
AbSciCon
2019

1
00:00:00,790 --> 00:00:07,320
[Music]

2
00:00:11,730 --> 00:00:09,230
[Applause]

3
00:00:13,800 --> 00:00:11,740
hi thank you I'm Elizabeth cada mio I'm

4
00:00:15,270 --> 00:00:13,810
a postdoc at the Jet Propulsion lab and

5
00:00:16,950 --> 00:00:15,280
today we'll be talking about a method

6
00:00:19,200 --> 00:00:16,960
I've been developing for the analysis of

7
00:00:20,550 --> 00:00:19,210
organic and inorganic ions using

8
00:00:22,109 --> 00:00:20,560
capillary electrophoresis with

9
00:00:25,290 --> 00:00:22,119
capacitively couple of contactless

10
00:00:28,260 --> 00:00:25,300
conductivity detection or CEC 4d for

11
00:00:30,779 --> 00:00:28,270
short so the target for this method is

12
00:00:32,910 --> 00:00:30,789
really analysis of the samples from this

13
00:00:34,410 --> 00:00:32,920

ocean world I don't have to explain to

14
00:00:36,270 --> 00:00:34,420
this group why this world these worlds

15
00:00:39,180 --> 00:00:36,280
are important or interesting so I'm not

16
00:00:40,590 --> 00:00:39,190
going to waste my time doing that but

17
00:00:41,819 --> 00:00:40,600
I'm going to say that one of the targets

18
00:00:44,220 --> 00:00:41,829
one of the things I would like to

19
00:00:46,500 --> 00:00:44,230
possibly use this for is incorporation

20
00:00:48,600 --> 00:00:46,510
into a potential larger mission for life

21
00:00:50,880 --> 00:00:48,610
detection and there was this wonderful

22
00:00:52,950 --> 00:00:50,890
paper that was published that sort of

23
00:00:55,740 --> 00:00:52,960
delineates how you might search for life

24
00:00:57,180 --> 00:00:55,750
and detect life on other worlds and the

25
00:00:58,950 --> 00:00:57,190
method that I'm developing would sort of

26
00:01:00,660 --> 00:00:58,960
fall on the rung that describes

27
00:01:03,119 --> 00:01:00,670
molecules and structures conferring

28
00:01:05,670 --> 00:01:03,129
function so I would be looking for

29
00:01:08,100 --> 00:01:05,680
patterns within classes of molecules

30
00:01:10,440 --> 00:01:08,110
that are not random and therefore might

31
00:01:11,850 --> 00:01:10,450
be indicative of life and the classes of

32
00:01:13,740 --> 00:01:11,860
molecules that I'd be looking at are

33
00:01:15,899 --> 00:01:13,750
things like amino acids or carboxylic

34
00:01:17,640 --> 00:01:15,909
acids because these are things that we

35
00:01:19,080 --> 00:01:17,650
find for carboxylic acids they're

36
00:01:21,270 --> 00:01:19,090
important intermediates and metabolic

37
00:01:24,570 --> 00:01:21,280
processes and they can sort of be

38
00:01:27,330 --> 00:01:24,580

component of cell membranes and things

39
00:01:29,070 --> 00:01:27,340
like that I'm also interested in this

40
00:01:31,380 --> 00:01:29,080
method and it probably has its strengths

41
00:01:33,000 --> 00:01:31,390
mainly and have ability assessment and I

42
00:01:33,960 --> 00:01:33,010
want to take a moment to make sure that

43
00:01:36,359 --> 00:01:33,970
we are clear about the difference

44
00:01:39,480 --> 00:01:36,369
between life detection and habitability

45
00:01:40,770 --> 00:01:39,490
so my Cliff Notes version of this is for

46
00:01:42,390 --> 00:01:40,780
life detection you're looking for

47
00:01:44,609 --> 00:01:42,400
evidence of some sort of metabolism

48
00:01:46,440 --> 00:01:44,619
habitability is just asking whether or

49
00:01:48,359 --> 00:01:46,450
not that environment could support a

50
00:01:49,679 --> 00:01:48,369
metabolism and it's much more

51
00:01:52,170 --> 00:01:49,689
complicated than that but those are the

52
