



**DR. MICHELLE
FOURNET
DECODING WHALE SONG**



1
00:00:35,350 --> 00:00:05,510

[Music]

2
00:00:49,020 --> 00:00:37,590

so

3
00:00:49,030 --> 00:01:03,029

[Music]

4
00:01:07,590 --> 00:01:05,109
welcome to coloring outside the lines

5
00:01:09,109 --> 00:01:07,600
i'm your host dan zetterstrom

6
00:01:10,550 --> 00:01:09,119
this is something a little different

7
00:01:12,149 --> 00:01:10,560
every now and then i'll be exploring

8
00:01:13,670 --> 00:01:12,159
subjects that i feel are relevant to the

9
00:01:15,109 --> 00:01:13,680
conversation around the search for other

10
00:01:16,310 --> 00:01:15,119
forms of life and our place in the

11
00:01:17,350 --> 00:01:16,320
universe

12
00:01:19,109 --> 00:01:17,360
my hope is that you find the

13
00:01:21,030 --> 00:01:19,119

conversations both informative and

14

00:01:23,510 --> 00:01:21,040

thought-provoking and that they help you

15

00:01:25,510 --> 00:01:23,520

see the world around you in a new light

16

00:01:28,789 --> 00:01:25,520

with that said thank you for tuning in

17

00:01:33,030 --> 00:01:31,109

my guest today is a marine ecologist who

18

00:01:34,870 --> 00:01:33,040

uses passive acoustics to understand

19

00:01:37,030 --> 00:01:34,880

communication behavior and the impacts

20

00:01:39,270 --> 00:01:37,040

of marine resource management decisions

21

00:01:41,270 --> 00:01:39,280

on underwater ecosystems you might know

22

00:01:43,350 --> 00:01:41,280

her work from the 2021 documentary

23

00:01:45,030 --> 00:01:43,360

fathom where dr fornay and dr alan

24

00:01:47,190 --> 00:01:45,040

garland set out on an undertaking as

25

00:01:49,190 --> 00:01:47,200

colossal as their subjects to decipher

26
00:01:51,590 --> 00:01:49,200
the complex communication of whales and

27
00:01:53,749 --> 00:01:51,600
then cover a culture eons older than our

28
00:01:55,590 --> 00:01:53,759
own ladies and gentlemen dr michelle

29
00:01:57,910 --> 00:01:55,600
fornay hi michelle how are you doing

30
00:01:59,590 --> 00:01:57,920
today hi good morning i'm fine thank you

31
00:02:01,109 --> 00:01:59,600
thanks so much for having me

32
00:02:03,030 --> 00:02:01,119
oh that's great thank you for coming uh

33
00:02:05,590 --> 00:02:03,040
you you got coffee with you there i've

34
00:02:07,429 --> 00:02:05,600
got a cup of tea with me this morning

35
00:02:09,190 --> 00:02:07,439
great lovely lovely

36
00:02:10,469 --> 00:02:09,200
okay so let's dive in for those who

37
00:02:12,790 --> 00:02:10,479
aren't aware just tell us a little bit

38
00:02:16,949 --> 00:02:12,800

about yourself and your field of study

39

00:02:19,589 --> 00:02:16,959

sure so um i am an acoustic ecologist

40

00:02:21,990 --> 00:02:19,599

which means i study

41

00:02:24,070 --> 00:02:22,000

i study how the natural world functions

42

00:02:26,869 --> 00:02:24,080

from the perspective of sound

43

00:02:29,750 --> 00:02:26,879

and predominantly i study underwater

44

00:02:31,750 --> 00:02:29,760

animals um and then within that i mostly

45

00:02:33,830 --> 00:02:31,760

my sort of primary subject is humpback

46

00:02:35,190 --> 00:02:33,840

whales but

47

00:02:36,949 --> 00:02:35,200

that said

48

00:02:38,790 --> 00:02:36,959

really what i what i'm trying to do is

49

00:02:41,589 --> 00:02:38,800

is to be a good listener to the natural

50

00:02:44,150 --> 00:02:41,599

world and understand how sound

51
00:02:46,790 --> 00:02:44,160
facilitates natural interactions and

52
00:02:49,190 --> 00:02:46,800
what it is that we as humans can do to

53
00:02:52,229 --> 00:02:49,200
protect natural soundscapes and to more

54
00:02:54,790 --> 00:02:52,239
effectively and happily coexist in this

55
00:02:57,190 --> 00:02:54,800
sonic world that we live in and how can

56
00:03:00,149 --> 00:02:57,200
we cultivate

57
00:03:02,869 --> 00:03:00,159
reverence and appreciation and space for

58
00:03:04,550 --> 00:03:02,879
animals that rely on sound in order to

59
00:03:07,270 --> 00:03:04,560
indirect in order to function for their

60
00:03:09,270 --> 00:03:07,280
basic life functions and and what it is

61
00:03:11,430 --> 00:03:09,280
that we are doing and can be doing to

62
00:03:12,790 --> 00:03:11,440
help facilitate that interaction so on

63
00:03:15,030 --> 00:03:12,800

the most basic level it means that i'm a

64

00:03:16,790 --> 00:03:15,040

researcher that i do i do research on

65

00:03:19,750 --> 00:03:16,800

underwater animals and what sounds they

66

00:03:21,589 --> 00:03:19,760

make um but on the broader scale it

67

00:03:23,509 --> 00:03:21,599

means that at the end of the day i am

68

00:03:25,110 --> 00:03:23,519

trying to make this world a better place

69

00:03:27,110 --> 00:03:25,120

for humans to listen and a better place

70

00:03:29,110 --> 00:03:27,120

for animals to live

71

00:03:32,070 --> 00:03:29,120

that's a really cool life mission i have

72

00:03:33,990 --> 00:03:32,080

to say um in in the film dr alan garland

73

00:03:35,670 --> 00:03:34,000

talks about kind of noticing the weird

74

00:03:37,190 --> 00:03:35,680

and and science often finds kind of

75

00:03:39,509 --> 00:03:37,200

interesting phenomena in in the

76

00:03:40,710 --> 00:03:39,519

anomalies in data and for a long time we

77

00:03:42,149 --> 00:03:40,720

assumed that humpback whales were just

78

00:03:44,229 --> 00:03:42,159

singing pretty songs and it turns out

79

00:03:45,589 --> 00:03:44,239

that that's not true uh but there's a

80

00:03:47,910 --> 00:03:45,599

lot more going on and you've set out to

81

00:03:49,750 --> 00:03:47,920

kind of decode that language so what

82

00:03:51,350 --> 00:03:49,760

what drove you to do this and where do

83

00:03:54,789 --> 00:03:51,360

you even start with something like this

84

00:03:57,110 --> 00:03:54,799

how do you decipher even what a word is

85

00:03:59,429 --> 00:03:57,120

yeah that's a great question so

86

00:04:01,350 --> 00:03:59,439

what drove me to do this wasn't wasn't

87

00:04:03,110 --> 00:04:01,360

science i wasn't a natural born

88

00:04:04,869 --> 00:04:03,120

scientist you know some people are are

89

00:04:07,830 --> 00:04:04,879

born with a desire to do science or to

90

00:04:10,229 --> 00:04:07,840

do math or to do physics um i i did not

91

00:04:12,869 --> 00:04:10,239

have that um but what i've always had is

92

00:04:15,190 --> 00:04:12,879

a lot of curiosity and that curiosity

93

00:04:17,270 --> 00:04:15,200

has driven me to many different places

94

00:04:19,909 --> 00:04:17,280

and lots of different fields and it took

95

00:04:22,469 --> 00:04:19,919

me a long time in my life to figure out

96

00:04:24,870 --> 00:04:22,479

what i wanted my career to be what did i

97

00:04:27,030 --> 00:04:24,880

want to do professionally and in that

98

00:04:29,510 --> 00:04:27,040

wandering

99

00:04:31,350 --> 00:04:29,520

have i moved to southeast alaska not

100

00:04:33,270 --> 00:04:31,360

because i thought oh i'm going to go and

101
00:04:36,070 --> 00:04:33,280
and and understand whales or i'm going

102
00:04:37,830 --> 00:04:36,080
to be a big you know animal lover um i i

103
00:04:40,550 --> 00:04:37,840
moved there because i was broke and

104
00:04:43,749 --> 00:04:40,560
because i wanted to get out of chicago

105
00:04:47,110 --> 00:04:43,759
where i was living and i wanted to

106
00:04:49,430 --> 00:04:47,120
get back outside and so i took a job on

107
00:04:51,270 --> 00:04:49,440
a whale watching boat because

108
00:04:53,430 --> 00:04:51,280
they would hire me i had never seen a

109
00:04:55,749 --> 00:04:53,440
whale i had never been to alaska i

110
00:04:58,550 --> 00:04:55,759
hadn't spent a lot of time on the water

111
00:05:01,670 --> 00:04:58,560
and i had the privilege of being out on

112
00:05:03,670 --> 00:05:01,680
this boat for 60 hours a week every week

113
00:05:04,550 --> 00:05:03,680

for four months out of the year

114

00:05:05,510 --> 00:05:04,560

and

115

00:05:08,230 --> 00:05:05,520

um

116

00:05:11,110 --> 00:05:08,240

and i i spent hours and hours and hours

117

00:05:13,029 --> 00:05:11,120

with whales and

118

00:05:14,790 --> 00:05:13,039

i started to notice though that this was

119

00:05:16,469 --> 00:05:14,800

a really profound experience for me it

120

00:05:19,430 --> 00:05:16,479

was really profound experience for my

121

00:05:22,150 --> 00:05:19,440

passengers but these boats were noisy

122

00:05:25,189 --> 00:05:22,160

and i i wanted to do something to give

123

00:05:27,350 --> 00:05:25,199

back if i had all of this time why was i

124

00:05:28,469 --> 00:05:27,360

not doing more this was benefiting me

125

00:05:31,029 --> 00:05:28,479

but it wasn't actually benefiting the

126

00:05:33,110 --> 00:05:31,039

animals and so from there i started to

127

00:05:35,510 --> 00:05:33,120

really think and concentrate on what the

128

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

impact of noise might be on the animals

129

00:05:39,590 --> 00:05:37,360

that i was watching i went back to

130

00:05:41,749 --> 00:05:39,600

school and in order to even begin to

131

00:05:43,909 --> 00:05:41,759

figure out how noise is changing

132

00:05:45,749 --> 00:05:43,919

humpback whale behavior well we first

133

00:05:48,790 --> 00:05:45,759

have to know what they're saying

134

00:05:50,390 --> 00:05:48,800

and it was shocking to me that in 2000 i

135

00:05:53,430 --> 00:05:50,400

think i started this work

136

00:05:54,629 --> 00:05:53,440

in 2009 but in 2011 i really dove into

137

00:05:55,590 --> 00:05:54,639

acoustics

138

00:05:57,510 --> 00:05:55,600

and

139

00:05:59,430 --> 00:05:57,520

i mean just 11 years ago we didn't even

140

00:06:00,550 --> 00:05:59,440

know what sounds alaskan humpback whales

141

00:06:02,150 --> 00:06:00,560

made

142

00:06:03,909 --> 00:06:02,160

we hadn't we didn't have a good

143

00:06:07,029 --> 00:06:03,919

catalogue to say oh yeah that belongs to

144

00:06:09,670 --> 00:06:07,039

a humpback and that was shocking to me

145

00:06:11,350 --> 00:06:09,680

that there was so little that was known

146

00:06:13,029 --> 00:06:11,360

and so i began documenting the sounds

147

00:06:14,710 --> 00:06:13,039

that the whales made and then from there

148

00:06:16,870 --> 00:06:14,720

i thought okay now i can do this concert

149

00:06:18,550 --> 00:06:16,880

but now i can meet my conservation goal

150

00:06:20,230 --> 00:06:18,560

but i couldn't because we still didn't

151
00:06:21,430 --> 00:06:20,240
know what the sounds meant and how do

152
00:06:22,870 --> 00:06:21,440
you protect something that you don't

153
00:06:25,029 --> 00:06:22,880
understand you have to demonstrate that

154
00:06:26,469 --> 00:06:25,039
it's vital and so that sort of set me

155
00:06:28,550 --> 00:06:26,479
down this other rabbit hole of saying

156
00:06:30,870 --> 00:06:28,560
okay well i guess the next step in my

157
00:06:33,350 --> 00:06:30,880
conservation journey is to understand

158
00:06:34,870 --> 00:06:33,360
how the whales are communicating and so

159
00:06:37,430 --> 00:06:34,880
i spent hours and hours and hours

160
00:06:39,029 --> 00:06:37,440
listening to these animals and trying to

161
00:06:41,189 --> 00:06:39,039
understand how they were interacting

162
00:06:44,309 --> 00:06:41,199
developing different hypotheses and then

163
00:06:46,390 --> 00:06:44,319

finally in 2019

164

00:06:48,790 --> 00:06:46,400

going out into the field and designing

165

00:06:51,189 --> 00:06:48,800

this very low impact

166

00:06:52,309 --> 00:06:51,199

experiment that would help us to

167

00:06:53,830 --> 00:06:52,319

understand how the whales were

168

00:06:55,589 --> 00:06:53,840

interacting with each other and i'm

169

00:06:57,510 --> 00:06:55,599

still following that line of questioning

170

00:06:59,589 --> 00:06:57,520

still trying to answer the questions of

171

00:07:01,909 --> 00:06:59,599

what do these sounds mean

172

00:07:03,430 --> 00:07:01,919

um but it's a very humbling experience

173

00:07:05,350 --> 00:07:03,440

because as it turns out these whales can

174

00:07:07,270 --> 00:07:05,360

produce

175

00:07:09,430 --> 00:07:07,280

dozens hundreds possibly an infinite

176
00:07:11,909 --> 00:07:09,440
combination of sounds and we are sort of

177
00:07:13,510 --> 00:07:11,919
going through them one by one one of the

178
00:07:14,790 --> 00:07:13,520
difficult things is that humpback whales

179
00:07:17,430 --> 00:07:14,800
can produce this

180
00:07:19,270 --> 00:07:17,440
wide wide range of sounds and um you

181
00:07:21,749 --> 00:07:19,280
know possibly an infinite combination of

182
00:07:23,909 --> 00:07:21,759
sounds and right now i we're in the

183
00:07:25,350 --> 00:07:23,919
process of trying to understand them

184
00:07:27,830 --> 00:07:25,360
one by one

185
00:07:29,430 --> 00:07:27,840
and so it seemed like a natural start to

186
00:07:31,189 --> 00:07:29,440
pick the sound that humpback whales use

187
00:07:33,029 --> 00:07:31,199
the most and that's sort of where we

188
00:07:33,990 --> 00:07:33,039

began this journey and

189

00:07:35,430 --> 00:07:34,000

we'll see

190

00:07:36,790 --> 00:07:35,440

what new methods we can come up with and

191

00:07:38,710 --> 00:07:36,800

how long it might

192

00:07:41,350 --> 00:07:38,720

how how long this rabbit hole might how

193

00:07:42,870 --> 00:07:41,360

deep it might be

194

00:07:44,950 --> 00:07:42,880

that's really cool before we get to that

195

00:07:46,950 --> 00:07:44,960

kind of magical eureka moment sound that

196

00:07:49,909 --> 00:07:46,960

uh we spoke about in the film uh can i

197

00:07:51,990 --> 00:07:49,919

just ask uh did whale communication kind

198

00:07:53,589 --> 00:07:52,000

of change during uh with the reduced

199

00:07:55,430 --> 00:07:53,599

noise during the pandemic how did how

200

00:07:57,430 --> 00:07:55,440

did that affect that

201
00:08:00,390 --> 00:07:57,440
yeah so we that's a really great

202
00:08:02,230 --> 00:08:00,400
question and that's a study that we

203
00:08:04,469 --> 00:08:02,240
started right when the pandemic hit

204
00:08:06,790 --> 00:08:04,479
actually um i remember sitting on the

205
00:08:09,110 --> 00:08:06,800
floor of my office on march the 13th

206
00:08:10,390 --> 00:08:09,120
friday the 13th 2020 and that was the

207
00:08:12,550 --> 00:08:10,400
last day that i was at work for the

208
00:08:14,790 --> 00:08:12,560
pandemic hit and we're all sort of

209
00:08:17,909 --> 00:08:14,800
packing up our offices and and wondering

210
00:08:19,510 --> 00:08:17,919
what's gonna happen next in life and um

211
00:08:21,670 --> 00:08:19,520
and someone said to me

212
00:08:24,230 --> 00:08:21,680
are you gonna put a hydrophone down

213
00:08:25,909 --> 00:08:24,240

and i thought oh yeah yes yes i'm

214

00:08:27,350 --> 00:08:25,919

absolutely gonna put a hydrophone down

215

00:08:29,510 --> 00:08:27,360

and i've been so caught up in sort of

216

00:08:30,950 --> 00:08:29,520

the social implications that i for 10

217

00:08:33,430 --> 00:08:30,960

minutes i did i wasn't thinking about

218

00:08:35,909 --> 00:08:33,440

whales but we sent a hydrophone up to

219

00:08:37,990 --> 00:08:35,919

glacier bay alaska and we listened

220

00:08:40,070 --> 00:08:38,000

during the pandemic and did find what i

221

00:08:41,909 --> 00:08:40,080

think several people have found which is

222

00:08:43,589 --> 00:08:41,919

the ocean got really quiet

223

00:08:45,990 --> 00:08:43,599

and that's not true everywhere but it

224

00:08:47,030 --> 00:08:46,000

certainly was true there and this is an

225

00:08:49,430 --> 00:08:47,040

area where we've been listening to

226

00:08:51,030 --> 00:08:49,440

whales for 50 years and actually a

227

00:08:53,430 --> 00:08:51,040

little bit longer we have this old

228

00:08:55,750 --> 00:08:53,440

record from the 70s and one of the

229

00:08:58,070 --> 00:08:55,760

amazing things that we found was that

230

00:08:59,990 --> 00:08:58,080

when it got quieter the quality of the

231

00:09:02,470 --> 00:09:00,000

conversation changed

232

00:09:04,470 --> 00:09:02,480

the the choice of sound types that the

233

00:09:06,870 --> 00:09:04,480

whales use shifted

234

00:09:09,509 --> 00:09:06,880

that during quiet periods they were more

235

00:09:10,949 --> 00:09:09,519

likely to contact call to um are sorry

236

00:09:13,190 --> 00:09:10,959

during noisy periods they were more

237

00:09:15,430 --> 00:09:13,200

likely to contact call to sort of try

238

00:09:17,350 --> 00:09:15,440

and stay in contact with one another and

239

00:09:19,670 --> 00:09:17,360

during these quiet periods associated

240

00:09:23,509 --> 00:09:19,680

with the pandemic the conversation got

241

00:09:25,509 --> 00:09:23,519

richer it got more complex and when we

242

00:09:28,470 --> 00:09:25,519

went back and compared this to these old

243

00:09:30,470 --> 00:09:28,480

recordings we had from 1976 when there

244

00:09:31,990 --> 00:09:30,480

weren't a lot of boats in the area

245

00:09:34,870 --> 00:09:32,000

what we found is that during the

246

00:09:36,590 --> 00:09:34,880

pandemic they basically reverted back

247

00:09:38,870 --> 00:09:36,600

to a sort of

248

00:09:42,310 --> 00:09:38,880

pre-industrial conversation

249

00:09:44,790 --> 00:09:42,320

um almost instantaneously so it was yeah

250

00:09:47,269 --> 00:09:44,800

it was super super super cool to see and

251

00:09:49,990 --> 00:09:47,279

also an indication of just how resilient

252

00:09:51,750 --> 00:09:50,000

humpback whales are that they can they

253

00:09:53,509 --> 00:09:51,760

can sort of bounce right back with

254

00:09:55,350 --> 00:09:53,519

getting the opportunity

255

00:09:56,470 --> 00:09:55,360

yeah absolutely it almost makes me think

256

00:09:58,150 --> 00:09:56,480

of you know when you're in a coffee shop

257

00:09:59,829 --> 00:09:58,160

with a friend and and it's a noisy

258

00:10:01,750 --> 00:09:59,839

environment and you don't have privacy

259

00:10:03,509 --> 00:10:01,760

and you talk about different things and

260

00:10:06,710 --> 00:10:03,519

and you might not get into as complex

261

00:10:08,790 --> 00:10:06,720

conversations as you would if you have

262

00:10:10,230 --> 00:10:08,800

yeah that's exactly it it's completely

263

00:10:12,630 --> 00:10:10,240

different versus like sitting on your

264

00:10:15,269 --> 00:10:12,640

couch cuddled up when you can

265

00:10:17,190 --> 00:10:15,279

bear all and then when there's time

266

00:10:20,949 --> 00:10:17,200

for nuance you know when when when

267

00:10:22,230 --> 00:10:20,959

there's when there's time for subtlety

268

00:10:24,069 --> 00:10:22,240

humans tend to think that we're

269

00:10:25,829 --> 00:10:24,079

amazingly intelligent yet here we are

270

00:10:28,069 --> 00:10:25,839

unable to talk to other forms of life on

271

00:10:29,590 --> 00:10:28,079

this planet um you know there's there's

272

00:10:31,910 --> 00:10:29,600

a lot to be said about communicating on

273

00:10:33,269 --> 00:10:31,920

our terms versus on their terms by which

274

00:10:37,269 --> 00:10:33,279

i mean you know whales learning english

275

00:10:39,269 --> 00:10:37,279

versus us learning whale um yeah you you

276

00:10:40,949 --> 00:10:39,279

uh said something in the movie where you

277

00:10:42,870 --> 00:10:40,959

said uh if i do my job the whale will

278

00:10:44,949 --> 00:10:42,880

never know that i'm there so you kind of

279

00:10:46,550 --> 00:10:44,959

have to trick the whale and i wanted to

280

00:10:48,150 --> 00:10:46,560

know how much wood and you've spoken

281

00:10:49,910 --> 00:10:48,160

kind of you touched on this a second ago

282

00:10:52,630 --> 00:10:49,920

but how much would knowing that you're

283

00:10:54,790 --> 00:10:52,640

there affect your results and do those

284

00:10:56,389 --> 00:10:54,800

sounds change in a group setting

285

00:10:57,590 --> 00:10:56,399

yeah i mean it would affect my results

286

00:10:59,110 --> 00:10:57,600

hugely

287

00:11:02,150 --> 00:10:59,120

i mean i don't

288

00:11:04,550 --> 00:11:02,160

contrary to sort of how all of the media

289

00:11:07,030 --> 00:11:04,560

around fathom has played out i don't

290

00:11:09,190 --> 00:11:07,040

have any desire to talk to whales

291

00:11:10,310 --> 00:11:09,200

um in fact i i would hope that humans

292

00:11:11,750 --> 00:11:10,320

never do

293

00:11:14,550 --> 00:11:11,760

i would hope that we would leave them

294

00:11:18,389 --> 00:11:14,560

alone and that we can happily let them

295

00:11:19,910 --> 00:11:18,399

go and do their thing and and so when i

296

00:11:22,069 --> 00:11:19,920

say that i have to trick the whale

297

00:11:24,389 --> 00:11:22,079

that's because my goal is to understand

298

00:11:26,949 --> 00:11:24,399

how whales talk to each other

299

00:11:29,750 --> 00:11:26,959

how they naturally interact and if i

300

00:11:32,550 --> 00:11:29,760

want to capture that as a researcher

301
00:11:35,110 --> 00:11:32,560
my job is to have as much fidelity as

302
00:11:38,389 --> 00:11:35,120
possible to the natural setting which

303
00:11:40,710 --> 00:11:38,399
means i have to behave like whale

304
00:11:43,030 --> 00:11:40,720
and a great deal of effort is put into

305
00:11:44,230 --> 00:11:43,040
making sure that the playbacks the you

306
00:11:46,069 --> 00:11:44,240
know the speaker that we put into the

307
00:11:47,350 --> 00:11:46,079
water to play sounds to these animals

308
00:11:50,310 --> 00:11:47,360
which is what we do you know we go to

309
00:11:51,670 --> 00:11:50,320
the ocean we find whales and and we play

310
00:11:53,030 --> 00:11:51,680
sounds to them and record how they

311
00:11:55,590 --> 00:11:53,040
respond

312
00:11:57,829 --> 00:11:55,600
the goal is to play sounds that sound

313
00:11:59,750 --> 00:11:57,839

exactly like a whale and that are played

314

00:12:01,030 --> 00:11:59,760

in the exact same cadence that a whale

315

00:12:03,590 --> 00:12:01,040

would say them

316

00:12:05,910 --> 00:12:03,600

and and to really mimic the natural

317

00:12:08,389 --> 00:12:05,920

world as closely as possible

318

00:12:09,430 --> 00:12:08,399

if i don't do that if i go out and i

319

00:12:12,310 --> 00:12:09,440

play

320

00:12:13,670 --> 00:12:12,320

um music to a whale for example

321

00:12:15,990 --> 00:12:13,680

which i've done you know you have to

322

00:12:17,990 --> 00:12:16,000

have a positive control sometimes so you

323

00:12:18,870 --> 00:12:18,000

know i i played bob marley to a whale

324

00:12:21,670 --> 00:12:18,880

once

325

00:12:23,970 --> 00:12:21,680

and which song did you choose

326

00:12:26,389 --> 00:12:23,980

uh i think we did three little birds

327

00:12:27,350 --> 00:12:26,399

[Laughter]

