
AB
GRAD
CON23

1
00:00:13,910 --> 00:00:10,810
[Music]

2
00:00:15,950 --> 00:00:13,920
well hello everyone first of all I'd

3
00:00:17,090 --> 00:00:15,960
like to thank for the organizers for

4
00:00:20,510 --> 00:00:17,100
having me here

5
00:00:22,730 --> 00:00:20,520
and I have already experienced how great

6
00:00:24,890 --> 00:00:22,740
this community can be I can tell that

7
00:00:29,050 --> 00:00:24,900
this is really a space for all

8
00:00:31,669 --> 00:00:29,060
uh so um how many of you like chemistry

9
00:00:34,910 --> 00:00:31,679
here in the audience

10
00:00:36,049 --> 00:00:34,920
quieter a few people here so

11
00:00:40,010 --> 00:00:36,059
um

12
00:00:41,290 --> 00:00:40,020
uh I will basically follow the logic of

13
00:00:43,850 --> 00:00:41,300

this quote

14
00:00:45,590 --> 00:00:43,860
throughout my whole presentation so

15
00:00:47,569 --> 00:00:45,600
probably what we're what I am doing and

16
00:00:50,330 --> 00:00:47,579
what we were doing is wrong but some of

17
00:00:51,529 --> 00:00:50,340
it might be useful in the future

18
00:00:52,130 --> 00:00:51,539
so

19
00:00:55,209 --> 00:00:52,140
um

20
00:00:58,430 --> 00:00:55,219
amino acids amino acids as we know

21
00:01:01,630 --> 00:00:58,440
basically looking for amino acids is one

22
00:01:04,729 --> 00:01:01,640
of the key Target for for future

23
00:01:06,469 --> 00:01:04,739
Institute life detection missions

24
00:01:08,510 --> 00:01:06,479
um I'm going to talk more about the

25
00:01:09,890 --> 00:01:08,520
Practical side of astrobiology rather

26
00:01:12,950 --> 00:01:09,900
than the theory that we have heard

27
00:01:15,050 --> 00:01:12,960
before maybe we can get together after

28
00:01:16,609 --> 00:01:15,060
it and find some new solutions for the

29
00:01:19,030 --> 00:01:16,619
problems and situations that we've

30
00:01:21,350 --> 00:01:19,040
encountered during our experiments so

31
00:01:23,570 --> 00:01:21,360
there are three levels that we have to

32
00:01:27,590 --> 00:01:23,580
look at when dealing with amino acids

33
00:01:31,070 --> 00:01:27,600
the first is uh kind of a qualitative

34
00:01:34,990 --> 00:01:31,080
problem uh what type of amino acids can

35
00:01:38,090 --> 00:01:35,000
we detect and what do those tell us

36
00:01:41,210 --> 00:01:38,100
the second is the abundance of these

37
00:01:43,550 --> 00:01:41,220
amino acids so their ratios are they

38
00:01:47,569 --> 00:01:43,560

more similar to what things that we see

39
00:01:49,609 --> 00:01:47,579
here on Earth as the metabolic processes

40
00:01:52,130 --> 00:01:49,619
of microbes or something completely

41
00:01:56,030 --> 00:01:52,140
different and the third is basically

42
00:01:59,210 --> 00:01:56,040
what makes it a lot more interesting or

43
00:02:03,050 --> 00:01:59,220
puts the icing in the cake is the

44
00:02:06,530 --> 00:02:03,060
chirality as you well know amino acids

45
00:02:09,710 --> 00:02:06,540
are basically chiral meaning that they

46
00:02:11,710 --> 00:02:09,720
have uh they are they have two versions

47
00:02:13,550 --> 00:02:11,720
of the same molecule and they're

48
00:02:15,650 --> 00:02:13,560
non-superimposable basically they are

49
00:02:18,309 --> 00:02:15,660
mirror images of each other they have

50
00:02:21,350 --> 00:02:18,319
exactly the same amount of atoms bonds

51
00:02:23,390 --> 00:02:21,360
but they have a totally different

52
00:02:26,510 --> 00:02:25,190
um structure when we're talking about

53
00:02:30,350 --> 00:02:26,520
the isomers

54
00:02:33,110 --> 00:02:30,360
and getting to know the the ratio of

55
00:02:36,589 --> 00:02:33,120
these amino acids is basically like a

56
00:02:38,030 --> 00:02:36,599
Smoking Gun evidence for life if if you

57
00:02:38,809 --> 00:02:38,040