00:01:53,880 --> 00:01:52,180
cliffnotes for now and so the basis for

53
00:01:56,120 --> 00:01:53,890
looking an habitable environment would

54
00:01:58,800 --> 00:01:56,130
be looking for something like water

55
00:02:00,870 --> 00:01:58,810
organic molecules and energy sources and

56
00:02:03,149 --> 00:02:00,880
having these are not simply enough you

57
00:02:05,399 --> 00:02:03,159
need to have them sort of co-located so

58
00:02:07,620 --> 00:02:05,409
any organism that might be present could

59
00:02:09,180 --> 00:02:07,630
actually use them for metabolism so to

60
00:02:10,979 --> 00:02:09,190
do this we're going to first search for

61
00:02:13,020 --> 00:02:10,989
these organic molecules and energy

62
00:02:14,460 --> 00:02:13,030
sources in the soluble chemistry of the

63
00:02:16,350 --> 00:02:14,470

environment and that will ensure not

64
00:02:17,160 --> 00:02:16,360
only that they are co-located but also

65
00:02:18,930 --> 00:02:17,170
that you

66
00:02:21,170 --> 00:02:18,940
a solvent that is able to participate

67
00:02:23,339 --> 00:02:21,180
and support the electron transport

68
00:02:25,740 --> 00:02:23,349
processes that are essential for

69
00:02:27,000 --> 00:02:25,750
metabolism so there are different

70
00:02:29,190 --> 00:02:27,010
organic molecules that we will be

71
00:02:32,040 --> 00:02:29,200
looking for and different energy sources

72
00:02:33,449 --> 00:02:32,050
that we will be looking for the specific

73
00:02:36,840 --> 00:02:33,459
targets that I've sort of used to

74
00:02:39,210 --> 00:02:36,850
develop my method for inorganic ions we

75
00:02:41,250 --> 00:02:39,220
have over here we based it off of

76
00:02:43,170 --> 00:02:41,260
seawater for a lot of them because if

77
00:02:45,030 --> 00:02:43,180
we're looking at ocean world's our ocean

78
00:02:46,170 --> 00:02:45,040
is sort of a decent model for and also

79
00:02:47,729 --> 00:02:46,180
we suspect there will be a lot of

80
00:02:49,740 --> 00:02:47,739
chlorine there will be a chloride there

81
00:02:52,979 --> 00:02:49,750
will be sulfate so we're looking for a

82
00:02:54,600 --> 00:02:52,989
bromide chloride carbonate sulfate and

83
00:02:56,309 --> 00:02:54,610
we're also looking for metabolic energy

84
00:02:58,920 --> 00:02:56,319
sources so microbial life on earth can

85
00:03:00,860 --> 00:02:58,930
use oxyanion species like sulfate and

86
00:03:03,449 --> 00:03:00,870
nitrate and perchlorate in order to

87
00:03:06,240 --> 00:03:03,459
metabolize I also want to take a moment

88
00:03:08,580 --> 00:03:06,250

to specifically focus on perchlorate

89
00:03:11,039 --> 00:03:08,590
just briefly if we are expecting these

90
00:03:13,229 --> 00:03:11,049
ocean worlds to have a lot of chloride

91
00:03:16,110 --> 00:03:13,239
and we think they might be highly

92
00:03:17,970 --> 00:03:16,120
oxidizing I think it is important that

93
00:03:21,030 --> 00:03:17,980
we consider the presence of perchlorate

94
00:03:23,160 --> 00:03:21,040
as a potential ion that could either

95
00:03:26,069 --> 00:03:23,170
interfere or support metabolic life in

96
00:03:28,680 --> 00:03:26,079
these oceans and so I wanted to make

97
00:03:30,930 --> 00:03:28,690
sure that that is part of our our search

98
00:03:33,270 --> 00:03:30,940
in these inorganic sources we're also

99
00:03:35,670 --> 00:03:33,280
looking for carboxylic acids so I sort

100
00:03:37,440 --> 00:03:35,680
of split them into these short chain

101
00:03:40,650 --> 00:03:37,450
carboxylic acids and potentially longer

102
00:03:42,120 --> 00:03:40,660