328

00:12:30,230 --> 00:12:27,360

um

329

00:12:32,550 --> 00:12:30,240

and and and then what i'm testing is

330

00:12:35,590 --> 00:12:32,560

does the whale have a novel response to

331

00:12:37,750 --> 00:12:35,600

a stimuli that it it doesn't know

332

00:12:39,829 --> 00:12:37,760

so then then i'm asking a completely

333

00:12:41,750 --> 00:12:39,839

different question how do does a whale

334

00:12:43,670 --> 00:12:41,760

respond when it when it sees or hears

335

00:12:45,910 --> 00:12:43,680

something unexpected

336

00:12:47,829 --> 00:12:45,920

and that's not my question i don't want

337

00:12:49,670 --> 00:12:47,839

to surprise the whale i want to

338

00:12:52,710 --> 00:12:49,680

understand the whale and so the work

339

00:12:54,949 --> 00:12:52,720

that i do the whole goal is to go out

340

00:12:57,430 --> 00:12:54,959

and to be as least invasive as possible

341

00:12:59,350 --> 00:12:57,440

while still deepening our understanding

342

00:13:01,190 --> 00:12:59,360

and it takes a while to do that i mean

343

00:13:03,030 --> 00:13:01,200

i've definitely played sounds to whales

344

00:13:04,629 --> 00:13:03,040

that i had to remove from the study

345

00:13:06,389 --> 00:13:04,639

because when i went back and listened to

346

00:13:07,910 --> 00:13:06,399

the recording i was like oh

347

00:13:10,230 --> 00:13:07,920

oh that definitely sounds like mickey

348

00:13:13,030 --> 00:13:10,240

mouse like that definitely sounds like

349

00:13:15,590 --> 00:13:13,040

whale robot and not like whale and so

350

00:13:17,509 --> 00:13:15,600

yes a whale probably responded to it but

351

00:13:19,509 --> 00:13:17,519

you know if siri started talking to me

352

00:13:22,230 --> 00:13:19,519

without me you know chatting her up

353

00:13:24,069 --> 00:13:22,240

first i might be surprised and so

354

00:13:26,629 --> 00:13:24,079

it's it's very similar to that with the

355

00:13:27,750 --> 00:13:26,639

whale is is the whale whales are are

356

00:13:30,949 --> 00:13:27,760

very

357

00:13:33,110 --> 00:13:30,959

subtle complex intelligent creatures and

358

00:13:35,350 --> 00:13:33,120

they have a very

359

00:13:38,629 --> 00:13:35,360

highly developed communication system so

360

00:13:40,310 --> 00:13:38,639

if i play a sound that sounds insincere

361

00:13:42,150 --> 00:13:40,320

without knowing everything there is to

362

00:13:43,670 --> 00:13:42,160

know about humpback whale hearing i

363

00:13:45,829 --> 00:13:43,680

would be surprised if it couldn't tell

364

00:13:47,189 --> 00:13:45,839

the difference between a synthesized

365

00:13:49,750 --> 00:13:47,199

sound and

366

00:13:52,230 --> 00:13:49,760

and a real one so my job is to be as

367

00:13:54,389 --> 00:13:52,240

faithful as possible

368

00:13:56,629 --> 00:13:54,399

sure so let's talk about some of these

369

00:13:58,629 --> 00:13:56,639

sounds so in the film we identified uh

370

00:14:00,069 --> 00:13:58,639

there was the tb the droplet the growl

371

00:14:02,310 --> 00:14:00,079

quite quite a lot of calls but there was

372

00:14:03,430 --> 00:14:02,320

one kind of magical one called the warp

373

00:14:05,030 --> 00:14:03,440

call

374

00:14:06,550 --> 00:14:05,040

that seemed to be the key can you tell

375

00:14:08,230 --> 00:14:06,560

me about that and whether all humpback

376

00:14:11,750 --> 00:14:08,240

whales make it

377

00:14:15,590 --> 00:14:13,910

this call i think is is one of the most

378

00:14:17,590 --> 00:14:15,600

important sounds that humpback whales

379

00:14:20,389 --> 00:14:17,600

worldwide produce

380

00:14:23,910 --> 00:14:20,399

so um it's it's a really lovely call it

381

00:14:28,629 --> 00:14:25,430

is sort of um

382

00:14:30,550 --> 00:14:28,639

how how i impersonate it and we've done

383

00:14:32,069 --> 00:14:30,560

some research again sort of laying the

384

00:14:35,110 --> 00:14:32,079

foundation for understanding all these

385

00:14:37,269 --> 00:14:35,120

things and in every population that we

386

00:14:38,230 --> 00:14:37,279

have looked for this call we have found

387

00:14:40,629 --> 00:14:38,240

it

388

00:14:42,310 --> 00:14:40,639

so i've listened to recordings from

389

00:14:44,069 --> 00:14:42,320

antarctica and heard whoop calls i've

390

00:14:46,069 --> 00:14:44,079

listened to recordings from south africa

391

00:14:47,910 --> 00:14:46,079

and her book calls from

392

00:14:51,350 --> 00:14:47,920

hawaii from

393

00:14:53,829 --> 00:14:51,360

from rortonga from iceland from norway

394

00:14:55,750 --> 00:14:53,839

from california from alaska every place

395

00:14:57,189 --> 00:14:55,760

where we have looked for it

396

00:14:59,350 --> 00:14:57,199

we have found it

397

00:15:01,750 --> 00:14:59,360

and this call is produced by male whales

398

00:15:04,550 --> 00:15:01,760

by female whales by young whales by old

399

00:15:06,470 --> 00:15:04,560

whales and they there are several calls

400

00:15:08,310 --> 00:15:06,480

that we think are are ubiquitous like

401
00:15:09,829 --> 00:15:08,320
this that might be innate you know calls

402
00:15:11,990 --> 00:15:09,839
that are sort of embedded in the

403
00:15:14,069 --> 00:15:12,000
humpback repertoire but this one really

404
00:15:15,269 --> 00:15:14,079
dominates in that it's very commonly

405
00:15:17,750 --> 00:15:15,279
used

406
00:15:19,829 --> 00:15:17,760
and when i you know i've listened to

407
00:15:21,430 --> 00:15:19,839
hundreds probably thousands of hours of

408
00:15:24,310 --> 00:15:21,440
humpback wheel

409
00:15:26,310 --> 00:15:24,320
you know acoustic exchanges and one of

410
00:15:28,230 --> 00:15:26,320
the things that myself and my colleague

411
00:15:30,629 --> 00:15:28,240
chris gabriel and and her colleague

412
00:15:33,110 --> 00:15:30,639
lauren wilde sort of noticed just by

413
00:15:34,949 --> 00:15:33,120

listening is that this call occurs in

414

00:15:37,110 --> 00:15:34,959

these counter calls

415

00:15:38,829 --> 00:15:37,120

that you hear one in a few moments you

416

00:15:41,829 --> 00:15:38,839

hear another one and they're slightly

417

00:15:43,990 --> 00:15:41,839

different and so we developed this

418

00:15:46,389 --> 00:15:44,000

hypothesis that this is a contact call

419

00:15:47,990 --> 00:15:46,399

this is a way that a whale would find

420

00:15:49,350 --> 00:15:48,000

and identify

421

00:15:52,150 --> 00:15:49,360

another whale

422

00:15:54,629 --> 00:15:52,160

and it's kind of like yelling marco polo

423

00:15:56,550 --> 00:15:54,639

yeah a little bit like marco polo a

424

00:15:58,870 --> 00:15:56,560

little bit exactly

425

00:16:00,310 --> 00:15:58,880

and and and the other thing that we're

426
00:16:03,030 --> 00:16:00,320
working on now and i'm actually headed

427
00:16:06,230 --> 00:16:03,040
to alaska in just a few weeks to dive

428
00:16:08,949 --> 00:16:06,240
into this is is this concept of voice

429
00:16:12,310 --> 00:16:08,959
is can you tell the individual by the

430
00:16:14,550 --> 00:16:12,320
sound of their voice and and if so is

431
00:16:16,150 --> 00:16:14,560
this the right call to find it if all

432
00:16:18,069 --> 00:16:16,160
whales are producing this call and

433
00:16:19,829 --> 00:16:18,079
whales use this to counter call back and

434
00:16:21,590 --> 00:16:19,839
forth with one another

435
00:16:22,949 --> 00:16:21,600
if there is embedded this concept of

436
00:16:25,829 --> 00:16:22,959
voice it means that whales might be

437
00:16:26,710 --> 00:16:25,839
using this this call to to identify one

438
00:16:27,509 --> 00:16:26,720

another

439

00:16:30,790 --> 00:16:27,519

and

440

00:16:32,069 --> 00:16:30,800

new research that just came out that

441

00:16:33,910 --> 00:16:32,079

demonstrates that humpback whales in

442

00:16:35,670 --> 00:16:33,920

alaska

443

00:16:37,189 --> 00:16:35,680

i mean they form relationships that last

444

00:16:40,069 --> 00:16:37,199

for decades

445

00:16:41,430 --> 00:16:40,079

and and different different whales spend

446

00:16:42,550 --> 00:16:41,440

time in sort of the in different

447

00:16:43,430 --> 00:16:42,560

communities

448

00:16:46,629 --> 00:16:43,440

and

449

00:16:49,189 --> 00:16:46,639

you're going to maintain a relationship

450

00:16:50,870 --> 00:16:49,199

underwater where light travels a very

451
00:16:51,910 --> 00:16:50,880
short distance and sound travels very

452
00:16:53,350 --> 00:16:51,920
very far

453
00:16:55,350 --> 00:16:53,360
it makes sense that if you're trying to

454
00:16:58,069 --> 00:16:55,360
find someone that you know

455
00:17:00,629 --> 00:16:58,079
that you'll do so through sound

456
00:17:01,670 --> 00:17:00,639
and so i think that this whoop call is

457
00:17:04,069 --> 00:17:01,680
um

458
00:17:06,470 --> 00:17:04,079
is the whale's way of maintaining

459
00:17:08,549 --> 00:17:06,480
contact with one another and

460
00:17:09,750 --> 00:17:08,559
and when and it also just shows up

461
00:17:11,909 --> 00:17:09,760
everywhere when you listen and it's a

462
00:17:14,470 --> 00:17:11,919
wonderful sound to hear and so it made

463
00:17:17,510 --> 00:17:14,480

sense when we're trying to understand

464

00:17:20,309 --> 00:17:17,520

the system of communication to to start

465

00:17:21,590 --> 00:17:20,319

there to start with the foundational

466

00:17:23,029 --> 00:17:21,600

you know you said earlier in this

467

00:17:24,630 --> 00:17:23,039

conversation that

468

00:17:26,949 --> 00:17:24,640

part of what science does is to

469

00:17:29,830 --> 00:17:26,959

recognize the unusual you know to find

470

00:17:32,070 --> 00:17:29,840

the weird and so much of science and a

471

00:17:34,630 --> 00:17:32,080

lot of society is about identifying the

472

00:17:37,669 --> 00:17:34,640

rare the rare and the precious

473

00:17:40,549 --> 00:17:37,679

and um i do the opposite of that i want

474

00:17:42,789 --> 00:17:40,559

to understand the most mundane humpback

475

00:17:45,029 --> 00:17:42,799

whale behavior there is i want to know

476

00:17:47,510 --> 00:17:45,039

what these whales do every single day

477

00:17:50,870 --> 00:17:47,520

without even giving it a second thought

478

00:17:53,510 --> 00:17:50,880

um i i am much less interested in

479

00:17:55,190 --> 00:17:53,520

the anomalous and and i want to be able

480

00:17:57,110 --> 00:17:55,200

to perceive the world from the

481

00:17:59,669 --> 00:17:57,120

perspective of these animals which means

482

00:18:01,909 --> 00:17:59,679

understanding their ordinary behavior

483

00:18:04,390 --> 00:18:01,919

and i think that this whoop call

484

00:18:08,630 --> 00:18:04,400

is sort of deeply seated in the root of

485

00:18:10,630 --> 00:18:08,640

of their their ordinary day-to-day life

486

00:18:12,549 --> 00:18:10,640

it's a really kind of magical call

487

00:18:14,310 --> 00:18:12,559

because it kind of almost sounds like

488

00:18:15,750 --> 00:18:14,320

they could be using it as a name or

489

00:18:17,990 --> 00:18:15,760

something you know an identifier for

490

00:18:20,150 --> 00:18:18,000

each other um and it's amazing to think

491

00:18:21,990 --> 00:18:20,160

that there's kind of this complex

492

00:18:23,830 --> 00:18:22,000

culture there um but i was hoping that

493

00:18:25,430 --> 00:18:23,840

you'd speak a little bit more about how

494

00:18:26,870 --> 00:18:25,440

complex that culture is but what do we

495

00:18:28,630 --> 00:18:26,880

mean by that when they say that we say

496

00:18:29,990 --> 00:18:28,640

that it's one of the oldest complex

497

00:18:31,909 --> 00:18:30,000

cultures

498

00:18:34,310 --> 00:18:31,919

yeah absolutely so

499

00:18:35,990 --> 00:18:34,320

um and you know the i i'll apologize now

500

00:18:37,909 --> 00:18:36,000

to the cultural anthropologists out

501
00:18:39,029 --> 00:18:37,919
there because um biologists have

502
00:18:40,870 --> 00:18:39,039
definitely

503
00:18:42,630 --> 00:18:40,880
co-opted this concept of culture and

504
00:18:43,750 --> 00:18:42,640
there's quite a large scientific debate

505
00:18:46,070 --> 00:18:43,760
over whether or not animals can have

506
00:18:47,510 --> 00:18:46,080
culture i certainly land on the side of

507
00:18:49,029 --> 00:18:47,520
yes animals can have culture and

508
00:18:50,070 --> 00:18:49,039
humpback oils are a great example of

509
00:18:53,909 --> 00:18:50,080
that

510
00:18:56,470 --> 00:18:53,919
um culture can be defined as information

511
00:18:58,789 --> 00:18:56,480
which is transmitted and learned

512
00:19:00,549 --> 00:18:58,799
um so information that one individual or

513
00:19:02,789 --> 00:19:00,559

one population gets from another

514

00:19:05,909 --> 00:19:02,799

individual or another population so it's

515

00:19:08,549 --> 00:19:05,919

not genetically passed on it's not um

516

00:19:10,870 --> 00:19:08,559

inherited from from you know from parent

517

00:19:12,870 --> 00:19:10,880

to offspring it's information that

518

00:19:14,710 --> 00:19:12,880

spreads and it can either be

519

00:19:15,830 --> 00:19:14,720

horizontally transmitted so you can

520

00:19:18,070 --> 00:19:15,840

learn it from someone of your same

521

00:19:20,390 --> 00:19:18,080

generation um someone you're not related

522

00:19:21,909 --> 00:19:20,400

to it can be obliquely transmitted so

523

00:19:23,590 --> 00:19:21,919

someone from another generation might

524

00:19:25,190 --> 00:19:23,600

send it down to a lower generation that

525

00:19:27,510 --> 00:19:25,200

they're not related to

526

00:19:29,270 --> 00:19:27,520

it's this concept that we can transfer

527

00:19:31,029 --> 00:19:29,280

and that animals can transfer

528

00:19:31,990 --> 00:19:31,039

information

529

00:19:41,029 --> 00:19:32,000

and

530

00:19:43,590 --> 00:19:41,039

thrive

531

00:19:44,470 --> 00:19:43,600

so we think of whale song as this really

532

00:19:47,110 --> 00:19:44,480

great

533

00:19:49,590 --> 00:19:47,120

example of cultural transmission because

534

00:19:52,390 --> 00:19:49,600

it's learned because animals learn it

535

00:19:54,070 --> 00:19:52,400

from each other and some of ellen's work

536

00:19:55,990 --> 00:19:54,080

and then really she's a person to talk

537

00:19:57,590 --> 00:19:56,000

to about this demonstrates that this

538

00:19:59,190 --> 00:19:57,600

song

539

00:20:01,110 --> 00:19:59,200

it travels at

540

00:20:03,350 --> 00:20:01,120

large scale from one population to

541

00:20:06,230 --> 00:20:03,360

another population and that it sort of

542

00:20:08,870 --> 00:20:06,240

moves from ocean basin to ocean basin in

543

00:20:11,270 --> 00:20:08,880

this pattern of social learning and we

544

00:20:12,870 --> 00:20:11,280

see this also with foraging behavior you

545

00:20:15,029 --> 00:20:12,880

