
AbSciCon
2017
MESA, ARIZONA

1
00:00:12,250 --> 00:00:06,150
you

2
00:00:17,140 --> 00:00:14,340
[Music]

3
00:00:19,570 --> 00:00:17,150
thank you for having me my name is

4
00:00:21,190 --> 00:00:19,580
Lawrence Tyler I'm a postdoc in match

5
00:00:25,179 --> 00:00:21,200
strikes lab at Michigan State University

6
00:00:29,710 --> 00:00:25,189
and I've been working on metabolomics as

7
00:00:31,540 --> 00:00:29,720
a means of mapping metabolic networks in

8
00:00:33,460 --> 00:00:31,550
microbial cultures and also an

9
00:00:35,200 --> 00:00:33,470
environmental sample since I started in

10
00:00:36,670 --> 00:00:35,210
this lab about a year and a half ago and

11
00:00:38,290 --> 00:00:36,680
so today I'm going to talk to you about

12
00:00:40,080 --> 00:00:38,300
a particular site that I've been working

13
00:00:43,210 --> 00:00:40,090

at the coast range ophiolite in

14
00:00:44,979 --> 00:00:43,220
California oh look it's the same slide

15
00:00:48,190 --> 00:00:44,989
that Katrina had it's almost like we

16
00:00:49,660 --> 00:00:48,200
worked in the same lab so you've already

17
00:00:51,400 --> 00:00:49,670
seen this you're already familiar with

18
00:00:53,200 --> 00:00:51,410
the reactions that are associated with

19
00:00:55,060 --> 00:00:53,210
repentance ation but what I really want

20
00:00:56,410 --> 00:00:55,070
to draw your attention to is the part of

21
00:00:58,299 --> 00:00:56,420
this reaction that interests me the most

22
00:01:00,490 --> 00:00:58,309
and that's this production of methane

23
00:01:02,260 --> 00:01:00,500
and these small organics and what's

24
00:01:05,950 --> 00:01:02,270
interesting about that to me is that

25
00:01:07,240 --> 00:01:05,960
while microbes can utilize methane and

26
00:01:08,800 --> 00:01:07,250
these small organics that are produced

27
00:01:10,240 --> 00:01:08,810
by this reaction they're also producing

28
00:01:11,529 --> 00:01:10,250
these things themselves

29
00:01:13,300 --> 00:01:11,539
we know that microbes can produce

30
00:01:15,370 --> 00:01:13,310
methane they produce these small

31
00:01:18,130 --> 00:01:15,380
organics and so it creates this really

32
00:01:21,010 --> 00:01:18,140
amazing and confounding grey area

33
00:01:22,840 --> 00:01:21,020
between geochemistry and biochemistry

34
00:01:25,030 --> 00:01:22,850
which i think is really at the crux of

35
00:01:27,039 --> 00:01:25,040
not only astrobiology but Originals life

36
00:01:29,289 --> 00:01:27,049
questions as well and it creates this

37
00:01:33,880 --> 00:01:29,299
beautiful loving relationship between

38
00:01:35,530 --> 00:01:33,890

microbes in rock and so as I mentioned

39
00:01:37,149 --> 00:01:35,540
I'm working specifically at the coast

40
00:01:40,300 --> 00:01:37,159
range ophiolite it's just one of many

41
00:01:44,319 --> 00:01:40,310
surprising environments that our lab is

42
00:01:46,240 --> 00:01:44,329
studying and this site is about three

43
00:01:48,490 --> 00:01:46,250
hours north of San Francisco or an hour

44
00:01:52,870 --> 00:01:48,500
north of Napa really nice drive up the

45
00:01:55,330 --> 00:01:52,880
coast and stop through wine country and

46
00:01:56,770 --> 00:01:55,340
there's two particular sites at the

47
00:01:58,630 --> 00:01:56,780
coast range ophiolite microbial

48
00:02:00,819 --> 00:01:58,640
Observatory which is shortened as chromo

49
00:02:02,920 --> 00:02:00,829
and that's Quarry Valley and the core

50
00:02:05,469 --> 00:02:02,930
shed well and each one of those sites

51
00:02:06,999 --> 00:02:05,479
has a cluster of well there's three at

52
00:02:09,639 --> 00:02:07,009
Quarry Valley and then there's another

53
00:02:12,930 --> 00:02:09,649
five plus an older well that was drilled

54
00:02:15,819 --> 00:02:12,940
before this project at korshack well and

55
00:02:18,090 --> 00:02:15,829
this is what the wells look like not

56
00:02:21,280 --> 00:02:18,100
very exciting to look at on the surface

57
00:02:23,990 --> 00:02:21,290
and I took these samples in May in June

58
00:02:25,760 --> 00:02:24,000
of last year

59
00:02:28,340 --> 00:02:25,770
and this is some work that Katrina did

60
00:02:32,960 --> 00:02:28,350
while she was still a PhD student in

61
00:02:34,970 --> 00:02:32,970
Matt's lab looking at 16s diversity in

62
00:02:38,120 --> 00:02:34,980
some of these wells and what I want to

63
00:02:40,400 --> 00:02:38,130

point out this is a figure from her

64
00:02:44,840 --> 00:02:40,410
latest paper what I want to point out

65
00:02:46,460 --> 00:02:44,850
here is the incredible decrease in alpha

66
00:02:51,530 --> 00:02:46,470
diversity that occurs as you go from

67
00:02:54,260 --> 00:02:51,540
these lower pH wells like CS w14 down to

68
00:02:57,500 --> 00:02:54,270
these very high alkaline walls like QV 1

69
00:02:59,510 --> 00:02:57,510
1 and c SW 1 1 so as you get into these

70
00:03:02,510 --> 00:02:59,520
higher alkaline well these deeper wells

71
00:03:03,949 --> 00:03:02,520
we really see a decrease in the amount

72
00:03:05,780 --> 00:03:03,959
of diversity that we see in these

73
00:03:07,910 --> 00:03:05,790
communities become very very simple and

74
00:03:09,949 --> 00:03:07,920
that's why I decided to focus on these

75
00:03:12,140 --> 00:03:09,959
1:1 wells because they are hyper alkalyn

76
00:03:13,940 --> 00:03:12,150
and they are very simple communities and

77
00:03:16,370 --> 00:03:13,950
I thought that they best reflected this

78
00:03:20,240 --> 00:03:16,380
relationship between microbes and mr.

