



Society for Scientific Exploration

1
00:00:03,300 --> 00:00:09,230

[Music]

2
00:00:14,539 --> 00:00:12,110

I work for a little company in Boulder

3
00:00:16,910 --> 00:00:14,549

called coalescence we're a privately

4
00:00:19,429 --> 00:00:16,920

funded group we've been doing ColdFusion

5
00:00:21,830 --> 00:00:19,439

work for the last seven years and we

6
00:00:24,350 --> 00:00:21,840

focus our work exclusively on

7
00:00:27,230 --> 00:00:24,360

experimental replication of work that

8
00:00:28,820 --> 00:00:27,240

has been published elsewhere as I get

9
00:00:32,720 --> 00:00:28,830

into this I'll try to deconstruct this

10
00:00:34,700 --> 00:00:32,730

title a little bit charge particles are

11
00:00:36,200 --> 00:00:34,710

things like alpha particles and there

12
00:00:37,970 --> 00:00:36,210

are evidence of cold fusion that's why

13
00:00:40,520 --> 00:00:37,980

it's interesting to look for it and I'll

14

00:00:43,280 --> 00:00:40,530

talk some about Co deposition which is a

15

00:00:46,700 --> 00:00:43,290

technique to initiate a cold fusion

16

00:00:51,259 --> 00:00:46,710

reaction let me start with a little bit

17

00:00:54,039 --> 00:00:51,269

of history before I got involved this

18

00:00:57,590 --> 00:00:54,049

Time magazine cover was kind of the

19

00:00:59,450 --> 00:00:57,600

beginning and end of my understanding of

20

00:01:00,770 --> 00:00:59,460

the field this was about the point where

21

00:01:02,660 --> 00:01:00,780

it was sort of made a big deal and then

22

00:01:06,020 --> 00:01:02,670

it kind of went away people thought it

23

00:01:07,250 --> 00:01:06,030

was sort of a hoax it turns out there's

24

00:01:09,590 --> 00:01:07,260

a number of people a couple hundred

25

00:01:15,399 --> 00:01:09,600

worldwide that have been working on it

26

00:01:20,539 --> 00:01:17,330

produced more heat than could be

27

00:01:23,260 --> 00:01:20,549

explained by known chemistry using a

28

00:01:26,389 --> 00:01:23,270

palladium deuterium electrolytic cell

29

00:01:27,980 --> 00:01:26,399

one of the questions the critics asked

30

00:01:29,870 --> 00:01:27,990

was well if this is really a nuclear

31

00:01:32,389 --> 00:01:29,880

reaction there should be some nuclear

32

00:01:35,480 --> 00:01:32,399

byproducts referred to by the cold

33

00:01:37,999 --> 00:01:35,490

fusion people this nuclear ash so what

34

00:01:40,789 --> 00:01:38,009

I'm going to talk about here is the look

35

00:01:42,349 --> 00:01:40,799

looking for that nuclear ash which in

36

00:01:44,690 --> 00:01:42,359

this particular case is charged

37

00:01:46,130 --> 00:01:44,700

particles a charged particle being

38

00:01:48,429 --> 00:01:46,140

something like an alpha particle helium

39

00:01:52,330 --> 00:01:48,439

nucleus or a proton or an energetic

40

00:01:58,459 --> 00:01:56,510

not long after well when in 1989 when

41

00:01:59,899 --> 00:01:58,469

the fields started everybody tried

42

00:02:04,660 --> 00:01:59,909

everything to see if they could recreate

43

00:02:07,910 --> 00:02:04,670

this a group led by Stan Spock

44

00:02:10,070 --> 00:02:07,920

who worked for a naval group out in San

45

00:02:13,070 --> 00:02:10,080

Diego described a technique called Co

46

00:02:15,590 --> 00:02:13,080

deposition in the original pons

47

00:02:17,780 --> 00:02:15,600

Fleischmann Cell the way that work is

48

00:02:20,480 --> 00:02:17,790

you had a Palladium cathode in heavy

49

00:02:22,559 --> 00:02:20,490

water and when you electrolyze water you

50

00:02:24,569 --> 00:02:22,569

pull hydrogen or

51
00:02:27,599 --> 00:02:24,579
this case deuterium to the cathode and

52
00:02:29,789 --> 00:02:27,609
oxygen forms at the anode and when you

53
00:02:31,440 --> 00:02:29,799
do that palladium is this magic material

54
00:02:34,860 --> 00:02:31,450
which absorbs lots of hydrogen or

