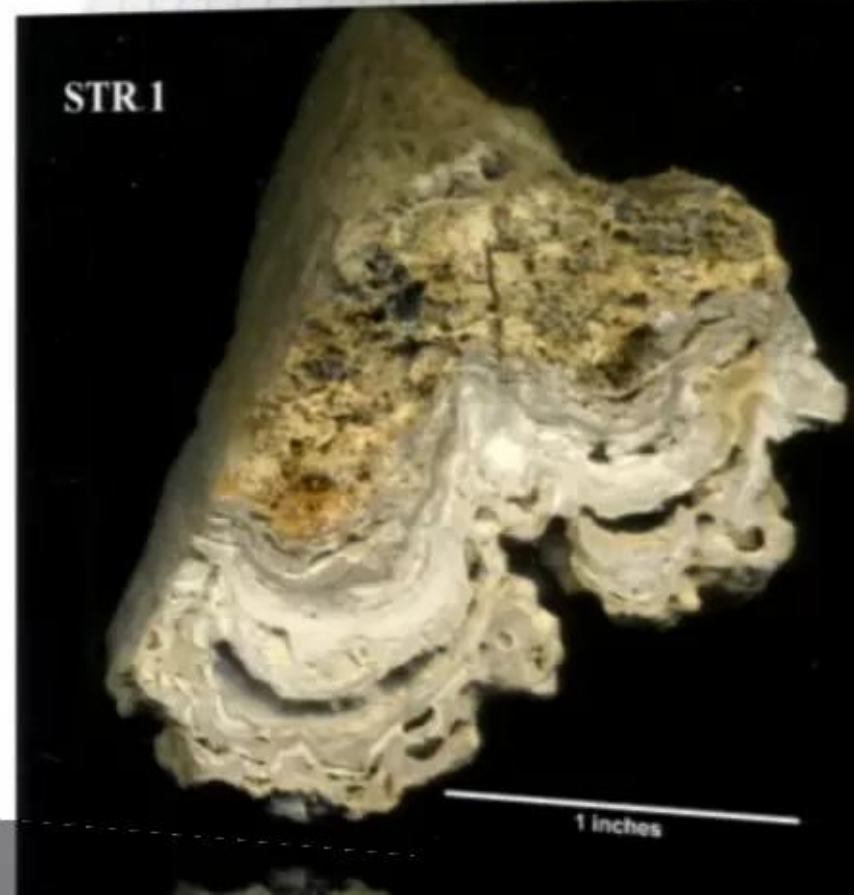
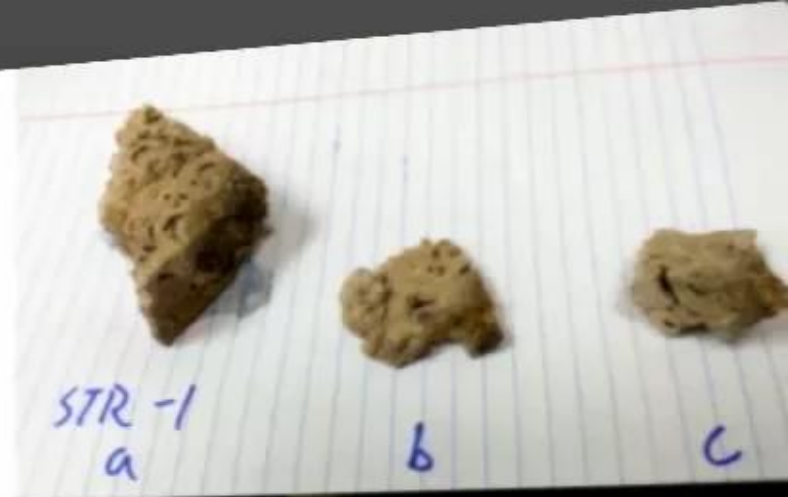


Hand Sample

- Late Holocene Stromatolite. (Last et al., 2012)
- Very porous.
- Morphology changes a lot from outside to inside.
- Inside is loosely structured and outside is well compact.