like

58
00:02:40,430 --> 00:02:38,819
um

59
00:02:43,750 --> 00:02:40,440
but what does it have to do with

60
00:02:47,150 --> 00:02:43,760
radiation well as you all know

61
00:02:48,550 --> 00:02:47,160
as we said here we are experiencing the

62
00:02:52,790 --> 00:02:48,560
effective radiation

63
00:02:55,309 --> 00:02:52,800

but in the early Universe the activity

64
00:02:57,170 --> 00:02:55,319
might have been a lot bigger than it is

65
00:02:57,770 --> 00:02:57,180
today and

66
00:03:01,130 --> 00:02:57,780
um

67
00:03:03,170 --> 00:03:01,140
there are all sorts of theories that are

68
00:03:05,630 --> 00:03:03,180
some of them are quite established some

69
00:03:08,330 --> 00:03:05,640
of their are some of them are in the

70
00:03:09,830 --> 00:03:08,340
process of proving but the point is that

71
00:03:11,509 --> 00:03:09,840
all the

72
00:03:18,110 --> 00:03:11,519
um

73
00:03:20,030 --> 00:03:18,120
ultraviolet light and if you have this

74
00:03:23,089 --> 00:03:20,040
scattered from a surface basically you

75
00:03:26,449 --> 00:03:23,099
have a polarized light and basically

76
00:03:29,990 --> 00:03:26,459
um amino acids and enantiomers which are

77
00:03:31,729 --> 00:03:30,000
which absorb a specific light better

78
00:03:34,190 --> 00:03:31,739
than their counterparts then basically

79
00:03:35,869 --> 00:03:34,200
they get destroyed in the process this

80
00:03:38,690 --> 00:03:35,879
is the same way actually as we detect

81
00:03:40,490 --> 00:03:38,700
the the their ratio but it's also their

82
00:03:42,170 --> 00:03:40,500
Doom if we are talking about high

83
00:03:43,990 --> 00:03:42,180
intensities so this is a pretty much

84
00:03:47,570 --> 00:03:44,000
established model

85
00:03:50,030 --> 00:03:47,580
we can basically replicate these using

86
00:03:52,910 --> 00:03:50,040
all sorts of accelerators and all sorts

87
00:03:56,289 --> 00:03:52,920
of sources to basically mimic this

88
00:03:59,509 --> 00:03:56,299

effect the other one is is

89
00:04:02,509 --> 00:03:59,519
more of a still about photons but but

90
00:04:06,830 --> 00:04:02,519
more of a having a

91
00:04:10,509 --> 00:04:06,840
um the magnetic effect also

92
00:04:14,030 --> 00:04:10,519
um taken into account when dealing with

93
00:04:15,949 --> 00:04:14,040
how radiation affects these molecules

94
00:04:17,110 --> 00:04:15,959
and the third is basically stepping

95
00:04:20,870 --> 00:04:17,120
towards

96
00:04:23,450 --> 00:04:20,880
particles and subatomic particles and

97
00:04:25,070 --> 00:04:23,460
how they change the isotopic ratio and

98
00:04:27,469 --> 00:04:25,080
through the isotopic ratio how they

99
00:04:29,890 --> 00:04:27,479
change uh basically the composition of

100
00:04:33,409 --> 00:04:29,900
the amino acids and having them

101
00:04:35,930 --> 00:04:33,419
change a chirality so these are just the

102
00:04:37,129 --> 00:04:35,940
main theories that we know so far that

103
00:04:37,730 --> 00:04:37,139
work

104
00:04:40,610 --> 00:04:37,740
um

105
00:04:44,150 --> 00:04:40,620
and uh in our Laboratories we basically

106
00:04:47,570 --> 00:04:44,160
set out to mimic some of these effects

107
00:04:50,270 --> 00:04:47,580
uh the the accelerator atom queue we

108
00:04:52,969 --> 00:04:50,280
have three of them a small a middle one

109
00:04:56,770 --> 00:04:52,979
and a big one they are all considered

110
00:05:00,290 --> 00:04:56,780
small in the field of uh Nuclear Physics

111
00:05:03,010 --> 00:05:00,300
but for our experiments we basically

112
00:05:05,749 --> 00:05:03,020
um used a tandem accelerator

113
00:05:09,710 --> 00:05:05,759

which allows

114
00:05:11,870 --> 00:05:09,720
um a pretty quick change of ion sources

115
00:05:14,570 --> 00:05:11,880