55
00:02:37,140 --> 00:02:34,870
deuterium and when you get about 1/2

56
00:02:39,270 --> 00:02:37,150
Tyrion atom for every palladium atom in

57
00:02:42,000 --> 00:02:39,280
the lattice you get this reaction it

58
00:02:43,679 --> 00:02:42,010
takes a long time for that to occur so

59
00:02:46,410 --> 00:02:43,689
the breakthrough that Stan Spock

60
00:02:49,860 --> 00:02:46,420
described was a technique where you

61
00:02:52,619 --> 00:02:49,870
plate palladium out at the same time you

62
00:02:55,199 --> 00:02:52,629
electrolyze it and so you build this 1

63
00:02:59,339 --> 00:02:55,209

to 1 ratio right away the reaction

64

00:03:01,920 --> 00:02:59,349
starts more quickly in 2007 from the

65

00:03:04,140 --> 00:03:01,930
same group ammos your boss described a

66

00:03:05,970 --> 00:03:04,150
technique to find charged particles

67

00:03:08,759 --> 00:03:05,980
using a solid-state detector called CR

68

00:03:12,479 --> 00:03:08,769
39 which I'll talk more about as we get

69

00:03:14,369 --> 00:03:12,489
into this so what I want to talk about

70

00:03:17,069 --> 00:03:14,379
is kind of the search that we did in our

71

00:03:20,879 --> 00:03:17,079
laboratory to reproduce the work that

72

00:03:23,789 --> 00:03:20,889
was described by this naval group we

73

00:03:24,449 --> 00:03:23,799
thought this was important work for a

74

00:03:27,599 --> 00:03:24,459
couple reasons

75

00:03:29,069 --> 00:03:27,609
a number of people described seeing

76

00:03:32,610 --> 00:03:29,079

similar things so it would seem to be

77

00:03:33,809 --> 00:03:32,620

pretty reproducible charged particles

78

00:03:35,309 --> 00:03:33,819

were real interesting because they don't

79

00:03:37,349 --> 00:03:35,319

happen by accident they have to happen

80

00:03:39,599 --> 00:03:37,359

as a result of a nuclear reaction so we

81

00:03:40,649 --> 00:03:39,609

thought that was interesting and what

82

00:03:43,349 --> 00:03:40,659

I'm going to do it and go through this

83

00:03:46,559 --> 00:03:43,359

talk is kind of chronologically what we

84

00:03:48,089 --> 00:03:46,569

did in our search and what we found we

85

00:03:49,800 --> 00:03:48,099

went into this trying to answer the

86

00:03:51,659 --> 00:03:49,810

question is okay these charged particles

87

00:03:53,309 --> 00:03:51,669

are there what's the nature of them when

88

00:03:56,670 --> 00:03:53,319

do they occur what are their energies

89

00:03:58,559 --> 00:03:56,680

what can we learn about them all right

90

00:04:02,009 --> 00:03:58,569

let's talk a little bit about Co

91

00:04:05,339 --> 00:04:02,019

deposition I've got a little cartoon

92

00:04:07,610 --> 00:04:05,349

over there so you take a little cell you

93

00:04:10,050 --> 00:04:07,620

fill it full of electrolyte in this case

94

00:04:11,369 --> 00:04:10,060

you need some sort of assault in the

95

00:04:13,499 --> 00:04:11,379

electrolyte in order to make it conduct

96

00:04:16,050 --> 00:04:13,509

electricity in this case it's lithium

97

00:04:18,060 --> 00:04:16,060

chloride and then there's also a small

98

00:04:19,529 --> 00:04:18,070

amount of palladium chloride so when you

99

00:04:21,719 --> 00:04:19,539

pass a current through the cell you do

100

00:04:24,439 --> 00:04:21,729

two things you plate palladium out on

101
00:04:27,120 --> 00:04:24,449
the cathode and you also evolve

102
00:04:29,850 --> 00:04:27,130
deuterium from the cathode and oxygen

103
00:04:32,430 --> 00:04:29,860
from the anode this protocol is

104
00:04:33,659 --> 00:04:32,440
relatively slow it runs for a couple

105
00:04:34,769 --> 00:04:33,669
weeks and then you turn the current up

106
00:04:35,719 --> 00:04:34,779
and that's when interesting things

107
00:04:39,499 --> 00:04:35,729
happen

108
00:04:41,269 --> 00:04:39,509
experiment takes about three weeks we

109