1
00:00:12,090 --> 00:00:09,360
hi everyone my name is Johan Fong I'm a

2
00:00:14,190 --> 00:00:12,100
first-year med student in Geoscience

3
00:00:16,650 --> 00:00:14,200
department of university of wisconsin

4
00:00:19,380 --> 00:00:16,660
and today i'm gonna talk about more than

5
00:00:23,010 --> 00:00:19,390
damai from a needle a great playing and

6
00:00:25,470 --> 00:00:23,020
its implications so first of all why do

7
00:00:28,050 --> 00:00:25,480
i understudied oh my because dalam is a

8
00:00:30,870 --> 00:00:28,060
major component of the carbon named

9
00:00:32,819 --> 00:00:30,880
reservoir and also because dolomite is

10
00:00:35,790 --> 00:00:32,829
kind of weird you find tons of them in

11
00:00:39,930 --> 00:00:35,800
the Asian record but it's kind of rare

12
00:00:41,970 --> 00:00:39,940
in the morning setting out and there's a

13
00:00:44,670 --> 00:00:41,980

famous tola my problem because it's

14

00:00:48,240 --> 00:00:44,680

hardest emphasizing labs on their

15

00:00:51,240 --> 00:00:48,250

surface condition and one group tried to

16

00:00:54,720 --> 00:00:51,250

synthesize damai under using

17

00:00:57,960 --> 00:00:54,730

supersaturated solution with within 32

18

00:00:59,370 --> 00:00:57,970

years and they failed and some people

19

00:01:02,700 --> 00:00:59,380

provoke think that all of my information

20

00:01:07,139 --> 00:01:02,710

is largely related to the pile microbial

21

00:01:10,410 --> 00:01:07,149

activity so we think that might be true

22

00:01:13,170 --> 00:01:10,420

and first of all I want to show you guys

23

00:01:18,180 --> 00:01:13,180

Wallace dolomite so you have calcite

24

00:01:20,219 --> 00:01:18,190

here so is CaCO_3 very simple and then if

25

00:01:22,260 --> 00:01:20,229

you replace have the calcium with

26
00:01:24,990 --> 00:01:22,270
magnesium and then they become older you

27
00:01:27,060 --> 00:01:25,000
got this ordered over mine and then so

28
00:01:29,130 --> 00:01:27,070
you got one layer of calcium that's the

29
00:01:31,740 --> 00:01:29,140
blue one and you got one layer of the

30
00:01:33,600 --> 00:01:31,750
magnesium that's a yellow one and if you

31
00:01:35,580 --> 00:01:33,610
just get out of my sometimes they're

32
00:01:37,320 --> 00:01:35,590
disorder and if they're like fifty

33
00:01:40,500 --> 00:01:37,330
percent magnesium in the crystal lattice

34
00:01:43,380 --> 00:01:40,510
then you have they would be random into

35
00:01:45,149 --> 00:01:43,390
circular so like this atom have fifty

36
00:01:49,530 --> 00:01:45,159
percent chance to be calcium nor fifty

37
00:01:53,429 --> 00:01:49,540
percent chance to be magnesium so how

38
00:01:56,609 --> 00:01:53,439

did it form our lab our research group

39

00:01:58,880 --> 00:01:56,619

try to synthesize over my lap so because

40

00:02:01,219 --> 00:01:58,890

we think is really to microbial activity

41

00:02:03,330 --> 00:02:01,229

first of all they try to use

42

00:02:05,030 --> 00:02:03,340

polysaccharides so sugar try to

43

00:02:07,590 --> 00:02:05,040

sympathize don't mind the lab and

44

00:02:09,779 --> 00:02:07,600

because the hard part for don't my to

45

00:02:11,729 --> 00:02:09,789

form is because the magnesium will bound

46

00:02:15,890 --> 00:02:11,739

with the water and so hard to get into

47

00:02:18,569 --> 00:02:15,900

the crystal lattice and they think

48

00:02:19,350 --> 00:02:18,579

polysaccharide can help to weaken the

49

00:02:21,990 --> 00:02:19,360

bounce between

50

00:02:23,790 --> 00:02:22,000