know humpback whales are really

546

00:20:17,029 --> 00:20:15,039

behaviorally plastic they learn very

547

00:20:18,710 --> 00:20:17,039

quickly and so one animal might develop

548

00:20:21,190 --> 00:20:18,720

a new foraging technique and then

549

00:20:24,149 --> 00:20:21,200

another animal will observe it and adopt

550

00:20:25,750 --> 00:20:24,159

it and that behavior spreads and so the

551
00:20:27,990 --> 00:20:25,760
next thing we know we see a behavior

552
00:20:30,390 --> 00:20:28,000
that was really isolated amongst just a

553
00:20:31,750 --> 00:20:30,400
few individuals and and now it's a

554
00:20:32,950 --> 00:20:31,760
handful of individuals and now it's

555
00:20:34,390 --> 00:20:32,960
hundreds of individuals now it's

556
00:20:36,070 --> 00:20:34,400
thousands of individuals

557
00:20:37,830 --> 00:20:36,080
and now it's moving from one population

558
00:20:39,110 --> 00:20:37,840
to another population

559
00:20:41,669 --> 00:20:39,120
and so

560
00:20:43,590 --> 00:20:41,679
what's lovely about studying humpback

561
00:20:46,149 --> 00:20:43,600
whales in terms of culture is watching

562
00:20:46,870 --> 00:20:46,159
them learn from each other and watching

563
00:20:49,430 --> 00:20:46,880

them

564

00:20:52,390 --> 00:20:49,440

teach each other and of course this all

565

00:20:53,590 --> 00:20:52,400

has to be observed at these really grand

566

00:20:56,470 --> 00:20:53,600

scales

567

00:20:57,990 --> 00:20:56,480

because um you know whales communicate

568

00:21:00,149 --> 00:20:58,000

over long distances they travel long

569

00:21:03,029 --> 00:21:00,159

distances they live long lives so to

570

00:21:05,909 --> 00:21:03,039

watch a behavior ripple outward from one

571

00:21:06,950 --> 00:21:05,919

to many it takes a lot of perspective

572

00:21:08,789 --> 00:21:06,960

um

573

00:21:10,710 --> 00:21:08,799

but yeah they're an excellent example of

574

00:21:12,630 --> 00:21:10,720

it in nature for sure

575

00:21:14,549 --> 00:21:12,640

amazing uh there's a great sequence in

576

00:21:16,470 --> 00:21:14,559

the film where it's kind of um

577

00:21:18,470 --> 00:21:16,480

a pitch black screen and you see these

578

00:21:20,870 --> 00:21:18,480

kind of light shows uh on the screen as

579

00:21:22,470 --> 00:21:20,880

you're hearing the sounds uh kind of

580

00:21:24,390 --> 00:21:22,480

like lighthouses in the dark and the

581

00:21:26,149 --> 00:21:24,400

voiceover says it's like knowing where

582

00:21:27,750 --> 00:21:26,159

the stars fit within time and space with

583

00:21:29,029 --> 00:21:27,760

just your ears i thought that was a

584

00:21:31,190 --> 00:21:29,039

really beautiful way to pour it and

585

00:21:33,510 --> 00:21:31,200

maybe think of how the ocean just has

586

00:21:34,870 --> 00:21:33,520

this barrage of sound and i know if it

587

00:21:36,230 --> 00:21:34,880

was me that would give me a massive

588

00:21:38,470 --> 00:21:36,240

headache and i wouldn't know where to

589

00:21:41,350 --> 00:21:38,480

start with it but um how do whales kind

590

00:21:42,950 --> 00:21:41,360

of process all of those different kind

591

00:21:45,750 --> 00:21:42,960

of signals

592

00:21:48,710 --> 00:21:45,760

oh i don't know

593

00:21:50,710 --> 00:21:48,720

i i have no idea how they process these

594

00:21:52,070 --> 00:21:50,720

signals it's true because it isn't just

595

00:21:53,750 --> 00:21:52,080

the sound of each other that they're

596

00:21:55,110 --> 00:21:53,760

processing it's also the sound of all

597

00:21:57,110 --> 00:21:55,120

the other animals in the ocean that

598

00:21:58,549 --> 00:21:57,120

they're processing and they likely

599

00:22:00,390 --> 00:21:58,559

respond to that

600

00:22:02,149 --> 00:22:00,400

um you know there's there's fish and

601
00:22:03,590 --> 00:22:02,159
there's seals and there's wind and

602
00:22:06,470 --> 00:22:03,600
there's rain

603
00:22:07,669 --> 00:22:06,480
and and i i think that in the same way

604
00:22:08,870 --> 00:22:07,679
that

605
00:22:11,270 --> 00:22:08,880
you know i can

606
00:22:13,350 --> 00:22:11,280
i can look out into my garden and

607
00:22:15,350 --> 00:22:13,360
i can see the flowers and and the dew

608
00:22:18,549 --> 00:22:15,360
drops and the rain falling at the same

609
00:22:20,630 --> 00:22:18,559
time and my eyes can process that and if

610
00:22:22,310 --> 00:22:20,640
i'm processing it carefully i can i can

611
00:22:23,830 --> 00:22:22,320
both know what's there and i can also

612
00:22:25,029 --> 00:22:23,840
appreciate it

613
00:22:27,830 --> 00:22:25,039

i think that

614

00:22:29,750 --> 00:22:27,840

that's likely how it is for whales

615

00:22:32,470 --> 00:22:29,760

you know the sounds that they hear they

616

00:22:35,029 --> 00:22:32,480

have millions of years of evolutionary

617

00:22:37,830 --> 00:22:35,039

processes that have allowed them to

618

00:22:40,470 --> 00:22:37,840

interpret complex sounds and to pay

619

00:22:43,110 --> 00:22:40,480

attention to them in a way that seems

620

00:22:45,669 --> 00:22:43,120

almost impossible for humans

621

00:22:48,070 --> 00:22:45,679

and and so i think as always putting the

622

00:22:49,990 --> 00:22:48,080

animal into context helps quite a bit

623

00:22:52,310 --> 00:22:50,000

they've spent generations upon

624

00:22:55,830 --> 00:22:52,320

generations upon generations learning

625

00:22:57,669 --> 00:22:55,840

how to interpret those acoustic stars

626

00:23:00,070 --> 00:22:57,679

yeah absolutely it's really interesting

627

00:23:01,990 --> 00:23:00,080

how we are how we see the world is a

628

00:23:04,149 --> 00:23:02,000

product of how our biology developed and

629

00:23:05,430 --> 00:23:04,159

evolved um

630

00:23:07,590 --> 00:23:05,440

to that end

631

00:23:09,270 --> 00:23:07,600

uh excuse my ignorance but how do whales

632

00:23:11,590 --> 00:23:09,280

even make the sounds do they have vocal

633

00:23:14,230 --> 00:23:11,600

chords like we do or something else

634

00:23:16,470 --> 00:23:14,240

kind of they have vocal folds which is

635

00:23:20,310 --> 00:23:16,480

like a vocal cord homolog it's you know

636

00:23:21,830 --> 00:23:20,320

the whale version of a vocal cord and um

637

00:23:23,510 --> 00:23:21,840

i never get this quite right i really

638

00:23:25,029 --> 00:23:23,520

should do better at it but humans have

639

00:23:26,310 --> 00:23:25,039

vocal cords that go in one direction i

640

00:23:28,390 --> 00:23:26,320

believe they're horizontally and whales

641

00:23:30,149 --> 00:23:28,400

have vocal folds that go vertically i

642

00:23:31,510 --> 00:23:30,159

could be wrong about that but basically

643

00:23:34,070 --> 00:23:31,520

they do they have vocal folds that are

644

00:23:35,510 --> 00:23:34,080

very similar to ours and they pass air

645

00:23:37,110 --> 00:23:35,520

back and forth through these vocal folds

646

00:23:39,750 --> 00:23:37,120

similar to the way that humans produce

647

00:23:40,950 --> 00:23:39,760

sound the difference is it's a closed

648

00:23:44,070 --> 00:23:40,960

system

649

00:23:46,390 --> 00:23:44,080

when we produce sounds we exhale or

650

00:23:47,909 --> 00:23:46,400

inhale as we're talking but whales when

651
00:23:50,549 --> 00:23:47,919
they're producing sound underwater are

652
00:23:51,909 --> 00:23:50,559
not releasing air um you know there's no

653
00:23:53,750 --> 00:23:51,919
bubbles coming out of their of their

654
00:23:55,590 --> 00:23:53,760
blowhole when they vocalize and so it's

655
00:23:57,430 --> 00:23:55,600
actually the passage of sound back and

656
00:23:59,029 --> 00:23:57,440
forth across these vocal folds but also

657
00:24:01,269 --> 00:23:59,039
through a series of sinuses that are in

658
00:24:04,950 --> 00:24:01,279
their skull so it's just the passage of

659
00:24:07,269 --> 00:24:04,960
air over space producing vibrations

660
00:24:10,549 --> 00:24:07,279
and humpback whales are are exceptional

661
00:24:13,269 --> 00:24:10,559
in the range of sounds that they make so

662
00:24:15,269 --> 00:24:13,279
we don't see that in a lot of other in

663
00:24:16,630 --> 00:24:15,279

any other marine mammals except perhaps

664

00:24:17,510 --> 00:24:16,640

bowhead whales

665

00:24:19,669 --> 00:24:17,520

um

666

00:24:21,830 --> 00:24:19,679

and so a lot of that complexity we don't

667

00:24:23,750 --> 00:24:21,840

actually we don't we don't know the

668

00:24:25,750 --> 00:24:23,760

mechanism behind it

669

00:24:27,750 --> 00:24:25,760

um other than to say that it is still

670

00:24:31,269 --> 00:24:27,760

this mammalian system of communication

671

00:24:32,470 --> 00:24:31,279

but a closed a closed system

672

00:24:34,070 --> 00:24:32,480

that's really cool

673

00:24:35,990 --> 00:24:34,080

do whales use kind of

674

00:24:37,990 --> 00:24:36,000

because sound travels differently in

675

00:24:39,909 --> 00:24:38,000

different mediums so i wondered if what

676

00:24:41,590 --> 00:24:39,919

else kind of use different frequencies

677

00:24:42,549 --> 00:24:41,600

to call further or shorter distances

678

00:24:43,750 --> 00:24:42,559

maybe

679

00:24:45,269 --> 00:24:43,760

sure i mean that's definitely the

680

00:24:47,029 --> 00:24:45,279

running hypothesis and we use that

681

00:24:49,029 --> 00:24:47,039

hypothesis when we try and infer call

682

00:24:50,789 --> 00:24:49,039

function um and that's absolutely true

683

00:24:53,269 --> 00:24:50,799

for other odometer seats like um like

684

00:24:55,029 --> 00:24:53,279

dolphins and porpoises so low frequency

685

00:24:57,669 --> 00:24:55,039

sound underwater will travel much

686

00:24:59,990 --> 00:24:57,679

further than high frequency sound so the

687

00:25:01,510 --> 00:25:00,000

sound of a blue whale i mean modeling

688

00:25:03,590 --> 00:25:01,520

has shown that blue whale and fin whale

689

00:25:07,029 --> 00:25:03,600

vocalizations can travel for

690

00:25:09,029 --> 00:25:07,039

thousands of kilometers whereas um white

691

00:25:11,590 --> 00:25:09,039

sided dolphins for example that have

692

00:25:13,590 --> 00:25:11,600

very high frequency echolocation clicks

693

00:25:15,029 --> 00:25:13,600

those clicks will only travel

694

00:25:17,590 --> 00:25:15,039

several meters

695

00:25:19,269 --> 00:25:17,600

um and so there is absolutely a

696

00:25:22,310 --> 00:25:19,279

relationship between frequency and

697

00:25:24,310 --> 00:25:22,320

distance and um for humpback whales that

698

00:25:25,909 --> 00:25:24,320

produce sound within the range of human

699

00:25:26,870 --> 00:25:25,919

hearing you know everything that they

700

00:25:28,230 --> 00:25:26,880

that they

701

00:25:31,190 --> 00:25:28,240

all the sounds they produce we can more

702

00:25:32,630 --> 00:25:31,200

or less hear um we we can use whether or

703

00:25:35,430 --> 00:25:32,640

not they've produced this really high

704

00:25:38,230 --> 00:25:35,440

squeaky up sweep or this really low boom

705

00:25:40,070 --> 00:25:38,240

to infer something about call function

706

00:25:41,590 --> 00:25:40,080

um and then some of the sounds that they

707

00:25:43,590 --> 00:25:41,600

make are very closely coupled with

708

00:25:45,350 --> 00:25:43,600

things like prey you know humpback

709

00:25:47,110 --> 00:25:45,360

whales produce a feeding call in the

710

00:25:48,630 --> 00:25:47,120

pacific in southeast alaska and in

711

00:25:51,190 --> 00:25:48,640

northern british columbia

712

00:25:53,110 --> 00:25:51,200

it's a 500 hertz call sounds a little

713

00:25:55,110 --> 00:25:53,120

bit like an opera singers you know

714

00:25:56,870 --> 00:25:55,120

sustaining a note

715

00:25:58,789 --> 00:25:56,880

um we don't hear that call in other

716

00:26:00,549 --> 00:25:58,799

populations we do believe that this call

717

00:26:02,470 --> 00:26:00,559

is culturally transmitted that it's

718

00:26:03,590 --> 00:26:02,480

passed from one you know one generation

719

00:26:04,549 --> 00:26:03,600

to the other

720

00:26:06,549 --> 00:26:04,559

um

721

00:26:09,830 --> 00:26:06,559

but that call is very closely coupled

722

00:26:13,190 --> 00:26:09,840

with hearing in fish in in one specific

723

00:26:15,029 --> 00:26:13,200

fish in the pacific herring and so the

724

00:26:17,590 --> 00:26:15,039

only time we hear it is when humpback

725

00:26:20,070 --> 00:26:17,600

whales are foraging on pacific herring

726

00:26:22,710 --> 00:26:20,080

and if they up shifted and made that

727

00:26:24,710 --> 00:26:22,720

call much higher or downshifted and made

728

00:26:26,149 --> 00:26:24,720

the call much lower the fish wouldn't

729

00:26:27,350 --> 00:26:26,159

hear it as well and so they wouldn't

730

00:26:29,909 --> 00:26:27,360

respond

731

00:26:32,310 --> 00:26:29,919

and so we see that humpback whales are

732

00:26:33,990 --> 00:26:32,320

very adept at coupling the sounds they

733

00:26:36,470 --> 00:26:34,000

make with the environments that they're

734

00:26:38,310 --> 00:26:36,480

in how far can your your microphones

735

00:26:39,669 --> 00:26:38,320

here then because i imagine there's

736

00:26:41,830 --> 00:26:39,679

there's a lot of work that goes into

737

00:26:43,110 --> 00:26:41,840

replicating those kind of you know the

738

00:26:45,430 --> 00:26:43,120

ears that connect up those sounds

739

00:26:47,669 --> 00:26:45,440

underwater yeah well it all depends on

740

00:26:50,070 --> 00:26:47,679

how loud the whale is calling

741

00:26:52,230 --> 00:26:50,080

um so you know humpback whales when they

742

00:26:54,630 --> 00:26:52,240

sing they produce these really loud

743

00:26:57,110 --> 00:26:54,640

songs songs can be heard for kilometers

744

00:26:59,669 --> 00:26:57,120

um you know tens tens of kilometers

745

00:27:01,190 --> 00:26:59,679

depending on oceanographic conditions

746

00:27:02,789 --> 00:27:01,200

um

747

00:27:04,630 --> 00:27:02,799

where i do my work the sounds don't

748

00:27:06,710 --> 00:27:04,640

actually travel very far

749

00:27:08,070 --> 00:27:06,720

like my microphone can hear far my

750

00:27:09,269 --> 00:27:08,080

microphone can hear boats that are 10

751
00:27:10,149 --> 00:27:09,279
miles away

752
00:27:11,830 --> 00:27:10,159
um

753
00:27:13,590 --> 00:27:11,840
but it can't hear a whale that's that

754
00:27:15,190 --> 00:27:13,600
far away because the whale isn't that

755
00:27:17,750 --> 00:27:15,200
loud

756
00:27:18,710 --> 00:27:17,760
so what i find in them though

757
00:27:20,470 --> 00:27:18,720
what our

758
00:27:22,630 --> 00:27:20,480
what the science tells us is that in

759
00:27:24,549 --> 00:27:22,640
alaska you can only hear humpback whales

760
00:27:26,710 --> 00:27:24,559
