



'Wings'

Not just a hit Cheers spinoff.

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The poster is white with a thin black border. At the top left is a vibrant blue butterfly with dark brown edges. To its right is a white bird, possibly a seagull, in flight with its wings spread wide. Below the butterfly and bird is the title "'Wings'" in a large, black, serif font. Underneath the title is the tagline "Not just a hit Cheers spinoff." in a smaller, italicized serif font. At the bottom left is a close-up photograph of a yellow dragonfly resting on a light-colored wooden surface. At the bottom right is a dark, rectangular image showing a glowing blue orb with the number "144" inside, set against a dark, textured background. In the bottom left corner of the poster, the copyright notice "© 1998" is visible.

1
00:00:12,970 --> 00:00:09,820
okay so my name is carlos moneys gun and

2
00:00:15,709 --> 00:00:12,980
the last time I ran this through it was

3
00:00:17,120 --> 00:00:15,719
13 minutes but I cut out the 90 seconds

4
00:00:20,570 --> 00:00:17,130
where I just stare you guys down so I

5
00:00:22,970 --> 00:00:20,580
think we'll be fine okay so my topic is

6
00:00:24,710 --> 00:00:22,980
what universe of biology should be him

7
00:00:26,690 --> 00:00:24,720
you know you're probably wondering what

8
00:00:30,019 --> 00:00:26,700
universal biology is let alone what it

9
00:00:32,359 --> 00:00:30,029
should be so there's a reason we don't

10
00:00:36,530 --> 00:00:32,369
think about biology as universal and it

11
00:00:39,200 --> 00:00:36,540
goes back to this guy who in 1859 wrote

12
00:00:42,590 --> 00:00:39,210
this really great book in which he

13
00:00:45,500 --> 00:00:42,600

argued among other things that there was

14

00:00:47,390 --> 00:00:45,510

common descent that all creatures on

15

00:00:50,150 --> 00:00:47,400

this planet ultimately trace their

16

00:00:57,530 --> 00:00:50,160

ancestry back to some last Universal

17

00:01:00,110 --> 00:00:57,540

common ancestor Luke gun and it so in a

18

00:01:04,850 --> 00:01:00,120

sense we're all related we have a sample

19

00:01:06,260 --> 00:01:04,860

size of one right you know before this

20

00:01:08,870 --> 00:01:06,270

it was reasonable to suppose that

21

00:01:10,580 --> 00:01:08,880

biology was as universal as any other

22

00:01:12,890 --> 00:01:10,590

science like physics or chemistry

23

00:01:14,180 --> 00:01:12,900

because he had millions of species you

24

00:01:16,370 --> 00:01:14,190

could generalize over them you could

25

00:01:18,350 --> 00:01:16,380

figure out interesting patterns and make

26

00:01:20,330 --> 00:01:18,360

interesting conclusions but once we

27

00:01:21,500 --> 00:01:20,340

realize that this is the case where

28

00:01:26,810 --> 00:01:21,510

should where in this kind of weird

29

00:01:29,270 --> 00:01:26,820

precarious situation now very few other

30

00:01:31,820 --> 00:01:29,280

Sciences if any are in this situation

31

00:01:33,980 --> 00:01:31,830

might even psychologies in the situation

32

00:01:37,750 --> 00:01:33,990

like in psychology could do comparative

33

00:01:39,830 --> 00:01:37,760

studies with chimpanzees for instance

34

00:01:43,160 --> 00:01:39,840

the closest I could think of was

35

00:01:46,340 --> 00:01:43,170

Egyptology which isn't really much of a

36

00:01:49,580 --> 00:01:46,350

science so this means that we're all

37

00:01:51,740 --> 00:01:49,590

alone and that everything we're

38

00:01:53,300 --> 00:01:51,750

generalizing over everything we're

39

00:01:55,490 --> 00:01:53,310

trying to figure out about biology is

40

00:01:57,740 --> 00:01:55,500

the dumbest in this context of a single

41

00:02:01,700 --> 00:01:57,750

example nevertheless a lot of people

42

00:02:03,859 --> 00:02:01,710

have thought that they could general are

43

00:02:05,570 --> 00:02:03,869

universalize biology and come up with

44

00:02:08,359 --> 00:02:05,580