water and magnesium and then they

51
00:02:26,430 --> 00:02:23,800
successfully synthesized all of my

52
00:02:30,750 --> 00:02:26,440
disorder to a life you can't see in that

53
00:02:33,270 --> 00:02:30,760
deck tardy didn't hear this and so

54
00:02:36,510 --> 00:02:33,280
polysaccharide works well L what's the

55
00:02:39,480 --> 00:02:36,520
next step then so they use eps so

56
00:02:43,260 --> 00:02:39,490
polysaccharide is a major component of

57
00:02:46,110 --> 00:02:43,270
the EPS and they also Susilo synthesized

58
00:02:48,890 --> 00:02:46,120
all of my using eps adding to the

59
00:02:52,920 --> 00:02:48,900
solution in reasonably short time and

60
00:02:55,980 --> 00:02:52,930
but how is it exactly work so one of our

61
00:03:00,210 --> 00:02:55,990
peers student tried to use molecular

62
00:03:02,210 --> 00:03:00,220
dynamics to simulate the try manos

63
00:03:07,260 --> 00:03:02,220

that's the only one we work on right now

64

00:03:10,260 --> 00:03:07,270

to try to run the modeling on how much

65

00:03:12,750 --> 00:03:10,270

the sugar help the to weaken the bond

66

00:03:15,870 --> 00:03:12,760

between water and magnesium and it turns

67

00:03:17,670 --> 00:03:15,880

out that a lower the funding energy user

68

00:03:20,670 --> 00:03:17,680

like about point seven two point eight

69

00:03:23,910 --> 00:03:20,680

kilo child promote that's pretty sick so

70

00:03:26,580 --> 00:03:23,920

it turns out that like sugar is really

71

00:03:29,430 --> 00:03:26,590

helping the main easy to get into the

72

00:03:33,840 --> 00:03:29,440

crystal lattice to form don't mine so

73

00:03:36,180 --> 00:03:33,850

now we move to my study so I was working

74

00:03:39,390 --> 00:03:36,190

on natural sample so where can you find

75

00:03:41,550 --> 00:03:39,400

more than total mind L don't mind mostly

76

00:03:44,580 --> 00:03:41,560

finds from LA right now and they're

77

00:03:46,259 --> 00:03:44,590

mostly in tropic setting I don't talk we

78

00:03:49,080 --> 00:03:46,269

heard this morning they're from like a

79

00:03:51,090 --> 00:03:49,090

Bahamas those area marine setting really

80

00:03:54,750 --> 00:03:51,100

warm temperature this one's the mini

81

00:03:56,699 --> 00:03:54,760

lake is in Saskatchewan Canada is really

82

00:03:59,729 --> 00:03:56,709

in a really co setting is even colder

83

00:04:03,330 --> 00:03:59,739

than medicine and the water level drops

84

00:04:06,210 --> 00:04:03,340

significantly from 1911 to now so you

85

00:04:09,300 --> 00:04:06,220

can see the block the light blue is the

86

00:04:12,449 --> 00:04:09,310

original size of the lake and it dropped

87

00:04:16,110 --> 00:04:12,459

to only about this much no and because

88

00:04:19,140 --> 00:04:16,120

the water is a they evaporate a lot of

89

00:04:22,770 --> 00:04:19,150

water the pH increase from 9.3 to close

90

00:04:26,700 --> 00:04:22,780

to 10 now and also the magnesium content

91

00:04:30,870 --> 00:04:26,710

in the lake also increase so this is

92

00:04:32,730 --> 00:04:30,880

what the future looks like surprisingly

93

00:04:33,239 --> 00:04:32,740

we found most of the carbonates are in

94

00:04:35,069 --> 00:04:33,249

the form

95

00:04:38,609 --> 00:04:35,079

of Cody bouldery rather than the stroma

96

00:04:41,189 --> 00:04:38,619

you expect to see and there most of them

97

00:04:43,949 --> 00:04:41,199

are found in like a really may fake

98

00:04:47,489 --> 00:04:43,959

rocks and even in the same location some

99