so basically if you want to irradiate

116
00:05:16,790 --> 00:05:14,580
your sample with hydrogen and then you

117
00:05:19,189 --> 00:05:16,800
want to see how the same scent was

118
00:05:21,409 --> 00:05:19,199
affected by a heavier ion basically you

119
00:05:23,689 --> 00:05:21,419
can change the ions in a matter of hours

120
00:05:25,850 --> 00:05:23,699
or even less if you're if you're

121
00:05:27,710 --> 00:05:25,860
experienced so it has a lot versatility

122
00:05:30,590 --> 00:05:27,720
that's the point of having a tandem

123
00:05:33,469 --> 00:05:30,600
accelerator so

124
00:05:36,129 --> 00:05:33,479
um on the image you see probably the

125
00:05:39,170 --> 00:05:36,139
closest thing to a real lightsaber

126
00:05:42,430 --> 00:05:39,180
and what you see here on the image in

127
00:05:45,050 --> 00:05:42,440
the top right is basically how uh

128
00:05:48,350 --> 00:05:45,060
hydrogen ions look like when they are

129
00:05:50,770 --> 00:05:48,360
extracted to air from vacuum and

130
00:05:54,909 --> 00:05:50,780
basically

131
00:06:00,529 --> 00:05:54,919
this shows the ionization of the air

132
00:06:01,249 --> 00:06:00,539
that the accelerated ions are hitting so

133
00:06:13,010 --> 00:06:01,259
um

134
00:06:15,710 --> 00:06:13,020
capillary electrophoresis to basically

135
00:06:17,270 --> 00:06:15,720
see what radiation might have to do with

136
00:06:19,070 --> 00:06:17,280
the with the molecules and their

137
00:06:21,409 --> 00:06:19,080
chirality

138
00:06:23,689 --> 00:06:21,419

um you see is really a very very

139
00:06:24,650 --> 00:06:23,699
friendly technique and it's very very

140
00:06:27,350 --> 00:06:24,660
simple

141
00:06:29,270 --> 00:06:27,360
but that's what people use that are

142
00:06:32,510 --> 00:06:29,280
basically saying who are expert in the

143
00:06:35,090 --> 00:06:32,520
field but the point is that you have a

144
00:06:37,550 --> 00:06:35,100
tiny capillary a tiny few silica

145
00:06:40,309 --> 00:06:37,560
capillary with an inner diameter let's

146
00:06:42,529 --> 00:06:40,319
say 50 microns and another in another

147
00:06:44,809 --> 00:06:42,539
diameter of let's say 400 microns and

148
00:06:46,430 --> 00:06:44,819
when you feel this capillary with an

149
00:06:48,650 --> 00:06:46,440
electrolyte then you

150
00:06:51,170 --> 00:06:48,660
and you apply voltage on this system

151
00:06:52,790 --> 00:06:51,180
basically you will see stuff migrate and

152
00:06:55,249 --> 00:06:52,800
they will migrate according to their

153
00:06:57,170 --> 00:06:55,259
higher Dynamic volume to charge ratio in

154
00:06:59,469 --> 00:06:57,180
this field so what it allows you to do

155
00:07:02,510 --> 00:06:59,479
it allows you to do to separate

156
00:07:07,850 --> 00:07:02,520
molecules based on the higher Dynamic

157
00:07:12,650 --> 00:07:07,860
volume to charge ratio and if you put a

158
00:07:16,430 --> 00:07:12,660
detector in uh the

159
00:07:19,730 --> 00:07:16,440
if you put a detector in the um

160
00:07:21,969 --> 00:07:19,740
uh at the specific point of the

161
00:07:25,490 --> 00:07:21,979
capillary basically

162
00:07:28,189 --> 00:07:25,500
you can see the molecules migrating

163
00:07:31,189 --> 00:07:28,199

through the capillary and the specific

164
00:07:34,270 --> 00:07:31,199
point you get intensity versus time so

165
00:07:36,409 --> 00:07:34,280
you you see migrating Peaks this

166
00:07:38,089 --> 00:07:36,419
simulation on the left would like to

167
00:07:40,129 --> 00:07:38,099
show that but unfortunately it doesn't

168
00:07:41,270 --> 00:07:40,139
run so you have to believe me that the

169
00:07:42,890 --> 00:07:41,280
Peaks you're seeing are actually

170
00:07:44,570 --> 00:07:42,900