79
00:03:21,770 --> 00:03:20,250
Penton izing system and so if we just

80
00:03:24,710 --> 00:03:21,780
want to look at the 1:1 wells at a

81
00:03:26,840 --> 00:03:24,720
glance these are the deepest wells at

82
00:03:29,540 --> 00:03:26,850
these sites with the exception of csw

83
00:03:30,949 --> 00:03:29,550
old and they are the highest pH as I

84
00:03:31,820 --> 00:03:30,959
mentioned they're the least diverse and

85
00:03:34,250 --> 00:03:31,830
so there you have the simplest

86
00:03:35,660 --> 00:03:34,260
communities they're also uncased which

87
00:03:37,850 --> 00:03:35,670
means that they can be influenced by

88
00:03:39,259 --> 00:03:37,860

water coming from the surface rain water

89
00:03:42,080 --> 00:03:39,269
which there isn't much of in this area

90
00:03:44,120 --> 00:03:42,090
but it is a concern and so we can have

91
00:03:45,979 --> 00:03:44,130
this percolation of organic material

92
00:03:49,160 --> 00:03:45,989
from the surface down into the swell

93
00:03:50,780 --> 00:03:49,170
water and if we just look really quickly

94
00:03:52,310 --> 00:03:50,790
at some of the chemical parameters of

95
00:03:56,600 --> 00:03:52,320
these wells they're about the same depth

96
00:03:58,610 --> 00:03:56,610
the pH ranges from 11.5 to 12.5 the

97
00:04:02,420 --> 00:03:58,620
highly reducing very low dissolved

98
00:04:04,280 --> 00:04:02,430
oxygen and relatively low biomass

99
00:04:07,449 --> 00:04:04,290
compared to something like seawater for

100
00:04:09,860 --> 00:04:07,459
example or surface strains in the area

101
00:04:15,020 --> 00:04:09,870
but again I want to draw your attention

102
00:04:17,240 --> 00:04:15,030
to the concentration of methane in these

103
00:04:20,180 --> 00:04:17,250
wells and some of these simple organic

104
00:04:22,009 --> 00:04:20,190
acids like acetate in forming in the QV

105
00:04:23,810 --> 00:04:22,019
wells in particular these organic acids

106
00:04:24,920 --> 00:04:23,820
are sometimes below detection limits but

107
00:04:26,510 --> 00:04:24,930
that doesn't necessarily mean that

108
00:04:31,250 --> 00:04:26,520
they're not being produced they may just

109
00:04:33,290 --> 00:04:31,260
be cycled very very rapidly so we're not

110
00:04:34,460 --> 00:04:33,300
really sure if the microbes are

111
00:04:35,570 --> 00:04:34,470
producing methane or if they're

112
00:04:37,450 --> 00:04:35,580
consuming methane or if they're

113
00:04:40,400 --> 00:04:37,460

producing something else entirely

114
00:04:42,530 --> 00:04:40,410
if we look at the meta genomic data

115
00:04:44,030 --> 00:04:42,540
which is provided by Billy Brazelton

116
00:04:47,570 --> 00:04:44,040
who's now professor at University of

117
00:04:49,120 --> 00:04:47,580
Utah we see a lot of pathways for things

118
00:04:51,740 --> 00:04:49,130
that we would expect and well that's

119
00:04:54,470 --> 00:04:51,750
influenced by groundwater percolating

120
00:04:56,810 --> 00:04:54,480
down into the wall so genes associated

121
00:04:58,970 --> 00:04:56,820
with the hydrolysis of cellulose from

122
00:05:01,190 --> 00:04:58,980
plants for example or the degradation of

123
00:05:03,590 --> 00:05:01,200
poly aromatic hydrocarbons fatty acid

124
00:05:05,540 --> 00:05:03,600
catabolism we also see a ton of gene

125
00:05:06,950 --> 00:05:05,550
pathways associated with fermentation

126
00:05:09,350 --> 00:05:06,960
which makes sense because it's a very

127
00:05:10,550 --> 00:05:09,360
low oxygen environment so the production

128