chain ones so here we have a sort of

103
00:03:43,949 --> 00:03:42,130
loose selection of ones that are found

104
00:03:46,259 --> 00:03:43,959
in meteorites that are shorter chain

105
00:03:48,780 --> 00:03:46,269
their mono carboxylic acids their branch

106
00:03:50,910 --> 00:03:48,790
they have hydroxy groups attached to

107
00:03:53,009 --> 00:03:50,920
them and then we have these which are

108
00:03:55,380 --> 00:03:53,019
sort of Diane tri carboxylic acids which

109
00:03:57,840 --> 00:03:55,390
are products and intermediates in

110
00:04:00,180 --> 00:03:57,850
metabolism we're also interested in some

111
00:04:02,130 --> 00:04:00,190
mono carboxylic acids that are longer

112
00:04:04,140 --> 00:04:02,140
chain lengths that are derived from

113
00:04:06,720 --> 00:04:04,150

lipids and could be potential components

114
00:04:09,000 --> 00:04:06,730
of cell walls

115
00:04:11,370 --> 00:04:09,010
so the technique we're using seee is

116
00:04:13,170 --> 00:04:11,380
ideal for this sort of analysis because

117
00:04:14,970 --> 00:04:13,180
it inherently separates charged species

118
00:04:15,990 --> 00:04:14,980
in an aqueous solution which is exactly

119
00:04:18,509 --> 00:04:16,000
what we're looking for

120
00:04:20,960 --> 00:04:18,519
so to do a cex parent you have a thin

121
00:04:23,430 --> 00:04:20,970
capillary about 50 microns in our case

122
00:04:25,260 --> 00:04:23,440
we fill it with a background electrolyte

123
00:04:27,150 --> 00:04:25,270
we inject sample into one end and then

124
00:04:29,040 --> 00:04:27,160
we apply a voltage and what happens is

125
00:04:30,840 --> 00:04:29,050
under the effect of that voltage the

126
00:04:33,510 --> 00:04:30,850
species of the charged species in the

127
00:04:35,580 --> 00:04:33,520
sample will separate based on their mass

128
00:04:37,470 --> 00:04:35,590
and there are there's their size and

129
00:04:39,330 --> 00:04:37,480
their charge and so at the other end you

130
00:04:40,800 --> 00:04:39,340
can place a detector and you can detect

131
00:04:44,370 --> 00:04:40,810
the different species that are already

132
00:04:45,390 --> 00:04:44,380
separated the detector detection method

133
00:04:47,370 --> 00:04:45,400
that we have chosen is a form of

134
00:04:49,350 --> 00:04:47,380
conductivity detection and we chose this

135
00:04:51,060 --> 00:04:49,360
because it will detect any charged

136
00:04:52,920 --> 00:04:51,070
species so we don't actually need to

137
00:04:54,719 --> 00:04:52,930
know what the charged species is so long

138
00:04:55,440 --> 00:04:54,729

as we can detect that that it is

139
00:04:57,420 --> 00:04:55,450
different from our background

140
00:04:58,980 --> 00:04:57,430
electrolyte it doesn't require any

141
00:05:00,540 --> 00:04:58,990
labeling or derivatives ation so we

142
00:05:02,129 --> 00:05:00,550
could use this in conjunction with other

143
00:05:05,250 --> 00:05:02,139
detection methods so we could put

144
00:05:06,930 --> 00:05:05,260
perhaps the c4d detector in line with a

145
00:05:13,050 --> 00:05:06,940
mass spec and get even more information

146
00:05:14,520 --> 00:05:13,060
out of it in the end so if you noticed

147
00:05:16,409 --> 00:05:14,530
when I talked about the targets that I

148
00:05:18,600 --> 00:05:16,419
was interested in I talked mostly about

149
00:05:20,219 --> 00:05:18,610
anions and the reason for that is that I

150
00:05:22,370 --> 00:05:20,229
have a lot of lab mates who have done a

151
00:05:24,450 --> 00:05:22,380
lot of work on the cation side of this

152
00:05:27,570 --> 00:05:24,460