00:04:42,769 --> 00:04:41,279
show here and lots of other people in

110
00:04:45,769 --> 00:04:42,779
the literature show these really

111
00:04:47,209 --> 00:04:45,779
interesting cauliflower like palladium

112
00:04:49,670 --> 00:04:47,219
deposits they have a lot of surface area

113
00:04:53,089 --> 00:04:49,680

and that's where the reaction is thought

114

00:04:56,059 --> 00:04:53,099

to occur so in the first phase of our

115

00:04:58,579 --> 00:04:56,069

study we said gee these charged

116

00:05:01,219 --> 00:04:58,589

particles exist what can we do to get

117

00:05:03,469 --> 00:05:01,229

more information about them so we used a

118

00:05:05,510 --> 00:05:03,479

scintillation detector and a simulation

119

00:05:07,399 --> 00:05:05,520

detector is a crystal or in some case an

120

00:05:08,809 --> 00:05:07,409

organic material that when you hit it

121

00:05:11,209 --> 00:05:08,819

with an energetic charged particle it

122

00:05:14,869 --> 00:05:11,219

makes light and then you can collect the

123

00:05:16,249 --> 00:05:14,879

light and figure out characteristics

124

00:05:20,119 --> 00:05:16,259

about when the particle arrived and how

125

00:05:21,829 --> 00:05:20,129

much energy it had radiation is a

126

00:05:24,290 --> 00:05:21,839

discrete events or every time you get a

127

00:05:26,540 --> 00:05:24,300

decay you get a flash of light and you

128

00:05:28,189 --> 00:05:26,550

typically put a counter behind it so we

129

00:05:30,350 --> 00:05:28,199

refer to counts as being a measure of

130

00:05:33,799 --> 00:05:30,360

the amount of radiation that was

131

00:05:35,719 --> 00:05:33,809

measured this is kind of a cartoon of

132

00:05:38,469 --> 00:05:35,729

what the first experiment looked like

133

00:05:41,659 --> 00:05:38,479

we've got this little electrolytic cell

134

00:05:43,820 --> 00:05:41,669

we make the cathode by putting a thin

135

00:05:46,129 --> 00:05:43,830

film of metal onto the scintillation

136

00:05:48,409 --> 00:05:46,139

crystal and then as you run the

137

00:05:50,239 --> 00:05:48,419

experiment you plate the plate palladium

138

00:05:52,760 --> 00:05:50,249

out which is those little irregular

139

00:05:54,199 --> 00:05:52,770

shaped blobs and on the side of the

140

00:05:56,149 --> 00:05:54,209

Palladium that faces assimilation

141

00:05:57,889 --> 00:05:56,159

crystal for reaction occurs you get a

142

00:05:59,839 --> 00:05:57,899

charged particle it doesn't have very

143

00:06:01,760 --> 00:05:59,849

far to go it goes into the scintillation

144

00:06:04,549 --> 00:06:01,770

crystal it makes light and it gets

145

00:06:07,369 --> 00:06:04,559

detected so in real life it looked like

146

00:06:12,320 --> 00:06:07,379

this these cells are about three inches

147

00:06:15,379 --> 00:06:12,330

tall this is the cathode right here it's

148

00:06:18,439 --> 00:06:15,389

the scintillation crystal with a metal

149

00:06:20,420 --> 00:06:18,449

film on it the vertical wires over here

150

00:06:22,909 --> 00:06:20,430

were the anode it was filled with this

151
00:06:24,290 --> 00:06:22,919
brown cocktail which was lithium

152
00:06:27,409 --> 00:06:24,300
chloride and palladium chloride in heavy

153
00:06:29,480 --> 00:06:27,419
water and then the backside of the

154
00:06:31,279 --> 00:06:29,490
scintillation crystal went up against a

155
00:06:33,290 --> 00:06:31,289
photomultiplier tube which is a light

156
00:06:35,719 --> 00:06:33,300
detection device and that whole device

157
00:06:37,540 --> 00:06:35,729
is sealed up in a dark chamber and the

158
00:06:44,449 --> 00:06:37,550
experiment runs for about three weeks

159
00:06:46,639 --> 00:06:44,459
what happened nothing that was bad we

160
00:06:48,559 --> 00:06:46,649
didn't see any increase in counts so we

161
00:06:49,939 --> 00:06:48,569
didn't see any charge particles above