just the parts of biology that are

45

00:02:14,000 --> 00:02:08,369

expected to apply everywhere everyone to

46

00:02:15,800 --> 00:02:14,010

every evolutionary system so these are a

47

00:02:18,500 --> 00:02:15,810

couple of people that have tried this

48

00:02:21,410 --> 00:02:18,510

the most recent group that tried that is

49

00:02:23,420 --> 00:02:21,420

at least claim to try to do this is this

50

00:02:25,339 --> 00:02:23,430

nice little group of they call

51
00:02:27,199 --> 00:02:25,349
themselves astrobiologists and I met a

52
00:02:31,339 --> 00:02:27,209
bunch of them in the bar yesterday a

53
00:02:33,860 --> 00:02:31,349
great these so I'm just going to read

54
00:02:35,449 --> 00:02:33,870
this a little bit so we must move beyond

55
00:02:37,580 --> 00:02:35,459
the circumstances of our own particular

56
00:02:40,190 --> 00:02:37,590
origins in order to develop a broader

57
00:02:42,080 --> 00:02:40,200
discipline Universal biology we need to

58
00:02:43,550 --> 00:02:42,090
exploit universal laws of physics and

59
00:02:46,039 --> 00:02:43,560
chemistry to understand polymer

60
00:02:48,110 --> 00:02:46,049
formation self-organization processes

61
00:02:50,210 --> 00:02:48,120
energy utilization information transfer

62
00:02:55,610 --> 00:02:50,220
and Darwinian evolution so these are all

63
00:02:58,910 --> 00:02:55,620

my emphasis and I'll get a little bit

64

00:03:01,520 --> 00:02:58,920

more into this so this is this was a

65

00:03:04,339 --> 00:03:01,530

promissory note I don't not very much

66

00:03:08,809 --> 00:03:04,349

has been done on this front since it was

67

00:03:10,009 --> 00:03:08,819

proposed but before I get into this I'm

68

00:03:11,479 --> 00:03:10,019

just messing with a camera I'm just

69

00:03:15,949 --> 00:03:11,489

making you happy to have to move it

70

00:03:17,180 --> 00:03:15,959

around okay so before I get into this we

71

00:03:19,910 --> 00:03:17,190

need to start talking about what is

72

00:03:21,170 --> 00:03:19,920

biology and a lot of people think that

73

00:03:24,650 --> 00:03:21,180

this means that you have to define life

74

00:03:27,920 --> 00:03:24,660

but there's very good reasons to think

75

00:03:31,819 --> 00:03:27,930

that we don't that we will never succeed

76

00:03:34,369 --> 00:03:31,829

in defining life I personally think that

77

00:03:37,729 --> 00:03:34,379

there's this continuum between abiotic

78

00:03:41,420 --> 00:03:37,739

and biotic factors and so even

79

00:03:42,500 --> 00:03:41,430

attempting to define life is equivalent

80

00:03:44,960 --> 00:03:42,510

to trying to say that there's a

81

00:03:46,970 --> 00:03:44,970

distinction between red and orange yeah

82

00:03:49,599 --> 00:03:46,980

there is but where do you draw the line

83

00:03:53,240 --> 00:03:49,609

there's no justified place to do it

84

00:03:55,210 --> 00:03:53,250

luckily it doesn't matter I think

85

00:03:57,650 --> 00:03:55,220

there's a more interesting way of

86

00:04:00,379 --> 00:03:57,660

carving nature edits joints to use the

87

00:04:04,399 --> 00:04:00,389

old phrase so the things that really

88

00:04:06,229 --> 00:04:04,409

matter aren't life kind of captures it

89

00:04:12,379 --> 00:04:06,239

but I think the thing that we need to

90

00:04:14,780 --> 00:04:12,389

focus on is evolution I think so the

91

00:04:16,580 --> 00:04:14,790

dope jansky Maxim is that nothing in

92

00:04:18,949 --> 00:04:16,590

biology makes sense except in the light

93

00:04:21,199 --> 00:04:18,959

of evolution and I think that

94

00:04:24,500 --> 00:04:21,209

astrobiologists haven't taken full

95

00:04:29,089 --> 00:04:24,510

advantage of evolution I there's a lot

96

00:04:31,460 --> 00:04:29,099

of power in evolutionary theory that is

97

00:04:35,030 --> 00:04:31,470

very helpful so

98

00:04:39,650 --> 00:04:35,040

going back to what we saw the smiths

99

00:04:43,160 --> 00:04:39,660