for maybe three or four kilometers not

761
00:27:28,310 --> 00:27:26,720
that far you know given the fact that

762
00:27:31,029 --> 00:27:28,320
they can produce sounds that can travel

763
00:27:33,590 --> 00:27:31,039

for tens or twenty you know you know

764

00:27:36,230 --> 00:27:33,600

tens of kilometers um

765

00:27:38,389 --> 00:27:36,240

and so the question there is why

766

00:27:39,750 --> 00:27:38,399

why is it that humpback whales in alaska

767

00:27:41,430 --> 00:27:39,760

are so quiet

768

00:27:44,149 --> 00:27:41,440

what secrets are they telling that they

769

00:27:46,389 --> 00:27:44,159

are whispering instead of screaming and

770

00:27:48,549 --> 00:27:46,399

when we do our work we try and replicate

771

00:27:49,590 --> 00:27:48,559

that exactly so we produce sounds that

772

00:27:51,909 --> 00:27:49,600

are the same

773

00:27:53,350 --> 00:27:51,919

loudness or i guess the same quietness

774

00:27:54,149 --> 00:27:53,360

as the whales itself

775

00:27:56,070 --> 00:27:54,159

um

776

00:27:58,149 --> 00:27:56,080

but the answer is that the whales that

777

00:28:00,230 --> 00:27:58,159

i'm listening to in alaska

778

00:28:02,549 --> 00:28:00,240

aren't actually that far away usually if

779

00:28:04,149 --> 00:28:02,559

i can see them i can hear them and

780

00:28:08,230 --> 00:28:04,159

usually if i can hear a whale on my

781

00:28:09,830 --> 00:28:08,240

hydrophone it's probably within eyesight

782

00:28:11,909 --> 00:28:09,840

okay that's interesting

783

00:28:13,590 --> 00:28:11,919

earlier you mentioned uh the whales

784

00:28:15,269 --> 00:28:13,600

travel real fur and i know that birds

785

00:28:16,789 --> 00:28:15,279

navigate using magnetic fields and

786

00:28:19,029 --> 00:28:16,799

there's all sorts of ways that animals

787

00:28:21,830 --> 00:28:19,039

interpret the world um do we know how

788

00:28:23,110 --> 00:28:21,840

humpback whales navigate the world

789

00:28:25,190 --> 00:28:23,120

no

790

00:28:27,110 --> 00:28:25,200

um so i hope that there are lots of

791

00:28:28,710 --> 00:28:27,120

budding marine biologists out there that

792

00:28:30,950 --> 00:28:28,720

are still interested in answering all of

793

00:28:32,470 --> 00:28:30,960

the questions that we it seems like we

794

00:28:33,350 --> 00:28:32,480

should know when we don't

795

00:28:35,190 --> 00:28:33,360

um

796

00:28:36,710 --> 00:28:35,200

we we know there's some evidence that

797

00:28:38,549 --> 00:28:36,720

similar to birds that humpback whales

798

00:28:41,269 --> 00:28:38,559

might be using um

799

00:28:42,870 --> 00:28:41,279

might be using magnets there's a really

800

00:28:44,710 --> 00:28:42,880

really interesting paper that says that

801
00:28:45,750 --> 00:28:44,720
humpback whales might actually be using

802
00:28:47,909 --> 00:28:45,760
um

803
00:28:49,750 --> 00:28:47,919
gravitational pull you know differences

804
00:28:53,269 --> 00:28:49,760
in the gravitational field

805
00:28:55,590 --> 00:28:53,279
um to to migrate more effectively um

806
00:28:57,990 --> 00:28:55,600
there's plenty of hypotheses that whales

807
00:28:59,510 --> 00:28:58,000
listen for acoustic cues and that they

808
00:29:00,549 --> 00:28:59,520
can actually listen their way to where

809
00:29:01,750 --> 00:29:00,559
they're going

810
00:29:03,430 --> 00:29:01,760
um

811
00:29:05,350 --> 00:29:03,440
i i mean as an acoustician i certainly

812
00:29:06,789 --> 00:29:05,360
subscribe to that one i know that if i

813
00:29:09,190 --> 00:29:06,799

close my eyes and walk up and down my

814

00:29:11,269 --> 00:29:09,200

street i know how close i am to my house

815

00:29:12,950 --> 00:29:11,279

i mean i can i can hear my chickens

816

00:29:14,789 --> 00:29:12,960

clucking before i turn the corner and i

817

00:29:16,950 --> 00:29:14,799

know that i'm almost home

818

00:29:19,110 --> 00:29:16,960

and we know that soundscapes in the

819

00:29:20,470 --> 00:29:19,120

ocean are unique that sound of a coral

820

00:29:21,830 --> 00:29:20,480

reef is different than the sound of a

821

00:29:24,710 --> 00:29:21,840

kelp bed which is different than the

822

00:29:26,549 --> 00:29:24,720

sound of the basin in open ocean so

823

00:29:27,590 --> 00:29:26,559

likely they they could be using sound

824

00:29:29,590 --> 00:29:27,600

but

825

00:29:30,389 --> 00:29:29,600

do we know exactly

826

00:29:37,510 --> 00:29:30,399

no

827

00:29:38,870 --> 00:29:37,520

they do it and i would say that that is

828

00:29:41,269 --> 00:29:38,880

very much

829

00:29:43,990 --> 00:29:41,279

where we are with a lot of science with

830

00:29:46,630 --> 00:29:44,000

a lot of marine mammal sciences often we

831

00:29:49,350 --> 00:29:46,640

know the what and that took

832

00:29:52,389 --> 00:29:49,360

a long time and lots of people

833

00:29:54,389 --> 00:29:52,399

we're beginning to understand the how

834

00:29:56,710 --> 00:29:54,399

but it's going to be the future marine

835

00:30:01,510 --> 00:29:56,720

biologists who really

836

00:30:04,710 --> 00:30:03,190

the the frontier there is is really

837

00:30:07,110 --> 00:30:04,720

incredible and your rights point out

838

00:30:09,190 --> 00:30:07,120

that there's a lot that we think of as

839

00:30:10,789 --> 00:30:09,200

kind of solved that really isn't you

840

00:30:12,310 --> 00:30:10,799

know the worlds are kind of it's full of

841

00:30:13,750 --> 00:30:12,320

these real mysteries that people can go

842

00:30:15,990 --> 00:30:13,760

out and solve

843

00:30:19,750 --> 00:30:16,000

what what is the the kind of

844

00:30:22,310 --> 00:30:19,760

weirdest or coolest way that an animal

845

00:30:23,990 --> 00:30:22,320

uh you know communicates or kind of sees

846

00:30:29,110 --> 00:30:24,000

the world that you've come across

847

00:30:32,710 --> 00:30:31,190

that's a great question i mean there's

848

00:30:34,789 --> 00:30:32,720

so many

849

00:30:36,230 --> 00:30:34,799

amazing examples of how animals

850

00:30:38,789 --> 00:30:36,240

communicate that are completely

851

00:30:40,789 --> 00:30:38,799

non-intuitive to humans

852

00:30:43,590 --> 00:30:40,799

um i mean i'm always partial to to

853

00:30:45,590 --> 00:30:43,600

underwater animals but i mean this is a

854

00:30:47,350 --> 00:30:45,600

fairly common example but the waggle

855

00:30:49,029 --> 00:30:47,360

dance and honeybees

856

00:30:51,430 --> 00:30:49,039

you know

857

00:30:53,669 --> 00:30:51,440

they they will fly in specific patterns

858

00:30:55,750 --> 00:30:53,679

in in in this sort of aerial dance to

859

00:30:57,269 --> 00:30:55,760

transmit information on where on where

860

00:30:59,110 --> 00:30:57,279

pollen is and on where good you know

861

00:31:01,509 --> 00:30:59,120

where flower sources are

862

00:31:03,750 --> 00:31:01,519

i mean that's a very what we think of as

863

00:31:05,190 --> 00:31:03,760

a comparatively simple creature with

864

00:31:06,549 --> 00:31:05,200

this incredibly complex system of

865

00:31:07,830 --> 00:31:06,559

communication which i think is just

866

00:31:08,789 --> 00:31:07,840

extraordinary

867

00:31:10,789 --> 00:31:08,799

um

868

00:31:12,710 --> 00:31:10,799

or or you know

869

00:31:13,909 --> 00:31:12,720

you know other sort of simple examples

870

00:31:15,669 --> 00:31:13,919

are the fact that

871

00:31:17,509 --> 00:31:15,679

like birds will couple the sounds of

872

00:31:19,110 --> 00:31:17,519

their calls with their environment you

873

00:31:20,389 --> 00:31:19,120

can listen to a bird and you can tell

874

00:31:22,310 --> 00:31:20,399

whether or not it's calling from a

875

00:31:24,789 --> 00:31:22,320

prairie or whether or not it's calling

876
00:31:26,710 --> 00:31:24,799
from a forest because sound can be more

877
00:31:28,549 --> 00:31:26,720
complex in a prairie it doesn't run into

878
00:31:30,549 --> 00:31:28,559
trees and bounce around but you might

879
00:31:31,669 --> 00:31:30,559
need to have a simpler call to call in

880
00:31:33,509 --> 00:31:31,679
the forest

881
00:31:35,669 --> 00:31:33,519
um but certainly some of my favorite

882
00:31:37,350 --> 00:31:35,679
sounds that i've ever listened to are

883
00:31:39,110 --> 00:31:37,360
are marine animals

884
00:31:40,870 --> 00:31:39,120
um i would encourage everyone to go and

885
00:31:43,350 --> 00:31:40,880
listen to the vocalization of a bearded

886
00:31:44,950 --> 00:31:43,360
seal it's one of the most extraordinary

887
00:31:46,470 --> 00:31:44,960
sounds on this planet

888
00:31:48,549 --> 00:31:46,480

and it sounds like it couldn't even come

889

00:31:50,710 --> 00:31:48,559

from earth it sounds like what you might

890

00:31:52,630 --> 00:31:50,720

imagine the soundtrack to a marvin the

891

00:31:54,630 --> 00:31:52,640

martian cartoon might be

892

00:31:56,950 --> 00:31:54,640

and and that animal is in the high

893

00:31:58,549 --> 00:31:56,960

arctic on the very northern tips of

894

00:32:01,509 --> 00:31:58,559

alaska and

895

00:32:03,190 --> 00:32:01,519

and off of you know greenland and if you

896

00:32:05,590 --> 00:32:03,200

listen then to the sound of a weddle

897

00:32:07,590 --> 00:32:05,600

seal which is an antarctic seal the two

898

00:32:09,509 --> 00:32:07,600

will never meet they will never cross

899

00:32:12,710 --> 00:32:09,519

the equator and interact but it's

900

00:32:14,950 --> 00:32:12,720

amazing how similar their vocalizations

901
00:32:16,470 --> 00:32:14,960
are weddel seals will also produce

902
00:32:19,430 --> 00:32:16,480
sounds that seem like they couldn't

903
00:32:21,830 --> 00:32:19,440
possibly be coming from an animal it

904
00:32:24,230 --> 00:32:21,840
must be coming from a ray gun

905
00:32:27,029 --> 00:32:24,240
um and so what does it mean that these

906
00:32:28,549 --> 00:32:27,039
two seal species that are you know

907
00:32:30,310 --> 00:32:28,559
millions of years separated in

908
00:32:32,549 --> 00:32:30,320
evolutionary lineage

909
00:32:35,509 --> 00:32:32,559
are sort of acoustic cousins in their

910
00:32:37,750 --> 00:32:35,519
icy bays so i would say that the weddle

911
00:32:40,149 --> 00:32:37,760
seals and the bearded seals are perhaps

912
00:32:41,590 --> 00:32:40,159
the most interesting animals to listen

913
00:32:43,029 --> 00:32:41,600

to

914

00:32:44,549 --> 00:32:43,039

i will definitely link those sounds in

915

00:32:46,230 --> 00:32:44,559

the description so people can go and

916

00:32:48,710 --> 00:32:46,240

listen to them and i'll do that right

917

00:32:50,149 --> 00:32:48,720

after our talk as well ah wonderful good

918

00:32:52,389 --> 00:32:50,159

good good

919

00:32:54,070 --> 00:32:52,399

uh you you talked about uh in in other

920

00:32:55,669 --> 00:32:54,080

places understanding sound through

921

00:32:57,029 --> 00:32:55,679

experience and how your dad's love of

922

00:32:58,950 --> 00:32:57,039

classical music helps you kind of

923

00:33:00,789 --> 00:32:58,960

appreciate sound and in the movie i

924

00:33:02,870 --> 00:33:00,799

really loved uh the the human touch the

925

00:33:04,230 --> 00:33:02,880

moments where i got to watch

926
00:33:05,590 --> 00:33:04,240
all of you guys kind of listening to

927
00:33:08,310 --> 00:33:05,600
those sounds and closing your eyes and

928
00:33:10,630 --> 00:33:08,320
really experience in the moment um

929
00:33:12,389 --> 00:33:10,640
and it reminded me of in in the movie

930
00:33:14,630 --> 00:33:12,399
arrival the research study in the kind

931
00:33:16,070 --> 00:33:14,640
of e.t language she she's affected by

932
00:33:17,750 --> 00:33:16,080
the language she's studying i think it's

933
00:33:20,230 --> 00:33:17,760
called the sapi award

934
00:33:21,909 --> 00:33:20,240
hypothesis and i wanted to ask how your

935
00:33:25,190 --> 00:33:21,919
research has affected you and if you

936
00:33:27,029 --> 00:33:25,200
dream maybe in whoops now

937
00:33:30,149 --> 00:33:27,039
um

938
00:33:31,669 --> 00:33:30,159

my research has very much affected me

939

00:33:36,549 --> 00:33:31,679

i am

940

00:33:38,870 --> 00:33:36,559

naturalist and biologists in that

941

00:33:40,789 --> 00:33:38,880

all of my hypotheses are driven by

942

00:33:43,590 --> 00:33:40,799

observations first

943

00:33:46,630 --> 00:33:43,600

and then i develop studies to answer

944

00:33:48,070 --> 00:33:46,640

those questions which means

945

00:33:50,830 --> 00:33:48,080

i don't

946

00:33:52,470 --> 00:33:50,840

go out into the natural world with an

947

00:33:56,149 --> 00:33:52,480

expectation

948

00:33:58,710 --> 00:33:56,159

i i'd spend a lot of time observing

949

00:33:59,990 --> 00:33:58,720

and that is very much something that i

950

00:34:03,590 --> 00:34:00,000

learned from my family from my

951
00:34:04,789 --> 00:34:03,600
stepfather um how how to be a good

952
00:34:05,509 --> 00:34:04,799
listener

953
00:34:10,069 --> 00:34:05,519
and

954
00:34:12,230 --> 00:34:10,079
it was the process of listening to music

955
00:34:14,550 --> 00:34:12,240
that taught me how to listen to whales

956
00:34:15,909 --> 00:34:14,560
and then in the

957
00:34:18,389 --> 00:34:15,919
over a decade now that i've been

958
00:34:20,550 --> 00:34:18,399
listening to whales i found that i have

959
00:34:22,790 --> 00:34:20,560
learned how to listen to other things in

960
00:34:25,190 --> 00:34:22,800
a way that i did not expect

961
00:34:27,349 --> 00:34:25,200
um i hear subtlety

962
00:34:29,430 --> 00:34:27,359
that i didn't hear before i spent so

963
00:34:31,190 --> 00:34:29,440

much time with headphones on listening

964

00:34:35,430 --> 00:34:31,200

to things underwater

965

00:34:39,030 --> 00:34:35,440

and i very rarely hear silence

966

00:34:41,909 --> 00:34:39,040

because the world is very rarely quiet

967

00:34:43,589 --> 00:34:41,919

and and that's something that i learned

968

00:34:45,190 --> 00:34:43,599

from listening to whales that it isn't

969

00:34:47,750 --> 00:34:45,200

just about listening to the sounds that

970

00:34:50,310 --> 00:34:47,760

they make it is listening to the pauses

971

00:34:53,669 --> 00:34:50,320

in between the sounds that they make

972

00:34:54,869 --> 00:34:53,679

and so i don't dream in whoops anymore

973

00:34:58,150 --> 00:34:54,879

i used to

974

00:35:00,310 --> 00:34:58,160

and when i'm in the field i certainly

975

00:35:02,150 --> 00:35:00,320

i dream i dream

976
00:35:03,430 --> 00:35:02,160
about the sounds and i dream about the

977
00:35:05,190 --> 00:35:03,440
ocean

978
00:35:06,390 --> 00:35:05,200
what i dream about

979
00:35:09,670 --> 00:35:06,400
is

980
00:35:11,910 --> 00:35:09,680
whales that are impossibly big

981
00:35:13,750 --> 00:35:11,920
larger than houses bigger than the

982
00:35:16,310 --> 00:35:13,760