here we have a paper that was published

153
00:05:29,969 --> 00:05:27,580
last year by a Philip O stock motto for

154
00:05:32,070 --> 00:05:29,979
da Santos and I encourage you if you're

155
00:05:34,740 --> 00:05:32,080
interested to look up that paper and he

156
00:05:37,040 --> 00:05:34,750
what he did was he used the same CEC 4d

157
00:05:39,900 --> 00:05:37,050
technology in order to separate

158
00:05:41,700 --> 00:05:39,910
inorganic cations and amino acids

159
00:05:43,680 --> 00:05:41,710
simultaneously and the background

160
00:05:46,800 --> 00:05:43,690
electrolyte he used for that was acetic

161
00:05:48,180 --> 00:05:46,810
acid and then we have another method

162
00:05:49,500 --> 00:05:48,190
that was developed by Jessica Kramer

163
00:05:51,840 --> 00:05:49,510

who's giving a talk later today that I

164
00:05:53,790 --> 00:05:51,850
encourage you all to go to that is done

165
00:05:55,650 --> 00:05:53,800
she's got excellent work developing

166
00:05:58,710 --> 00:05:55,660
chiral separations of amino acids with

167
00:06:00,840 --> 00:05:58,720
very low detection detection limits and

168
00:06:04,750 --> 00:06:00,850
the electrolyte that she's been using

169
00:06:08,740 --> 00:06:06,940
so as I go forward to develop my method

170
00:06:10,900 --> 00:06:08,750
I'm looking for using it in these in

171
00:06:12,790 --> 00:06:10,910
situ environments where we're really

172
00:06:14,710 --> 00:06:12,800
trying to minimize the complexity of our

173
00:06:16,000 --> 00:06:14,720
instruments and our methods because we

174
00:06:18,820 --> 00:06:16,010
don't have a lot of space we don't have

175
00:06:20,110 --> 00:06:18,830
a lot of power and so we want to have it

176
00:06:22,420 --> 00:06:20,120
be as simple as possible but we're not

177
00:06:24,640 --> 00:06:22,430
really willing to give up any of the

178
00:06:26,500 --> 00:06:24,650
science that we're looking for and so my

179
00:06:28,060 --> 00:06:26,510
approach to doing this is to take those

180
00:06:30,190 --> 00:06:28,070
cation methods that my lab mates have

181
00:06:31,990 --> 00:06:30,200
developed and develop an anion version

182
00:06:33,340 --> 00:06:32,000
that is compatible so it should be run

183
00:06:35,470 --> 00:06:33,350
on the same capillary with the same

184
00:06:39,510 --> 00:06:35,480
equipment and ideally use as many of the

185
00:06:45,850 --> 00:06:43,420
so this is exactly what I did so method

186
00:06:47,320 --> 00:06:45,860
1 I basically took the acetic acid based

187
00:06:49,660 --> 00:06:47,330
method that was developed for the

188
00:06:53,380 --> 00:06:49,670

simultaneous separation of inorganic

189
00:06:54,970 --> 00:06:53,390
cations and amino acids and I titrated

190
00:06:57,790 --> 00:06:54,980
it with sodium tetraborate until it

191
00:06:59,830 --> 00:06:57,800
reached around the pKa of acetic acid

192
00:07:01,870 --> 00:06:59,840
and I used that to separate whoops

193
00:07:04,960 --> 00:07:01,880
that's the wrong button use that to

194
00:07:06,400 --> 00:07:04,970
separate the the inorganic ions that I

195
00:07:09,520 --> 00:07:06,410
was interested and then the small very

196
00:07:11,320 --> 00:07:09,530
highly charged oxalic acid and then I

197
00:07:13,810 --> 00:07:11,330
basically did the inverse in order to

198
00:07:15,100 --> 00:07:13,820
develop the carboxylic acid version of

199
00:07:16,810 --> 00:07:15,110
this so I took the sodium tetraborate

200
00:07:18,670 --> 00:07:16,820
that's being used for the chiral amino

201
00:07:21,580 --> 00:07:18,680
acids and I titrated that with acetic