thing of this camera going back to the

100

00:04:44,740 --> 00:04:43,170

definition that the roadmap proposes it

101
00:04:47,540 --> 00:04:44,750
said that we need to exploit these

102
00:04:49,490 --> 00:04:47,550
universal laws of physics and chemistry

103
00:04:54,020 --> 00:04:49,500
we take physics and chemistry to be

104
00:04:55,910 --> 00:04:54,030
universal but there it's interesting

105
00:04:59,240 --> 00:04:55,920
that much of what biology is is

106
00:05:01,910 --> 00:04:59,250
functional it's defined by what it does

107
00:05:06,500 --> 00:05:01,920
not what it is so there's lots of ways

108
00:05:08,390 --> 00:05:06,510
to realize certain concepts in biology

109
00:05:11,870 --> 00:05:08,400
and I'll give an example of examples

110
00:05:15,170 --> 00:05:11,880
right now so even though life is based

111
00:05:18,230 --> 00:05:15,180
on chemistry and physics all the really

112
00:05:23,720 --> 00:05:18,240
interesting stuff occurs under a variety

113
00:05:25,850 --> 00:05:23,730

of different configurations right so now

114

00:05:30,020 --> 00:05:25,860

from here it doesn't necessarily follow

115

00:05:31,540 --> 00:05:30,030

that there's no necessary universal laws

116

00:05:33,740 --> 00:05:31,550

of biology it's just that they're

117

00:05:36,380 --> 00:05:33,750

they're going to be different and I

118

00:05:38,990 --> 00:05:36,390

prefer to think of this in terms of

119

00:05:41,900 --> 00:05:39,000

recurrent causal mechanisms took me like

120

00:05:44,590 --> 00:05:41,910

five but 20 minutes to make these this

121

00:05:47,510 --> 00:05:44,600

morning I couldn't find them online so

122

00:05:51,440 --> 00:05:47,520

gears so those of you they can't help

123

00:05:53,870 --> 00:05:51,450

okay uh-huh so recurrent causal

124

00:05:56,330 --> 00:05:53,880

mechanisms I think is a better way of

125

00:05:58,640 --> 00:05:56,340

approaching this instead of trying to

126
00:06:03,310 --> 00:05:58,650
figure out how to scale up from laws of

127
00:06:05,870 --> 00:06:03,320
physics and this I should probably

128
00:06:10,700 --> 00:06:05,880
justify why i said that biology is at

129
00:06:12,260 --> 00:06:10,710
least at least partially functional and

130
00:06:14,680 --> 00:06:12,270
a lot of things in biology or defined

131
00:06:17,480 --> 00:06:14,690
functionally so take for example the

132
00:06:19,909 --> 00:06:17,490
concept of wings it's not just a cheers

133
00:06:23,659 --> 00:06:19,919
spin-off I don't know why you leave

134
00:06:27,380 --> 00:06:23,669
these jokes in I need it ah I have a

135
00:06:31,190 --> 00:06:27,390
problem ok so there's butterfly wings or

136
00:06:35,150 --> 00:06:31,200
bird wings there's a dragonfly wings and

137
00:06:40,100 --> 00:06:35,160
then there's the bat wings all of these

138
00:06:43,430 --> 00:06:40,110

evolved separately parallel evolution to

139

00:06:44,810 --> 00:06:43,440

solve the same design problem to how to

140

00:06:47,700 --> 00:06:44,820

fly now

141

00:06:50,580 --> 00:06:47,710

there's also multicellularity for

142

00:06:56,990 --> 00:06:50,590

example has evolved 25 times in the

143

00:07:00,060 --> 00:06:57,000

history of life eyes this thing here

144

00:07:02,490 --> 00:07:00,070

those have evolved at least 40 times and

145

00:07:05,760 --> 00:07:02,500

probably as much as 65 times in the

146

00:07:10,350 --> 00:07:05,770

history of life so there's something

147

00:07:12,810 --> 00:07:10,360

there there's something about the

148

00:07:15,260 --> 00:07:12,820

function that role that things play that

149

00:07:20,700 --> 00:07:15,270

is how we should start approaching

150

00:07:23,730 --> 00:07:20,710

universality in biology so this is what

151

00:07:25,460 --> 00:07:23,740

I propose we should think of universal

152

00:07:28,650 --> 00:07:25,470

biology as a set of all interesting

153

00:07:30,060 --> 00:07:28,660

evolutionary models which make no

154

