Panelists

Attendees

- Hosts (1)
  - Mike Toillion
- Presenters (4)
  - Andy Burnett
  - Britney Schmidt
  - Francis McCubbin
  - Matt Pasek
- Participants (9)
  - John Rummel
  - Lee Bebout
  - Lindsay Hays
  - Melissa
  - migun
  - Pauli
  - ron oremland
  - Tony Del Genio
  - Zach Adam

Open Chat

--------- (10/23/2013 10:54) ---------

Mike Toillion: Good morning, everyone! We will be getting started at 11am Pacific / 2pm Eastern time. For audio, please dial into the teleconference listed below, and when not speaking, please MUTE your telephone's mic by pushing * 6 on your phone's keypad. Thanks!

--------- (10/23/2013 11:02) ---------

Britney Schmidt: Hey guys, I'm here too!

Mike Toillion: Britney, you've been added.

Teleconference Instructions (Parti...

Teleconference Line: 866-692-3158
Passcode: 9109668#
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More info: https://astrobiologyfuture.org

Matt Pasek - Presentation

Full Screen

Major questions

- Geochemical considerations for the origin of life
- Planetary considerations relevant to biological origins
- Organism-environment interdependence
- Environmental precursors

1
00:00:14,060 --> 00:00:11,030
good afternoon everyone and welcome back

2
00:00:19,130 --> 00:00:14,070
to the Adobe Connect version of this

3
00:00:22,490 --> 00:00:19,140
series of webinars this one as I believe

4
00:00:25,269 --> 00:00:22,500
Mike now said is being recorded and will

5
00:00:28,970 --> 00:00:25,279
go up on the astrobiology website

6
00:00:32,179 --> 00:00:28,980
shortly um other things to be aware of

7
00:00:34,520 --> 00:00:32,189
is that we have two presenters today

8
00:00:38,180 --> 00:00:34,530
Madame and Francis who are going to go

9
00:00:40,010 --> 00:00:38,190
through the Eternity waving this going

10
00:00:42,590 --> 00:00:40,020
to go through the overview of their

11
00:00:45,770 --> 00:00:42,600
paper after this presentation has

12
00:00:47,840 --> 00:00:45,780
finished we will change the status of

13
00:00:49,880 --> 00:00:47,850

the paper which you can get to straight

14
00:00:53,450 --> 00:00:49,890
from the front of the astrobiology

15
00:00:55,340 --> 00:00:53,460
website so that it will be open for

16
00:00:58,010 --> 00:00:55,350
comments and just in case anyone hasn't

17
00:01:00,410 --> 00:00:58,020
done this before what that means is you

18
00:01:03,170 --> 00:01:00,420
can't edit the paper directly which you

19
00:01:05,299 --> 00:01:03,180
can highlight any piece of text and do

20
00:01:09,140 --> 00:01:05,309
the equivalent of a de post it note to

21
00:01:12,740 --> 00:01:09,150
it we have over the last few weeks also

22
00:01:15,469 --> 00:01:12,750
been setting up discussion threads for

23
00:01:17,840 --> 00:01:15,479
each paper but so far no one has

24
00:01:20,630 --> 00:01:17,850
actually used those so unless anyone

25
00:01:23,300 --> 00:01:20,640
wants to send an email to support at no

26
00:01:24,890 --> 00:01:23,310
innovation com we won't set up a

27
00:01:26,480 --> 00:01:24,900
discussion thread for this it seems to

28
00:01:29,630 --> 00:01:26,490
be working much better for people to

29
00:01:31,760 --> 00:01:29,640
write directly into the papers and then

30
00:01:33,560 --> 00:01:31,770
if the conversation becomes too

31
00:01:36,319 --> 00:01:33,570
complicated or you want to talk about

32
00:01:39,830 --> 00:01:36,329
things at a higher level than we can set

33
00:01:41,990 --> 00:01:39,840
up a discussion thread so we have the

34
00:01:44,569 --> 00:01:42,000
presentation you are welcome to ask

35
00:01:55,550 --> 00:01:44,579
questions as we go along I can see

36
00:02:14,070 --> 00:02:01,440
you

37
00:02:19,050 --> 00:02:14,080
channel because brittany is obviously

38
00:02:23,190 --> 00:02:19,060

one of the authors of this and while she

39
00:02:25,500 --> 00:02:23,200
is thinking deeply about that if if you

40
00:02:28,380 --> 00:02:25,510
do we will bump you up to to be a

41
00:02:32,130 --> 00:02:28,390
presenter but in the meantime Matt let

42
00:02:35,940 --> 00:02:32,140
me pass it over to you all right well

43
00:02:43,860 --> 00:02:39,860
I've rittany begin with the sort of the

44
00:02:46,710 --> 00:02:43,870
overview of this this is I guess one

45
00:02:49,199 --> 00:02:46,720
that we are discussing as far as origins

46
00:02:51,449 --> 00:02:49,209
of life emergence of life with respect

47
00:02:54,300 --> 00:02:51,459
to the environment and there's an inter

48
00:02:58,620 --> 00:02:54,310
coupling of these two and by all means

49
00:03:01,050 --> 00:02:58,630
if Maya is the anemia other authors in

50
00:03:04,259 --> 00:03:01,060
this have comments or that please let me

51
00:03:08,240 --> 00:03:04,269
know or what have you and add it in as

52
00:03:10,949 --> 00:03:08,250
you need to for some of these areas

53
00:03:13,380 --> 00:03:10,959
being a group effort it certainly has

54
00:03:15,120 --> 00:03:13,390
some my ideas that I might nap pass

55
00:03:18,030 --> 00:03:15,130
along as well as some of the other

56
00:03:21,240 --> 00:03:18,040
authors and so and by all means please

57
00:03:25,229 --> 00:03:21,250
feel free to chime in as needed and so

58
00:03:27,839 --> 00:03:25,239
as sort of a get getting started part of

59
00:03:31,949 --> 00:03:27,849
this sort of the explanation for why

60
00:03:33,960 --> 00:03:31,959
we're this PowerPoint or this

61
00:03:36,870 --> 00:03:33,970
presentation was even design is that

62
00:03:39,360 --> 00:03:36,880
there is a interplay between life and

63
00:03:41,729 --> 00:03:39,370

its habitat and that is certainly true

64
00:03:43,740 --> 00:03:41,739
nowadays that many of the metabolic

65
00:03:46,410 --> 00:03:43,750
processes and that are intimately tied

66
00:03:48,690 --> 00:03:46,420
to the environment and the various

67
00:03:50,520 --> 00:03:48,700
chemistry and physical processes that

68
00:03:53,699 --> 00:03:50,530
are available within that environment

69
00:03:56,220 --> 00:03:53,709
and have in turn infected to them as

70
00:03:59,550 --> 00:03:56,230
well so it's a sort of a very much a

71
00:04:02,699 --> 00:03:59,560
interplay between these two and so

72
00:04:06,210 --> 00:04:02,709
presumably life and environment are

73
00:04:09,180 --> 00:04:06,220
intimately related and for the emergence

74
00:04:11,220 --> 00:04:09,190
the habitat or the environment probably

75
00:04:14,720 --> 00:04:11,230
was very important in determining life

76
00:04:17,190 --> 00:04:14,730
in the early evolution of the ability to

77
00:04:19,710 --> 00:04:17,200
diversify in those was an important part

78
00:04:21,990 --> 00:04:19,720
of that as well and so some of the other

79
00:04:24,060 --> 00:04:22,000
points that may come up with this as

80
00:04:27,750 --> 00:04:24,070
well are that the requirements of life

81
00:04:30,120 --> 00:04:27,760
on a very broad scale may be universal

82
00:04:32,580 --> 00:04:30,130
we are looking for life on certain ways

83
00:04:34,980 --> 00:04:32,590
we are looking for very fundamental

84
00:04:37,830 --> 00:04:34,990
parts of that parts of life so things

85
00:04:39,210 --> 00:04:37,840
that perhaps organic carbon or things

86
00:04:43,529 --> 00:04:39,220
that that if we wanted to stay within

87
00:04:45,930 --> 00:04:43,539
the realm of organic organisms or energy

88
00:04:49,020 --> 00:04:45,940

gradients or perhaps even proton or

89
00:04:49,830 --> 00:04:49,030
electron gradients as well and by many

90
00:04:52,800 --> 00:04:49,840
ways

91
00:04:54,870 --> 00:04:52,810
an interdisciplinary approach will be

92
00:04:56,580 --> 00:04:54,880
required to assess these environments

93
00:05:00,000 --> 00:04:56,590
though from a chemical from a geological

94
00:05:03,240 --> 00:05:00,010
from a biological from an astronomical

95
00:05:05,070 --> 00:05:03,250
and many other perspectives and so this

96
00:05:07,560 --> 00:05:05,080
is definitely one that requires a

97
00:05:10,650 --> 00:05:07,570
multitude of different fields to sort of

98
00:05:14,180 --> 00:05:10,660
address certain the aspect of

99
00:05:18,560 --> 00:05:14,190