202
00:07:23,620 --> 00:07:21,590
acid to about the pKa of sodium

203
00:07:27,370 --> 00:07:23,630
tetraborate and I use that to separate

204
00:07:29,470 --> 00:07:27,380
out these carboxylic acids and this is

205
00:07:30,700 --> 00:07:29,480
very interesting because we can get it's

206
00:07:32,920 --> 00:07:30,710
very convenient I don't know if it's

207
00:07:34,990 --> 00:07:32,930
interesting because we have basically we

208
00:07:36,580 --> 00:07:35,000
have this division here and at this

209
00:07:39,070 --> 00:07:36,590
point everything below that are these

210
00:07:40,630 --> 00:07:39,080
sort of mono carboxylic acids these

211
00:07:43,450 --> 00:07:40,640
hydroxy acids these things which are

212
00:07:45,130 --> 00:07:43,460
typically found in meteorites and and

213
00:07:47,020 --> 00:07:45,140

the like and on the other side we have

214
00:07:48,610 --> 00:07:47,030
the highly charged ion tri carboxylic

215
00:07:50,770 --> 00:07:48,620
acids and things that are typically

216
00:07:51,760 --> 00:07:50,780
found as metabolic intermediates it

217
00:07:54,910 --> 00:07:51,770
might be more interesting in that

218
00:07:57,700 --> 00:07:54,920
respect we were also interested in these

219
00:07:59,950 --> 00:07:57,710
longer chain carboxylic acids so these

220
00:08:01,690 --> 00:07:59,960
are the potential components of cell

221
00:08:03,940 --> 00:08:01,700
membranes and things like that and so we

222
00:08:06,460 --> 00:08:03,950
find that earlier on even earlier than

223
00:08:08,839 --> 00:08:06,470
many of the hydroxy and branched mono

224
00:08:10,790 --> 00:08:08,849
carboxylic acids we get this

225
00:08:14,719 --> 00:08:10,800
sweet of them that come out I ran this

226
00:08:16,309 --> 00:08:14,729
between a 3-carbon long mono carboxylic

227
00:08:17,959 --> 00:08:16,319
acid all the way up to a 20 and we were

228
00:08:20,779 --> 00:08:17,969
able to get up through 14 car back

229
00:08:22,279 --> 00:08:20,789
carbon long mono carboxylic acids which

230
00:08:25,279 --> 00:08:22,289
starts to approach your cell ability

231
00:08:27,140 --> 00:08:25,289
solubility limit for these so I think

232
00:08:28,519 --> 00:08:27,150
this is pretty indicative that if we're

233
00:08:30,739 --> 00:08:28,529
looking in the soluble chemistry we can

234
00:08:33,579 --> 00:08:30,749
get most of them using this method and

235
00:08:36,769 --> 00:08:33,589
we can get them in chunks along the way

236
00:08:37,880 --> 00:08:36,779
so we also felt it was important to test

237
00:08:39,259 --> 00:08:37,890
this in a natural sample because

238
00:08:43,399 --> 00:08:39,269

standards are great because standards

239
00:08:44,810 --> 00:08:43,409
are great so I found a pond that was

240
00:08:47,600 --> 00:08:44,820
certainly full of life it had a lot of

241
00:08:50,000 --> 00:08:47,610
green in it and a lot of turtles and so

242
00:08:52,280 --> 00:08:50,010
we analyzed the sample from there we did

243
00:08:55,269 --> 00:08:52,290
not dilute it the only pretreatment that

244
00:08:58,220 --> 00:08:55,279
we did was we hydrolyze the cells by

245
00:08:59,870 --> 00:08:58,230
heating them up to 180 degrees for about

246
00:09:01,130 --> 00:08:59,880
30 minutes which would hopefully break

247
00:09:03,139 --> 00:09:01,140
apart the membranes and get anything

248
00:09:04,340 --> 00:09:03,149
that was inside of them out and when we

249
00:09:06,050 --> 00:09:04,350
ran that we found that we found the

250
00:09:08,810 --> 00:09:06,060
chloride and saw the sulphate which are

251
00:09:10,670 --> 00:09:08,820