162
00:06:53,419 --> 00:06:49,949
background

163
00:06:57,199 --> 00:06:53,429

of wanted it to we were seeing about 200

164

00:06:59,239 --> 00:06:57,209

counts a day of background so it meant

165

00:07:01,369 --> 00:06:59,249

that if we got a lot of energy all at

166

00:07:03,949 --> 00:07:01,379

once we certainly would see it if we got

167

00:07:05,569 --> 00:07:03,959

particles counts it showed up uniformly

168

00:07:08,029 --> 00:07:05,579

over the two-week period we probably

169

00:07:09,499 --> 00:07:08,039

wouldn't see it whenever you're doing a

170

00:07:12,139 --> 00:07:09,509

replication you get a negative result

171

00:07:13,459 --> 00:07:12,149

the first question you ask is okay did

172

00:07:16,279 --> 00:07:13,469

we run the right experiment did we

173

00:07:18,349 --> 00:07:16,289

create the right conditions or did or

174

00:07:19,279 --> 00:07:18,359

can we explain the negative result by

175

00:07:22,489 --> 00:07:19,289

the fact we didn't run the right

176
00:07:25,009 --> 00:07:22,499
experiment which led us to the second

177
00:07:27,139 --> 00:07:25,019
set of our experiment which was to try

178
00:07:30,289 --> 00:07:27,149
to understand you know why didn't the

179
00:07:32,479 --> 00:07:30,299
first one work in order to do that we

180
00:07:34,489 --> 00:07:32,489
decided to run two cells at the same

181
00:07:36,559 --> 00:07:34,499
time one of them like the one I just

182
00:07:39,949 --> 00:07:36,569
described and the sewol we were going to

183
00:07:42,469 --> 00:07:39,959
use the Sierra 39 whoops detector that

184
00:07:44,659 --> 00:07:42,479
the the Navy group had used so let me

185
00:07:47,419 --> 00:07:44,669
tell you a little bit about CR 39 and

186
00:07:49,999 --> 00:07:47,429
how it works on the right hand side is a

187
00:07:51,589 --> 00:07:50,009
little piece of CR 39 it's plastic it's

188
00:07:53,629 --> 00:07:51,599

the same material your eyeglasses are

189

00:07:56,149 --> 00:07:53,639

made out of in this case it's made in

190

00:07:58,969 --> 00:07:56,159

really thin sheets and it's extremely

191

00:08:01,129 --> 00:07:58,979

pure doesn't have any holes in it it has

192

00:08:02,809 --> 00:08:01,139

the characteristic if you hit it with an

193

00:08:06,199 --> 00:08:02,819

energetic charged particle the charged

194

00:08:08,629 --> 00:08:06,209

particle damages the plastic and then

195

00:08:10,909 --> 00:08:08,639

you after you've run your experiment you

196

00:08:13,219 --> 00:08:10,919

develop it if you will by edging the

197

00:08:14,989 --> 00:08:13,229

material in a hot life solution and then

198

00:08:17,659 --> 00:08:14,999

you read it by looking at it with a

199

00:08:19,879 --> 00:08:17,669

microscope see you have 39 is an

200

00:08:21,919 --> 00:08:19,889

integrating detector what that means is

201
00:08:23,629 --> 00:08:21,929
that any particle that hits it from the

202
00:08:26,209 --> 00:08:23,639
time it was born until you develop it

203
00:08:28,459 --> 00:08:26,219
get recorded so you could detect very

204
00:08:30,169 --> 00:08:28,469
low levels of activity the bad news is

205
00:08:35,719 --> 00:08:30,179
you have no idea when that activity

206
00:08:37,429 --> 00:08:35,729
occurred in order to count it you can do

207
00:08:39,589 --> 00:08:37,439
it by hand and you do that for about two

208
00:08:42,290 --> 00:08:39,599
days and you go nuts we ended up

209
00:08:44,329 --> 00:08:42,300
building a an automatic scanner which

210
00:08:46,939 --> 00:08:44,339
was a microscope on a three axis stage

211
00:08:49,340 --> 00:08:46,949
it's just sort of ran across the piece

212
00:08:51,350 --> 00:08:49,350
of CR 39 taking two to four thousand

213
00:08:55,040 --> 00:08:51,360

images and then we crunch those images

214

00:08:58,639 --> 00:08:55,050

with some computer programs and it

215

00:09:00,290 --> 00:08:58,649