environment and emergence of life I

100
00:05:21,570 --> 00:05:18,570
think I've gotten that all covered there

101
00:05:25,250 --> 00:05:21,580
so sort of the major goals of this that

102
00:05:27,390 --> 00:05:25,260
we highlighted within the the paper is

103
00:05:29,370 --> 00:05:27,400
understanding the conditions for the

104
00:05:31,020 --> 00:05:29,380
origin of life on the earth those are

105
00:05:33,450 --> 00:05:31,030
the environmental conditions there's a

106
00:05:37,200 --> 00:05:33,460
number of other conditions that play

107
00:05:40,379 --> 00:05:37,210
within that as well chemical and sort of

108
00:05:42,300 --> 00:05:40,389
physical but sort of a geologic or a

109
00:05:44,070 --> 00:05:42,310
type of conditions are important for

110
00:05:45,870 --> 00:05:44,080
those and by understanding the

111
00:05:48,510 --> 00:05:45,880
conditions for the origin of life on the

112
00:05:50,340 --> 00:05:48,520
earth there's certainly a very clear

113
00:05:53,310 --> 00:05:50,350

application to other planetary bodies

114
00:05:55,040 --> 00:05:53,320
and the search for life elsewhere at

115
00:05:57,570 --> 00:05:55,050
least for hunting for earth-like life

116
00:05:58,950 --> 00:05:57,580
finding out how the conditions are for

117
00:06:01,680 --> 00:05:58,960
the earth would certainly be very useful

118
00:06:06,360 --> 00:06:01,690
for understanding other earth-like life

119
00:06:09,659 --> 00:06:06,370
on other planets and so part of this

120
00:06:12,089 --> 00:06:09,669
requirement is to identify key factors

121
00:06:14,100 --> 00:06:12,099
within the origin of life so what are

122
00:06:16,830 --> 00:06:14,110
some of the ways of trying to approach

123
00:06:18,529 --> 00:06:16,840
this whether or not carbon or various

124
00:06:21,629 --> 00:06:18,539
other islands phosphorous nitrogen

125
00:06:24,210 --> 00:06:21,639
sulfur are a key factors in the origin

126
00:06:26,370 --> 00:06:24,220
of life remains certainly an open

127
00:06:32,010 --> 00:06:26,380
question which can be approached that

128
00:06:34,560 --> 00:06:32,020
from both in sample analysis from on a

129
00:06:36,510 --> 00:06:34,570
variety of environments so you have only

130
00:06:38,129 --> 00:06:36,520
a limited geologic record but there's

131
00:06:40,770 --> 00:06:38,139
still information to be extracted from

132
00:06:44,100 --> 00:06:40,780
that as well as laboratory experiments

133
00:06:46,350 --> 00:06:44,110
which might deduce methods of production

134
00:06:48,900 --> 00:06:46,360
of certain types of compounds or

135
00:06:52,140 --> 00:06:48,910
liberation of certain elements from the

136
00:06:55,140 --> 00:06:52,150
environment or other thermodynamic

137
00:06:58,020 --> 00:06:55,150
properties or kinetic properties that

138
00:07:00,839 --> 00:06:58,030

might start kicking in and encouraging

139
00:07:02,550 --> 00:07:00,849
various environmental features start

140
00:07:05,370 --> 00:07:02,560
coming about

141
00:07:07,050 --> 00:07:05,380
and so related to this is finding the

142
00:07:08,940 --> 00:07:07,060
environments in which life could emerge

143
00:07:12,060 --> 00:07:08,950
versus where it could persisted this

144
00:07:14,129 --> 00:07:12,070
brings to mind the sort of league the

145
00:07:17,730 --> 00:07:14,139
complimentary yet competing ideas of

146
00:07:20,070 --> 00:07:17,740
fertility and fecundity and so fertility

147
00:07:23,790 --> 00:07:20,080
in this way is where life might have

148
00:07:26,070 --> 00:07:23,800
arose in sort of a certain very much a

149
00:07:28,129 --> 00:07:26,080
key environment environment might have

150
00:07:30,960 --> 00:07:28,139
been more conducive to write to

151
00:07:33,540 --> 00:07:30,970
originating life but where am I they

152
00:07:36,420 --> 00:07:33,550
diversified and thrived would be a more

153
00:07:39,450 --> 00:07:36,430
second environment where would certainly

154
00:07:42,090 --> 00:07:39,460
be those may have persisted for a much

155
00:07:44,460 --> 00:07:42,100
longer time geologic time than the

156
00:07:48,600 --> 00:07:44,470
fertile environment and so both of those

157
00:07:52,379 --> 00:07:48,610
are within that area of active potential

158
00:07:59,969 --> 00:07:52,389
research within this sub sub document of

159
00:08:03,830 --> 00:07:59,979
the astrobiology roadmap to come so we

160
00:08:07,620 --> 00:08:03,840
divided this up into sort of four major

161
00:08:09,570 --> 00:08:07,630
major categories of questions from the

162
00:08:12,779 --> 00:08:09,580
geochemical considerations for the

163
00:08:15,390 --> 00:08:12,789

origin life as well as planetary and so

164
00:08:17,940 --> 00:08:15,400
the stretching of those two together is

165
00:08:20,690 --> 00:08:17,950
an important process here as well as

166
00:08:23,460 --> 00:08:20,700
understanding how organisms environment

167
00:08:26,219 --> 00:08:23,470
relate to each other as far as affecting

168
00:08:28,920 --> 00:08:26,229
each other and identifying ways that

169
00:08:32,390 --> 00:08:28,930
those two might be able to be correlated

170
00:08:34,860 --> 00:08:32,400
and especially with respect to

171
00:08:37,020 --> 00:08:34,870
biological emergence and then finally

172
00:08:39,230 --> 00:08:37,030
the environmental precursors what sort

173
00:08:43,230 --> 00:08:39,240
of environmental processes were sort of

174
00:08:44,730 --> 00:08:43,240
encouraged in the emergence of life in

175
00:08:47,190 --> 00:08:44,740
the environment was definitely an

176
00:08:49,650 --> 00:08:47,200
important major sub-questions within

177
00:08:52,440 --> 00:08:49,660
this broader question of how to the

178
00:08:55,650 --> 00:08:52,450
earth and environment related to each

179
00:09:00,150 --> 00:08:55,660
other as far as origins and early

180
00:09:02,519 --> 00:09:00,160
diversification so within the

181
00:09:04,560 --> 00:09:02,529
geochemical questions section we have a

182
00:09:06,630 --> 00:09:04,570
half we highlighted inca ten different

183
00:09:09,360 --> 00:09:06,640
questions and so there's in total i

184
00:09:10,890 --> 00:09:09,370
think about 20 questions ten of which

185
00:09:13,140 --> 00:09:10,900
are within the geochemical and that's

186
00:09:16,100 --> 00:09:13,150
due to our own biases partially

187
00:09:18,079 --> 00:09:16,110
geochemists and for certain if there

188
00:09:21,710 --> 00:09:18,089

other questions that are coming out from

189
00:09:25,130 --> 00:09:21,720
other fields within the astronomic or

190
00:09:27,079 --> 00:09:25,140
planetary realms please feel free to add

191
00:09:28,819 --> 00:09:27,089
on within comments and so the

192
00:09:30,410 --> 00:09:28,829
geochemical questions include a number

193
00:09:32,840 --> 00:09:30,420
of different things including what was

194
00:09:36,410 --> 00:09:32,850
the role mineral surfaces acting as

195
00:09:38,509 --> 00:09:36,420
enzymes or sort of catalyst in early

196
00:09:40,240 --> 00:09:38,519
biogeochemistry and did it play an

197
00:09:42,590 --> 00:09:40,250
important factor in the origin of life

198
00:09:45,370 --> 00:09:42,600
another example of this would be the

199
00:09:48,920 --> 00:09:45,380
certain types of clays that may catalyze

200
00:09:52,370 --> 00:09:48,930
RNA synthesis or sulfides that may

201
00:09:55,930 --> 00:09:52,380
promote reactions that are sort of

202
00:09:59,990 --> 00:09:55,940
reduction of carbon and perhaps other

203
00:10:02,300 --> 00:10:00,000
catalysis within life and so the mineral

204
00:10:05,210 --> 00:10:02,310
part of life is an important part of the

205
00:10:08,449 --> 00:10:05,220
environment determining emergence for

206
00:10:10,220 --> 00:10:08,459
certain and then the next question would

207
00:10:11,990 --> 00:10:10,230
be what are the necessary bioavailable

208
00:10:15,139 --> 00:10:12,000
minerals or elemental components for

209
00:10:16,310 --> 00:10:15,149
early life a big question from my own

210
00:10:20,630 --> 00:10:16,320
research would be phosphorus

211
00:10:22,490 --> 00:10:20,640
availability for biological systems

212
00:10:23,660 --> 00:10:22,500