the dominant anions in organic anions in

252
00:09:12,740 --> 00:09:10,680
that solution and then we also found

253
00:09:14,689 --> 00:09:12,750
citric acid which we would expect

254
00:09:17,269 --> 00:09:14,699
because if you have a lot of metabolism

255
00:09:19,430 --> 00:09:17,279
in a very large life filled pool you

256
00:09:21,110 --> 00:09:19,440
would expect citric acid from the citric

257
00:09:23,180 --> 00:09:21,120
acid cycle to be there

258
00:09:26,150 --> 00:09:23,190
we found carbonate and we found tiny bit

259
00:09:28,009 --> 00:09:26,160
of mono carboxylic acids and then we

260
00:09:30,319 --> 00:09:28,019
found this little peak down here which

261
00:09:32,240 --> 00:09:30,329
turns out to be indicative of

262
00:09:34,400 --> 00:09:32,250
potentially a lot of amino acid so we

263
00:09:36,710 --> 00:09:34,410

can't separate any amino acids with this

264
00:09:38,420 --> 00:09:36,720
method but what we do get when we spike

265
00:09:40,699 --> 00:09:38,430
a solution with amino acids is this

266
00:09:44,060 --> 00:09:40,709
immediate large dip that looks exactly

267
00:09:48,730 --> 00:09:44,070
like this which may be indicative of the

268
00:09:53,210 --> 00:09:48,740
amino acids great so I am ahead of time

269
00:09:54,319 --> 00:09:53,220
so moving forward on this method there

270
00:09:56,060 --> 00:09:54,329
are things we want to do so right now

271
00:09:58,130 --> 00:09:56,070
we've tested in this very friendly life

272
00:10:00,980 --> 00:09:58,140
filled pool but we want to be able to

273
00:10:02,300 --> 00:10:00,990
make sure that we can use this on things

274
00:10:03,590 --> 00:10:02,310
that are a little more analogous to the

275
00:10:05,630 --> 00:10:03,600
ocean world's that we're hoping to use

276
00:10:06,620 --> 00:10:05,640
it on in the future so we did some field

277
00:10:09,949 --> 00:10:06,630
work and we went and collected samples

278
00:10:12,470 --> 00:10:09,959
from Owens Lake and Mono Lake which are

279
00:10:14,000 --> 00:10:12,480
too hyper saline alkaline lake

280
00:10:16,189 --> 00:10:14,010
environments which could be analogous to

281
00:10:19,220 --> 00:10:16,199
these and so we're hoping to use this

282
00:10:21,019 --> 00:10:19,230
method to analyze those samples and then

283
00:10:23,569 --> 00:10:21,029
we're also beginning to develop a

284
00:10:25,009 --> 00:10:23,579
simultaneous method because well it's

285
00:10:26,509 --> 00:10:25,019
beautiful and simple to say we're just

286
00:10:28,880 --> 00:10:26,519
going to use the reagents from these

287
00:10:30,110 --> 00:10:28,890
cation methods and use the capillary and

288
00:10:32,509 --> 00:10:30,120

use all the equipment and there's a

289
00:10:35,930 --> 00:10:32,519
simplicity that makes that that really

290
00:10:38,269 --> 00:10:35,940
exciting it still requires two analyses

291
00:10:39,829 --> 00:10:38,279
and so if time is your issue then it's

292
00:10:41,900 --> 00:10:39,839
actually not as simple as we had hoped

293
00:10:43,730 --> 00:10:41,910
and so I'm attempting to develop a new

294
00:10:46,040 --> 00:10:43,740
method that will do this all at once and

295
00:10:48,380 --> 00:10:46,050
we're still using the same acetic acid

296
00:10:52,790 --> 00:10:48,390
base but we're adding triethylamine

297
00:10:55,309 --> 00:10:52,800
instead of boring as to adjust the pH of

298
00:10:57,949 --> 00:10:55,319
this and using this we can separate all

299
00:10:59,540 --> 00:10:57,959
of the primary inorganic ions with the

300
00:11:01,430 --> 00:10:59,550
exception of the chlorate and