empire state building

983
00:35:19,190 --> 00:35:16,320
that are in our world so i have this

984
00:35:20,470 --> 00:35:19,200
recurring dream of these giant whales

985
00:35:22,470 --> 00:35:20,480
that are

986
00:35:23,430 --> 00:35:22,480
are swimming through

987
00:35:26,310 --> 00:35:23,440
sort of

988
00:35:28,870 --> 00:35:26,320

city streets that are now oceans and

989

00:35:31,670 --> 00:35:28,880

as if to say like this is how large this

990

00:35:33,430 --> 00:35:31,680

animal's existence actually is as big as

991

00:35:35,750 --> 00:35:33,440

they are in the ocean

992

00:35:36,790 --> 00:35:35,760

the essence of them is actually much

993

00:35:37,910 --> 00:35:36,800

much

994

00:35:39,750 --> 00:35:37,920

bigger

995

00:35:40,710 --> 00:35:39,760

and you can figure that out if you

996

00:35:42,790 --> 00:35:40,720

listen

997

00:35:44,390 --> 00:35:42,800

and so you can actually begin to get the

998

00:35:46,790 --> 00:35:44,400

scale of the animal

999

00:35:49,030 --> 00:35:46,800

by listening to it rather than looking

1000

00:35:50,790 --> 00:35:49,040

at it and so i think that being able to

1001
00:35:53,990 --> 00:35:50,800
listen to these animals gives me greater

1002
00:35:59,030 --> 00:35:54,790
for

1003
00:36:00,470 --> 00:35:59,040
thank you i i really hope that one day

1004
00:36:01,990 --> 00:36:00,480
someone kind of takes your description

1005
00:36:03,829 --> 00:36:02,000
there and kind of makes a visual so you

1006
00:36:07,030 --> 00:36:03,839
can see that that would be a really cool

1007
00:36:10,710 --> 00:36:07,040
you know painting or cg kind of escape

1008
00:36:13,510 --> 00:36:10,720
yeah yeah that's a great idea

1009
00:36:15,589 --> 00:36:13,520
so wales really evolved to build

1010
00:36:17,349 --> 00:36:15,599
relationships in the dark and in a real

1011
00:36:18,710 --> 00:36:17,359
figurative sense humanity is kind of

1012
00:36:19,670 --> 00:36:18,720
similar you know we come into this world

1013
00:36:21,109 --> 00:36:19,680

in the dark and we're all kind of

1014

00:36:24,230 --> 00:36:21,119

putting our faith in other people when

1015

00:36:26,310 --> 00:36:24,240

we you know make connections uh so based

1016

00:36:27,990 --> 00:36:26,320

on your research i wanted to ask if you

1017

00:36:29,910 --> 00:36:28,000

think there are lessons that humanity

1018

00:36:31,589 --> 00:36:29,920

can can learn from wales and if you

1019

00:36:33,349 --> 00:36:31,599

think that nature's more about survival

1020

00:36:35,990 --> 00:36:33,359

of the fittest or if it's more about

1021

00:36:37,990 --> 00:36:36,000

cooperation

1022

00:36:41,349 --> 00:36:38,000

um i'll answer the latter question first

1023

00:36:42,390 --> 00:36:41,359

i think it is about both i think that we

1024

00:36:44,470 --> 00:36:42,400

it

1025

00:36:46,870 --> 00:36:44,480

nature is complex

1026
00:36:49,829 --> 00:36:46,880
and in some cases it is survival of the

1027
00:36:51,510 --> 00:36:49,839
fittest and strong survive and in other

1028
00:36:53,430 --> 00:36:51,520
species and other contexts it is the

1029
00:36:55,270 --> 00:36:53,440
cooperative that survive

1030
00:36:58,550 --> 00:36:55,280
and i think that it is important to

1031
00:36:59,270 --> 00:36:58,560
recognize that natural laws are varied

1032
00:37:01,270 --> 00:36:59,280
and

1033
00:37:03,349 --> 00:37:01,280
that there is no one single thing that

1034
00:37:05,510 --> 00:37:03,359
applies to everything

1035
00:37:07,430 --> 00:37:05,520
i mean even even gravity has its

1036
00:37:10,550 --> 00:37:07,440
limitations underwater you can defy it

1037
00:37:14,069 --> 00:37:10,560
with buoyancy and

1038
00:37:16,069 --> 00:37:14,079

so i i think that it is important to

1039

00:37:18,230 --> 00:37:16,079

recognize that

1040

00:37:20,710 --> 00:37:18,240

there is no black and white answer to

1041

00:37:22,390 --> 00:37:20,720

any question about nature

1042

00:37:23,829 --> 00:37:22,400

and maybe that's the lesson that i have

1043

00:37:27,030 --> 00:37:23,839

learned from wales

1044

00:37:29,589 --> 00:37:27,040

is that it is okay to not know

1045

00:37:31,430 --> 00:37:29,599

not knowing something doesn't make it

1046

00:37:33,510 --> 00:37:31,440

lesser than

1047

00:37:36,390 --> 00:37:33,520

something being ordinary doesn't mean

1048

00:37:38,390 --> 00:37:36,400

that it's not also extraordinary and

1049

00:37:41,030 --> 00:37:38,400

that it is not always the exception to

1050

00:37:43,829 --> 00:37:41,040

the rule that is interesting

1051

00:37:45,589 --> 00:37:43,839

sometimes it is simply being that is

1052

00:37:48,630 --> 00:37:45,599

interesting

1053

00:37:51,750 --> 00:37:48,640

and i i worry sometimes that we spend so

1054

00:37:55,030 --> 00:37:51,760

much time trying to

1055

00:37:57,030 --> 00:37:55,040

be special and unique and different

1056

00:37:59,589 --> 00:37:57,040

and to stand out

1057

00:38:02,829 --> 00:37:59,599

that that becomes more important than

1058

00:38:04,630 --> 00:38:02,839

the ability to simply gloriously

1059

00:38:06,630 --> 00:38:04,640

be and

1060

00:38:09,910 --> 00:38:06,640

humpback whales spend all of their time

1061

00:38:11,670 --> 00:38:09,920

simply gloriously being i mean they're

1062

00:38:14,390 --> 00:38:11,680

out there right now doing exactly what

1063

00:38:17,349 --> 00:38:14,400

they do and and our species finds it

1064

00:38:19,270 --> 00:38:17,359

fascinating when they take a breath

1065

00:38:20,710 --> 00:38:19,280

all they have to do is breathe to be

1066

00:38:23,349 --> 00:38:20,720

impressive

1067

00:38:25,829 --> 00:38:23,359

and i think that we can um

1068

00:38:27,109 --> 00:38:25,839

we can perhaps apply that same thing to

1069

00:38:29,190 --> 00:38:27,119

to each other

1070

00:38:32,630 --> 00:38:29,200

um we do not need

1071

00:38:34,470 --> 00:38:32,640

to do backflips to be extraordinary

1072

00:38:35,829 --> 00:38:34,480

um and we can also be a little bit more

1073

00:38:38,310 --> 00:38:35,839

patient

1074

00:38:39,510 --> 00:38:38,320

and a little bit slower

1075

00:38:43,510 --> 00:38:39,520

and

1076
00:38:45,349 --> 00:38:43,520
necessarily a rush with everything we do

1077
00:38:49,349 --> 00:38:45,359
what i love about spending time with

1078
00:38:52,950 --> 00:38:49,359
whales is i find my heart rate slows

1079
00:38:54,150 --> 00:38:52,960
and and things get quieter and calmer

1080
00:38:55,589 --> 00:38:54,160
and um

1081
00:38:57,270 --> 00:38:55,599
that was certainly something that i hope

1082
00:38:59,430 --> 00:38:57,280
that people could take away from

1083
00:39:01,109 --> 00:38:59,440
spending time with nature and writ large

1084
00:39:03,510 --> 00:39:01,119
whether it's a humpback whale or a robin

1085
00:39:04,630 --> 00:39:03,520
in your backyard that taking time to be

1086
00:39:09,990 --> 00:39:04,640
present

1087
00:39:13,349 --> 00:39:11,589
i really love the the effort they put

1088
00:39:15,270 --> 00:39:13,359

into the soundscapes in the film because

1089

00:39:17,109 --> 00:39:15,280

there are all these moments of just

1090

00:39:19,829 --> 00:39:17,119

silence and quietness of you all out on

1091

00:39:21,349 --> 00:39:19,839

the ocean and it really immerses me in

1092

00:39:23,270 --> 00:39:21,359

essentially what you described there you

1093

00:39:24,710 --> 00:39:23,280

know um it's always better to go outside

1094

00:39:27,430 --> 00:39:24,720

but if you happen to be watching a movie

1095

00:39:29,589 --> 00:39:27,440

it's good that they included it

1096

00:39:31,109 --> 00:39:29,599

yeah yeah that was really really

1097

00:39:33,109 --> 00:39:31,119

important you know drew the director of

1098

00:39:35,349 --> 00:39:33,119

the film he has become a dear dear

1099

00:39:37,030 --> 00:39:35,359

friend um he spent a lot of time with me

1100

00:39:38,710 --> 00:39:37,040

in alaska before he started filming so

1101

00:39:41,430 --> 00:39:38,720

he came up there with me and

1102

00:39:43,510 --> 00:39:41,440

spent some time in the summer and

1103

00:39:44,950 --> 00:39:43,520

he was just blown away i remember him

1104

00:39:46,950 --> 00:39:44,960

running around this little island that

1105

00:39:48,550 --> 00:39:46,960

we were on just giddy

1106

00:39:49,910 --> 00:39:48,560

at the sounds and he's like i can't

1107

00:39:51,910 --> 00:39:49,920

believe you can hear a whale breathing

1108

00:39:53,190 --> 00:39:51,920

from two miles away he's like i can't

1109

00:39:54,950 --> 00:39:53,200

believe that you can hear an eagle

1110

00:39:56,950 --> 00:39:54,960

calling from a mile away he's like i

1111

00:39:58,069 --> 00:39:56,960

can't believe how much you can hear

1112

00:40:03,510 --> 00:39:58,079

and

1113

00:40:06,069 --> 00:40:03,520

devoted his efforts to making sure

1114

00:40:08,790 --> 00:40:06,079

that that was translated in the film

1115

00:40:11,829 --> 00:40:08,800

um and and i think i certainly know that

1116

00:40:13,270 --> 00:40:11,839

that changed him as a listener um and my

1117

00:40:14,710 --> 00:40:13,280

hope is that the people who would watch

1118

00:40:16,950 --> 00:40:14,720

the film that it would it would also

1119

00:40:18,870 --> 00:40:16,960

change them as listeners

1120

00:40:20,950 --> 00:40:18,880

yeah absolutely speaking for myself i

1121

00:40:22,230 --> 00:40:20,960

can say it did i i have the uh i don't

1122

00:40:25,190 --> 00:40:22,240

know if you can see it there i have the

1123

00:40:26,550 --> 00:40:25,200

whoop call on my on my wrist

1124

00:40:28,390 --> 00:40:26,560

i thought that was a really beautiful

1125

00:40:29,510 --> 00:40:28,400

kind of you know the whales yelling i am

1126

00:40:31,910 --> 00:40:29,520

to each other i thought that was a

1127

00:40:33,670 --> 00:40:31,920

really profound kind of moment and i

1128

00:40:34,630 --> 00:40:33,680

wanted to have that around to look at

1129

00:40:35,589 --> 00:40:34,640

you know

1130

00:40:38,230 --> 00:40:35,599

ah

1131

00:40:39,670 --> 00:40:38,240

that's extraordinary and and i agree i

1132

00:40:41,190 --> 00:40:39,680

think this concept that nature is

1133

00:40:42,950 --> 00:40:41,200

declaring itself

1134

00:40:45,349 --> 00:40:42,960

and that we also have the right to

1135

00:40:46,790 --> 00:40:45,359

declare ourselves um and i also love the

1136

00:40:47,990 --> 00:40:46,800

fact that nature can declare itself

1137

00:40:49,510 --> 00:40:48,000

quietly

1138

00:40:51,270 --> 00:40:49,520

um yeah

1139

00:40:54,550 --> 00:40:51,280

yeah so that's really that's really

1140

00:40:56,550 --> 00:40:54,560

wonderful it's really really wonderful

1141

00:40:58,150 --> 00:40:56,560

the the film opens with uh this quote

1142

00:41:00,069 --> 00:40:58,160

from charles bowden i hope i'm saying

1143

00:41:01,910 --> 00:41:00,079

this renamed right there it says we must

1144

00:41:03,750 --> 00:41:01,920

keep the beasts obey and in their place

1145

00:41:05,589 --> 00:41:03,760

so we seldom ask them questions lest

1146

00:41:08,390 --> 00:41:05,599

they answer and terrify us by smashing

1147

00:41:10,630 --> 00:41:08,400

our beliefs there are at least 9 million

1148

00:41:13,030 --> 00:41:10,640

species on the planet 2.2 million in the

1149

00:41:14,630 --> 00:41:13,040

ocean roughly um and we're finding more

1150

00:41:16,950 --> 00:41:14,640

and more every day in some of the most

1151
00:41:18,870 --> 00:41:16,960
extreme places we never thought possible

1152
00:41:20,950 --> 00:41:18,880
finding complex cultures and systems in

1153
00:41:22,630 --> 00:41:20,960
places we never ever thought to look

1154
00:41:24,790 --> 00:41:22,640
so i wanted to ask do you think that

1155
00:41:29,670 --> 00:41:24,800
kind of science is breaking our idea of

1156
00:41:34,150 --> 00:41:31,270
well i hope not

1157
00:41:36,790 --> 00:41:34,160
i would hope that science isn't breaking

1158
00:41:38,150 --> 00:41:36,800
life as we know it into pieces although

1159
00:41:39,670 --> 00:41:38,160
science does have a tendency to take

1160
00:41:41,589 --> 00:41:39,680
things apart and forget to put them back

1161
00:41:43,750 --> 00:41:41,599
together sometimes

1162
00:41:46,069 --> 00:41:43,760
i would hope that what science is doing

1163
00:41:48,710 --> 00:41:46,079

is making us aware that the world is a

1164

00:41:51,589 --> 00:41:48,720

richer place it's giving us an

1165

00:41:53,190 --> 00:41:51,599

opportunity to see more and do more and

1166

00:41:56,069 --> 00:41:53,200

know more

1167

00:41:58,470 --> 00:41:56,079

and and to cultivate reverence and

1168

00:41:59,510 --> 00:41:58,480

understanding and appreciation

1169

00:42:02,230 --> 00:41:59,520

um

1170

00:42:05,910 --> 00:42:02,240

does that perhaps mean sometimes that we

1171

00:42:06,950 --> 00:42:05,920

we untie a and not that was a worldview

1172

00:42:09,430 --> 00:42:06,960

sure

1173

00:42:12,309 --> 00:42:09,440

but science should if nothing else give

1174

00:42:14,630 --> 00:42:12,319

us the opportunity to change our mind

1175

00:42:16,710 --> 00:42:14,640

and to acknowledge that there is more

1176

00:42:19,349 --> 00:42:16,720

out there than we currently know but i

1177

00:42:24,550 --> 00:42:19,359

think that that is as as building a

1178

00:42:29,670 --> 00:42:26,950

i i love how richard feynman is is kind

1179

00:42:31,430 --> 00:42:29,680

of as curious as a child and ever since

1180

00:42:33,349 --> 00:42:31,440

seeing him be like that i i felt the

1181

00:42:35,349 --> 00:42:33,359

scientists should be you know as curious

1182

00:42:37,109 --> 00:42:35,359

as children when going into the world uh

1183

00:42:38,630 --> 00:42:37,119

you've mentioned curiosity a few times

1184

00:42:42,230 --> 00:42:38,640

during this conversation so i wanted to

1185

00:42:44,470 --> 00:42:42,240

ask if if you maybe had a little more to

1186

00:42:45,829 --> 00:42:44,480

say about it about how do you choose in

1187

00:42:48,069 --> 00:42:45,839

a complex world

1188

00:42:50,630 --> 00:42:48,079

oh absolutely um

1189

00:42:52,470 --> 00:42:50,640

curiosity i think is part of the of

1190

00:42:55,349 --> 00:42:52,480

what it means to be human

1191

00:42:57,750 --> 00:42:55,359

and i mean children are curious and and

1192

00:42:59,829 --> 00:42:57,760

then we again they get busy

1193

00:43:01,510 --> 00:42:59,839

and curiosity i think in a lot of ways

1194

00:43:02,870 --> 00:43:01,520

is easy to cultivate you just have to

1195

00:43:05,190 --> 00:43:02,880

give it time

1196

00:43:06,390 --> 00:43:05,200

you know write a list instead of

1197

00:43:07,589 --> 00:43:06,400

saying i don't know what questions to

1198

00:43:10,470 --> 00:43:07,599

ask for i don't know what i'm interested

1199