00:07:31,409 --> 00:07:30,070

reference to any considered facts on

155

00:07:33,510 --> 00:07:31,419

earth and so we're expected to obtain

156

00:07:35,400 --> 00:07:33,520

elsewhere in the universe this talk is

157

00:07:37,950 --> 00:07:35,410

based on two papers by the way email me

158

00:07:39,600 --> 00:07:37,960

if you want them one of them is more of

159

00:07:43,370 --> 00:07:39,610

a literature review one develops us a

160

00:07:49,950 --> 00:07:43,380

little bit more and justifies my use of

161

00:07:53,159 --> 00:07:49,960

all of those words ok so for structural

162

00:07:55,080 --> 00:07:53,169

things that are based on it that are in

163

00:07:57,360 --> 00:07:55,090

biology and based on physics and

164

00:08:00,210 --> 00:07:57,370

chemistry maybe maybe just approaching

165

00:08:03,180 --> 00:08:00,220

it the way now so the roadmap approaches

166

00:08:04,969 --> 00:08:03,190

it is fine but for other things we

167

00:08:07,830 --> 00:08:04,979

should probably focus on these Universal

168

00:08:09,300 --> 00:08:07,840

these design problems that are expected

169

00:08:12,450 --> 00:08:09,310

to obtain everywhere in the universe

170

00:08:15,060 --> 00:08:12,460

like resistance to radiation perhaps a

171

00:08:19,080 --> 00:08:15,070

fidelity of information transfer might

172

00:08:22,170 --> 00:08:19,090

be another thing and this is not the

173

00:08:24,270 --> 00:08:22,180

kind of thing that can be done by one

174

00:08:26,550 --> 00:08:24,280

person which probably the reason why

175

00:08:28,920 --> 00:08:26,560

hasn't been done by one person even

176

00:08:31,710 --> 00:08:28,930

though a lot of people claim to try them

177

00:08:34,579 --> 00:08:31,720

this is a discipline wide effort which

178

00:08:38,459 --> 00:08:34,589

is why I come here to you today I'm okay

179

00:08:40,500 --> 00:08:38,469

so what it should be we should seek out

180

00:08:42,899 --> 00:08:40,510

these broadest possible candidate

181

00:08:47,460 --> 00:08:42,909

Universal generalizations that are

182

00:08:51,000 --> 00:08:47,470

consistent with research categorized

183

00:08:53,610 --> 00:08:51,010

them justify them seek maybe seek some

184

00:08:56,280 --> 00:08:53,620

out of patterns and then test against

185

00:08:57,850 --> 00:08:56,290

nature if possible and some of this will

186

00:09:01,840 --> 00:08:57,860

turn out to be possible

187

00:09:03,490 --> 00:09:01,850

I expect I actually was going to take a

188

00:09:06,130 --> 00:09:03,500

screenshot of the database that I've

189

00:09:08,470 --> 00:09:06,140

been working on but it turns out tables

190

00:09:10,870 --> 00:09:08,480

are really boring so here's a different

191

00:09:15,490 --> 00:09:10,880

kind of table that's slightly less

192

00:09:16,780 --> 00:09:15,500

boring so we've seen this has been set a

193

00:09:18,370 --> 00:09:16,790

couple of times these are all things

194

00:09:25,780 --> 00:09:18,380

that I've picked up from the literature

195

00:09:34,410 --> 00:09:25,790

of various places huh okay that's

196

00:09:45,690 --> 00:09:34,420

troubling okay so so essentially a lot

197

00:09:48,910 --> 00:09:45,700

anyway the point is that'll do it okay

198

00:09:50,370 --> 00:09:48,920

the point is that they're all of we can

199

00:09:56,620 --> 00:09:50,380

investigate these people have

200

00:09:59,380 --> 00:09:56,630

highlighted these okay people have taken

201
00:10:01,540 --> 00:09:59,390
some time to two point these out

202
00:10:03,610 --> 00:10:01,550
whenever they find them this one's the

203
00:10:07,600 --> 00:10:03,620
Benner's that said that in a couple of

204
00:10:08,829 --> 00:10:07,610
interviews I don't necessarily stand by

205
00:10:11,829 --> 00:10:08,839
any of these I just think that a lot of

206
00:10:18,009 --> 00:10:11,839
people should start thinking in these

207
00:10:22,060 --> 00:10:18,019
terms okay now this might go contrary to