migrating through the detector window

171
00:07:46,270 --> 00:07:44,580
that we're looking at

172
00:07:48,950 --> 00:07:46,280
and um

173
00:07:49,969 --> 00:07:48,960
it is using laser induced fluorescence

174
00:07:52,309 --> 00:07:49,979
well

175
00:07:55,129 --> 00:07:52,319
uh why are we using laser induced filter

176
00:07:57,350 --> 00:07:55,139
since the main reason is that to achieve

177
00:08:00,469 --> 00:07:57,360
High sensitivity it's you can imagine it

178
00:08:03,650 --> 00:08:00,479
like going or being in a dark room uh

179
00:08:07,129 --> 00:08:03,660
sleeping and you basically just

180
00:08:08,629 --> 00:08:07,139
um open up or or open your phone and you

181
00:08:10,670 --> 00:08:08,639
have a lot of bright light coming in

182
00:08:12,050 --> 00:08:10,680
even though if you're doing it in the

183
00:08:14,809 --> 00:08:12,060
broad daylight probably you're not

184
00:08:17,029 --> 00:08:14,819
affected that much it allows you to

185
00:08:19,969 --> 00:08:17,039
remove background basically have a great

186
00:08:21,710 --> 00:08:19,979
big signal and to do that you need some

187
00:08:24,170 --> 00:08:21,720
molecules that basically have a

188
00:08:26,650 --> 00:08:24,180

fluorescent property meaning that you're

189
00:08:29,330 --> 00:08:26,660
excited them over the specific

190
00:08:33,130 --> 00:08:29,340
wavelength and they respond to you with

191
00:08:35,990 --> 00:08:33,140
a different wavelength this is a a

192
00:08:37,790 --> 00:08:36,000
molecule that we used to do the

193
00:08:40,550 --> 00:08:37,800
conjugation of our amino acids to

194
00:08:41,709 --> 00:08:40,560
basically enhance the selectivity and

195
00:08:45,710 --> 00:08:41,719
enhance

196
00:08:48,350 --> 00:08:45,720
separation efficiency so in order to do

197
00:08:51,170 --> 00:08:48,360
CE what you have to do is you have to

198
00:08:55,730 --> 00:08:51,180
have molecules that have a net charge

199
00:08:58,370 --> 00:08:55,740
other than zero and we have to make them

200
00:09:02,329 --> 00:08:58,380
visible this molecule here does the two

201
00:09:04,910 --> 00:09:02,339
things at the same time so basically

202
00:09:09,410 --> 00:09:04,920
um what what you see here is

203
00:09:13,730 --> 00:09:09,420
uh the six centimeter from the die

204
00:09:16,550 --> 00:09:13,740
reacting with the Mi forming a stable uh

205
00:09:19,850 --> 00:09:16,560
amide conjugate and this way basically

206
00:09:21,889 --> 00:09:19,860
you uh if you if you separate them uh

207
00:09:24,949 --> 00:09:21,899
you're you're getting a pretty huge

208
00:09:26,630 --> 00:09:24,959
resolution so what we did is basically

209
00:09:28,070 --> 00:09:26,640
first developed the buffer system or

210
00:09:30,470 --> 00:09:28,080
background of that right the thing that

211
00:09:32,990 --> 00:09:30,480
you feel the capillary with to do this

212
00:09:35,030 --> 00:09:33,000
separation it's a pretty simple buffer

213
00:09:38,030 --> 00:09:35,040

it contains two components and the

214
00:09:41,269 --> 00:09:38,040
reason behind it was that we had to keep

215
00:09:43,550 --> 00:09:41,279
in mind the restrictions that a possible

216
00:09:45,590 --> 00:09:43,560
future Institute life detection Mission

217
00:09:48,410 --> 00:09:45,600
would have that you're not allowed to

218
00:09:50,509 --> 00:09:48,420
have a ton of regions you're not allowed

219
00:09:52,490 --> 00:09:50,519
to have all sorts of mixing to happen

220
00:09:54,110 --> 00:09:52,500
you have to make everything simple that

221
00:09:55,790 --> 00:09:54,120
was the mindset that we had when we were

222
00:09:57,889 --> 00:09:55,800
doing the experiments and as you see

223
00:10:01,130 --> 00:09:57,899
we've managed to separate actually 15

224
00:10:03,949 --> 00:10:01,140