00:05:13,010 --> 00:05:10,560
of acetone

129
00:05:17,420 --> 00:05:13,020
for example which permit ativ cells used

130
00:05:18,950 --> 00:05:17,430
to store excess acetate and this makes

131
00:05:20,630 --> 00:05:18,960
sense when we look again at the chemical

132
00:05:22,160 --> 00:05:20,640
parameters of the wells you can see this

133
00:05:23,900 --> 00:05:22,170
production of formate and acetate

134
00:05:25,910 --> 00:05:23,910
through all of these fermentated

135
00:05:28,820 --> 00:05:25,920
processes so that's interesting but what

136
00:05:31,070 --> 00:05:28,830
about the methane well if we start

137
00:05:33,020 --> 00:05:31,080
looking at the genes associated with

138
00:05:34,460 --> 00:05:33,030

methane production and consumption we

139
00:05:39,530 --> 00:05:34,470
start to get a really interesting story

140
00:05:41,540 --> 00:05:39,540
here so the reductive acetyl co a

141
00:05:43,100 --> 00:05:41,550
pathway or the wood long draw pathway

142
00:05:46,580 --> 00:05:43,110
isn't really prevalent in these wells

143
00:05:48,530 --> 00:05:46,590
and neither are the genes for Masana

144
00:05:50,090 --> 00:05:48,540
genesis which makes sense because we

145
00:05:53,270 --> 00:05:50,100
weren't really able to find any evidence

146
00:05:56,210 --> 00:05:53,280
of mismanage ends in the 16s data either

147
00:05:57,620 --> 00:05:56,220
that comes from these meta-genome so it

148
00:06:01,960 --> 00:05:57,630
doesn't really look like methanogenesis

149
00:06:04,670 --> 00:06:01,970
is happening in these well there is

150
00:06:07,250 --> 00:06:04,680
Mehsana Genesis from acetate here in a

151
00:06:09,140 --> 00:06:07,260
small amount but if we can't find the

152
00:06:12,080 --> 00:06:09,150
misc antigens and that could be there

153
00:06:14,570 --> 00:06:12,090
because of a horizontal gene transfer or

154
00:06:17,930 --> 00:06:14,580
maybe it's been mislabeled any number of

155
00:06:20,470 --> 00:06:17,940
things we do find them quite a bit of

156
00:06:24,530 --> 00:06:20,480
acetate formation from acetyl co a and

157
00:06:26,330 --> 00:06:24,540
then all of these available genes and

158
00:06:30,890 --> 00:06:26,340
gene pathways for the consumption of

159
00:06:33,920 --> 00:06:30,900
methane from methyl a trophy and not

160
00:06:36,320 --> 00:06:33,930
quite as much methane oxidation to co2

161
00:06:38,120 --> 00:06:36,330
as I would have expected so there's all

162
00:06:42,110 --> 00:06:38,130
of these potential pathways for

163
00:06:44,750 --> 00:06:42,120

consuming methane and using it up but

164
00:06:47,030 --> 00:06:44,760
not necessarily pushing it to co2 and

165
00:06:48,770 --> 00:06:47,040
perhaps that's because co2 precipitates

166
00:06:50,119 --> 00:06:48,780
out so readily in these systems I'm not

167
00:06:54,659 --> 00:06:50,129
really sure

168
00:06:56,129 --> 00:06:54,669
so we have this very complex metabolic

169
00:06:58,469 --> 00:06:56,139
network here that we're trying to tease

170
00:07:00,330 --> 00:06:58,479
apart and while we have all this

171
00:07:02,010 --> 00:07:00,340
metagenomic data all that's really

172
00:07:03,719 --> 00:07:02,020
telling us is that these cells have the

173
00:07:05,429 --> 00:07:03,729
potential or they have the knowledge for

174
00:07:07,050 --> 00:07:05,439
these processes not necessarily that

175
00:07:09,659 --> 00:07:07,060
these processes are actively occurring

176
00:07:11,249 --> 00:07:09,669
and that's where metabolomics comes into

177
00:07:14,129 --> 00:07:11,259