00:04:49,889 --> 00:04:47,499

are felsic rather than have any color

100

00:04:52,529 --> 00:04:49,899

border to company growing on top of them

101
00:04:54,719 --> 00:04:52,539
and only on the east side of the lake we

102
00:04:57,299 --> 00:04:54,729
found this pinnacle extra man like

103
00:04:59,189 --> 00:04:57,309
growing and then if you cut it open the

104
00:05:02,099 --> 00:04:59,199
middle is really black and it's loose

105
00:05:03,779 --> 00:05:02,109
and it smells that probably indicates it

106
00:05:06,419 --> 00:05:03,789
has tons of getting material inside of

107
00:05:10,049 --> 00:05:06,429
it and then this is the hand sample you

108
00:05:12,109 --> 00:05:10,059
can see the outer outside like with

109
00:05:15,929 --> 00:05:12,119
respect to see in a stromatolite is

110
00:05:18,029 --> 00:05:15,939
porous and the rock is very young from

111
00:05:21,359 --> 00:05:18,039
previous study this show that late

112
00:05:27,119 --> 00:05:21,369
holocene so maybe less than 500 years

113
00:05:29,429 --> 00:05:27,129

old and so this is the optical images

114

00:05:31,409 --> 00:05:29,439

you can see more clearly now there is a

115

00:05:33,449 --> 00:05:31,419

really bright layer and there's a dark

116

00:05:36,139 --> 00:05:33,459

layer and then we think the dark layers

117

00:05:39,989 --> 00:05:36,149

are any bridge in the organic material

118

00:05:42,419 --> 00:05:39,999

but how we gonna test that uh-huh what

119

00:05:46,709 --> 00:05:42,429

if there is no my inside of it so we use

120

00:05:49,109 --> 00:05:46,719

x-ray diffraction xrd ah so you have the

121

00:05:50,999 --> 00:05:49,119

x-ray source here and the heat sample

122

00:05:53,069 --> 00:05:51,009

and then scatter based on practice law

123

00:05:56,219 --> 00:05:53,079

in different angle and then we collect

124

00:05:57,659 --> 00:05:56,229

that in the detector for a 2d

125

00:05:59,879 --> 00:05:57,669

diffraction pattern and view software to

126

00:06:02,639 --> 00:05:59,889

convert back to what D so it's easier to

127

00:06:06,329 --> 00:06:02,649

analyze so because this machine can do

128

00:06:09,479 --> 00:06:06,339

institute xrd so we can actually pick

129

00:06:13,079 --> 00:06:09,489

individual points from the rock and then

130

00:06:17,639 --> 00:06:13,089

examine the minerals inside of it so we

131

00:06:22,579 --> 00:06:17,649

can see one two and five is like this

132

00:06:26,699 --> 00:06:22,589

and it has tons of oregano calcite and

133

00:06:29,249 --> 00:06:26,709

though my pecan bit but in the dark area

134

00:06:31,559 --> 00:06:29,259

the free and for all you can see was

135

00:06:34,379 --> 00:06:31,569

just on my you can find a rag night and

136

00:06:37,769 --> 00:06:34,389

calcite it probably some high magnesium

137

00:06:40,859 --> 00:06:37,779

chance at but mostly total mine and take

138

00:06:43,679 --> 00:06:40,869

a closer look at the dolomite here this

139

00:06:46,199 --> 00:06:43,689

is the dolomite we got from the lake and

140

00:06:46,950 --> 00:06:46,209

this is a standard over my x-ray

141

00:06:50,040 --> 00:06:46,960

diffraction

142

00:06:53,219 --> 00:06:50,050

and you can see that we is missing a pig

143

00:06:55,860 --> 00:06:53,229

here that's the 015 pic that's depict

144

00:06:57,689 --> 00:06:55,870

indicating the ordinance of the goal of

145

00:07:01,409 --> 00:06:57,699

mine so that helps us our dough in my

146

00:07:04,050 --> 00:07:01,419

history young and is really disorder but

147

00:07:06,689 --> 00:07:04,060