results in little montages of tracks so

216

00:09:02,629 --> 00:09:00,300

this is what our radiation track looks

217

00:09:03,240 --> 00:09:02,639

like those little squares represent

218

00:09:05,340 --> 00:09:03,250

about 50

219

00:09:10,170 --> 00:09:05,350

microns of distance on a piece of CR 39

220

00:09:15,350 --> 00:09:10,180

plastic so this is the cartoon of what

221

00:09:18,050 --> 00:09:15,360

the Serie 39 experiment looks like

222

00:09:20,610 --> 00:09:18,060

similar to the other experiment we had a

223

00:09:23,100 --> 00:09:20,620

wire which is a cathode

224

00:09:24,830 --> 00:09:23,110

a piece of the CR 39 plastic which is

225

00:09:27,750 --> 00:09:24,840

inside the cell with the electrolyte

226
00:09:29,850 --> 00:09:27,760
again the Palladium forms on the wire if

227
00:09:32,250 --> 00:09:29,860
the reaction occurs on the CR 39 side

228
00:09:35,280 --> 00:09:32,260
charge particles hit to see our 39 and

229
00:09:40,350 --> 00:09:35,290
make tracks in real life it looked like

230
00:09:41,730 --> 00:09:40,360
this the top picture is the cell with a

231
00:09:44,970 --> 00:09:41,740
scintillation crystal which is that

232
00:09:46,500 --> 00:09:44,980
round disc the cathode wires ran

233
00:09:47,940 --> 00:09:46,510
horizontally and then behind it you

234
00:09:50,520 --> 00:09:47,950
can't really see the anode wires ran

235
00:09:53,130 --> 00:09:50,530
vertically and the lower picture is the

236
00:09:57,510 --> 00:09:53,140
same thing with the CR 39 so we ran

237
00:09:59,100 --> 00:09:57,520
those two cells at the same time this is

238
00:10:03,350 --> 00:09:59,110

interesting we saw some good stuff here

239

00:10:06,930 --> 00:10:03,360

and curious we didn't see anything on

240

00:10:11,910 --> 00:10:06,940

the scintillation counter but on the CR

241

00:10:14,340 --> 00:10:11,920

39 we saw all sorts of good stuff this

242

00:10:15,480 --> 00:10:14,350

picture here is what the physical part

243

00:10:17,280 --> 00:10:15,490

looked like when we brought it out so

244

00:10:19,170 --> 00:10:17,290

there was physical evidence you could

245

00:10:23,700 --> 00:10:19,180

see where the lines were and if I blew

246

00:10:25,829 --> 00:10:23,710

those up with a microscope I see all

247

00:10:28,829 --> 00:10:25,839

sorts of tracks here and this

248

00:10:31,380 --> 00:10:28,839

representation on the right side is the

249

00:10:33,180 --> 00:10:31,390

spatial track density so in the area

250

00:10:36,510 --> 00:10:33,190

where the cathode is you've got the

251
00:10:41,310 --> 00:10:36,520
elevated counts what's interesting here

252
00:10:43,590 --> 00:10:41,320
is the number of counts was well larger

253
00:10:45,360 --> 00:10:43,600
than our background so if those counts

254
00:10:46,680 --> 00:10:45,370
represented charged particles we should

255
00:10:50,370 --> 00:10:46,690
have seen something on our scintillation

256
00:10:53,400 --> 00:10:50,380
counter which begged the question why

257
00:10:55,950 --> 00:10:53,410
not which brought us into the third

258
00:10:59,220 --> 00:10:55,960
phase of the experiment which was okay

259
00:11:00,750 --> 00:10:59,230
we see counts on the CR 39 how come we

260
00:11:03,150 --> 00:11:00,760
didn't see counts on the scintillation

261
00:11:06,570 --> 00:11:03,160
counter one of the criticisms that was

262
00:11:09,090 --> 00:11:06,580
mounted in the the field of this

263
00:11:10,860 --> 00:11:09,100

experiment was CA 39 is traditionally

264

00:11:13,140 --> 00:11:10,870

used in high-energy physics experiments

265

00:11:16,380 --> 00:11:13,150

in a vacuum chamber which is pristine

266

00:11:18,420 --> 00:11:16,390

and clean there were some

267

00:11:20,610 --> 00:11:18,430

criticisms that putting CR 39 into the

268

00:11:23,280 --> 00:11:20,620

electrolyte might allow the electrolyte