whether or not there are other things

213
00:10:27,850 --> 00:10:23,670

that might be able to substitute for

214
00:10:29,660 --> 00:10:27,860
instance glyoxylate or arsenic would be

215
00:10:31,939 --> 00:10:29,670
substitutes for those sorts of materials

216
00:10:35,120 --> 00:10:31,949
and certainly aren't available open

217
00:10:37,280 --> 00:10:35,130
questions for other materials sulfur and

218
00:10:39,050 --> 00:10:37,290
selenium looking in my periodic table as

219
00:10:42,380 --> 00:10:39,060
well as a number of other materials too

220
00:10:44,480 --> 00:10:42,390
and so the next one what novel in

221
00:10:46,840 --> 00:10:44,490
organic mineral structures aided the

222
00:10:49,639 --> 00:10:46,850
formation of complex organic molecules

223
00:10:52,460 --> 00:10:49,649
this includes a number of various types

224
00:10:54,439 --> 00:10:52,470
of clays and certain other materials

225
00:10:56,720 --> 00:10:54,449
that might have been helpful in sort of

226
00:10:58,009 --> 00:10:56,730
promoting organic biochemistry and

227
00:11:01,550 --> 00:10:58,019
perhaps there's an interplay between

228
00:11:03,079 --> 00:11:01,560
these two and another I guess area that

229
00:11:06,620 --> 00:11:03,089
this might research that this might

230
00:11:09,280 --> 00:11:06,630
cover would be sort of a rock membranes

231
00:11:13,670 --> 00:11:09,290
or ethicals within rocks and the

232
00:11:16,220 --> 00:11:13,680
interplay between determining how

233
00:11:19,460 --> 00:11:16,230
similar those might be to cellular

234
00:11:21,790 --> 00:11:19,470
processes and it's in the certainly an

235
00:11:24,350 --> 00:11:21,800
open question sort of a mineral

236
00:11:27,079 --> 00:11:24,360
mimicking what we have in modern biology

237
00:11:30,110 --> 00:11:27,089
question and there's plenty of room to

238
00:11:32,930 --> 00:11:30,120

sort of expand on that idea as well

239
00:11:34,820 --> 00:11:32,940
then within and the next question how do

240
00:11:36,769 --> 00:11:34,830
we go from simple organic compounds to

241
00:11:38,720 --> 00:11:36,779
increasingly complex compounds this is a

242
00:11:42,110 --> 00:11:38,730
broad question that is asked throughout

243
00:11:44,000 --> 00:11:42,120
these last few documents as well and

244
00:11:46,790 --> 00:11:44,010
will continue to be asked with the next

245
00:11:49,190 --> 00:11:46,800
few from the origin monomers and then

246
00:11:51,980 --> 00:11:49,200
the origin of polymers this one is sort

247
00:11:53,840 --> 00:11:51,990
of within that branch of the influence

248
00:12:00,260 --> 00:11:53,850
of the environment within those two as

249
00:12:02,570 --> 00:12:00,270
well continuing with the geochemical

250
00:12:04,810 --> 00:12:02,580
questions again we have most of our

251
00:12:07,460 --> 00:12:04,820
questions within the geochemical realm

252
00:12:10,070 --> 00:12:07,470
the physical and chemical ephemeral

253
00:12:12,980 --> 00:12:10,080
gradients what what extent were those

254
00:12:15,530 --> 00:12:12,990
necessary for the within the inorganic

255
00:12:17,240 --> 00:12:15,540
and the organic precursors are required

256
00:12:20,570 --> 00:12:17,250
for the emergence of life for instance

257
00:12:23,480 --> 00:12:20,580
proton gradients redox radians thermal

258
00:12:25,190 --> 00:12:23,490
gradients so temperature differences how

259
00:12:27,320 --> 00:12:25,200
important were how critical were those

260
00:12:29,800 --> 00:12:27,330
for sort of varying chemistry and

261
00:12:32,960 --> 00:12:29,810
promoting a sort of disequilibrium

262
00:12:34,550 --> 00:12:32,970
chemistry what environments are there

263
00:12:36,440 --> 00:12:34,560

for those sorts of things that are both

264
00:12:38,900 --> 00:12:36,450
occurring geologically and out of

265
00:12:42,380 --> 00:12:38,910
planetary scale and how might those have

266
00:12:46,070 --> 00:12:42,390
influenced the biological processes next

267
00:12:47,870 --> 00:12:46,080
one is a fairly distinct question that

268
00:12:49,190 --> 00:12:47,880
of course we do not know the answer to

269
00:12:51,470 --> 00:12:49,200
but is the presence of an atmosphere

270
00:12:54,829 --> 00:12:51,480
required for the emergence of life and

271
00:12:56,630 --> 00:12:54,839
we have at least had on this earth for a

272
00:12:58,370 --> 00:12:56,640
long time a very clear and thick

273
00:13:00,440 --> 00:12:58,380
atmosphere but whether or not

274
00:13:03,440 --> 00:13:00,450
atmospheres are necessary and the

275
00:13:05,630 --> 00:13:03,450
broader question how volatile could have

276
00:13:08,120 --> 00:13:05,640
incorporated on an atmosphere less body

277
00:13:10,340 --> 00:13:08,130
such as the moon or an asteroid and of

278
00:13:12,620 --> 00:13:10,350
those frost those is the atmosphere an

279
00:13:16,070 --> 00:13:12,630
intrinsic part of life or development

280
00:13:19,370 --> 00:13:16,080
versions of life or is it a just a

281
00:13:23,930 --> 00:13:19,380
beneficial aspect and so this is an open

282
00:13:26,090 --> 00:13:23,940
question it may not be obvious how to

283
00:13:28,010 --> 00:13:26,100
answer that question but there are

284
00:13:32,240 --> 00:13:28,020
certain ideas that might come in with

285
00:13:35,420 --> 00:13:32,250
that for certain within this uh within

286
00:13:37,310 --> 00:13:35,430
this field of sub pressions here then

287
00:13:38,900 --> 00:13:37,320
next one what geologic environments on

288
00:13:40,850 --> 00:13:38,910

early worlds would have produced

289
00:13:43,670 --> 00:13:40,860
organics and liquid water this is

290
00:13:45,980 --> 00:13:43,680
certainly and has a very broad overlap

291
00:13:49,600 --> 00:13:45,990
other questions including polymers and

292
00:13:53,590 --> 00:13:49,610
monomers how do those how are those

293
00:13:58,370 --> 00:13:53,600
generated on early Earth and within the

294
00:14:00,110 --> 00:13:58,380
planetary scale as well presumably are

295
00:14:02,540 --> 00:14:00,120
certain requirements for those and what

296
00:14:04,639 --> 00:14:02,550
for those requirements and then related

297
00:14:07,250 --> 00:14:04,649
to that did indigenous or exogenous

298
00:14:09,079 --> 00:14:07,260
organics and volatile such as water play

299
00:14:10,370 --> 00:14:09,089
a larger role which of those two might

300
00:14:12,860 --> 00:14:10,380
have played their larger role in the

301
00:14:15,560 --> 00:14:12,870
origin of life given that these things

302
00:14:18,560 --> 00:14:15,570
can be both produced through in the

303
00:14:20,420 --> 00:14:18,570
indigenous and exogenous processes which

304
00:14:23,780 --> 00:14:20,430
of those two might be more relevant in

305
00:14:25,910 --> 00:14:23,790
this case I think there's two more

306
00:14:28,100 --> 00:14:25,920
geochemical questions yeah what solvents

307
00:14:30,650 --> 00:14:28,110
influenced the origin of life within a

308
00:14:31,910 --> 00:14:30,660
document we specifically highlight water

309
00:14:35,510 --> 00:14:31,920
as being the most important one

310
00:14:38,960 --> 00:14:35,520
obviously but also lipids of acting as a

311
00:14:41,389 --> 00:14:38,970
cell membrane create a hydrophobic layer

312
00:14:43,430 --> 00:14:41,399
that causes certain chemistry to occur

313
00:14:45,590 --> 00:14:43,440

but you can also envision that others

314
00:14:47,720 --> 00:14:45,600
types of solvents have been invoked in

315
00:14:51,290 --> 00:14:47,730
both and origin life studies including

316
00:14:53,510 --> 00:14:51,300
formatted and ammonia and a few of these

317
00:14:57,199 --> 00:14:53,520
others and so those might also certainly

318
00:14:59,000 --> 00:14:57,209
be relevant in the origin of life and

319
00:15:01,250 --> 00:14:59,010
the development of it on earth and on

320
00:15:02,360 --> 00:15:01,260
other planetary bodies then the last one

321
00:15:05,720 --> 00:15:02,370
what physical chemical and thermal

322
00:15:07,850 --> 00:15:05,730
gradients required for the coexistence

323
00:15:10,940 --> 00:15:07,860
of organics and liquid water in various

324
00:15:13,640 --> 00:15:10,950