amino acids chirally of the 17 that we

225
00:10:06,530 --> 00:10:03,959
had in mind

226
00:10:09,170 --> 00:10:06,540
um why is it a promising technique like

227
00:10:12,769 --> 00:10:09,180
just like I said a sports review of

228
00:10:15,410 --> 00:10:12,779
moving Parts no power consumption uh

229
00:10:17,750 --> 00:10:15,420
easy to implement and it's just

230
00:10:21,350 --> 00:10:17,760
basically very very friendly technique

231
00:10:23,509 --> 00:10:21,360
and guys at JP are basically are

232
00:10:25,130 --> 00:10:23,519
developing this kind of technology and

233
00:10:27,530 --> 00:10:25,140
what you see here on the image is

234
00:10:30,350 --> 00:10:27,540
basically the base plate of this whole

235
00:10:31,910 --> 00:10:30,360
setup is basically the size of your

236
00:10:32,570 --> 00:10:31,920
laptop

237
00:10:35,090 --> 00:10:32,580
um

238
00:10:37,070 --> 00:10:35,100

so uh actually what we did during the

239
00:10:39,110 --> 00:10:37,080
year radiations well we made some sample

240
00:10:42,769 --> 00:10:39,120
holders from a drill press to kind of a

241
00:10:47,210 --> 00:10:42,779
modified drill press and we made 100

242
00:10:50,030 --> 00:10:47,220
Micron thick pellets of uh racemic uh

243
00:10:53,210 --> 00:10:50,040
alanine and we irradiated them here you

244
00:10:55,910 --> 00:10:53,220
see the simulation how the protein bees

245
00:10:59,329 --> 00:10:55,920
would actually behave in the 100 Micron

246
00:11:01,910 --> 00:10:59,339
thick alanine pellet and as you see

247
00:11:04,250 --> 00:11:01,920
towards the end around 80 microns all

248
00:11:06,110 --> 00:11:04,260
the ions stop and this is actually where

249
00:11:08,710 --> 00:11:06,120
the most interesting things happen

250
00:11:11,930 --> 00:11:08,720
during an imbu analysis or or

251
00:11:14,930 --> 00:11:11,940
irradiation as well which you see here a

252
00:11:17,030 --> 00:11:14,940
bit a bit in more detail so we have the

253
00:11:18,949 --> 00:11:17,040
protons coming in the in the vacuum from

254
00:11:22,210 --> 00:11:18,959
the accelerator and then we have a

255
00:11:25,250 --> 00:11:22,220
window where the protons

256
00:11:27,889 --> 00:11:25,260
are extracted to the air and then as

257
00:11:30,230 --> 00:11:27,899
they enter the the amino acids they

258
00:11:34,069 --> 00:11:30,240
basically lose energy and the nice thing

259
00:11:36,110 --> 00:11:34,079
about the the ions is that that they

260
00:11:39,050 --> 00:11:36,120
give off all their almost all the

261
00:11:40,910 --> 00:11:39,060
energies right before they stop and this

262
00:11:44,090 --> 00:11:40,920
is actually why it's really useful

263
00:11:46,250 --> 00:11:44,100

during proton therapy and so we

264
00:11:48,650 --> 00:11:46,260
irradiated these samples with these

265
00:11:50,449 --> 00:11:48,660
energies to basically and we designed

266
00:11:52,610 --> 00:11:50,459
the system to basically stop all the

267
00:11:55,670 --> 00:11:52,620
ions in the sample and see how

268
00:11:59,630 --> 00:11:55,680
destruction or any alterations occur

269
00:12:02,630 --> 00:11:59,640
so moving forward basically

270
00:12:06,730 --> 00:12:02,640
you see that this is an expected

271
00:12:12,889 --> 00:12:10,370
over D and L I mean erasmic as amino

272
00:12:14,750 --> 00:12:12,899
acid some of you might see that these

273
00:12:17,210 --> 00:12:14,760
are not exactly the same height and that

274
00:12:19,190 --> 00:12:17,220
is the same area this is just the

275
00:12:21,170 --> 00:12:19,200
control that we were using and we

276
00:12:23,870 --> 00:12:21,180
compared all our results to these

277
00:12:26,690 --> 00:12:23,880
control runs so basically you have two

278
00:12:29,210 --> 00:12:26,700