play so for those of you in the audience

178
00:07:16,140 --> 00:07:14,139
who are not biochemist or not microbial

179
00:07:18,600 --> 00:07:16,150
ecologists like me a metabolite is a

180
00:07:20,580 --> 00:07:18,610
small organic molecule it's a product or

181
00:07:23,700 --> 00:07:20,590
an intermediate of a metabolic process

182
00:07:25,499 --> 00:07:23,710
and the metabolomic election of all the

183
00:07:29,730 --> 00:07:25,509
metabolites produced by an organism a

184
00:07:31,950 --> 00:07:29,740
population or a community so metabolomic

185
00:07:34,110 --> 00:07:31,960
this is really a snapshot of metabolism

186
00:07:35,279 --> 00:07:34,120
as it's occurring we have genomics which

187
00:07:37,320 --> 00:07:35,289
will tell us that a cell has the

188
00:07:38,640 --> 00:07:37,330

knowledge of a process proteomics will

189
00:07:40,680 --> 00:07:38,650
tell us that the cells producing the

190
00:07:42,659 --> 00:07:40,690
tools to perform that process but

191
00:07:44,610 --> 00:07:42,669
metabolomics is evidence of the process

192
00:07:46,890 --> 00:07:44,620
in action of course there are some

193
00:07:48,390 --> 00:07:46,900
limitations and as I mentioned before

194
00:07:50,580 --> 00:07:48,400
there's not a lot of biomass in these

195
00:07:52,260 --> 00:07:50,590
wells so in order to really get at some

196
00:07:54,390 --> 00:07:52,270
of the rarer metabolites that are like

197
00:07:56,339 --> 00:07:54,400
the smoking gun of metabolism we need

198
00:07:59,850 --> 00:07:56,349
quite a bit of carbon on these on these

199
00:08:01,800 --> 00:07:59,860
filters if we assume that each cell

200
00:08:03,749 --> 00:08:01,810
contains about 30 50 grams of carbon

201
00:08:06,540 --> 00:08:03,759
that means I would need to filter about

202
00:08:08,969 --> 00:08:06,550
50 litres of water that's a huge amount

203
00:08:10,709 --> 00:08:08,979
and while the one on wells have a pretty

204
00:08:12,689 --> 00:08:10,719
high fluid output that's not true for

205
00:08:14,189 --> 00:08:12,699
all of the wells at this site and

206
00:08:16,439 --> 00:08:14,199
there's also limitations just to

207
00:08:18,240 --> 00:08:16,449
filtration the filters can clog because

208
00:08:20,339 --> 00:08:18,250
as this highly alkaline water comes in

209
00:08:22,079 --> 00:08:20,349
contact with the atmosphere carbonates

210
00:08:24,269 --> 00:08:22,089
precipitate out clog the filter it's

211
00:08:25,980 --> 00:08:24,279
difficult to keep this water cold to

212
00:08:27,659 --> 00:08:25,990
prevent all kinds of metabolic

213
00:08:29,850 --> 00:08:27,669

interactions from occurring as you're

214
00:08:33,180 --> 00:08:29,860
filtering so the data shown here is for

215
00:08:35,100 --> 00:08:33,190
about 12 liters of water so it's really

216
00:08:37,469 --> 00:08:35,110
a two-step process first a filter the

217
00:08:39,719 --> 00:08:37,479
water through a vacuum filtration and a

218
00:08:42,449 --> 00:08:39,729
glass stand like this through a PTFE

219
00:08:44,910 --> 00:08:42,459
filter and then yes that's the front

220
00:08:46,290 --> 00:08:44,920
seat of a car this is the best picture I

221
00:08:50,220 --> 00:08:46,300
had of me actually doing this in the

222
00:08:52,620 --> 00:08:50,230
field so and then that filtered water is

223
00:08:53,689 --> 00:08:52,630
run again through an SP II cartridge

224
00:08:55,949 --> 00:08:53,699
which stands for solid phase extraction

225
00:08:58,590 --> 00:08:55,959
which captures all of the dissolved