269

00:11:26,790 --> 00:11:23,290

to damage the CR 39 and make fake tracks

270

00:11:28,110 --> 00:11:26,800

if you will so the Navy Group came up

271

00:11:31,560 --> 00:11:28,120

with an experiment where they protected

272

00:11:34,290 --> 00:11:31,570

the Sierra 39 with mylar and we set out

273

00:11:36,800 --> 00:11:34,300

to reproduce that experiment exactly

274

00:11:39,750 --> 00:11:36,810

I might make a note that one of the

275

00:11:41,610 --> 00:11:39,760

Leonard researchers lectures is about

276

00:11:43,160 --> 00:11:41,620

constantly and that is if you're going

277

00:11:45,300 --> 00:11:43,170

to reproduce somebody's experiment

278

00:11:46,770 --> 00:11:45,310

reproduce their experiment don't make it

279

00:11:49,440 --> 00:11:46,780

better so what we did here was exactly

280

00:11:51,720 --> 00:11:49,450

the opposite we made it better and then

281

00:11:53,270 --> 00:11:51,730

about a year later we finally got to

282

00:11:57,000 --> 00:11:53,280

doing what we should have done at first

283

00:12:00,020 --> 00:11:57,010

but this is what we did okay so this is

284

00:12:02,640 --> 00:12:00,030

a cartoon of the mylar protected sea r39

285

00:12:05,640 --> 00:12:02,650

we cut a hole in the cell this little

286

00:12:08,640 --> 00:12:05,650

plastic box and we covered that hole

287

00:12:10,590 --> 00:12:08,650

with a mylar window the mylar was very

288

00:12:13,020 --> 00:12:10,600

thin so that the charged particles could

289

00:12:14,790 --> 00:12:13,030

pass through it without any problem and

290

00:12:17,130 --> 00:12:14,800

then the Sierra 39 was on the outside of

291

00:12:19,680 --> 00:12:17,140

the window not in the in contact with

292

00:12:23,310 --> 00:12:19,690

the electrolyte so again if a reaction

293

00:12:25,140 --> 00:12:23,320

occurs on the mylar side of the little

294

00:12:28,230 --> 00:12:25,150

palladium deposit the charge particle is

295

00:12:29,760 --> 00:12:28,240

generated passes through the through the

296

00:12:33,270 --> 00:12:29,770

mylar window hits the Sierra 39 and

297

00:12:37,770 --> 00:12:33,280

makes a track in real life it looked

298

00:12:39,390 --> 00:12:37,780

like this the mylar window was 6 microns

299

00:12:41,610 --> 00:12:39,400

to put that in perspective a piece of

300

00:12:43,290 --> 00:12:41,620

paper is about 10 times that size it's

301

00:12:49,200 --> 00:12:43,300

about 50 to 100 microns so this is

302

00:12:51,210 --> 00:12:49,210

really thin the cathode wire is pressed

303

00:12:53,940 --> 00:12:51,220

up against the CR 39 and then up against

304

00:12:55,980 --> 00:12:53,950

the up against the mylar then the COR 39

305

00:12:58,320 --> 00:12:55,990

the charged particles pass through with

306

00:13:01,290 --> 00:12:58,330

very little attendant attenuation in

307

00:13:02,940 --> 00:13:01,300

addition to the CR 39 we also monitored

308

00:13:04,830 --> 00:13:02,950

some chemical characteristics of the

309

00:13:06,360 --> 00:13:04,840

cell we monitor this voltage and the pH

310

00:13:07,740 --> 00:13:06,370

and some things like that to get a

311

00:13:12,150 --> 00:13:07,750

better idea of what might be going on

312

00:13:13,350 --> 00:13:12,160

inside these cells what do we see well

313

00:13:16,950 --> 00:13:13,360

in all the cells that we ran with

314

00:13:20,420 --> 00:13:16,960

deuterium we saw significant increase in

315

00:13:23,490 --> 00:13:20,430

tracks in the area of the cathode and

316

00:13:25,170 --> 00:13:23,500

here you can see you know this is what

317

00:13:28,530 --> 00:13:25,180

the tracks look like in the microscope

318

00:13:29,920 --> 00:13:28,540

and they showed up here in the area of

319

00:13:35,120 --> 00:13:29,930

the cathode

320

00:13:38,210 --> 00:13:35,130

what did that mean we looked at the

321

00:13:40,550 --> 00:13:38,220