xrd cannot tell how much disorder that

148

00:07:11,760 --> 00:07:06,699

oh my is that she is so we need leave it

149

00:07:18,990 --> 00:07:11,770

yeah for that and then this is the fee

150

00:07:21,990 --> 00:07:19,000

104 and magnesium percentage so we think

151
00:07:23,850 --> 00:07:22,000
previous think that are you can use the

152
00:07:27,510 --> 00:07:23,860
composition to tell the tale spacing of

153
00:07:29,640 --> 00:07:27,520
them all right but this is the complete

154
00:07:32,700 --> 00:07:29,650
orders olamide this is the complete

155
00:07:35,999 --> 00:07:32,710
disorder tore my our sample falls into

156
00:07:39,180 --> 00:07:36,009
this little red circle around here so

157
00:07:41,189 --> 00:07:39,190
now not just a conversation are

158
00:07:45,240 --> 00:07:41,199
controlling the size of the crystal

159
00:07:47,040 --> 00:07:45,250
lattice is also be the ordinance is also

160
00:07:50,550 --> 00:07:47,050
controlling that so we were thinking

161
00:07:53,040 --> 00:07:50,560
about running Ward keeps ah experiment

162
00:08:00,600 --> 00:07:53,050
to find out where they said leave this

163
00:08:03,689 --> 00:08:00,610

line with falls on and then so it turns

164

00:08:05,760 --> 00:08:03,699

out though might because only the really

165

00:08:07,830 --> 00:08:05,770

organic rich part of the rock dust

166

00:08:10,920 --> 00:08:07,840

Ramallah I we found all my constraint in

167

00:08:12,749 --> 00:08:10,930

them so we think on my distribution are

168

00:08:15,719 --> 00:08:12,759

controlled by the organic material

169

00:08:18,290 --> 00:08:15,729

distribution and they're also don't my

170

00:08:21,390 --> 00:08:18,300

might be able to use the indicator for

171

00:08:24,029 --> 00:08:21,400

microorganism so that if you ever find

172

00:08:26,730 --> 00:08:24,039

out doe my on Mars for example there

173

00:08:29,310 --> 00:08:26,740

might be probably from a fair chance to

174

00:08:31,290 --> 00:08:29,320

say that it's a biogenic and then it

175

00:08:33,959 --> 00:08:31,300

might indicate there's microorganism

176

00:08:36,719 --> 00:08:33,969

once living on Mars and then for the

177

00:08:40,649 --> 00:08:36,729

next that we're thinking about using gas

178

00:08:43,290 --> 00:08:40,659

chromatog in a stronger GCMs for organic

179

00:08:46,410 --> 00:08:43,300

content so we get a better quantitative

180

00:08:49,550 --> 00:08:46,420

relation between the X double my

181

00:08:53,310 --> 00:08:49,560

percentage and organic materials and

182

00:08:57,689 --> 00:08:53,320

then also using more xrd to get more

183

00:09:00,390 --> 00:08:57,699

data points for the dolomite and then

184

00:09:02,910 --> 00:09:00,400

also using scanning electron microscope

185

00:09:05,940 --> 00:09:02,920

cm to get a me fall detail mythology up

186

00:09:08,820 --> 00:09:05,950

the rock for the minerals and then using

187

00:09:11,070 --> 00:09:08,830

epma the electron probe microanalysis to

188

00:09:14,940 --> 00:09:11,080

get exact composition because xrq can

189

00:09:19,890 --> 00:09:14,950

now provide you with a really ah really

190

00:09:22,500 --> 00:09:19,900

good reliable also we're because the 015

191

00:09:24,840 --> 00:09:22,510

pick is really really low we cannot tell

192

00:09:27,060 --> 00:09:24,850

you're just using SRD and the refinement

193

00:09:30,990 --> 00:09:27,070

so we need to use transmission electron

194

00:09:33,870 --> 00:09:31,000

microscope to get the exactly was the

195