226
00:09:01,800 --> 00:08:58,600
carbon in the sample so that can be run

227
00:09:03,929 --> 00:09:01,810
separately so we're looking at two pools

228
00:09:06,179 --> 00:09:03,939
metabolites here whatever trapped on the

229
00:09:07,679 --> 00:09:06,189
filter which represents intracellular

230
00:09:09,239 --> 00:09:07,689
metabolites and then all of the

231
00:09:12,150 --> 00:09:09,249
dissolved organic matter that's present

232
00:09:14,970 --> 00:09:12,160
in the well water and if we look at that

233
00:09:17,850 --> 00:09:14,980
and compare those samples on a PCA plot

234
00:09:20,189 --> 00:09:17,860
we see that the fluid samples are sort

235
00:09:25,799 --> 00:09:20,199
of similar to each other but drastically

236
00:09:34,110 --> 00:09:25,809
different from everything else what's

237
00:09:35,100 --> 00:09:34,120
happening it's not going over there goes

238
00:09:37,619 --> 00:09:35,110

sorry

239
00:09:39,480 --> 00:09:37,629
and then the biomass samples are very

240
00:09:43,530 --> 00:09:39,490
very similar to each other and there's

241
00:09:45,569 --> 00:09:43,540
our blank and our biomass like so if we

242
00:09:47,040 --> 00:09:45,579
look at all of the different compounds

243
00:09:49,590 --> 00:09:47,050
that we've observed which are analyzed

244
00:09:52,559 --> 00:09:49,600
on a tandem liquid chromatography mass

245
00:09:54,480 --> 00:09:52,569
spec we had a total of about 6,800

246
00:09:55,799 --> 00:09:54,490
compounds when we subtracted out

247
00:09:59,610 --> 00:09:55,809
whatever ones were also found in the

248
00:10:01,650 --> 00:09:59,620
blanks that was about 4500 and only 79

249
00:10:04,110 --> 00:10:01,660
of those samples or those compounds were

250
00:10:05,850 --> 00:10:04,120
found across all the samples so there

251
00:10:08,490 --> 00:10:05,860
were a lot of compounds that were very

252
00:10:10,769 --> 00:10:08,500
unique to the extracellular fluid and

253
00:10:14,100 --> 00:10:10,779
only a few that were unique to the

254
00:10:15,900 --> 00:10:14,110
biomass and the CSW well had a lot more

255
00:10:18,689 --> 00:10:15,910
unique compounds from the QV well for

256
00:10:20,670 --> 00:10:18,699
whatever reason there's also a ton of

257
00:10:22,559 --> 00:10:20,680
possible identifications for all of

258
00:10:25,549 --> 00:10:22,569
these compounds we searched database and

259
00:10:28,019 --> 00:10:25,559
compared with the mass-to-charge ratio

260
00:10:29,400 --> 00:10:28,029
retention time fragmentation and try to

261
00:10:32,340 --> 00:10:29,410
figure out what all of these compounds

262
00:10:34,499 --> 00:10:32,350
are and there are 50,000 possible IDs in

263
00:10:36,540 --> 00:10:34,509

a human metabolomic data base which we

264
00:10:39,990 --> 00:10:36,550
were able to narrow down to about 3600

265
00:10:41,579 --> 00:10:40,000
in the CAG database so some of the

266
00:10:43,439 --> 00:10:41,589
common compounds that we found here are

267
00:10:44,850 --> 00:10:43,449
some compounds of interest lots of

268
00:10:46,860 --> 00:10:44,860
different vitamins including a lot of B

269
00:10:49,910 --> 00:10:46,870
vitamins and the metabolites of those

270
00:10:52,049 --> 00:10:49,920
vitamins quinolones which are used in

271
00:10:58,079 --> 00:10:52,059
respiration and for different metabolic

272
00:10:59,910 --> 00:10:58,089
processes aromatic hydrocarbons acetone

273
00:11:02,519 --> 00:10:59,920
acetate which I mentioned is linked to

274
00:11:04,230 --> 00:11:02,529