big Peaks and we are happy and if we go

279
00:12:32,269 --> 00:12:29,220
further uh we'll be interested more in

280
00:12:35,150 --> 00:12:32,279
the in the small Peak part of the uh of

281
00:12:37,069 --> 00:12:35,160
the electrophilograms as we go with the

282
00:12:40,250 --> 00:12:37,079
irradiation and as we go with the

283
00:12:43,970 --> 00:12:40,260
function of those increases so what you

284
00:12:47,150 --> 00:12:43,980
have here is basically the control that

285
00:12:49,009 --> 00:12:47,160
I just showed and different doses that

286
00:12:51,050 --> 00:12:49,019
have reached the sample and it's

287
00:12:54,530 --> 00:12:51,060
apparent that some of the Peaks are

288
00:12:57,350 --> 00:12:54,540

clearly increasing some of them show a

289
00:12:58,190 --> 00:12:57,360
nice correlation

290
00:13:01,129 --> 00:12:58,200
um

291
00:13:04,610 --> 00:13:01,139
and some of these Peaks are basically

292
00:13:07,670 --> 00:13:04,620
coming in duplets and this is what made

293
00:13:10,569 --> 00:13:07,680
us think that actually uh although we

294
00:13:13,670 --> 00:13:10,579
were irradiating wrestling

295
00:13:16,910 --> 00:13:13,680
alanine we are basically seeing racemic

296
00:13:20,269 --> 00:13:18,190
um so

297
00:13:22,670 --> 00:13:20,279
we're still in the process of

298
00:13:24,829 --> 00:13:22,680
identifying these molecules

299
00:13:27,170 --> 00:13:24,839
um and in these radicals that we found

300
00:13:28,250 --> 00:13:27,180
but they seem to correlate well with the

301
00:13:30,230 --> 00:13:28,260
dose

302
00:13:32,629 --> 00:13:30,240
and also another interesting thing

303
00:13:37,550 --> 00:13:32,639
happened when we were looking at the big

304
00:13:39,889 --> 00:13:37,560
peaks of the uh amino acids and we were

305
00:13:41,990 --> 00:13:39,899
just wondering what could this mean what

306
00:13:44,829 --> 00:13:42,000
you see in the uh in this picture is

307
00:13:49,550 --> 00:13:44,839
basically as we go with the dose

308
00:13:52,370 --> 00:13:49,560
the the LD ratio is getting more and

309
00:13:56,090 --> 00:13:52,380
more hectic which means that we're not

310
00:13:58,910 --> 00:13:56,100
seeing uh it going towards one and

311
00:14:02,870 --> 00:13:58,920
anterior or the other but kind of mixed

312
00:14:05,930 --> 00:14:02,880
noisy version of the two as we go with

313
00:14:08,350 --> 00:14:05,940

those higher and higher so in summary

314
00:14:12,110 --> 00:14:08,360
basically

315
00:14:15,290 --> 00:14:12,120
we put together a simple setup and

316
00:14:17,629 --> 00:14:15,300
measured some radicals that could form

317
00:14:22,250 --> 00:14:17,639
due to radiation and we've done it in a

318
00:14:24,170 --> 00:14:22,260
chiral manner to basically see whether

319
00:14:27,650 --> 00:14:24,180
our method is capable of separating

320
00:14:30,290 --> 00:14:27,660
these chiral amino acids and more

321
00:14:32,750 --> 00:14:30,300
importantly if you think about the the

322
00:14:35,030 --> 00:14:32,760
next possible or the most possible

323
00:14:36,350 --> 00:14:35,040
places in our solar system but life

324
00:14:38,990 --> 00:14:36,360
could be

325
00:14:41,449 --> 00:14:39,000
um actually they are in a in a huge

326
00:14:43,069 --> 00:14:41,459
radiation environment so I think it is

327
00:14:46,310 --> 00:14:43,079
it is really necessary to basically

328
00:14:48,710 --> 00:14:46,320
create a library of radicals simulated

329
00:14:54,710 --> 00:14:48,720
here in the labs to basically make the

330
00:14:56,269 --> 00:14:54,720
work uh easier and the unload this from

331
00:14:59,629 --> 00:14:56,279
the scientists you will have to

332
00:15:02,750 --> 00:14:59,639
basically figure out how

333
00:15:04,189 --> 00:15:02,760