00:09:36,780 --> 00:09:33,880

ordinance of the dolomite so we can have

196

00:09:39,600 --> 00:09:36,790

more correlation between them and also

197

00:09:42,380 --> 00:09:39,610

because TN has ed as attached to it so

198

00:09:45,630 --> 00:09:42,390

we can use in ds2 get a much better

199

00:10:07,509 --> 00:09:45,640

accurate composition information through

200

00:10:11,630 --> 00:10:10,670

yeah I have a kind of a weird one good

201
00:10:14,449 --> 00:10:11,640
talk by the way that was a lot was

202
00:10:16,190 --> 00:10:14,459
awesome some years ago and one of my

203
00:10:19,370 --> 00:10:16,200
cultures of software reducing

204
00:10:21,769 --> 00:10:19,380
microorganisms I saw these really weird

205
00:10:23,060 --> 00:10:21,779
structures that I've never gone down the

206
00:10:26,019 --> 00:10:23,070
path of trying to figure out what they

207
00:10:29,210 --> 00:10:26,029
really are but I know that they're there

208
00:10:31,519 --> 00:10:29,220
magnesium and there's carbonate and

209
00:10:33,380 --> 00:10:31,529
there's calcium in these structures and

210
00:10:35,960 --> 00:10:33,390
they look like dumbbells little

211
00:10:38,210 --> 00:10:35,970
microbial dumbbells and I've seen in the

212
00:10:40,100 --> 00:10:38,220
literature that it's been claimed some

213
00:10:41,329 --> 00:10:40,110

years ago that when you see these things

214

00:10:43,970 --> 00:10:41,339

that they are actually dolemite being

215

00:10:45,949 --> 00:10:43,980

formed by microorganisms in the lab but

216

00:10:48,259 --> 00:10:45,959

I have what I have two small amount of

217

00:10:50,810 --> 00:10:48,269

material to really figure out with xrd

218

00:10:52,069 --> 00:10:50,820

that it's dolomite so what would you

219

00:10:53,360 --> 00:10:52,079

suggest you could do for something like

220

00:10:54,800 --> 00:10:53,370

that and do you think that even could be

221

00:10:55,940 --> 00:10:54,810

Donell my do you think that there's kind

222

00:10:57,500 --> 00:10:55,950

of papers where they suggest that

223

00:11:00,290 --> 00:10:57,510

microbes make these little dumbbell

224

00:11:01,639 --> 00:11:00,300

structures and unique forms that that

225

00:11:03,470 --> 00:11:01,649

would be dolemite yeah I'm not sure

226

00:11:05,960 --> 00:11:03,480

about it dumbbell structured but I think

227

00:11:09,230 --> 00:11:05,970

their lives are suggesting like South by

228

00:11:11,630 --> 00:11:09,240

reducing bacteria can promote rope don't

229

00:11:14,389 --> 00:11:11,640

mind if you have really small amount on

230

00:11:17,540 --> 00:11:14,399

my not enough for xrd probably you can

231

00:11:23,420 --> 00:11:17,550

use TM to determine that okay awesome

232

00:11:26,420 --> 00:11:23,430

hey cool um I was just a little confused

233

00:11:28,670 --> 00:11:26,430

about how with xrd you can only really

234

00:11:31,009 --> 00:11:28,680

look at crystal and mineral so confused

235

00:11:33,980 --> 00:11:31,019

how you were saying it was disordered

236

00:11:35,329 --> 00:11:33,990

but based on the absence of a peak but

237

00:11:37,250 --> 00:11:35,339

like why would it give you such a nice

238

00:11:40,400 --> 00:11:37,260

xrd pattern to begin with if it was that

239

00:11:42,939 --> 00:11:40,410

disordered oh because the space group

240

00:11:46,639 --> 00:11:42,949

for a causa and alumni are different so

241

00:11:49,130 --> 00:11:46,649

callous I was our free art bar 3c and

242

00:11:52,460 --> 00:11:49,140

then don't my was our part 3 so they're