geologic environments and so these

325
00:15:16,820 --> 00:15:13,650
environments were certainly a fairly

326
00:15:20,480 --> 00:15:16,830
important in sort of developing geologic

327
00:15:22,390 --> 00:15:20,490
environments that might be create

328
00:15:28,000 --> 00:15:22,400
certain chemical disequilibrium

329
00:15:34,640 --> 00:15:32,090
large-scale mixing to do some movies or

330
00:15:38,750 --> 00:15:34,650
okay so to do some of the prebiotic

331
00:15:41,930 --> 00:15:38,760
chemistry and origins early life might

332
00:15:45,740 --> 00:15:41,940
depend on these sorts of large gradients

333
00:15:49,400 --> 00:15:45,750
and what scale must those have been on

334
00:15:52,310 --> 00:15:49,410
and their micro or macro scale it's not

335
00:15:54,530 --> 00:15:52,320
not certain at all and so those are the

336
00:15:55,880 --> 00:15:54,540
major geochemical questions we identify

337
00:15:57,049 --> 00:15:55,890
there's a number of others that might

338
00:15:59,799 --> 00:15:57,059

pop up

339
00:16:03,499 --> 00:15:59,809
as well and certainly we do encourage

340
00:16:05,779 --> 00:16:03,509
others to help us find and address some

341
00:16:08,629 --> 00:16:05,789
of these questions and expand on these

342
00:16:10,999 --> 00:16:08,639
as well and see having gone through

343
00:16:19,029 --> 00:16:11,009
geochemical Frances Brittany any any

344
00:16:36,529 --> 00:16:33,709
bloody quarter free will okay okay move

345
00:16:38,749 --> 00:16:36,539
on to the planetary just one second

346
00:16:40,849 --> 00:16:38,759
Francis can you put you your phone back

347
00:16:46,339 --> 00:16:40,859
on mint please because we're getting

348
00:16:48,529 --> 00:16:46,349
feedback great change okay all right so

349
00:16:51,709 --> 00:16:48,539
the the next set of questions comes

350
00:16:54,289 --> 00:16:51,719
about from the planetary scale and so of

351
00:16:57,859 --> 00:16:54,299
course if we are able to establish the

352
00:17:00,799 --> 00:16:57,869
geochemical scale for life in certain

353
00:17:03,259 --> 00:17:00,809
views of that yeah we can thereby sort

354
00:17:07,309 --> 00:17:03,269
of expand that to the planetary scale of

355
00:17:08,779 --> 00:17:07,319
things as well okay and i see ron has

356
00:17:10,489 --> 00:17:08,789
pointed out liquid methane and ethane

357
00:17:13,100 --> 00:17:10,499
good service aqueous solvents for

358
00:17:16,069 --> 00:17:13,110
extreme friars fears like I'm tightened

359
00:17:18,169 --> 00:17:16,079
and that is certainly a very true point

360
00:17:21,350 --> 00:17:18,179
here as well and it would be a certainly

361
00:17:24,019 --> 00:17:21,360
a would fit well within the alternative

362
00:17:26,210 --> 00:17:24,029
solvents ideas that might pop up and

363
00:17:27,829 --> 00:17:26,220

could be quite valuable with

364
00:17:30,289 --> 00:17:27,839
understanding some of the chemistry is

365
00:17:31,879 --> 00:17:30,299
going on with those especially since you

366
00:17:40,730 --> 00:17:31,889
start changing temperature and pressure

367
00:17:42,710 --> 00:17:40,740
and various other scales as well all

368
00:17:45,200 --> 00:17:42,720
right so the planet area that does bring

369
00:17:48,169 --> 00:17:45,210
us fairly well into the planetary scale

370
00:17:50,149 --> 00:17:48,179
thing so alternative solvent may

371
00:17:52,539 --> 00:17:50,159
certainly be a lot more important as you

372
00:17:55,549 --> 00:17:52,549
move around in your pressure temperature

373
00:17:58,369 --> 00:17:55,559
regime and compositional regime within

374
00:18:02,060 --> 00:17:58,379
the planetary environment moving into

375
00:18:04,519 --> 00:18:02,070
sort of organo hydrocarbons and is there

376
00:18:08,539 --> 00:18:04,529
okay so uh what those might actually be

377
00:18:10,169 --> 00:18:08,549
important on these in tomm in different

378
00:18:12,509 --> 00:18:10,179
planetary environments so

379
00:18:15,960 --> 00:18:12,519
let's go ahead into the planetary and so

380
00:18:17,879 --> 00:18:15,970
John you say what is a time scale over

381
00:18:21,060 --> 00:18:17,889
which an environment must persist to be

382
00:18:22,769 --> 00:18:21,070
conducive to the emergence of life yes

383
00:18:26,249 --> 00:18:22,779
not so much is there because obviously

384
00:18:28,169 --> 00:18:26,259
there is it's just what is and so what

385
00:18:29,700 --> 00:18:28,179
is the time scale over which environment

386
00:18:31,710 --> 00:18:29,710
must persist to be conducive to the

387
00:18:35,999 --> 00:18:31,720
emergence of life and you can consider

388
00:18:39,450 --> 00:18:36,009

this within Alisa treasure context where

389
00:18:42,769 --> 00:18:39,460
the potential for impact frustration of

390
00:18:45,480 --> 00:18:42,779
life might have caused various

391
00:18:48,570 --> 00:18:45,490
environmental catastrophes and burned

392
00:18:50,549 --> 00:18:48,580
off whatever little happy little warm

393
00:18:52,700 --> 00:18:50,559
little ponds might have arisen when I

394
00:18:55,980 --> 00:18:52,710
got vaporized by a couple choice

395
00:18:58,019 --> 00:18:55,990
meteorite impacts and so especially if

396
00:19:00,989 --> 00:18:58,029
the late heavy bombardment happened to

397
00:19:02,850 --> 00:19:00,999
have pelted the earlier and then how

398
00:19:05,430 --> 00:19:02,860
many times did life merge on earth

399
00:19:07,169 --> 00:19:05,440
before persisted this is not exactly a

400
00:19:11,730 --> 00:19:07,179
question that might be easy to identify

401
00:19:14,519 --> 00:19:11,740
and but might be now one of those that

402
00:19:19,080 --> 00:19:14,529
it would be a geologic question within

403
00:19:21,899 --> 00:19:19,090
this environment too and so for instance

404
00:19:24,359 --> 00:19:21,909
if we have some constraints on how much

405
00:19:27,419 --> 00:19:24,369
damage happened to the early Earth and

406
00:19:29,310 --> 00:19:27,429
other environments or sort of various

407
00:19:31,710 --> 00:19:29,320
other processes on other planets might

408
00:19:41,549 --> 00:19:31,720
have been present too and so Brittany is

409
00:19:43,980 --> 00:19:41,559
is typing now also things like how long

410
00:19:46,889 --> 00:19:43,990
would a subsurface ocean on an asteroid

411
00:19:49,049 --> 00:19:46,899
or moon need to remain or stay active

412
00:19:53,580 --> 00:19:49,059
before it's dead okay so for instance on

413
00:19:55,889 --> 00:19:53,590

another planet um Ganymede or something

414
00:20:00,239 --> 00:19:55,899
of that how long the liquid water ocean

415
00:20:02,639 --> 00:20:00,249
might actually persist at least on the

416
00:20:04,619 --> 00:20:02,649
surface or I can also take an example

417
00:20:08,580 --> 00:20:04,629
and tighten if you haven't impact Basin

418
00:20:11,039 --> 00:20:08,590
that forms a water lake out of the icy

419
00:20:14,730 --> 00:20:11,049
crust the length of that might actually

420
00:20:16,470 --> 00:20:14,740
be a length of duration of that material

421
00:20:19,169 --> 00:20:16,480
might be very important for sort of

422
00:20:23,090 --> 00:20:19,179
mixing sunless material and it's life

423
00:20:25,130 --> 00:20:23,100
can arise quickly how can it it does it

424
00:20:28,760 --> 00:20:25,140
the same power to the diversify and move

425
00:20:37,580 --> 00:20:28,770
into other environments so or before it

426
00:20:39,710 --> 00:20:37,590
is alive so did the next one that did

427
00:20:40,909 --> 00:20:39,720
life originate in a single environment

428
00:20:42,830 --> 00:20:40,919
or from mixtures of multiple

429
00:20:45,340 --> 00:20:42,840
environments this is an important one

430
00:20:48,320 --> 00:20:45,350
that especially from the perspective of

431
00:20:50,150 --> 00:20:48,330
geochemistry we can vision certain

432
00:20:53,210 --> 00:20:50,160
environments being conducive to certain

433
00:20:55,039 --> 00:20:53,220
chemical systems arising for instance a

434
00:20:57,830 --> 00:20:55,049
reducing environment may be important

435
00:21:00,320 --> 00:20:57,840
for forming certain organics and if

436
00:21:01,789 --> 00:21:00,330