um molecules are formed in these high

334
00:15:05,949 --> 00:15:04,199
radiation environments and what they are

335
00:15:08,449 --> 00:15:05,959
seeing on the the results when these

336
00:15:12,410 --> 00:15:08,459
instruments send back the data so

337
00:15:14,389 --> 00:15:12,420
basically we're trying to to establish a

338
00:15:16,730 --> 00:15:14,399

big Library where all sorts of amino

339
00:15:19,850 --> 00:15:16,740
acids mixers and single ones are

340
00:15:22,990 --> 00:15:19,860
irradiated or with all sorts of

341
00:15:26,629 --> 00:15:23,000
radiation sources and see

342
00:15:28,670 --> 00:15:26,639
what products are there and what can be

343
00:15:29,930 --> 00:15:28,680
identified using this technology so I'd

344
00:15:33,889 --> 00:15:29,940
like to thank you very much for your

345
00:15:33,899 --> 00:15:37,970
foreign

346
00:15:49,009 --> 00:15:43,189
Chad

347
00:15:50,870 --> 00:15:49,019
uh I was really glad to see c-elif uh

348
00:15:53,629 --> 00:15:50,880
because it's a method that I work with

349
00:15:55,790 --> 00:15:53,639
as well and so uh seeing it being used

350
00:15:57,350 --> 00:15:55,800
around is is wonderful and I have a

351
00:16:01,730 --> 00:15:57,360
question about your Cairo method which

352
00:16:04,009 --> 00:16:01,740
seemed to work very well um so uh did

353
00:16:05,810 --> 00:16:04,019
you develop this in its entirety or uh

354
00:16:07,970 --> 00:16:05,820
when did you develop it where basically

355
00:16:11,090 --> 00:16:07,980
I wanted all about the Cairo method um

356
00:16:13,069 --> 00:16:11,100
is it published and uh yeah uh it's not

357
00:16:15,889 --> 00:16:13,079
published yet but we've developed it uh

358
00:16:19,850 --> 00:16:15,899
in collaboration with JPL

359
00:16:22,370 --> 00:16:19,860
um basically the key thing here is that

360
00:16:24,829 --> 00:16:22,380
to do chiro separation the way you can

361
00:16:27,650 --> 00:16:24,839
imagine is is that when you have these

362
00:16:29,629 --> 00:16:27,660
molecules uh in the solution and that

363
00:16:31,550 --> 00:16:29,639

they migrate through the capillary if

364
00:16:35,030 --> 00:16:31,560
you have some additional additives in

365
00:16:35,710 --> 00:16:35,040
your buffer basically you can in

366
00:16:38,930 --> 00:16:35,720
um

367
00:16:40,749 --> 00:16:38,940
emphasize or or basically manipulate how

368
00:16:44,749 --> 00:16:40,759
these

369
00:16:46,269 --> 00:16:44,759
molecules behave but which I mean that

370
00:16:50,329 --> 00:16:46,279
if you have

371
00:16:52,990 --> 00:16:50,339
sugars like cyclins these are circular

372
00:16:56,090 --> 00:16:53,000
uh long oligomers

373
00:16:59,689 --> 00:16:56,100
basically these amino acids are as they

374
00:17:02,090 --> 00:16:59,699
migrate they meet with these cavities

375
00:17:04,010 --> 00:17:02,100
and they basically form an inclusion

376
00:17:05,990 --> 00:17:04,020
complex they go in they go out they go

377
00:17:08,990 --> 00:17:06,000
in they go out and some of the Indian

378
00:17:10,909 --> 00:17:09,000
tumors are staying longer in this cavity

379
00:17:12,710 --> 00:17:10,919
and some of them are staying for a short

380
00:17:14,510 --> 00:17:12,720
period of time and as they migrate they

381
00:17:17,870 --> 00:17:14,520
basically separate and this is what we

382
00:17:19,490 --> 00:17:17,880
see and and in this context to basically

383
00:17:21,829 --> 00:17:19,500
answer your question

384
00:17:24,350 --> 00:17:21,839
um we had a lot of constraints first of

385
00:17:26,929 --> 00:17:24,360
all we are not allowed to have a ton of

386
00:17:29,630 --> 00:17:26,939
additives a ton of stuff in the buffer

387
00:17:32,510 --> 00:17:29,640
because an instrument has to be able to

388
00:17:35,690 --> 00:17:32,520