00:43:14,390 --> 00:43:10,480

in spend five minutes writing a list of

1200

00:43:15,349 --> 00:43:14,400

what you don't know and watch curiosity

1201
00:43:16,710 --> 00:43:15,359
grow

1202
00:43:18,550 --> 00:43:16,720
when you can figure out what you don't

1203
00:43:20,550 --> 00:43:18,560
know suddenly there's an interest in

1204
00:43:22,470 --> 00:43:20,560
figuring out what you can and answering

1205
00:43:24,550 --> 00:43:22,480
those questions

1206
00:43:26,309 --> 00:43:24,560
and and i think that curiosity is

1207
00:43:27,990 --> 00:43:26,319
essential for science but it's also

1208
00:43:29,430 --> 00:43:28,000
essential for art

1209
00:43:32,470 --> 00:43:29,440
innovation

1210
00:43:35,030 --> 00:43:32,480
relationship building

1211
00:43:37,190 --> 00:43:35,040
for social harmony if you can have a

1212
00:43:38,150 --> 00:43:37,200
curiosity about something it means that

1213
00:43:40,550 --> 00:43:38,160

you can

1214

00:43:43,829 --> 00:43:40,560

that you you have a desire to understand

1215

00:43:45,030 --> 00:43:43,839

it that there's an interest in it so i i

1216

00:43:47,109 --> 00:43:45,040

think

1217

00:43:49,910 --> 00:43:47,119

again starting with what you don't know

1218

00:43:51,109 --> 00:43:49,920

is a great way to cultivate curiosity

1219

00:43:52,550 --> 00:43:51,119

and um

1220

00:43:54,550 --> 00:43:52,560

and now and then from there it just

1221

00:43:56,309 --> 00:43:54,560

explodes and also starting with what you

1222

00:43:58,150 --> 00:43:56,319

don't know instead of seeking the answer

1223

00:43:59,990 --> 00:43:58,160

that somebody else gives you try and

1224

00:44:01,430 --> 00:44:00,000

make one up

1225

00:44:03,430 --> 00:44:01,440

don't look up the answer to your

1226
00:44:04,390 --> 00:44:03,440
questions discover the answer to your

1227
00:44:08,950 --> 00:44:04,400
questions

1228
00:44:10,390 --> 00:44:08,960
so instead of saying you know

1229
00:44:13,589 --> 00:44:10,400
i don't know

1230
00:44:15,750 --> 00:44:13,599
grass grows

1231
00:44:17,670 --> 00:44:15,760
don't don't google it

1232
00:44:19,589 --> 00:44:17,680
go outside and look at the grass like

1233
00:44:20,630 --> 00:44:19,599
pull up a glade of rest a blade of grass

1234
00:44:22,150 --> 00:44:20,640
think about everything you've ever

1235
00:44:24,309 --> 00:44:22,160
learned and what make what might make

1236
00:44:26,230 --> 00:44:24,319
grass grow or if you say i don't know

1237
00:44:28,150 --> 00:44:26,240
what birds are in my backyard

1238
00:44:29,910 --> 00:44:28,160

don't look at a bird list

1239

00:44:32,150 --> 00:44:29,920

go outside and listen count how many

1240

00:44:33,910 --> 00:44:32,160

birds you see see what you hear

1241

00:44:35,270 --> 00:44:33,920

so come up with questions you don't know

1242

00:44:38,630 --> 00:44:35,280

the answer to and then be the one who

1243

00:44:43,109 --> 00:44:40,950

curiosity is kind of almost

1244

00:44:44,710 --> 00:44:43,119

the engine of the human race i think you

1245

00:44:45,910 --> 00:44:44,720

know whether it's technology or any of

1246

00:44:47,589 --> 00:44:45,920

the other areas you mentioned it

1247

00:44:49,270 --> 00:44:47,599

certainly drives us and maybe it's what

1248

00:44:52,309 --> 00:44:49,280

took us from you know huddled around a

1249

00:44:53,910 --> 00:44:52,319

fire in a cave to the world we see today

1250

00:44:55,349 --> 00:44:53,920

and and that carries on at the end of

1251

00:44:57,030 --> 00:44:55,359

the film you said that

1252

00:44:58,630 --> 00:44:57,040

it's so hard to interpret the language

1253

00:45:00,790 --> 00:44:58,640

of the natural world to

1254

00:45:03,190 --> 00:45:00,800

listen and understand what it's saying

1255

00:45:05,030 --> 00:45:03,200

to itself and and that's that is of the

1256

00:45:06,710 --> 00:45:05,040

same proportion of pointless satellite

1257

00:45:08,950 --> 00:45:06,720

skyward and listening for a sign from

1258

00:45:10,630 --> 00:45:08,960

outer space and i wanted to ask uh with

1259

00:45:12,150 --> 00:45:10,640

the launch of the james webb telescope

1260

00:45:13,910 --> 00:45:12,160

what are your hopes for science in terms

1261

00:45:16,069 --> 00:45:13,920

of finding and understanding other forms

1262

00:45:17,510 --> 00:45:16,079

of life and our place in the universe

1263

00:45:19,670 --> 00:45:17,520

and do you think we're alone in that

1264

00:45:20,950 --> 00:45:19,680

regard or that intelligent life exists

1265

00:45:23,109 --> 00:45:20,960

elsewhere

1266

00:45:24,550 --> 00:45:23,119

oh that's a big question

1267

00:45:26,710 --> 00:45:24,560

i mean you just asked me what all of my

1268

00:45:29,030 --> 00:45:26,720

hopes for science were and whether or

1269

00:45:31,270 --> 00:45:29,040

not we were alone in the universe

1270

00:45:32,630 --> 00:45:31,280

i mean i'm still drinking my morning tea

1271

00:45:35,750 --> 00:45:32,640

um

1272

00:45:38,230 --> 00:45:35,760

i mean my hopes for science is that

1273

00:45:40,790 --> 00:45:38,240

science is integrated that science

1274

00:45:43,510 --> 00:45:40,800

becomes a part of society

1275

00:45:45,510 --> 00:45:43,520

and that science finds a better way at

1276

00:45:48,309 --> 00:45:45,520

communicating with people who don't

1277

00:45:51,190 --> 00:45:48,319

identify as scientists that way when we

1278

00:45:53,109 --> 00:45:51,200

learn about what is out there

1279

00:45:54,790 --> 00:45:53,119

people care to understand they care

1280

00:45:55,990 --> 00:45:54,800

about it

1281

00:45:58,390 --> 00:45:56,000

um

1282

00:46:00,069 --> 00:45:58,400

i i in terms of are we alone in the

1283

00:46:02,150 --> 00:46:00,079

universe

1284

00:46:04,790 --> 00:46:02,160

that isn't both a scientific question

1285

00:46:05,990 --> 00:46:04,800

and an existential one

1286

00:46:07,990 --> 00:46:06,000

so

1287

00:46:11,030 --> 00:46:08,000

no i don't think that we are alone in

1288

00:46:12,710 --> 00:46:11,040

the universe i don't necessarily know

1289

00:46:14,309 --> 00:46:12,720

whether or not it means that there is

1290

00:46:15,990 --> 00:46:14,319

another planet out there with

1291

00:46:18,069 --> 00:46:16,000

intelligent life i think that that's

1292

00:46:20,069 --> 00:46:18,079

likely it's probable

1293

00:46:21,430 --> 00:46:20,079

um it's not my field of study but i

1294

00:46:23,430 --> 00:46:21,440

certainly have

1295

00:46:25,270 --> 00:46:23,440

i have a curiosity about that and

1296

00:46:27,270 --> 00:46:25,280

interest in it and i would have a hope

1297

00:46:29,510 --> 00:46:27,280

that it was true

1298

00:46:31,510 --> 00:46:29,520

um i also

1299

00:46:34,069 --> 00:46:31,520

think that there is a lot of life here

1300

00:46:35,829 --> 00:46:34,079

on this planet that we don't understand

1301
00:46:38,150 --> 00:46:35,839
and i would hope that sometimes we would

1302
00:46:39,750 --> 00:46:38,160
point those satellites inward

1303
00:46:42,950 --> 00:46:39,760
and ask ourselves

1304
00:46:45,910 --> 00:46:42,960
what we can learn right here and

1305
00:46:48,309 --> 00:46:45,920
and my hope for science is that science

1306
00:46:49,990 --> 00:46:48,319
becomes a language that everyone can

1307
00:46:51,510 --> 00:46:50,000
understand i mean we talk about

1308
00:46:54,069 --> 00:46:51,520
interpreting languages of the natural

1309
00:46:56,550 --> 00:46:54,079
world or interpreting the language of

1310
00:46:58,710 --> 00:46:56,560
of species beyond this world

1311
00:47:00,309 --> 00:46:58,720
what do we do about interpreting

1312
00:47:02,470 --> 00:47:00,319
our own language

1313
00:47:04,710 --> 00:47:02,480

i mean we are not talking to each other

1314

00:47:06,390 --> 00:47:04,720

as a society even though we are speaking

1315

00:47:08,870 --> 00:47:06,400

the same language

1316

00:47:11,589 --> 00:47:08,880

how can we take curiosity how can we

1317

00:47:14,390 --> 00:47:11,599

take human experience to cultivate a

1318

00:47:17,270 --> 00:47:14,400

more compassionate world how can we take

1319

00:47:20,390 --> 00:47:17,280

what we observe in nature and share it

1320

00:47:23,829 --> 00:47:20,400

in a way that anyone can understand it

1321

00:47:26,470 --> 00:47:23,839

so how do we how do we find the essence

1322

00:47:29,030 --> 00:47:26,480

of communication and get better at it so

1323

00:47:31,190 --> 00:47:29,040

that science can be a tool not just for

1324

00:47:33,750 --> 00:47:31,200

understanding the other but also perhaps

1325

00:47:35,270 --> 00:47:33,760

a tool for understanding ourselves

1326

00:47:37,270 --> 00:47:35,280

and how can we get better at sharing

1327

00:47:39,710 --> 00:47:37,280

things that's my hope for science is

1328

00:47:41,510 --> 00:47:39,720

that we become better communicators both

1329

00:47:42,630 --> 00:47:41,520

inter-specifically and interests

1330

00:47:44,150 --> 00:47:42,640

specifically

1331

00:47:46,549 --> 00:47:44,160

so let's communicate amongst our own

1332

00:47:48,230 --> 00:47:46,559

species and then and then also be able

1333

00:47:49,030 --> 00:47:48,240

to be better listeners to

1334

00:47:53,510 --> 00:47:49,040

to

1335

00:47:55,190 --> 00:47:53,520

on on the subject of kind of

1336

00:47:56,630 --> 00:47:55,200

communicating with our own species do

1337

00:47:57,990 --> 00:47:56,640

you have any advice for young people

1338

00:48:00,390 --> 00:47:58,000

especially young girls i noticed that

1339

00:48:01,910 --> 00:48:00,400

your team was all female in the movie uh

1340

00:48:03,510 --> 00:48:01,920

who wanted to go into science and maybe

1341

00:48:05,670 --> 00:48:03,520

do work like you

1342

00:48:09,990 --> 00:48:05,680

yeah um

1343

00:48:13,270 --> 00:48:10,000

oh advice i mean my my advice is is is

1344

00:48:16,390 --> 00:48:13,280

find a group of people that you love

1345

00:48:18,069 --> 00:48:16,400

and do what you want to do find a way

1346

00:48:19,990 --> 00:48:18,079

now i know that that's very esoteric

1347

00:48:21,109 --> 00:48:20,000

advice so like some really tangible

1348

00:48:23,430 --> 00:48:21,119

advice

1349

00:48:25,910 --> 00:48:23,440

is find an organization that is willing

1350

00:48:29,270 --> 00:48:25,920

to pay you to do good work you know get

1351

00:48:32,950 --> 00:48:29,280

a good education be curious read books

1352

00:48:35,589 --> 00:48:32,960

um read published literature read op-eds

1353

00:48:36,470 --> 00:48:35,599

you know devour the knowledge

1354

00:48:37,990 --> 00:48:36,480

like

1355

00:48:39,990 --> 00:48:38,000

and then the other piece of advice that

1356

00:48:41,670 --> 00:48:40,000

i would say for anyone that wants to do

1357

00:48:43,750 --> 00:48:41,680

science particularly for young women

1358

00:48:45,829 --> 00:48:43,760

that want to do science

1359

00:48:48,549 --> 00:48:45,839

go there

1360

00:48:50,630 --> 00:48:48,559

it isn't about following a traditional

1361

00:48:51,990 --> 00:48:50,640

path like yes get a degree in biology if

1362

00:48:53,190 --> 00:48:52,000

you want to go to graduate school if

1363

00:48:54,950 --> 00:48:53,200

that speaks to you and that's a path

1364

00:48:56,549 --> 00:48:54,960

that works for you do that get an

1365

00:48:58,230 --> 00:48:56,559

education but

1366

00:48:59,910 --> 00:48:58,240

if you want to understand the natural

1367

00:49:00,870 --> 00:48:59,920

world and you want to be successful in

1368

00:49:04,710 --> 00:49:00,880

science

1369

00:49:07,190 --> 00:49:04,720

go there move to alaska

1370

00:49:09,270 --> 00:49:07,200

spend your mornings before you do the

1371

00:49:11,190 --> 00:49:09,280

job that's going to help support you as

1372

00:49:12,870 --> 00:49:11,200

a human spend your morning sitting on

1373

00:49:14,150 --> 00:49:12,880

the beach looking at the waves and

1374

00:49:17,510 --> 00:49:14,160

listening

1375

00:49:19,190 --> 00:49:17,520

if you want to if you want to study

1376

00:49:21,109 --> 00:49:19,200

animals go there

1377

00:49:22,870 --> 00:49:21,119

go and listen you don't necessarily have

1378

00:49:24,630 --> 00:49:22,880

to go there to be a biologist you can go

1379

00:49:27,349 --> 00:49:24,640

to be an observer

1380

00:49:29,430 --> 00:49:27,359

and then find someone you trust and tell

1381

00:49:31,349 --> 00:49:29,440

them what you hear find someone you love

1382

00:49:33,910 --> 00:49:31,359

and tell them your story help to

1383

00:49:35,910 --> 00:49:33,920

cultivate a community find a mentor and

1384

00:49:37,910 --> 00:49:35,920

don't take any mentor

1385

00:49:40,069 --> 00:49:37,920

take a mentor that resonates with you

1386

00:49:42,069 --> 00:49:40,079

work with people that appreciate you

1387

00:49:44,309 --> 00:49:42,079

acknowledge that you have strengths and

1388

00:49:46,870 --> 00:49:44,319

if someone else is not seeing them

1389

00:49:49,910 --> 00:49:46,880

perhaps they aren't the best fit for you

1390

00:49:51,990 --> 00:49:49,920

and raise up other women

1391

00:49:55,030 --> 00:49:52,000

when a woman does something that is

1392

00:49:57,750 --> 00:49:55,040

amazing or something that is admirable

1393

00:50:00,150 --> 00:49:57,760

or something that is humble

1394

00:50:01,349 --> 00:50:00,160

loud that give that a platform and give

1395

00:50:03,589 --> 00:50:01,359

that a voice

1396

00:50:06,150 --> 00:50:03,599

give a voice to the the people and the

1397

00:50:07,510 --> 00:50:06,160

women and the allies that you respect

1398

00:50:08,870 --> 00:50:07,520

and so sometimes i think the most

1399

00:50:10,870 --> 00:50:08,880

successful thing that we can do to

1400

00:50:12,470 --> 00:50:10,880

cultivate a more diverse group of

1401
00:50:14,230 --> 00:50:12,480
scientific voices

1402
00:50:15,990 --> 00:50:14,240
is to talk less

1403
00:50:17,430 --> 00:50:16,000
spend less time talking about yourself

1404
00:50:19,829 --> 00:50:17,440
and more time talking about somebody

1405
00:50:23,190 --> 00:50:19,839
else find people you admire and emulate

1406
00:50:24,470 --> 00:50:23,200
them and acknowledge them publicly and

1407
00:50:26,309 --> 00:50:24,480
loudly

1408
00:50:28,230 --> 00:50:26,319
the more that we can acknowledge diverse

1409
00:50:30,309 --> 00:50:28,240
voices the voices of women the voices of

1410
00:50:33,910 --> 00:50:30,319
indigenous people the voices of people

1411
00:50:35,510 --> 00:50:33,920
of color the more that we can raise up

1412
00:50:38,069 --> 00:50:35,520
the idea that there is a diversity of

1413
00:50:40,069 --> 00:50:38,079

perspectives that will cultivate a

1414

00:50:43,270 --> 00:50:40,079

opportunity and a culture of science

1415

00:50:46,069 --> 00:50:43,280

that is worth participating in

1416