fermentated processes and antibiotics

275
00:11:05,879 --> 00:11:04,240
and the products of the degradation of

276
00:11:07,590 --> 00:11:05,889
antibiotics all very interesting but

277
00:11:10,139 --> 00:11:07,600
what was most interesting to me is that

278
00:11:13,549 --> 00:11:10,149
I found all of the compounds that are

279
00:11:15,180 --> 00:11:13,559
associated with this are ump

280
00:11:16,950 --> 00:11:15,190
formaldehyde fixation

281
00:11:20,220 --> 00:11:16,960
halfway associated with methyl a trophy

282
00:11:21,870 --> 00:11:20,230
all of the compounds associated with the

283
00:11:24,000 --> 00:11:21,880
cesarean pathway for formaldehyde

284
00:11:26,460 --> 00:11:24,010
fixation some of the ones associated

285
00:11:28,130 --> 00:11:26,470
with tetrahydrofolate pathway and some

286
00:11:30,750 --> 00:11:28,140
of the ones that were associated with a

287
00:11:32,340 --> 00:11:30,760
glutathione pathway as well so there's

288
00:11:34,170 --> 00:11:32,350

plenty of evidence here from methyl a

289
00:11:36,000 --> 00:11:34,180
trophy occurring in these wells not only

290
00:11:39,120 --> 00:11:36,010
in the meta genome but also in the

291
00:11:42,030 --> 00:11:39,130
metabolome and very little evidence I

292
00:11:46,620 --> 00:11:42,040
believe for Mehsana Genesis at least in

293
00:11:48,300 --> 00:11:46,630
this particular site we still need to

294
00:11:49,260 --> 00:11:48,310
use some more sensitive methods to

295
00:11:50,040 --> 00:11:49,270
measure some of these small

296
00:11:52,050 --> 00:11:50,050
intermediates

297
00:11:53,700 --> 00:11:52,060
because lc/ms doesn't really pick up the

298
00:11:56,130 --> 00:11:53,710
very small metabolites especially

299
00:11:58,230 --> 00:11:56,140
uncharged ones and we have a ton of an

300
00:12:00,120 --> 00:11:58,240
unidentified compounds that may also be

301
00:12:01,940 --> 00:12:00,130
used as possible biomarkers for for

302
00:12:04,620 --> 00:12:01,950
looking for microbes associated with

303
00:12:06,480 --> 00:12:04,630
serpentine izing environment potentially

304
00:12:09,480 --> 00:12:06,490
on other worlds and they may be very

305
00:12:13,800 --> 00:12:09,490
very useful for for those kinds of

306
00:12:15,300 --> 00:12:13,810
studies so I'm running out of time but

307
00:12:16,890 --> 00:12:15,310
the next steps that we're going to do in

308
00:12:19,170 --> 00:12:16,900
this project is we're going to construct

309
00:12:22,500 --> 00:12:19,180
metabolic networks in our using the

310
00:12:23,940 --> 00:12:22,510
metabolome and the meta-genome i'm going

311
00:12:26,100 --> 00:12:23,950
to do some further work in chromo and

312
00:12:27,810 --> 00:12:26,110
including some work at c SW old because

313
00:12:29,610 --> 00:12:27,820

it is such a deep well and it is so

314
00:12:31,670 --> 00:12:29,620
interesting it's got very low amount of

315
00:12:34,170 --> 00:12:31,680
biomass there's a lot of potential there

316
00:12:36,270 --> 00:12:34,180
I've also been using these same

317
00:12:38,460 --> 00:12:36,280
techniques in the Oman drilling project

318
00:12:41,330 --> 00:12:38,470
and the picture from the front seat of a

319
00:12:44,780 --> 00:12:41,340
car was some problems from that project

320
00:12:47,100 --> 00:12:44,790
that's an entirely separate funny story

321
00:12:48,540 --> 00:12:47,110
I'm also using these techniques on

322
00:12:50,430 --> 00:12:48,550
microcosms and enrichments in the

323
00:12:52,080 --> 00:12:50,440
laboratory we're talking about

324