tracks and we observed as as others that

322

00:13:45,530 --> 00:13:40,560

observe before us that the tracks

323

00:13:48,260 --> 00:13:45,540

produced by the the electrolytic Co

324

00:13:52,160 --> 00:13:48,270

deposition process didn't look like

325

00:13:54,740 --> 00:13:52,170

tracks we got from calibration and the

326

00:13:58,730 --> 00:13:54,750

Lord said these tracks were produced by

327

00:14:01,190 --> 00:13:58,740

taking a known 5 MeV alpha emitter which

328

00:14:02,720 --> 00:14:01,200

was polonium-210 and exposing that to

329

00:14:04,280 --> 00:14:02,730

the CR 39 and then going through the

330

00:14:06,550 --> 00:14:04,290

development process and you get these

331

00:14:09,920 --> 00:14:06,560

really round or elliptical shaped

332

00:14:11,360 --> 00:14:09,930

distinct tracks the shape is a function

333

00:14:15,170 --> 00:14:11,370

of the angle that the particle hits the

334

00:14:16,640 --> 00:14:15,180

CR 39 with it hits dead-on there they're

335

00:14:19,040 --> 00:14:16,650

round otherwise are a little elliptical

336

00:14:22,160 --> 00:14:19,050

and up here we saw tracks that look very

337

00:14:25,250 --> 00:14:22,170

different which raised the question ok

338

00:14:29,030 --> 00:14:25,260

what what maybe made those the other

339

00:14:30,640 --> 00:14:29,040

thing we noted you know these cells run

340

00:14:33,680 --> 00:14:30,650

for three weeks and the cells

341

00:14:35,870 --> 00:14:33,690

particularly after electrolysis and a

342

00:14:40,190 --> 00:14:35,880

heavy water environment were clearly

343

00:14:42,730 --> 00:14:40,200

damaged the other thing we noted is in

344

00:14:46,700 --> 00:14:42,740

every case where we have elevated tracks

345

00:14:49,400 --> 00:14:46,710

the area where the tracks were elevated

346

00:14:51,770 --> 00:14:49,410

we saw something on the CR 39 we saw

347

00:14:53,660 --> 00:14:51,780

stuff like this you know the micrograph

348

00:14:55,700 --> 00:14:53,670

of a little blow-up look you know lots

349

00:15:00,380 --> 00:14:55,710

and lots of activity which correspond

350

00:15:03,110 --> 00:15:00,390

into regions that had high counts if you

351

00:15:04,790 --> 00:15:03,120

take CR 39 and put it in a vacuum

352

00:15:06,620 --> 00:15:04,800

chamber and expose it to a radioactive

353

00:15:08,150 --> 00:15:06,630

source you don't see anything to the

354

00:15:10,370 --> 00:15:08,160

naked eye you see it in the microscope

355

00:15:12,050 --> 00:15:10,380

but not to the naked eye so that made us

356

00:15:16,220 --> 00:15:12,060

a little suspicious that maybe something

357

00:15:18,440 --> 00:15:16,230

else was going on I'm not going to say

358

00:15:20,320 --> 00:15:18,450

much about this other than there was

359

00:15:23,240 --> 00:15:20,330

significant evidence from our

360

00:15:24,140 --> 00:15:23,250

measurement of pH and cell voltage and

361

00:15:26,180 --> 00:15:24,150

stuff like that there's a lot of

362

00:15:29,060 --> 00:15:26,190

chemistry going on inside the cell the

363

00:15:31,580 --> 00:15:29,070

pH goes from kind of acidic to real

364

00:15:33,170 --> 00:15:31,590

acidic up to very basic and there was

365

00:15:36,790 --> 00:15:33,180

also a period where we're making hypo

366

00:15:40,880 --> 00:15:36,800

chloride ions which is basically bleach

367

00:15:42,200 --> 00:15:40,890

so that made us ask is there any way

368

00:15:43,040 --> 00:15:42,210

that the chemistry in the cell is

369

00:15:47,510 --> 00:15:43,050

damaging

370

00:15:49,730 --> 00:15:47,520

the the CR 39 one of our colleagues at

371

00:15:50,990 --> 00:15:49,740

the Naval Research Lab suggested well

372

00:15:52,730 --> 00:15:51,000

why don't you put some aluminum foil on

373

00:15:54,770 --> 00:15:52,740

it aluminum is pretty easily attacked by

374