00:50:48,069 --> 00:50:46,079

so that was a bit of a rant but

1417

00:50:51,349 --> 00:50:48,079

no i loved it that's uh

1418

00:50:53,190 --> 00:50:51,359

you're my people michelle i'll say that

1419

00:50:54,630 --> 00:50:53,200

but before we finish up let's just go

1420

00:50:57,670 --> 00:50:54,640

through some listener questions uh

1421

00:50:59,430 --> 00:50:57,680

nathan asked do whale's dream

1422

00:51:02,150 --> 00:50:59,440

oh i don't know

1423

00:51:06,790 --> 00:51:04,470

so that's a complex question this one's

1424

00:51:10,950 --> 00:51:06,800

a little technical

1425

00:51:13,829 --> 00:51:10,960

whales don't sleep like we sleep

1426

00:51:15,670 --> 00:51:13,839

they have something called um

1427

00:51:18,069 --> 00:51:15,680

semi-hemispheric

1428

00:51:19,829 --> 00:51:18,079

sleeping in that whales are voluntary

1429

00:51:21,190 --> 00:51:19,839

breathers this is true for all cetaceans

1430

00:51:22,150 --> 00:51:21,200

so they can't fully go to sleep or they

1431

00:51:24,470 --> 00:51:22,160

would forget to breathe and they would

1432

00:51:25,670 --> 00:51:24,480

drown or suffocate rather so they have

1433

00:51:27,109 --> 00:51:25,680

two sides of their brain and what

1434

00:51:28,470 --> 00:51:27,119

they'll do is they'll put one side of

1435

00:51:30,630 --> 00:51:28,480

their brain to sleep and the other side

1436

00:51:31,829 --> 00:51:30,640

will stay awake to remember to function

1437

00:51:32,870 --> 00:51:31,839

you need to take a breath to stay at the

1438

00:51:34,390 --> 00:51:32,880

surface of the water and things like

1439

00:51:35,670 --> 00:51:34,400

that and then they switch and the other

1440

00:51:36,870 --> 00:51:35,680

side of their brain will go to sleep and

1441

00:51:37,829 --> 00:51:36,880

the other side of their brain will stay

1442

00:51:40,710 --> 00:51:37,839

awake

1443

00:51:42,470 --> 00:51:40,720

um and we know this from um from

1444

00:51:44,230 --> 00:51:42,480

scientists that i wish i could remember

1445

00:51:45,349 --> 00:51:44,240

their names right now who have

1446

00:51:47,510 --> 00:51:45,359

done this with dolphins and other

1447

00:51:49,670 --> 00:51:47,520

citations you know they've put

1448

00:51:52,790 --> 00:51:49,680

anodes and whatnot on on this patient

1449

00:51:54,630 --> 00:51:52,800

heads and looked at brain activity so

1450

00:51:59,589 --> 00:51:54,640

does the side of the brain that is

1451

00:52:03,990 --> 00:52:01,990

most mammals dream

1452

00:52:05,750 --> 00:52:04,000

so i can't i i would guess that whale

1453

00:52:07,430 --> 00:52:05,760

stream so i don't know the answer to

1454

00:52:08,470 --> 00:52:07,440

that but i'll say i hope so and i think

1455

00:52:10,870 --> 00:52:08,480

so

1456

00:52:14,150 --> 00:52:10,880

i i wonder if a whales dreams of you

1457

00:52:15,750 --> 00:52:14,160

really giant swimming around coral reefs

1458

00:52:18,150 --> 00:52:15,760

that's exactly what they're doing

1459

00:52:20,309 --> 00:52:18,160

they're like whose voice was that she

1460

00:52:22,309 --> 00:52:20,319

was calling to me in the night i have to

1461

00:52:24,549 --> 00:52:22,319

find her yeah that's that's definitely

1462

00:52:27,349 --> 00:52:24,559

what the whales are dreaming about

1463

00:52:29,270 --> 00:52:27,359

uh sean cahill asks uh if you could

1464

00:52:30,870 --> 00:52:29,280

share any impressions of the impact of

1465

00:52:33,349 --> 00:52:30,880

increased spindle cells in the oka

1466

00:52:35,750 --> 00:52:33,359

occalimbic brain and observations in

1467

00:52:37,670 --> 00:52:35,760

perceived creation culture is there

1468

00:52:39,349 --> 00:52:37,680

observational evidence for the existence

1469

00:52:41,670 --> 00:52:39,359

of a more complex level of emotional

1470

00:52:43,750 --> 00:52:41,680

communication amongst oral consultations

1471

00:52:47,109 --> 00:52:43,760

than amongst humans

1472

00:52:48,630 --> 00:52:47,119

yes so um this spindle neuron concept is

1473

00:52:50,309 --> 00:52:48,640

one that there is neuron which is

1474

00:52:52,630 --> 00:52:50,319

identified in several different species

1475

00:52:55,430 --> 00:52:52,640

humans being one of them and it has been

1476
00:52:58,390 --> 00:52:55,440
hypothesized that that particular um

1477
00:53:01,910 --> 00:52:58,400
neuron is associated with compassion and

1478
00:53:03,510 --> 00:53:01,920
with altruism and we have seen this you

1479
00:53:05,349 --> 00:53:03,520
know spindle neurons in the brains of

1480
00:53:07,990 --> 00:53:05,359
humpback whales um and a couple other

1481
00:53:10,309 --> 00:53:08,000
species it is comparatively rare um

1482
00:53:11,829 --> 00:53:10,319
whether or not it's rare because we

1483
00:53:14,470 --> 00:53:11,839
haven't looked or it's rare because it's

1484
00:53:16,790 --> 00:53:14,480
ecologically rare i can't speak to but

1485
00:53:19,109 --> 00:53:16,800
there has been evidence in

1486
00:53:22,150 --> 00:53:19,119
in the humpback whales of

1487
00:53:24,230 --> 00:53:22,160
of what we perceive as altruism um of

1488
00:53:25,589 --> 00:53:24,240

selfless acts and

1489

00:53:27,670 --> 00:53:25,599

and you know there's a really great

1490

00:53:28,790 --> 00:53:27,680

paper about this um

1491

00:53:30,630 --> 00:53:28,800

that

1492

00:53:32,950 --> 00:53:30,640

i think bob pittman wrote

1493

00:53:34,870 --> 00:53:32,960

um where there have been many examples

1494

00:53:37,109 --> 00:53:34,880

that that folks have seen over the years

1495

00:53:40,390 --> 00:53:37,119

of humpback whales intervening

1496

00:53:42,069 --> 00:53:40,400

to protect another species so as killer

1497

00:53:43,990 --> 00:53:42,079

whales would come in to try and predate

1498

00:53:46,230 --> 00:53:44,000

something a humpback whale would come

1499

00:53:47,430 --> 00:53:46,240

and get in between them and protect

1500

00:53:49,910 --> 00:53:47,440

either

1501

00:53:51,270 --> 00:53:49,920

i know in one instance it was a sunfish

1502

00:53:52,390 --> 00:53:51,280

that they came in to protect this

1503

00:53:55,510 --> 00:53:52,400

sunfish

1504

00:53:57,990 --> 00:53:55,520

and i can say

1505

00:54:00,470 --> 00:53:58,000

personally

1506

00:54:02,309 --> 00:54:00,480

that i have observed this now i want to

1507

00:54:04,870 --> 00:54:02,319

be very careful about whether or not

1508

00:54:06,710 --> 00:54:04,880

it's compassion because compassion is a

1509

00:54:09,990 --> 00:54:06,720

word that we use to describe humanity

1510

00:54:12,069 --> 00:54:10,000

this is that is a human emotion a human

1511

00:54:15,109 --> 00:54:12,079

action to be compassionate

1512

00:54:16,390 --> 00:54:15,119

whales are not human

1513

00:54:18,069 --> 00:54:16,400

the the

1514

00:54:19,349 --> 00:54:18,079

you can't apply

1515

00:54:25,190 --> 00:54:19,359

our

1516

00:54:26,390 --> 00:54:25,200

to whales it's unfair

1517

00:54:27,670 --> 00:54:26,400

now that doesn't mean that they are

1518

00:54:29,910 --> 00:54:27,680

lesser than

1519

00:54:32,309 --> 00:54:29,920

it likely means that they are they are

1520

00:54:34,470 --> 00:54:32,319

other equal to but other

1521

00:54:36,390 --> 00:54:34,480

that being said though i was on a boat

1522

00:54:39,670 --> 00:54:36,400

in southeast alaska

1523

00:54:41,990 --> 00:54:39,680

and um we were whale watching and

1524

00:54:44,549 --> 00:54:42,000

we saw a group of killer whales that

1525

00:54:46,150 --> 00:54:44,559

were hunting a stellar sea lion

1526

00:54:47,510 --> 00:54:46,160

and there were humpback whales quite far

1527

00:54:50,230 --> 00:54:47,520

away you know we had seen humpback

1528

00:54:51,670 --> 00:54:50,240

whales off in the distance and our boat

1529

00:54:54,069 --> 00:54:51,680

we were being very responsible stay very

1530

00:54:55,750 --> 00:54:54,079

far away um but we were watching this

1531

00:54:57,430 --> 00:54:55,760

group of transient killer whales

1532

00:54:58,630 --> 00:54:57,440

attacking the sea lion because that's

1533

00:54:59,589 --> 00:54:58,640

what they eat

1534

00:55:01,750 --> 00:54:59,599

and

1535

00:55:03,190 --> 00:55:01,760

a humpback whale that we know

1536

00:55:05,990 --> 00:55:03,200

very well

1537

00:55:07,670 --> 00:55:06,000

that it's a junco resident whale a whale

1538

00:55:08,710 --> 00:55:07,680

that had been in the community for many

1539

00:55:09,589 --> 00:55:08,720

many years

1540

00:55:11,430 --> 00:55:09,599

um

1541

00:55:14,789 --> 00:55:11,440

spot is that whale's name

1542

00:55:16,309 --> 00:55:14,799

um got in between the killer whales and

1543

00:55:18,549 --> 00:55:16,319

the stellar sea lion

1544

00:55:21,829 --> 00:55:18,559

and then two other humpback whales came

1545

00:55:23,990 --> 00:55:21,839

over and they formed a triangle around

1546

00:55:25,349 --> 00:55:24,000

this stellar sea lion and one of them

1547

00:55:27,589 --> 00:55:25,359

actually rolled over and put the sea

1548

00:55:31,270 --> 00:55:27,599

lion on its belly and began slapping its

1549

00:55:32,150 --> 00:55:31,280

pectoral fins and actively protecting it

1550

00:55:37,030 --> 00:55:32,160

from

1551
00:55:39,349 --> 00:55:37,040
there's not a

1552
00:55:40,789 --> 00:55:39,359
it was incredible it was extraordinary

1553
00:55:42,950 --> 00:55:40,799
and

1554
00:55:44,870 --> 00:55:42,960
there's there's not a lot of reasons or

1555
00:55:47,670 --> 00:55:44,880
things that you can

1556
00:55:50,069 --> 00:55:47,680
say to describe an interaction like that

1557
00:55:51,910 --> 00:55:50,079
other than just to to acknowledge that

1558
00:55:52,950 --> 00:55:51,920
those humpbacks intervened in that

1559
00:55:54,309 --> 00:55:52,960
particular

1560
00:55:57,270 --> 00:55:54,319
ecological

1561
00:55:59,589 --> 00:55:57,280
sequence and the best and most obvious

1562
00:56:02,710 --> 00:55:59,599
explanation is that they were protecting

1563
00:56:05,109 --> 00:56:02,720

that sea lion from being eaten

1564

00:56:06,549 --> 00:56:05,119

whether or not that's an altruistic act

1565

00:56:08,069 --> 00:56:06,559

it certainly seems like it from our

1566

00:56:09,589 --> 00:56:08,079

human perspective

1567

00:56:12,710 --> 00:56:09,599

there's a whole suite of other

1568

00:56:15,030 --> 00:56:12,720

explanations that you could come up with

1569

00:56:19,270 --> 00:56:15,040

but one of them is certainly that that

1570

00:56:21,589 --> 00:56:20,069

that's

1571

00:56:23,109 --> 00:56:21,599

kind of encouraging to know isn't it

1572

00:56:24,950 --> 00:56:23,119

that it might be a natural state of

1573

00:56:26,789 --> 00:56:24,960

things

1574

00:56:28,230 --> 00:56:26,799

yeah although it's not so good for the

1575

00:56:30,870 --> 00:56:28,240

killer whales

1576

00:56:32,710 --> 00:56:30,880

no i guess not yeah so it really depends

1577

00:56:34,390 --> 00:56:32,720

on whose perspective you're taking uh if

1578

00:56:35,990 --> 00:56:34,400

somebody came into my home and refused

1579

00:56:37,990 --> 00:56:36,000

to let me eat my dinner and they took it

1580

00:56:40,069 --> 00:56:38,000

from me i don't think that we would call

1581

00:56:42,150 --> 00:56:40,079

that person altruistic i think we would

1582

00:56:43,349 --> 00:56:42,160

call them a thief and so i think that's

1583

00:56:45,349 --> 00:56:43,359

another really important thing to

1584

00:56:47,109 --> 00:56:45,359

remember is that there is no greater

1585

00:56:48,069 --> 00:56:47,119

than in the natural world

1586

00:56:50,549 --> 00:56:48,079

um

1587

00:56:53,430 --> 00:56:50,559

that they're it's it's it's a web it's

1588

00:56:55,670 --> 00:56:53,440

an it's interactive and predators and

1589

00:56:58,470 --> 00:56:55,680

prey is i mean certainly they're like

1590

00:57:00,549 --> 00:56:58,480

killer whales are predators um

1591

00:57:02,470 --> 00:57:00,559

and sea lions are prey

1592

00:57:04,630 --> 00:57:02,480

sea lions are also predators and fish

1593

00:57:06,069 --> 00:57:04,640

are prey would we deny the sea lion the

1594

00:57:07,829 --> 00:57:06,079

fish like

1595

00:57:09,750 --> 00:57:07,839

what does it mean when you think about

1596

00:57:12,870 --> 00:57:09,760

things not from the perspective of good

1597

00:57:17,270 --> 00:57:12,880

or bad or right or wrong um

1598

00:57:19,349 --> 00:57:17,280

but but as as complex as the system is

1599

00:57:21,430 --> 00:57:19,359

so who as humans do we want to have

1600

00:57:23,349 --> 00:57:21,440

compassion for

1601
00:57:25,109 --> 00:57:23,359
so i think um having perspective on that

1602
00:57:26,870 --> 00:57:25,119
one is really important

1603
00:57:28,390 --> 00:57:26,880
i i really love that a discussion about

1604
00:57:30,950 --> 00:57:28,400
whale language has essentially turned

1605
00:57:32,390 --> 00:57:30,960
into a philosophical conversation

1606
00:57:33,990 --> 00:57:32,400
it says a lot about their culture and

1607
00:57:35,670 --> 00:57:34,000
what we're finding out right

1608
00:57:37,430 --> 00:57:35,680
yeah yeah absolutely i think you're

1609
00:57:38,710 --> 00:57:37,440
absolutely right

1610
00:57:39,750 --> 00:57:38,720
benji would like to know if you found

1611
00:57:42,069 --> 00:57:39,760
any

1612
00:57:43,829 --> 00:57:42,079
commonalities between the frequency of

1613
00:57:46,309 --> 00:57:43,839

major or minor musical scales and the

1614

00:57:48,069 --> 00:57:46,319

emotional states of the animal singing

1615

00:57:51,349 --> 00:57:48,079

so i have not done that research but

1616

00:57:52,870 --> 00:57:51,359

some people are um what we have found is

1617

00:57:54,870 --> 00:57:52,880

there's this theory in science called

1618

00:57:57,349 --> 00:57:54,880

motivational structure theory

1619

00:57:58,150 --> 00:57:57,359

and it's the concept that invertebrates

1620

00:57:59,910 --> 00:57:58,160

so

1621

00:58:01,349 --> 00:57:59,920

mammals and birds predominantly is where

1622

00:58:02,710 --> 00:58:01,359

they've looked at this that you can

1623

00:58:04,470 --> 00:58:02,720

actually identify an animal's

1624

00:58:06,230 --> 00:58:04,480

motivational state based on the sounds

1625

00:58:08,470 --> 00:58:06,240

that it makes so if you think about this

1626
00:58:10,870 --> 00:58:08,480
in humans and human human language does

1627
00:58:12,230 --> 00:58:10,880
obey motivational structure laws

1628
00:58:13,589 --> 00:58:12,240
um

1629
00:58:15,750 --> 00:58:13,599
you know you can tell the difference

1630
00:58:18,870 --> 00:58:15,760
between someone who is trying to be

1631
00:58:21,109 --> 00:58:18,880
aggressive and sort of shouting or

1632
00:58:23,589 --> 00:58:21,119
you know ah get away go go go versus

1633
00:58:25,990 --> 00:58:23,599