do this on its own its own so we had two

389
00:17:37,430 --> 00:17:35,700
components in it which is the happish or

390
00:17:41,150 --> 00:17:37,440
hippies I don't know how they say it in

391
00:17:43,190 --> 00:17:41,160
English properly AGP yes and and the

392
00:17:46,789 --> 00:17:43,200
other one is the md40 which is basically

393
00:17:50,870 --> 00:17:46,799
similar to cyclodextrins but it consists

394
00:17:54,770 --> 00:17:50,880
of sugar oligomers or actually monomers

395
00:17:57,350 --> 00:17:54,780
and as you go you have at the end at the

396
00:18:00,169 --> 00:17:57,360
beginning one sugar one glucose unit and

397
00:18:02,150 --> 00:18:00,179
as you go two three four Etc and these

398
00:18:05,390 --> 00:18:02,160
after some around seven they start to

399
00:18:08,090 --> 00:18:05,400
become helico and you have a long long

400
00:18:11,450 --> 00:18:08,100
longer chains of these sugars and

401
00:18:14,690 --> 00:18:11,460
basically it enhanced the effectiveness

402
00:18:17,090 --> 00:18:14,700
of this cavity movement

403
00:18:24,850 --> 00:18:17,100
thanks

404
00:18:29,150 --> 00:18:27,230
hi my name is shiv agrawal from Western

405
00:18:30,590 --> 00:18:29,160
Michigan University so you have used

406
00:18:33,590 --> 00:18:30,600
protons for radiation have you

407
00:18:36,049 --> 00:18:33,600
considered using leptons and not yet uh

408
00:18:38,510 --> 00:18:36,059
we know it should be done and it should

409
00:18:41,630 --> 00:18:38,520
be interesting but we wanted to do to

410
00:18:44,330 --> 00:18:41,640
use the facility that we have available

411
00:18:46,070 --> 00:18:44,340
um and currently we are only only able

412
00:18:49,490 --> 00:18:46,080
only able to do

413
00:18:51,890 --> 00:18:49,500

um protons and heavy ions

414
00:18:54,169 --> 00:18:51,900
um it would be a nice thing to move

415
00:18:56,570 --> 00:18:54,179
forward and do all sorts of experiment

416
00:18:57,890 --> 00:18:56,580
on this on this field as well I'm happy

417
00:18:59,690 --> 00:18:57,900
to collaborate

418
00:19:01,669 --> 00:18:59,700
second thing is uh have you used

419
00:19:03,710 --> 00:19:01,679
variable energies for protons at what

420
00:19:06,049 --> 00:19:03,720
energies are you we in this experiment

421
00:19:08,570 --> 00:19:06,059
we used only one energy we didn't want

422
00:19:10,730 --> 00:19:08,580
to have too many variables if it's hard

423
00:19:13,250 --> 00:19:10,740
enough to figure out whether with a

424
00:19:16,909 --> 00:19:13,260
hundred Micron thickness of a pallet are

425
00:19:19,430 --> 00:19:16,919
we able to do robustly uh do experiments

426
00:19:21,529 --> 00:19:19,440
and unfortunately with a simple system

427
00:19:24,590 --> 00:19:21,539
and with a great care we were able to

428
00:19:26,330 --> 00:19:24,600
basically make it uh work uh so this was

429
00:19:30,049 --> 00:19:26,340
the first goal that we wanted to achieve

430
00:19:32,750 --> 00:19:30,059
and and uh of course we have all sorts

431
00:19:36,110 --> 00:19:32,760
of experiments either already running or

432
00:19:38,690 --> 00:19:36,120
in plan to vary energies where I

433
00:19:40,909 --> 00:19:38,700
actually the the dose rate which is

434
00:19:44,270 --> 00:19:40,919
actually a much more important thing it

435
00:19:47,450 --> 00:19:44,280
looks like it is a key factor in some uh

436
00:19:50,390 --> 00:19:47,460
um instances and also doing everything

437
00:19:52,010 --> 00:19:50,400
in vacuum doing everything it was in air

438
00:19:53,870 --> 00:19:52,020

but we also would like to do it in

439
00:19:54,710 --> 00:19:53,880
vacuum and also in cold temperatures as

440
00:19:56,570 --> 00:19:54,720
well

441
00:19:58,070 --> 00:19:56,580
thanks a lot