00:12:54,720 --> 00:12:52,090
potentially using them on micro cosmos

325
00:12:56,220 --> 00:12:54,730
from lost city and definitely if you're

326
00:12:57,480 --> 00:12:56,230
interested in this work and particularly

327
00:12:58,890 --> 00:12:57,490
the work that we're doing at chromo you

328
00:13:00,780 --> 00:12:58,900
should check out Marisa Buddha's and

329
00:13:04,050 --> 00:13:00,790
Lindsey Williams's talk this afternoon

330
00:13:06,270 --> 00:13:04,060
in this room and hopefully we'll be able

331
00:13:09,390 --> 00:13:06,280
to use some of this work to eventually

332
00:13:10,890 --> 00:13:09,400
find a microbe in space and so with that

333
00:13:12,360 --> 00:13:10,900
I'd like to thank you for your attention

334
00:13:18,740 --> 00:13:12,370
and I welcome your questions if there's

335
00:13:26,940 --> 00:13:21,120
we have time for a question or two for

336
00:13:28,260 --> 00:13:26,950
Lord oh yeah in the back if you could

337
00:13:49,889 --> 00:13:28,270
either speak loudly or come up to a

338
00:13:52,650 --> 00:13:49,899

microphone so I'm still working very

339
00:13:54,540 --> 00:13:52,660
preliminary on some of these enrichment

340
00:13:56,460 --> 00:13:54,550
experiments and microcosms but if you're

341
00:13:58,350 --> 00:13:56,470
interested in enrichment experiments

342
00:14:00,090 --> 00:13:58,360
from from this site in particular

343
00:14:03,180 --> 00:14:00,100
definitely check out Mary's talk this

344
00:14:07,050 --> 00:14:03,190
afternoon but we've been basically

345
00:14:09,690 --> 00:14:07,060
providing a reductant to to these

346
00:14:11,400 --> 00:14:09,700
microcosms and seeing if we can observe

347
00:14:16,199 --> 00:14:11,410
methyl a trophy in the production of co2

348
00:14:17,940 --> 00:14:16,209
in our lab hi hi Jamie Foster University

349
00:14:19,710 --> 00:14:17,950
of Florida I'm really curious about the

350
00:14:21,720 --> 00:14:19,720
metabolomic so did you see any cycling

351
00:14:24,380 --> 00:14:21,730
any Dial cycling within your community

352
00:14:26,699 --> 00:14:24,390
or you is this just a single time point

353
00:14:28,980 --> 00:14:26,709
what's the reproducibility of your

354
00:14:31,800 --> 00:14:28,990
signatures in your community

355
00:14:34,230 --> 00:14:31,810
so this is a single time point I

356
00:14:36,030 --> 00:14:34,240
initially took triplicates samples but

357
00:14:37,620 --> 00:14:36,040
the signal was so low that I had to pull

358
00:14:39,180 --> 00:14:37,630
all of them and that's why I was a 12

359
00:14:42,540 --> 00:14:39,190
leader sample because originally it was

360
00:14:44,880 --> 00:14:42,550
four in samples that I've done in

361
00:14:47,579 --> 00:14:44,890
culturing these results are very

362
00:14:49,860 --> 00:14:47,589
reproducible and triplicate samples look

363
00:14:51,690 --> 00:14:49,870

very very alike as far as

364
00:14:53,760 --> 00:14:51,700
reproducibility at this particular site

365
00:14:55,019 --> 00:14:53,770
this is still very preliminary and we're

366
00:14:57,870 --> 00:14:55,029
still working through the methodology

367
00:15:00,840 --> 00:14:57,880
and so I was only able to take one

368
00:15:02,760 --> 00:15:00,850
sample from each well but we'll be going

369
00:15:04,980 --> 00:15:02,770
back and hopefully doing this at a

370
00:15:06,780 --> 00:15:04,990
larger scale in order to show that

371
00:15:09,449 --> 00:15:06,790
reproducibility and maybe see some

372
00:15:14,790 --> 00:15:09,459
differences seasonally or with other