301
00:11:04,220 --> 00:11:01,440
perchlorates to both oxychloride species

302
00:11:06,019 --> 00:11:04,230
seem to collude and we can actually get

303
00:11:08,300 --> 00:11:06,029
all of the carboxylic it's acids that we

304
00:11:10,370 --> 00:11:08,310
were interested in all the way up to c10

305
00:11:11,540 --> 00:11:10,380
so it kind of crashes out at that point

306
00:11:13,730 --> 00:11:11,550
but we're able to get all of the other

307
00:11:14,990 --> 00:11:13,740
ones including citric acid and we're

308
00:11:15,980 --> 00:11:15,000
able to take carbonate and things like

309
00:11:19,639 --> 00:11:15,990
that

310
00:11:21,889 --> 00:11:19,649
shameless plug for the rest of my lab

311
00:11:23,750 --> 00:11:21,899
mates so we're part of the chemical

312
00:11:25,610 --> 00:11:23,760
analysis and life detection group at JPL

313
00:11:28,490 --> 00:11:25,620

and a lot of us are giving talks and

314
00:11:30,199 --> 00:11:28,500
posters this week so this is a Nate and

315
00:11:31,250 --> 00:11:30,209
Constantin have posters tonight and

316
00:11:32,960 --> 00:11:31,260
they're talking about developing the

317
00:11:34,220 --> 00:11:32,970
hardware and qualifying the hardware for

318
00:11:35,900 --> 00:11:34,230
the instruments that might use these

319
00:11:37,699 --> 00:11:35,910
kinds of methods they've done a lot of

320
00:11:39,079 --> 00:11:37,709
terrific work so I suggest you go by and

321
00:11:41,199 --> 00:11:39,089
talk to them I already talked about

322
00:11:44,120 --> 00:11:41,209
Jess's talk for chiral amino acids

323
00:11:45,920 --> 00:11:44,130
fernanda is giving a talk on her

324
00:11:48,259 --> 00:11:45,930
chemical laptop which is a portable

325
00:11:49,690 --> 00:11:48,269
microchip device it's automated and

326
00:11:51,280 --> 00:11:49,700
she's done a lot of X

327
00:11:53,410 --> 00:11:51,290
with that so you can see that tomorrow

328
00:11:54,760 --> 00:11:53,420
and Florian is giving a talk about his

329
00:11:56,290 --> 00:11:54,770
liquid extractors so even if we had a

330
00:11:57,940 --> 00:11:56,300
soil sample or something that wasn't

331
00:12:00,220 --> 00:11:57,950
necessarily already in our perfect

332
00:12:01,900 --> 00:12:00,230
liquid form he's developed a tool that

333
00:12:04,570 --> 00:12:01,910
will help us get it into the form we

334
00:12:06,550 --> 00:12:04,580
need for this and then on Thursday Peter

335
00:12:08,260 --> 00:12:06,560
our group supervisor is going to give an

336
00:12:10,120 --> 00:12:08,270
excellent overview of all of the work

337
00:12:12,720 --> 00:12:10,130
that we've been doing developing these

338
00:12:15,580 --> 00:12:12,730

types of techniques for for these

339
00:12:17,430 --> 00:12:15,590
environments and then Aaron is going to

340
00:12:19,840 --> 00:12:17,440
be talking later about a microfluidic

341
00:12:21,310 --> 00:12:19,850
ion analyzer that we've been developing

342
00:12:24,610 --> 00:12:21,320
as well which is complemented with all

343
00:12:31,540 --> 00:12:24,620
of this so with that I will take any

344
00:12:35,350 --> 00:12:31,550
questions we've got plenty of time for

345
00:12:37,540 --> 00:12:35,360
questions hi Lawrence Tyler from hooey

346
00:12:40,210 --> 00:12:37,550
um so there's a pretty big difference

347
00:12:42,010 --> 00:12:40,220
between a small amino acid like glycine

348
00:12:44,410 --> 00:12:42,020
and like a really huge one like prolene

349
00:12:46,990 --> 00:12:44,420
or tryptophan um do you have any idea

350
00:12:49,210 --> 00:12:47,000
why this technique can't tell the