208
00:10:24,610 --> 00:10:22,070
what a lot of how we think normally of

209
00:10:29,079 --> 00:10:24,620
science a lot of people don't want to

210
00:10:34,269 --> 00:10:29,089
make these wide claims about things it's

211
00:10:36,699 --> 00:10:34,279
typically viewed as is risky but if

212
00:10:39,340 --> 00:10:36,709
science is about testability then the

213
00:10:41,350 --> 00:10:39,350

broader the claim and the stronger you

214

00:10:43,630 --> 00:10:41,360

test it the better science you're doing

215

00:10:45,610 --> 00:10:43,640

I'm not entirely sure that's what

216

00:10:49,019 --> 00:10:45,620

science is about but that's it at least

217

00:10:53,620 --> 00:10:49,029

what we have to believe in doing science

218

00:10:56,650 --> 00:10:53,630

so I'm see for example this observation

219

00:11:01,060 --> 00:10:56,660

of an eclipse in 1919 that tested this

220

00:11:05,860 --> 00:11:01,070

theory by this guy I try to choose the

221

00:11:08,350 --> 00:11:05,870

pictures of these of Einstein and Darwin

222

00:11:11,019 --> 00:11:08,360

that were more appropriate to when they

223

00:11:11,740 --> 00:11:11,029

actually developed these views rather

224

00:11:14,290 --> 00:11:11,750

than the picture

225

00:11:18,640 --> 00:11:14,300

then with huge beards and crazy hair

226

00:11:23,410 --> 00:11:18,650

that we are so familiar with so he

227

00:11:25,210 --> 00:11:23,420

proposes that gravity actually that

228

00:11:28,330 --> 00:11:25,220

object actually bend the space around

229

00:11:30,970 --> 00:11:28,340

them and an interesting test of this is

230

00:11:33,100 --> 00:11:30,980

during a solar eclipse stars should be

231

00:11:37,420 --> 00:11:33,110

slightly different from where we see the

232

00:11:40,450 --> 00:11:37,430

normally and it takes a dozen years but

233

00:11:44,530 --> 00:11:40,460

eventually this is observed this is a

234

00:11:50,650 --> 00:11:44,540

wild claim and when it's not refuted

235

00:11:53,170 --> 00:11:50,660

it's corroborated and so I'm proposing

236

00:11:57,460 --> 00:11:53,180

doing something similar to like that for

237

00:11:59,830 --> 00:11:57,470

biology as his potential payoff so

238

00:12:02,350 --> 00:11:59,840

Universal claim is falsified by a single

239

00:12:06,010 --> 00:12:02,360

counter example so any claim and

240

00:12:08,380 --> 00:12:06,020

universal biology should be falsified by

241

00:12:10,360 --> 00:12:08,390

a single if you see if you find one

242

00:12:16,270 --> 00:12:10,370

group set of organisms that prefers

243

00:12:19,030 --> 00:12:16,280

higher isotope higher isotopes for no

244

00:12:21,310 --> 00:12:19,040

reason then that seems to go against the

245

00:12:25,110 --> 00:12:21,320

claim at all life prefers higher

246

00:12:30,310 --> 00:12:25,120

isotopes largely sorry lighter isotopes

247

00:12:35,500 --> 00:12:30,320

okay so by seeking these mechanisms we

248

00:12:38,650 --> 00:12:35,510

can better get at this universality this

249

00:12:40,390 --> 00:12:38,660

is doable to a limited extent it'd be

250

00:12:44,950 --> 00:12:40,400

great if we had other examples of life

251
00:12:47,700 --> 00:12:44,960
but since we don't we should start

252
00:12:50,770 --> 00:12:47,710
thinking about what that would look like

253
00:12:52,930 --> 00:12:50,780
maybe make these claims that would

254
00:12:54,610 --> 00:12:52,940
actually be tested if we encountered

255
00:12:57,300 --> 00:12:54,620
life rather than just trying to explore

256
00:13:01,210 --> 00:12:57,310
the evidence and saying what it shows us

257
00:13:03,910 --> 00:13:01,220
so in sum we had a systematically

258
00:13:04,960 --> 00:13:03,920
categorize this biology in a way that

259
00:13:07,750 --> 00:13:04,970
highlights the parts I'm like the

260
00:13:11,400 --> 00:13:07,760
universal should be use this approach

261
00:13:14,700 --> 00:13:11,410
should be useful in that pursuit and