you're able to mix those two with a mix

437
00:21:05,029 --> 00:21:01,799
it with another environment that might

438
00:21:07,870 --> 00:21:05,039

have different environmental systems

439
00:21:09,980 --> 00:21:07,880
might be an important process

440
00:21:11,720 --> 00:21:09,990
understanding how you might get those

441
00:21:13,190 --> 00:21:11,730
two disparate types of chemistry

442
00:21:14,600 --> 00:21:13,200
mixtures in multiple environments and

443
00:21:16,279 --> 00:21:14,610
then mix the two of them would be

444
00:21:20,600 --> 00:21:16,289
certainly in an interesting question

445
00:21:24,110 --> 00:21:20,610
here how long can stable this equilibria

446
00:21:26,000 --> 00:21:24,120
how long can they be sustained and in

447
00:21:28,039 --> 00:21:26,010
turn how long can lie pious the same in

448
00:21:30,380 --> 00:21:28,049
a static world was certainly an open

449
00:21:33,350 --> 00:21:30,390
question for these are other two that

450
00:21:35,120 --> 00:21:33,360
Brittney raises here as well and I see

451
00:21:37,340 --> 00:21:35,130
also irrelevant to insello the

452
00:21:39,220 --> 00:21:37,350
subsurface oceans now about to be

453
00:21:42,289 --> 00:21:39,230
ephemeral and located at a South Pole

454
00:21:44,510 --> 00:21:42,299
okay so in that case the liquid water

455
00:21:46,610 --> 00:21:44,520
that we presume might be necessary for

456
00:21:49,490 --> 00:21:46,620
life may not persist for anything the

457
00:21:52,700 --> 00:21:49,500
time titan's atmosphere is a similar

458
00:21:55,669 --> 00:21:52,710
case to that the organic material that

459
00:21:57,919 --> 00:21:55,679
we see in that bed is raining out has a

460
00:21:59,480 --> 00:21:57,929
life span of about 10 million years and

461
00:22:01,190 --> 00:21:59,490
should not be there right now but it is

462
00:22:02,779 --> 00:22:01,200
and so that implies certain chemistry

463
00:22:06,409 --> 00:22:02,789

might be coming along with those things

464
00:22:09,080 --> 00:22:06,419
as well what planetary conditions lead

465
00:22:12,919 --> 00:22:09,090
to energetics prebiotic environments and

466
00:22:15,919 --> 00:22:12,929
so how do we get the energy part of life

467
00:22:17,659 --> 00:22:15,929
how these materials and are they is the

468
00:22:21,320 --> 00:22:17,669
energy enough to sort of promote

469
00:22:23,930 --> 00:22:21,330
different chemistry's and some changes

470
00:22:26,750 --> 00:22:23,940
in things like stellar radiance geologic

471
00:22:30,200 --> 00:22:26,760
cycles plate tectonics or a eugenic

472
00:22:32,440 --> 00:22:30,210
decay water rock cycling those sorts of

473
00:22:34,940 --> 00:22:32,450
things set up different environments and

474
00:22:36,920 --> 00:22:34,950
allow for different energetic systems

475
00:22:38,530 --> 00:22:36,930
and would certainly be useful and

476
00:22:42,890 --> 00:22:38,540
understanding planetary scale

477
00:22:45,890 --> 00:22:42,900
environment organism interactions pet

478
00:22:49,210 --> 00:22:45,900
see Frances Brittany anything else have

479
00:22:58,730 --> 00:22:49,220
I left anything out huh thumbs upper or

480
00:23:00,920 --> 00:22:58,740
how good okay and then the next sub

481
00:23:03,650 --> 00:23:00,930
question within this talk is how

482
00:23:06,590 --> 00:23:03,660
organisms and environments are related

483
00:23:08,870 --> 00:23:06,600
to each other and so for instance what

484
00:23:11,330 --> 00:23:08,880
was the role compartmentalization and

485
00:23:13,130 --> 00:23:11,340
exchange in the origin life and we

486
00:23:17,270 --> 00:23:13,140
highlighted the word exchange because

487
00:23:19,460 --> 00:23:17,280
compartmentalization alone is not does

488
00:23:21,170 --> 00:23:19,470

not make for life but exchange with the

489
00:23:23,810 --> 00:23:21,180
environment is a necessary part of

490
00:23:26,920 --> 00:23:23,820
compartmentalization in order to keep

491
00:23:29,390 --> 00:23:26,930
things out of out of equilibrium and

492
00:23:32,000 --> 00:23:29,400
identifying those processes is a very

493
00:23:33,320 --> 00:23:32,010
important identifying those environments

494
00:23:35,870 --> 00:23:33,330
is a very important part of

495
00:23:38,990 --> 00:23:35,880
understanding much of this material as

496
00:23:40,940 --> 00:23:39,000
well and so compartmentalization has

497
00:23:44,210 --> 00:23:40,950
several relevant scales for biology

498
00:23:47,990 --> 00:23:44,220
including things like a cellular to

499
00:23:51,680 --> 00:23:48,000
organismal and on the same scale the

500
00:23:53,720 --> 00:23:51,690
compartmentalization is common to for

501
00:23:57,920 --> 00:23:53,730
instance water environments from small

502
00:24:01,040 --> 00:23:57,930
bodies of water to oceans and in mineral

503
00:24:02,380 --> 00:24:01,050
structures as well and so how these

504
00:24:04,820 --> 00:24:02,390
environments are capable of

505
00:24:07,040 --> 00:24:04,830
compartmentalizing to scale those and

506
00:24:09,710 --> 00:24:07,050
how they can actually exchanged with the

507
00:24:12,500 --> 00:24:09,720
surroundings is important part of how

508
00:24:16,670 --> 00:24:12,510
environments interacted with organisms

509
00:24:19,340 --> 00:24:16,680
as well we're biological adaptations for

510
00:24:22,000 --> 00:24:19,350
the survival of early life forced bi or

511
00:24:27,020 --> 00:24:22,010
deride from the physical environment

512
00:24:31,580 --> 00:24:27,030
these this is for instance city and was

513
00:24:34,030 --> 00:24:31,590

early life messy as the text within me

514
00:24:36,590 --> 00:24:34,040
the document here so the messy life

515
00:24:38,570 --> 00:24:36,600
presumably means one that is able to

516
00:24:41,570 --> 00:24:38,580
tolerate a diversity of different

517
00:24:44,960 --> 00:24:41,580
organic substrates minerals things along

518
00:24:47,180 --> 00:24:44,970
those lines presumably a messy life

519
00:24:49,510 --> 00:24:47,190
would have had much greater fecundity

520
00:24:50,840 --> 00:24:49,520
and been able to spread around and

521
00:24:52,970 --> 00:24:50,850
diversify

522
00:24:56,870 --> 00:24:52,980
more easily than one that is stuck on a

523
00:24:59,420 --> 00:24:56,880
specific uh in biochemical pathways and

524
00:25:01,630 --> 00:24:59,430
the modern life at least as far as

525
00:25:04,940 --> 00:25:01,640
definitely one that is very much diverse

526
00:25:07,070 --> 00:25:04,950
however how diverse early life might

527
00:25:09,980 --> 00:25:07,080
have been would have been an important

528
00:25:11,960 --> 00:25:09,990
part and so how quickly cuz it has could

529
00:25:14,060 --> 00:25:11,970
it had diversified out from there

530
00:25:16,970 --> 00:25:14,070
including things like changes in pH

531
00:25:18,650 --> 00:25:16,980
water availability redox and a number of

532
00:25:21,970 --> 00:25:18,660
other things my then quite important for

533
00:25:24,230 --> 00:25:21,980
sort of understanding how quickly

534
00:25:26,660 --> 00:25:24,240
environments have to adapt and thereby

535
00:25:29,390 --> 00:25:26,670
how quickly organisms would have had to

536
00:25:31,220 --> 00:25:29,400
adapt as well and then the final one

537
00:25:33,710 --> 00:25:31,230
here is what environmental conditions

538
00:25:36,820 --> 00:25:33,720

provided energy for prebiotic prophecies

539
00:25:39,710 --> 00:25:36,830
and so the production of energy is

540
00:25:41,240 --> 00:25:39,720
fundamental to all life and so

541
00:25:43,130 --> 00:25:41,250
production and utilization of

542
00:25:45,880 --> 00:25:43,140
environmental energy is certainly useful

543
00:25:48,380 --> 00:25:45,890
for all these things as well given what

544
00:25:51,020 --> 00:25:48,390
are some of the ways and environments

545
00:25:53,270 --> 00:25:51,030
could have supplied energy for life and

546
00:25:57,710 --> 00:25:53,280
there's a lot of different ways that

547
00:26:00,650 --> 00:25:57,720
life does it as well and so John you

548
00:26:02,630 --> 00:26:00,660
have a question here about prebiotic as

549
00:26:04,940 --> 00:26:02,640