351
00:12:51,370 --> 00:12:49,220
difference between those things yes so

352
00:12:53,790 --> 00:12:51,380
it has to do with basically the speed

353
00:12:56,110 --> 00:12:53,800
with which they move so the method that

354
00:13:00,220 --> 00:12:56,120
detects them but doesn't separate them

355
00:13:03,040 --> 00:13:00,230
is because the Y actually I'm not sure

356
00:13:05,380 --> 00:13:03,050
it would even measure glycine they all

357
00:13:06,970 --> 00:13:05,390
just move so fast under that because in

358
00:13:09,010 --> 00:13:06,980
addition to separating based on our

359
00:13:10,720 --> 00:13:09,020
charge in size when you apply the

360
00:13:12,910 --> 00:13:10,730
electric field you also get what's

361
00:13:14,950 --> 00:13:12,920
called an electrostatic flow so the

362
00:13:17,560 --> 00:13:14,960
solution the background electrolyte gets

363
00:13:19,720 --> 00:13:17,570

pulled along with these ions toward the

364
00:13:22,540 --> 00:13:19,730
negative end and so if that's happening

365
00:13:24,610 --> 00:13:22,550
it can if it's too fast it can sometimes

366
00:13:26,830 --> 00:13:24,620
squish together those small highly

367
00:13:28,120 --> 00:13:26,840
charged positive ions and so the reason

368
00:13:30,100 --> 00:13:28,130
the negative ones separate is because

369
00:13:31,600 --> 00:13:30,110
they have a draw backwards that the

370
00:13:33,880 --> 00:13:31,610
positive ones don't have so you really

371
00:13:35,080 --> 00:13:33,890
just get them all at once and you don't

372
00:13:56,190 --> 00:13:35,090
get any separation because they move

373
00:14:04,060 --> 00:14:01,990
yes okay um yeah so she was asking about

374
00:14:05,590 --> 00:14:04,070
the size of the peaks given that the

375
00:14:07,440 --> 00:14:05,600
abundance of life we'd expect in that

376
00:14:11,650 --> 00:14:07,450
pond right okay

377
00:14:14,680 --> 00:14:11,660
yes also it can be quantitative

378
00:14:17,110 --> 00:14:14,690
I didn't quantify that because I'm still

379
00:14:20,579 --> 00:14:17,120
working on really making that a little

380
00:14:23,440 --> 00:14:20,589
more I guess robust would be the phrase

381
00:14:25,389 --> 00:14:23,450
but especially with the mono carboxylic

382
00:14:27,579 --> 00:14:25,399
acids probably what's present there just

383
00:14:28,990 --> 00:14:27,589
isn't soluble in the water they're

384
00:14:31,480 --> 00:14:29,000
probably still longer chains that we

385
00:14:32,860 --> 00:14:31,490
just can't get to in terms of the citric

386
00:14:35,260 --> 00:14:32,870
acid I'm not sure how much I would

387
00:14:37,389 --> 00:14:35,270
expect to see to be honest I haven't

388
00:14:41,410 --> 00:14:37,399

quite finished doing that it was our

389
00:14:44,680 --> 00:14:41,420
sort of first attempt at a at an

390
00:14:46,870 --> 00:14:44,690
analysis like this so it could just be

391
00:14:49,569 --> 00:14:46,880
that that when you break apart a Cell

392
00:14:51,040 --> 00:14:49,579
right maybe I'm not sure how much citric

393
00:14:52,900 --> 00:14:51,050
acid you expect to get out with that

394
00:14:54,370 --> 00:14:52,910
metabolism but it's something that we're

395
00:14:56,980 --> 00:14:54,380
kind of looking at and trying to figure

396
00:14:58,630 --> 00:14:56,990
out how much we expect sort of per cell

397
00:15:01,300 --> 00:14:58,640
and how many cells we might need to say

398
00:15:04,990 --> 00:15:01,310
that we found something and iterative we

399
00:15:10,620 --> 00:15:09,139
so let's thank our speaker again we've

400
00:15:11,230 --> 00:15:10,630
got our meal