> 00:14:42,439

puzzle perhaps one day more the

287

00:14:48,309 --> 00:14:44,930

mysteries of space will be revealed and