meaning the conditions that do or should

550
00:26:07,070 --> 00:26:04,950
lead to the origin of life inators

551
00:26:09,620 --> 00:26:07,080
prebiotic for instance the moon would be

552
00:26:11,600 --> 00:26:09,630
proud I guess that is true and so that's

553
00:26:14,570 --> 00:26:11,610
a that's a good point that prebiotic we

554
00:26:16,700 --> 00:26:14,580
are using here is before life yet

555
00:26:18,920 --> 00:26:16,710
followed by life and thank you for

556
00:26:21,830 --> 00:26:18,930
making sure that that point is clear or

557
00:26:24,680 --> 00:26:21,840
is clarified here and that would be one

558
00:26:29,210 --> 00:26:24,690
that we will try to change within this

559
00:26:31,070 --> 00:26:29,220
document as well let's see web

560
00:26:33,740 --> 00:26:31,080
environment conditions provided energy

561
00:26:40,490 --> 00:26:33,750
for before life but followed by life

562
00:26:42,290 --> 00:26:40,500
processes yes okay and then the final

563
00:26:45,110 --> 00:26:42,300

set of questions that were highlighted

564
00:26:47,360 --> 00:26:45,120
by this group right here is that is

565
00:26:50,090 --> 00:26:47,370
their environmental precursor or analog

566
00:26:55,370 --> 00:26:50,100
foreign but for information transfer and

567
00:26:59,960 --> 00:26:55,380
so information transfer it for certain

568
00:27:02,960 --> 00:26:59,970
consist on a very small scale on a

569
00:27:06,230 --> 00:27:02,970
chemical recognition

570
00:27:09,590 --> 00:27:06,240
so crystalline substances have a sort of

571
00:27:11,500 --> 00:27:09,600
very low level information transfer yet

572
00:27:15,919 --> 00:27:11,510
how high level could there have been

573
00:27:18,770 --> 00:27:15,929
from sort of environmental process and

574
00:27:21,080 --> 00:27:18,780
sort of a in organic organic mixture or

575
00:27:22,909 --> 00:27:21,090
something along those lines and so

576
00:27:24,590 --> 00:27:22,919
information transfer and early life

577
00:27:27,020 --> 00:27:24,600
might provide some information on this

578
00:27:28,640 --> 00:27:27,030
process and we might discover how much

579
00:27:32,840 --> 00:27:28,650
functionality might have come out from

580
00:27:34,610 --> 00:27:32,850
that system as well and so what physical

581
00:27:36,590 --> 00:27:34,620
chemical and thermal gradients

582
00:27:38,360 --> 00:27:36,600
requirements for the origin life so the

583
00:27:41,500 --> 00:27:38,370
gradient idea is so an important one

584
00:27:44,240 --> 00:27:41,510
you've seen throughout this uh the

585
00:27:46,310 --> 00:27:44,250
document that we've discussed so far so

586
00:27:48,830 --> 00:27:46,320
these gradients set up the

587
00:27:50,390 --> 00:27:48,840
disequilibrium system necessary for some

588
00:27:53,450 --> 00:27:50,400

of the chemistry that comes about from

589
00:27:56,240 --> 00:27:53,460
here and so sort of continuing what

590
00:27:57,740 --> 00:27:56,250
those uh what those things were is it

591
00:27:59,060 --> 00:27:57,750
sort of them a little bit of overlap

592
00:28:01,909 --> 00:27:59,070
with some of the previous questions as

593
00:28:03,860 --> 00:28:01,919
well and then are there structural or

594
00:28:05,240 --> 00:28:03,870
functional out logs for cells membranes

595
00:28:09,680 --> 00:28:05,250
and other biological elements within

596
00:28:12,560 --> 00:28:09,690
environments and so for instance sulfide

597
00:28:17,690 --> 00:28:12,570
bubbles or some material like that might

598
00:28:22,159 --> 00:28:17,700
serve as membrane analogs or other

599
00:28:24,380 --> 00:28:22,169
material as well oh I saw a question

600
00:28:26,930 --> 00:28:24,390
from Ron the peers that that has gone

601
00:28:34,370 --> 00:28:26,940
away so there are a comment from wrong

602
00:28:36,500 --> 00:28:34,380
but ok then the final one that we

603
00:28:38,360 --> 00:28:36,510
identify here is how much diversity in

604
00:28:40,789 --> 00:28:38,370
geologic environments is required to

605
00:28:42,350 --> 00:28:40,799
produce all of the prebiotic chemistry I

606
00:28:44,870 --> 00:28:42,360
guess so that were definitely that word

607
00:28:47,029 --> 00:28:44,880
all will be highlighted how is produce

608
00:28:50,029 --> 00:28:47,039
sufficient prebiotic chemistry required

609
00:28:52,880 --> 00:28:50,039
for the emergence of life and so I guess

610
00:28:54,590 --> 00:28:52,890
accused high prebiotic into before life

611
00:28:56,899 --> 00:28:54,600
but followed my life that would be a

612
00:29:00,289 --> 00:28:56,909
little bit more reasonable view of all

613
00:29:02,750 --> 00:29:00,299

the word all there and so required for

614
00:29:04,159 --> 00:29:02,760
the emergence of life presumably life of

615
00:29:06,890 --> 00:29:04,169
course we'd have to get down to the very

616
00:29:08,600 --> 00:29:06,900
fundamentals of where life is and is

617
00:29:11,090 --> 00:29:08,610
this question even addressable is

618
00:29:14,799 --> 00:29:11,100
certainly a it's an open question with

619
00:29:17,649 --> 00:29:14,809
in chemistry and elsewhere as well

620
00:29:19,330 --> 00:29:17,659
so that is our basic overview of the

621
00:29:21,039 --> 00:29:19,340
questions that we've highlighted each of

622
00:29:23,860 --> 00:29:21,049
these questions if you take a look at

623
00:29:25,840 --> 00:29:23,870
the document is expanded upon in greater

624
00:29:27,430 --> 00:29:25,850
depth and with better examples and I

625
00:29:30,159 --> 00:29:27,440
probably have given in to this half hour

626
00:29:33,190 --> 00:29:30,169
but please do take a look and feel free

627
00:29:34,720 --> 00:29:33,200
to comment as it comes along and I see

628
00:29:37,539 --> 00:29:34,730
that run given all the prerequisite

629
00:29:39,610 --> 00:29:37,549
materials and physical conditions for

630
00:29:42,669 --> 00:29:39,620
prebiotic places to come biotic the

631
00:29:45,190 --> 00:29:42,679
sixty four dollar question how did how

632
00:29:48,340 --> 00:29:45,200
long should emergence take and that is

633
00:29:50,320 --> 00:29:48,350
an excellent question how dare you

634
00:29:53,289 --> 00:29:50,330
highlight 500 million years that would

635
00:29:56,169 --> 00:29:53,299
be a fairly long time from many of our

636
00:29:59,649 --> 00:29:56,179
perspectives as chemists but can it be a

637
00:30:03,850 --> 00:29:59,659
much shorter time as possible for

638
00:30:07,509 --> 00:30:03,860

instance Mars was a lot more a nice

639
00:30:10,840 --> 00:30:07,519
place to live back in the 4.5 to 3.5

640
00:30:12,100 --> 00:30:10,850
million years or before present and so

641
00:30:16,149 --> 00:30:12,110
maybe that environment might have been

642
00:30:19,600 --> 00:30:16,159
better for that process as well that is

643
00:30:22,659 --> 00:30:19,610
the end of this document here via the

644
00:30:24,340 --> 00:30:22,669
the presentation so I will leave Frances

645
00:30:26,560 --> 00:30:24,350
Brittany if you have other comments or

646
00:30:34,690 --> 00:30:26,570
if I miss something please do please

647
00:30:36,249 --> 00:30:34,700
feel free of pipe in there is the

648
00:30:43,480 --> 00:30:36,259
rustling of paper which suggests

649
00:30:48,340 --> 00:30:43,490
thinking all right no Frances Brittany

650
00:30:51,700 --> 00:30:48,350
nothing at the moment um let me in that

651
00:30:55,779 --> 00:30:51,710
case well in fact as mike has just said

652
00:30:58,239 --> 00:30:55,789
phone lines are open for anyone who may

653
00:30:59,950 --> 00:30:58,249
want to ask a question directly if you

654
00:31:01,810 --> 00:30:59,960
have a look at the top of the screen I

655
00:31:03,730 --> 00:31:01,820
always get this the wrong way so over

656
00:31:08,350 --> 00:31:03,740
here we'll see someone with their hand

657
00:31:10,330 --> 00:31:08,360
sticking in there o.o Brittany I can see

658
00:31:24,190 --> 00:31:10,340
the open do you Mike did you want to say

659
00:31:26,169 --> 00:31:24,200
something hey Brittany I think it's kind

660
00:31:27,310 --> 00:31:26,179
of hard to hear you remember we're doing

661
00:31:31,960 --> 00:31:27,320