00:15:57,740 --> 00:15:54,780

chlorine we did that in two different

375

00:15:59,690 --> 00:15:57,750

ways we put some strips of aluminum on

376

00:16:02,450 --> 00:15:59,700

and we also after we had built one of

377

00:16:04,970 --> 00:16:02,460

these cells we had a phenol thin film of

378

00:16:07,730 --> 00:16:04,980

my aluminum put on the mylar sheikhan

379

00:16:09,320 --> 00:16:07,740

slips as you can see here it was pretty

380

00:16:11,780 --> 00:16:09,330

much destroyed and we had evidence of

381

00:16:14,090 --> 00:16:11,790

damage here the final experiment we did

382

00:16:16,910 --> 00:16:14,100

was we introduced a small air gap a half

383

00:16:20,480 --> 00:16:16,920

a millimeter air gap which is not enough

384

00:16:23,450 --> 00:16:20,490

to significantly lower the energy of

385

00:16:25,310 --> 00:16:23,460

charged particles and what we saw was in

386

00:16:27,710 --> 00:16:25,320

the case where we didn't have an air gap

387

00:16:29,450 --> 00:16:27,720

we had elevated counts in the cases

388

00:16:33,550 --> 00:16:29,460

where we did have our gaps the counts

389

00:16:37,300 --> 00:16:33,560

went away so in summary we never saw

390

00:16:41,570 --> 00:16:39,710

we saw tracks even in the mylar

391

00:16:44,540 --> 00:16:41,580

protective Sierra 39 cell as well so

392

00:16:47,000 --> 00:16:44,550

cells without the mylar the tracks look

393

00:16:48,620 --> 00:16:47,010

different from normal alpha tracks the

394

00:16:51,560 --> 00:16:48,630

track location correlated well with

395

00:16:55,220 --> 00:16:51,570

damages mylar didn't prevent damage to

396

00:16:59,200 --> 00:16:55,230

the foil and if we put an air gap in the

397

00:17:01,340 --> 00:16:59,210

tracks all went away so we concluded

398

00:17:06,050 --> 00:17:01,350

unfortunately not what we wanted to find

399

00:17:08,329 --> 00:17:06,060

when we set out we concluded that the

400

00:17:12,670 --> 00:17:08,339

likely cause of the CR 39 tracks was

401
00:17:15,410 --> 00:17:12,680
chemical damage not nuclear activity and

402
00:17:19,310 --> 00:17:15,420
in all the runs we did in our lab over

403
00:17:23,300 --> 00:17:19,320
an 18-month period we don't think we saw

404
00:17:24,740 --> 00:17:23,310
any evidence of charged particles and

405
00:17:28,880 --> 00:17:24,750
one of the lessons that we took away

406
00:17:30,110 --> 00:17:28,890
from this was it's important not to give

407
00:17:30,620 --> 00:17:30,120
up when you get the results you're

408
00:17:32,420 --> 00:17:30,630
looking for

409
00:17:33,770 --> 00:17:32,430
you really need to dig in and see if

410
00:17:36,230 --> 00:17:33,780
there's anything else that might be

411
00:17:39,180 --> 00:17:36,240
explaining what you've got thank you

412
00:18:09,730 --> 00:17:46,110
Oh dr. Kendall thank you very much we

413
00:18:14,710 --> 00:18:12,520

I actually just wanted to applaud your

414

00:18:16,570 --> 00:18:14,720

closing statement I overheard a

415

00:18:20,440 --> 00:18:16,580

conversation with another attendee at

416

00:18:22,780 --> 00:18:20,450

this meeting saying that in any study

417

00:18:40,610 --> 00:18:22,790

she was always most suspicious when she

418

00:18:47,690 --> 00:18:44,990

just a very crude loose replication that

419

00:18:49,760 --> 00:18:47,700

got the same results as you I did one

420

00:18:54,140 --> 00:18:49,770

run sort of as a slap together

421

00:18:58,610 --> 00:18:54,150

duct tape hobbyist two runs one with the

422

00:19:01,280 --> 00:18:58,620

CR 39 rate on the electrolyte fills with

423

00:19:03,260 --> 00:19:01,290

millions of hits got hold of some very

424

00:19:05,180 --> 00:19:03,270

thin mylar put the mylar in the way I

425

00:19:07,670 --> 00:19:05,190

couldn't see any pits but then I didn't

426

00:19:10,370 --> 00:19:07,680

get the damage to the miler you saw so