243

00:11:54,350 --> 00:11:52,470

like slightly different because if you

244

00:11:56,509 --> 00:11:54,360

get a disorder dolomite then would be

245

00:11:59,120 --> 00:11:56,519

more closer to the calcite and they were

246

00:12:04,460 --> 00:11:59,130

missing one peak if you only get that

247

00:12:06,350 --> 00:12:04,470

pic if you ordered online so because

248

00:12:10,250 --> 00:12:06,360

once you have order dolomite you have

249

00:12:12,319 --> 00:12:10,260

one layer sorry if you could go back to

250

00:12:13,550 --> 00:12:12,329

that disordered slider be awesome

251
00:12:14,900 --> 00:12:13,560
because I guess I just wasn't really

252
00:12:16,120 --> 00:12:14,910
understanding what you meant by

253
00:12:18,970 --> 00:12:16,130
disordered in this console

254
00:12:21,310 --> 00:12:18,980
sent so if you get ordered all my you

255
00:12:27,940 --> 00:12:21,320
actually a wonder your calcium in one

256
00:12:30,610 --> 00:12:27,950
video ok distributed randomly ok handing

257
00:12:33,700 --> 00:12:30,620
on the ordinance of the UH of the

258
00:12:36,430 --> 00:12:33,710
crystal so if you have this you actually

259
00:12:42,310 --> 00:12:36,440
adding more information to it so thank

260
00:12:44,830 --> 00:12:42,320
you I just a quick comment like a

261
00:12:47,260 --> 00:12:44,840
student is asked question have fun is a

262
00:12:49,140 --> 00:12:47,270
weekend whatever can run exactly how

263
00:12:52,630 --> 00:12:49,150

could it because we can do micro x-ray

264

00:12:55,090 --> 00:12:52,640

diffraction no problem but I just let

265

00:12:57,580 --> 00:12:55,100

you know okay most published papers a

266

00:13:01,270 --> 00:12:57,590

cook or a microbial dolomite are not a

267

00:13:02,500 --> 00:13:01,280

dollar mad so most of them I phosphated

268

00:13:04,780 --> 00:13:02,510

because they put a fulfilling their

269

00:13:06,610 --> 00:13:04,790

fourth Vader and a magnesium calcium

270

00:13:09,280 --> 00:13:06,620

they love each other very much so

271

00:13:11,140 --> 00:13:09,290

they're from 1st to the precipitates so

272

00:13:13,270 --> 00:13:11,150

and even some people even people

273

00:13:17,070 --> 00:13:13,280

purposely destroyed to the data okay

274

00:13:20,770 --> 00:13:17,080

fabricated data to cream dollar mad and

275

00:13:23,620 --> 00:13:20,780

student took a my course okay they have

276

00:13:26,590 --> 00:13:23,630

a project to read the papers and I found

277

00:13:29,320 --> 00:13:26,600

out what's wrong with the epic papers so

278

00:13:33,490 --> 00:13:29,330

because dollar matters is so important

279

00:13:35,680 --> 00:13:33,500

okay it's a challenging problem so I and

280

00:13:38,130 --> 00:13:35,690

also very recently last month the other

281

00:13:41,950 --> 00:13:38,140

paper thing that you know of a sediment

282

00:13:46,210 --> 00:13:41,960

sedimentary research paper by Professor

283

00:13:49,240 --> 00:13:46,220

J and aqueous at all from Oklahoma State

284

00:13:53,620 --> 00:13:49,250

University so they they just hope tablet

285

00:13:55,930 --> 00:13:53,630

although the papers okay they they they

286

00:13:58,390 --> 00:13:55,940

are being the ability and automata

287

00:14:00,970 --> 00:13:58,400

little right but what are you know some

288

00:14:03,040 --> 00:14:00,980

of my students paper they Kremlin much

289

00:14:06,100 --> 00:14:03,050

is the dollar matter whatever real stuff

290

00:14:09,940 --> 00:14:06,110

in there so dumb bear down the mean like