the audio through the phone

662
00:31:39,910 --> 00:31:31,970
connect this respond through the phone

663
00:31:43,090 --> 00:31:39,920

line can you hear me what are you okay

664
00:31:44,320 --> 00:31:43,100
um yeah so I just wanted to say that I

665
00:31:46,900 --> 00:31:44,330
thought that was a pretty good summary

666
00:31:49,810 --> 00:31:46,910
of the discussions we've been having is

667
00:31:51,970 --> 00:31:49,820
basically how to think about planetary

668
00:31:53,260 --> 00:31:51,980
systems and biological systems in the

669
00:31:55,120 --> 00:31:53,270
same light and how they might work

670
00:31:58,270 --> 00:31:55,130
together how they might be similar and

671
00:32:00,910 --> 00:31:58,280
different so that that's kind of the

672
00:32:04,600 --> 00:32:00,920
theme for the whole for the whole

673
00:32:09,760 --> 00:32:04,610
document I thought just on the planetary

674
00:32:13,150 --> 00:32:09,770
side it was thinking about what parts of

675
00:32:15,670 --> 00:32:13,160
a planetary system are really needed and

676
00:32:18,160 --> 00:32:15,680
so kind of answer that static question

677
00:32:20,860 --> 00:32:18,170
we would talk a lot about in planetary

678
00:32:23,590 --> 00:32:20,870
science and this uh this environment has

679
00:32:26,650 --> 00:32:23,600
water or this environment has ice this

680
00:32:28,690 --> 00:32:26,660
environment has whatever and then the

681
00:32:31,560 --> 00:32:28,700
big question is is that really a

682
00:32:34,420 --> 00:32:31,570
habitable environment or does it require

683
00:32:37,420 --> 00:32:34,430
activity doesn't require other

684
00:32:40,560 --> 00:32:37,430
ingredients or other other systems to be

685
00:32:43,720 --> 00:32:40,570
active in order for that to be really

686
00:32:48,960 --> 00:32:43,730
Astra biologically relevant so that is

687
00:33:00,870 --> 00:32:55,990
great um no one else about my mind kind

688
00:33:03,430 --> 00:33:00,880

of okay yeah so me here this aside yes

689
00:33:06,520 --> 00:33:03,440
don't consider just to extend if I'm not

690
00:33:08,800 --> 00:33:06,530
a little you know a lot of focus simply

691
00:33:12,610 --> 00:33:08,810
gets put on the presence of water and

692
00:33:15,060 --> 00:33:12,620
the after the activity of water you know

693
00:33:17,350 --> 00:33:15,070
but for all the other ingredients needed

694
00:33:20,130 --> 00:33:17,360
they're not always necessarily in the

695
00:33:24,850 --> 00:33:20,140
same stability field of liquid water and

696
00:33:27,280 --> 00:33:24,860
so in order to expand upon the I guess

697
00:33:29,500 --> 00:33:27,290
parameter space that that were kind of

698
00:33:33,090 --> 00:33:29,510
observing so consider things like option

699
00:33:35,500 --> 00:33:33,100
fee Assateague the stability of organics

700
00:33:37,420 --> 00:33:35,510
and where the stability of organics

701
00:33:38,470 --> 00:33:37,430
overlaps with the stability of liquid

702
00:33:40,830 --> 00:33:38,480
water

703
00:33:42,940 --> 00:33:40,840
how that's going to change from from

704
00:33:44,740 --> 00:33:42,950
bodies your body or even different

705
00:33:47,200 --> 00:33:44,750
environments on the early Earth and

706
00:33:48,970 --> 00:33:47,210
those are the kind of steps forward that

707
00:33:51,370 --> 00:33:48,980
we need to start making because now that

708
00:33:55,350 --> 00:33:51,380
we've discovered water on Mars about 27

709
00:33:58,659 --> 00:33:55,360
times it's time to start thinking of

710
00:34:00,820 --> 00:33:58,669
other ways to put this information in

711
00:34:05,940 --> 00:34:00,830
the context the better understand and

712
00:34:14,859 --> 00:34:12,010
great thanks um okay so what we're

713
00:34:17,230 --> 00:34:14,869

looking for now is as you've seen your

714
00:34:20,080 --> 00:34:17,240
welcome to type questions into the chat

715
00:34:22,780 --> 00:34:20,090
box but if any of you want to actually

716
00:34:24,220 --> 00:34:22,790
ask your questions directly or make

717
00:34:26,200 --> 00:34:24,230
statements and observations you're

718
00:34:29,139 --> 00:34:26,210
welcome to do it what seems to work

719
00:34:31,149 --> 00:34:29,149
quite well is if you use the little hand

720
00:34:33,460 --> 00:34:31,159
icon and I'm just going to turn mine on

721
00:34:36,129 --> 00:34:33,470
there so if you look next to Andy

722
00:34:38,560 --> 00:34:36,139
Burnett right and with that a sudden

723
00:34:43,180 --> 00:34:38,570
blast of interest okay um well let me

724
00:34:46,599 --> 00:34:43,190
take the first one um bruna if she'd

725
00:34:51,340 --> 00:34:46,609
like to yes mean can you hear me you

726
00:34:56,260 --> 00:34:51,350
hear me I want to bring to the attention

727
00:35:00,580 --> 00:34:56,270
of the group the wonderful paper that

728
00:35:04,560 --> 00:35:00,590
was given by Steve dinner in florence

729
00:35:09,099 --> 00:35:04,570
italy in august concerning the fact that

730
00:35:11,380 --> 00:35:09,109
if current theories are true that the

731
00:35:14,380 --> 00:35:11,390
earth was completely covered by ocean

732
00:35:18,550 --> 00:35:14,390
and therefore could not have developed

733
00:35:22,660 --> 00:35:18,560
certain key minerals such as molybdate

734
00:35:27,160 --> 00:35:22,670
sand borates that are needed to bring

735
00:35:29,520 --> 00:35:27,170
into existence the are of RNA and that's

736
00:35:33,130 --> 00:35:29,530
assuming of course that the RNA world is

737
00:35:37,390 --> 00:35:33,140
the current darling theory of the origin

738
00:35:41,340 --> 00:35:37,400

of life people but I have nothing else I

739
00:35:45,490 --> 00:35:41,350
think his paper should be put on the

740
00:35:50,710 --> 00:35:45,500
resources of this website for people to

741
00:35:54,370 --> 00:35:52,810
do you have a link to the paper i'm

742
00:36:00,550 --> 00:35:54,380
going to say by all means pop it into

743
00:36:04,630 --> 00:36:00,560
the chat window i don't but i can send

744
00:36:09,430 --> 00:36:04,640
the paper and as a PDF if you tell me

745
00:36:12,550 --> 00:36:09,440
where to send it and just if you send it

746
00:36:15,670 --> 00:36:12,560
to that address that would be great and

747
00:36:18,190 --> 00:36:15,680
will weaken and also actually and anyone

748
00:36:20,550 --> 00:36:18,200
is free to upload documents onto the

749
00:36:24,310 --> 00:36:20,560
astrobiology website but by all means

750
00:36:27,099 --> 00:36:24,320
send it and we will do that okay all

751
00:36:31,960 --> 00:36:27,109
right i'll be sending it later luckily

752
00:36:34,690 --> 00:36:31,970
here I commenters about that yeah I can

753
00:36:36,010 --> 00:36:34,700
I can make it a related comment there's

754
00:36:37,960 --> 00:36:36,020
also that there was a new favor in

755
00:36:40,900 --> 00:36:37,970
nature a couple of weeks ago about an

756
00:36:42,910 --> 00:36:40,910
alternative interpretation so the

757
00:36:45,010 --> 00:36:42,920
assumption that we have an earlier is

758
00:36:49,030 --> 00:36:45,020
all ocean scenario i think is probably

759
00:36:50,950 --> 00:36:49,040
related to the Hadean zircon data which

760
00:36:56,760 --> 00:36:50,960
seemed to imply the same temperature as

761
00:37:00,339 --> 00:36:56,770
exist at at subduction zones currently

762
00:37:04,240 --> 00:37:00,349
those having possibly occurred in the

763
00:37:06,460 --> 00:37:04,250

same basically water stability in the

764
00:37:09,190 --> 00:37:06,470
Hadean earth and so that was that's one

765
00:37:10,990 --> 00:37:09,200
of the data points they point to there's

766
00:37:13,060 --> 00:37:11,000
a new paper on nature about heat pipe

767
00:37:16,530 --> 00:37:13,070
volcanism and how that might have the

768
00:37:19,450 --> 00:37:16,540
same effect you might engender the same

769
00:37:22,599 --> 00:37:19,460
chemical situation as a different

770
00:37:24,780 --> 00:37:22,609
initiation point for plate tectonics so

771
00:37:28,510 --> 00:37:24,790
that's another theory it's certainly not

772
00:37:31,839 --> 00:37:28,520
I would say that the weather you have in

773