someone who is trying to appease like oh

1634
00:58:27,589 --> 00:58:26,000
oh that's wonderful oh thank you so much

1635
00:58:29,990 --> 00:58:27,599
and you can hear that in one case my

1636
00:58:32,630 --> 00:58:30,000
voice gets low and

1637
00:58:34,230 --> 00:58:32,640
louder and has some specific qualities

1638
00:58:35,589 --> 00:58:34,240

and in the other my voice gets higher

1639

00:58:36,470 --> 00:58:35,599

and softer

1640

00:58:39,030 --> 00:58:36,480

and

1641

00:58:40,390 --> 00:58:39,040

we have observed this in animals i mean

1642

00:58:41,910 --> 00:58:40,400

you we know the difference between a dog

1643

00:58:43,430 --> 00:58:41,920

that's whining and a dog that's growling

1644

00:58:45,430 --> 00:58:43,440

and a dog that's barking

1645

00:58:47,109 --> 00:58:45,440

and um rebecca dunlop did some of this

1646

00:58:49,750 --> 00:58:47,119

work in humpback whales

1647

00:58:51,990 --> 00:58:49,760

and um and looked to see whether or not

1648

00:58:53,589 --> 00:58:52,000

arousal states followed these rules and

1649

00:58:55,030 --> 00:58:53,599

found that it did that there is some

1650

00:58:57,990 --> 00:58:55,040

evidence that you can infer the

1651
00:59:00,150 --> 00:58:58,000
motivation or the the state of a whale

1652
00:59:03,109 --> 00:59:00,160
based on the sounds itself now we

1653
00:59:04,870 --> 00:59:03,119
haven't linked that to music and um

1654
00:59:07,109 --> 00:59:04,880
there's a woman whose name escapes me at

1655
00:59:09,109 --> 00:59:07,119
the moment but she's been doing that a

1656
00:59:11,030 --> 00:59:09,119
little bit with whale's song looking at

1657
00:59:12,470 --> 00:59:11,040
the relationship between the structure

1658
00:59:14,710 --> 00:59:12,480
of whale song and the structure of human

1659
00:59:16,549 --> 00:59:14,720
music and finding commonalities there

1660
00:59:19,030 --> 00:59:16,559
but i do think that

1661
00:59:20,630 --> 00:59:19,040
um in the same way that we in it's

1662
00:59:21,510 --> 00:59:20,640
really important for lots of mammals to

1663
00:59:23,589 --> 00:59:21,520

infer

1664

00:59:25,030 --> 00:59:23,599

the motivational or emotional state of

1665

00:59:26,950 --> 00:59:25,040

others in order to know how to properly

1666

00:59:28,390 --> 00:59:26,960

act but that is definitely information

1667

00:59:29,910 --> 00:59:28,400

that is encoded in humpback whale

1668

00:59:32,150 --> 00:59:29,920

language and

1669

00:59:35,190 --> 00:59:32,160

while we haven't yet necessarily figured

1670

00:59:37,910 --> 00:59:35,200

out what the sound of an aggressive

1671

00:59:42,710 --> 00:59:37,920

whale call versus a appeasing whale call

1672

00:59:46,470 --> 00:59:43,990

last question

1673

00:59:48,950 --> 00:59:46,480

uh lou elizondo uh

1674

00:59:51,190 --> 00:59:48,960

asked by what basis do we or can we

1675

00:59:53,190 --> 00:59:51,200

establish a baseline for for that which

1676
00:59:55,030 --> 00:59:53,200
there is no apparent decoder or legend

1677
00:59:56,150 --> 00:59:55,040
to read the code in the first place does

1678
00:59:58,150 --> 00:59:56,160
this include

1679
01:00:00,309 --> 00:59:58,160
non-verbal cues as well and can it

1680
01:00:02,309 --> 01:00:00,319
include languages that are non-verbal

1681
01:00:03,990 --> 01:00:02,319
too

1682
01:00:07,030 --> 01:00:04,000
it certainly should

1683
01:00:08,309 --> 01:00:07,040
um i mean it is again it's there's an

1684
01:00:09,990 --> 01:00:08,319
arrogance and thinking that

1685
01:00:12,549 --> 01:00:10,000
communication is only limited to the way

1686
01:00:14,789 --> 01:00:12,559
that we do it and i mean for that matter

1687
01:00:16,630 --> 01:00:14,799
humans use non-verbal cues all the time

1688
01:00:18,390 --> 01:00:16,640

so there are lots of

1689

01:00:21,430 --> 01:00:18,400

field of scientific study about visual

1690

01:00:23,670 --> 01:00:21,440

signaling and olfactory communication

1691

01:00:25,349 --> 01:00:23,680

um and so i would say that in in the

1692

01:00:27,190 --> 01:00:25,359

animal world we're actually fairly good

1693

01:00:29,829 --> 01:00:27,200

at that at looking at how animals

1694

01:00:31,910 --> 01:00:29,839

communicate non-verbally um and in

1695

01:00:33,589 --> 01:00:31,920

humpback whales i'm working on a project

1696

01:00:35,750 --> 01:00:33,599

right now with um

1697

01:00:37,349 --> 01:00:35,760

a researcher named um josephine schultz

1698

01:00:38,710 --> 01:00:37,359

where we're looking at what what makes a

1699

01:00:40,470 --> 01:00:38,720

whale breach

1700

01:00:42,390 --> 01:00:40,480

why you know what inspires the whale to

1701

01:00:44,470 --> 01:00:42,400

jump out of the water and

1702

01:00:46,230 --> 01:00:44,480

and that's a non-verbal cue and the work

1703

01:00:48,630 --> 01:00:46,240

by rebecca dunlop showed that it's

1704

01:00:50,309 --> 01:00:48,640

likely that these like breaching and

1705

01:00:52,549 --> 01:00:50,319

flipper slapping and tail lobbing that

1706

01:00:53,750 --> 01:00:52,559

those are all forms of of non-verbal

1707

01:00:56,470 --> 01:00:53,760

communication

1708

01:00:59,030 --> 01:00:56,480

so yes i think that it is essential that

1709

01:01:00,549 --> 01:00:59,040

we look at these things holistically now

1710

01:01:02,309 --> 01:01:00,559

underwater it makes the most sense to

1711

01:01:04,309 --> 01:01:02,319

look at sound because it's very hard to

1712

01:01:07,270 --> 01:01:04,319

otherwise see and because chemical

1713

01:01:09,829 --> 01:01:07,280

signals don't travel very far um but in

1714

01:01:12,069 --> 01:01:09,839

air and in land i think that that's an

1715

01:01:13,510 --> 01:01:12,079

extremely important point that it isn't

1716

01:01:16,069 --> 01:01:13,520

just what we hear and what is said that

1717

01:01:18,950 --> 01:01:16,079

makes up language that there are cues

1718

01:01:20,309 --> 01:01:18,960

that come from from all kind of sources

1719

01:01:21,190 --> 01:01:20,319

that might not be things that you can

1720

01:01:22,309 --> 01:01:21,200

hear

1721

01:01:24,710 --> 01:01:22,319

one more question that i'm just going to

1722

01:01:26,789 --> 01:01:24,720

throw in here um is about the the area

1723

01:01:28,309 --> 01:01:26,799

of the catalina islands off the coast of

1724

01:01:29,910 --> 01:01:28,319

uh california

1725

01:01:32,390 --> 01:01:29,920

i hear a lot of conversation about that

1726

01:01:34,789 --> 01:01:32,400

area being important to whale migration

1727

01:01:37,510 --> 01:01:34,799

um yeah and i just wanted to know if you

1728

01:01:40,309 --> 01:01:37,520

uh could enlighten me on that

1729

01:01:41,990 --> 01:01:40,319

um sure i i don't work there so i should

1730

01:01:44,470 --> 01:01:42,000

be very clear about that but the whole

1731

01:01:46,390 --> 01:01:44,480

area in sort of that southern california

1732

01:01:47,990 --> 01:01:46,400

region near the catalina islands

1733

01:01:48,789 --> 01:01:48,000

is i mean

1734

01:01:49,990 --> 01:01:48,799

i'm assuming we're talking about

1735

01:01:52,309 --> 01:01:50,000

catalina island which is off of

1736

01:01:53,349 --> 01:01:52,319

california yes that's right yeah okay

1737

01:01:54,870 --> 01:01:53,359

all right just making sure that i'm not

1738

01:01:56,630 --> 01:01:54,880

making a total fool of myself on a

1739

01:01:58,150 --> 01:01:56,640

podcast um

1740

01:02:00,309 --> 01:01:58,160

yes that's a really important foraging

1741

01:02:02,950 --> 01:02:00,319

ground um for blue whales fin whales

1742

01:02:05,109 --> 01:02:02,960

humpback whales um it's also a really

1743

01:02:07,190 --> 01:02:05,119

important foraging ground for california

1744

01:02:09,029 --> 01:02:07,200

sea lions and harbor seals it's um it's

1745

01:02:11,190 --> 01:02:09,039

a biological hot spot for sure um

1746

01:02:12,549 --> 01:02:11,200

catalina island also has a really quite

1747

01:02:14,390 --> 01:02:12,559

extraordinary

1748

01:02:16,870 --> 01:02:14,400

biodiversity of birds

1749

01:02:18,710 --> 01:02:16,880

and um you know in southern california

1750

01:02:20,789 --> 01:02:18,720

also is an industrial area

1751

01:02:22,230 --> 01:02:20,799

so that whole area down there they've

1752

01:02:24,789 --> 01:02:22,240

been doing a lot of work on preventing

1753

01:02:27,349 --> 01:02:24,799

shift strikes and reducing noise and and

1754

01:02:28,950 --> 01:02:27,359

trying to understand biodiversity um and

1755

01:02:30,309 --> 01:02:28,960

then the california coast all the way up

1756

01:02:32,470 --> 01:02:30,319

the pacific coast up to oregon and

1757

01:02:34,230 --> 01:02:32,480

washington is an upwelling zone

1758

01:02:36,470 --> 01:02:34,240

and so we have areas of really high

1759

01:02:38,390 --> 01:02:36,480

primary productivity and there are

1760

01:02:41,349 --> 01:02:38,400

populations of whales that will stick

1761

01:02:43,589 --> 01:02:41,359

around in that um in some cases we call

1762

01:02:45,829 --> 01:02:43,599

them the cow stock the california oregon

1763

01:02:48,870 --> 01:02:45,839

washington stock rather than migrating

1764

01:02:50,870 --> 01:02:48,880

all the way up north and so that area is

1765

01:02:53,109 --> 01:02:50,880

is i mean it's it's a it's a critical

1766

01:02:54,630 --> 01:02:53,119

foraging ground it's a conservation area

1767

01:02:56,390 --> 01:02:54,640

and it's also an area where we have a

1768

01:02:57,990 --> 01:02:56,400

lot of people which means it's a great

1769

01:02:59,430 --> 01:02:58,000

opportunity it's an opportunity for

1770

01:03:01,750 --> 01:02:59,440

people to observe whales it's an

1771

01:03:04,470 --> 01:03:01,760

opportunity for people to understand the

1772

01:03:06,710 --> 01:03:04,480

diversity in their local ecosystem and

1773

01:03:08,950 --> 01:03:06,720

for us to

1774

01:03:10,309 --> 01:03:08,960

self-manage like how do we manage

1775

01:03:12,870 --> 01:03:10,319

ourselves in the context of these

1776

01:03:14,470 --> 01:03:12,880

animals not remove us from the ecosystem

1777

01:03:16,710 --> 01:03:14,480

we're never going to remove humans from

1778

01:03:19,510 --> 01:03:16,720

the equation and we shouldn't but how do

1779

01:03:21,109 --> 01:03:19,520

we how do we happily coexist in this

1780

01:03:22,470 --> 01:03:21,119

sort of urban

1781

01:03:23,990 --> 01:03:22,480

urban ocean

1782

01:03:25,990 --> 01:03:24,000

that was an incredibly enlightening

1783

01:03:27,430 --> 01:03:26,000

conversation and just before we wrap up

1784

01:03:29,029 --> 01:03:27,440

uh can you let people know how they can

1785

01:03:32,630 --> 01:03:29,039

follow your work

1786

01:03:33,670 --> 01:03:32,640

sure yeah um i'm easy to find um you can

1787

01:03:36,150 --> 01:03:33,680

follow

1788

01:03:38,150 --> 01:03:36,160

my work on occasionally i'm on twitter

1789

01:03:40,069 --> 01:03:38,160

and bella lady you can also follow the

1790

01:03:42,150 --> 01:03:40,079

work of my of the non-profit of which i

1791

01:03:43,670 --> 01:03:42,160

am the director which is um the sound

1792

01:03:46,950 --> 01:03:43,680

science research collective you can find

1793

01:03:51,670 --> 01:03:49,430

you can also find me on instagram where

1794

01:03:53,750 --> 01:03:51,680

i post whale photos from time to time

1795

01:03:55,670 --> 01:03:53,760

i'm also at embella lady there you can

1796

01:03:56,950 --> 01:03:55,680

also just google me i'm a visiting

1797

01:03:58,950 --> 01:03:56,960

assistant professor at the university of

1798

01:04:01,750 --> 01:03:58,960

new hampshire so you can follow my

1799

01:04:03,349 --> 01:04:01,760

research lab there the seababel lab so

1800

01:04:05,349 --> 01:04:03,359

it's the marine bioacoustics and

1801
01:04:07,510 --> 01:04:05,359
behavior lab cbable

1802
01:04:10,630 --> 01:04:07,520
and

1803
01:04:11,910 --> 01:04:10,640
haven't already

1804
01:04:13,430 --> 01:04:11,920
and then you'll learn more about me than

1805
01:04:15,270 --> 01:04:13,440
you ever wanted to because it's a very

1806
01:04:16,549 --> 01:04:15,280
revealing film but there's also lots of

1807
01:04:18,309 --> 01:04:16,559
whales so you could watch it for the

1808
01:04:20,549 --> 01:04:18,319
whales well do you know if there'll be a

1809
01:04:22,150 --> 01:04:20,559
follow-up for fathom no there will not

1810
01:04:24,309 --> 01:04:22,160
be a follow-up for fathom that is just a

1811
01:04:25,910 --> 01:04:24,319
one-and-done yeah although i do think

1812
01:04:28,309 --> 01:04:25,920
that the filmmaker will probably come

1813
01:04:29,190 --> 01:04:28,319

back to me into the film into the field

1814

01:04:31,510 --> 01:04:29,200

um

1815

01:04:33,190 --> 01:04:31,520

just for just for giggles but no there

1816

01:04:35,349 --> 01:04:33,200

there will be there will be no fathom

1817

01:04:37,670 --> 01:04:35,359

too

1818

01:04:38,789 --> 01:04:37,680

well a huge thank you to yourself dr

1819

01:04:40,069 --> 01:04:38,799

michelle fourney for a wonderful

1820

01:04:41,910 --> 01:04:40,079

conversation and thank you to all the

1821

01:04:43,349 --> 01:04:41,920

listeners for listening with that we'll

1822

01:04:44,789 --> 01:04:43,359

sit for a minute and just really take in

1823

01:04:46,630 --> 01:04:44,799

what we're hearing and listen to some

1824

01:04:48,470 --> 01:04:46,640

complex whale song and appreciate it now

1825

01:04:52,690 --> 01:04:48,480

michelle's enlightened us as to as to

1826
01:05:18,450 --> 01:05:14,310

[Music]

1827
01:05:25,530 --> 01:05:18,460

me

1828
01:05:25,540 --> 01:05:29,829

[Music]

1829
01:05:29,839 --> 01:05:33,380

trees

1830
01:05:47,190 --> 01:05:43,560

[Music]

1831
01:05:48,870 --> 01:05:47,200
that is all for this week's show thank

1832
01:05:50,390 --> 01:05:48,880
you very much for listening please

1833
01:05:52,150 --> 01:05:50,400
remember to leave the podcaster review

1834
01:05:54,069 --> 01:05:52,160
on your chosen platform if you could

1835
01:05:56,069 --> 01:05:54,079
like share and subscribe that would be

1836
01:05:58,069 --> 01:05:56,079
very much appreciated you can support

1837
01:05:59,910 --> 01:05:58,079
the show and get ad-free early access to

1838
01:06:01,990 --> 01:05:59,920

content by becoming a member on youtube

1839

01:06:04,789 --> 01:06:02,000

or on patreon just search the name of

1840

01:06:06,549 --> 01:06:04,799

the channel that ufo podcast please feel

1841

01:06:09,829 --> 01:06:06,559

free to get in touch with me on twitter

1842

01:06:11,390 --> 01:06:09,839

or instagram at thesignal or email me at

1843

01:06:14,069 --> 01:06:11,400

thesignal

1844

01:06:16,069 --> 01:06:14,079

protonmail.com as always remember to be

1845

01:06:21,230 --> 01:06:16,079

curious the universe is bigger than we