00:37:33,910 --> 00:37:31,849
ocean world or or or runaway volcanism

774
00:37:35,470 --> 00:37:33,920
at the same point in time you can get

775
00:37:37,990 --> 00:37:35,480
similar temperatures out of the same

776
00:37:39,460 --> 00:37:38,000
situation so we're out of both situation

777
00:37:43,870 --> 00:37:39,470
so that's another theory that's out

778
00:37:46,660 --> 00:37:43,880
there so I'm certainly aware of so you

779
00:37:49,420 --> 00:37:46,670
know Steve's point is interesting the

780
00:37:54,640 --> 00:37:49,430
Hadean data that has been pointing to

781
00:37:57,670 --> 00:37:54,650
this is from a one reservoir and so it's

782
00:37:59,620 --> 00:37:57,680
quite possibly not at not a global out

783
00:38:01,839 --> 00:37:59,630
or either global average or localized

784
00:38:04,329 --> 00:38:01,849
data point but there's also many other

785
00:38:05,200 --> 00:38:04,339
interpretations for that data set so I

786
00:38:08,440 --> 00:38:05,210
think those are the types of questions

787
00:38:10,059 --> 00:38:08,450
we don't want to pick up on one thing

788
00:38:12,759 --> 00:38:10,069

being the answer or the other thing it's

789
00:38:15,309 --> 00:38:12,769
it's the right the right question that

790
00:38:16,569 --> 00:38:15,319
people can take this as a field of study

791
00:38:19,150 --> 00:38:16,579
and then we can actually have these

792
00:38:23,019 --> 00:38:19,160
conversations about what each of these

793
00:38:24,849 --> 00:38:23,029
datasets imply so I think that that's

794
00:38:28,329 --> 00:38:24,859
that's in jet there you know that's

795
00:38:31,059 --> 00:38:28,339
really pointing to not a result but a

796
00:38:32,589 --> 00:38:31,069
question which is what really was the

797
00:38:34,569 --> 00:38:32,599
early Earth like and that's the same

798
00:38:37,299 --> 00:38:34,579
thing you know or the time scale is what

799
00:38:40,539 --> 00:38:37,309
were the ingredients what were what were

800
00:38:42,430 --> 00:38:40,549
the environmental precursors of both

801
00:38:45,459 --> 00:38:42,440
both of those situations might might

802
00:38:50,289 --> 00:38:45,469
might point at the same thing so I think

803
00:38:52,420 --> 00:38:50,299
that that's hopefully then stated in a

804
00:38:54,069 --> 00:38:52,430
generic enough way that that it opens up

805
00:38:56,319 --> 00:38:54,079
fields of research that talk to each

806
00:39:01,479 --> 00:38:56,329
other in such a way as just been

807
00:39:03,130 --> 00:39:01,489
suggested in trust okay and any other

808
00:39:07,890 --> 00:39:03,140
comments to that otherwise we'll go to

809
00:39:10,239 --> 00:39:07,900
John I see Iran has a comment here

810
00:39:13,539 --> 00:39:10,249
plenty of boron as well as molybdenum

811
00:39:16,599 --> 00:39:13,549
and tungsten and soda Lakes in volcanic

812
00:39:19,079 --> 00:39:16,609
areas and them his idea at least if I

813
00:39:21,640 --> 00:39:19,089

remember reviewing it was that it was a

814
00:39:25,809 --> 00:39:21,650
these sorts of materials are less common

815
00:39:27,849 --> 00:39:25,819
in sort of a until plate tectonics has

816
00:39:32,890 --> 00:39:27,859
had to set a chance to kind of kick into

817
00:39:34,329 --> 00:39:32,900
gear just a loser they had to illuminate

818
00:39:36,249 --> 00:39:34,339
I guess what a bit of steve was

819
00:39:37,809 --> 00:39:36,259
mentioning back in the time but I

820
00:39:40,719 --> 00:39:37,819
certainly agree with Brittany that it's

821
00:39:44,259 --> 00:39:40,729
a question to be asked within the whole

822
00:39:47,109 --> 00:39:44,269
and is not it certainly and I know the

823
00:39:50,200 --> 00:39:47,119
abstract at least was a suggestion to

824
00:39:52,749 --> 00:39:50,210
the community for putting out an idea

825
00:39:54,549 --> 00:39:52,759
and it would definitely fall within this

826
00:39:57,940 --> 00:39:54,559
realm of area that we have talked about

827
00:40:00,099 --> 00:39:57,950
here today too absolutely so let me just

828
00:40:02,559 --> 00:40:00,109
take that moment to encourage everyone

829
00:40:04,839 --> 00:40:02,569
as soon as we're finished here we'll

830
00:40:07,569 --> 00:40:04,849
open it up for commenting and and do

831
00:40:10,029 --> 00:40:07,579
insert your thoughts on the paper to

832
00:40:11,859 --> 00:40:10,039
make sure we don't lose anything John

833
00:40:14,739 --> 00:40:11,869
you've been waiting patiently with your

834
00:40:16,150 --> 00:40:14,749
hand up don't you like to ask it's not

835
00:40:19,120 --> 00:40:16,160
how to raise your hand here so

836
00:40:20,770 --> 00:40:19,130
that's not bad I was a along the lines

837
00:40:22,660 --> 00:40:20,780
of Ron's question though I would think

838
00:40:26,470 --> 00:40:22,670

to the third awake and I completely

839
00:40:29,680 --> 00:40:26,480
clever covered goal yeah globe would be

840
00:40:31,690 --> 00:40:29,690
inconsistent but incompleteness in the

841
00:40:34,599 --> 00:40:31,700
coverage of the globe with a notion is

842
00:40:37,450 --> 00:40:34,609
probable meanwhile I did want to point

843
00:40:40,420 --> 00:40:37,460
out that the ocean of life always sounds

844
00:40:42,460 --> 00:40:40,430
like a demarcation where you go Eureka

845
00:40:45,849 --> 00:40:42,470
and then there's some hungry organism

846
00:40:47,799 --> 00:40:45,859
looking for a place to eat and I think

847
00:40:51,730 --> 00:40:47,809
that the ocean of life is unlikely to be

848
00:40:54,160 --> 00:40:51,740
a single event but is a continuum over

849
00:40:59,410 --> 00:40:54,170
time the coexistence between an

850
00:41:02,020 --> 00:40:59,420
inorganic and organic world all in the

851
00:41:04,510 --> 00:41:02,030
same place and not only do you have to

852
00:41:07,750 --> 00:41:04,520
get the first organism out there who

853
00:41:10,450 --> 00:41:07,760
presumably will continue to be nourished

854
00:41:13,299 --> 00:41:10,460
by mother earth but you've got to get a

855
00:41:15,609 --> 00:41:13,309
second organism or in a third a fourth

856
00:41:18,099 --> 00:41:15,619
out there so looking at the origin of

857
00:41:20,620 --> 00:41:18,109
life is how a community developed I

858
00:41:22,690 --> 00:41:20,630
think would be a wise thing to do rather

859
00:41:30,880 --> 00:41:22,700
than to look for that kind of Eureka

860
00:41:36,069 --> 00:41:30,890
moment I see Pig snorting any anyone

861
00:41:39,039 --> 00:41:36,079
want to chip in on it I certainly think

862
00:41:40,480 --> 00:41:39,049
that's reasonable and in it yeah for

863
00:41:42,430 --> 00:41:40,490

certain that there's terms that are

864
00:41:44,049 --> 00:41:42,440
accepted and I guess that when I terms

865
00:41:45,700 --> 00:41:44,059
of there are terms that are well used

866
00:41:47,589 --> 00:41:45,710
and that as one of those the origin of

867
00:41:50,140 --> 00:41:47,599
life there's a whole journal dedicated

868
00:41:52,650 --> 00:41:50,150
to it although it's a community-based

869
00:41:55,329 --> 00:41:52,660
would certainly it would be

870
00:41:57,309 --> 00:41:55,339
inconceivable to have one cell come out

871
00:41:59,339 --> 00:41:57,319
from this process rather than sort of

872
00:42:01,720 --> 00:41:59,349
sort of a community for certain so I

873
00:42:04,029 --> 00:42:01,730
agree with that that's why they have

874
00:42:10,930 --> 00:42:04,039
evolution of the bastard second phone

875
00:42:14,460 --> 00:42:10,940
right yeah okay sorry sorry co-op

876
00:42:17,859 --> 00:42:14,470
Francis this also gets into the kind of

877
00:42:21,190 --> 00:42:17,869
distinction between clean habitability

878
00:42:23,410 --> 00:42:21,200
and the emergence of life you know if

879
00:42:25,120 --> 00:42:23,420
you have the emergence of life and can

880
00:42:26,620 --> 00:42:25,130
you have that in a non avital

881
00:42:29,060 --> 00:42:26,630
environment or do you need to develop a

882
00:42:31,720 --> 00:42:29,070
habitable environment

883
00:42:36,200 --> 00:42:31,730
in order to have the emergence of life

884
00:42:44,620 --> 00:42:36,210
but seems like what a philosophical

885
00:42:47,990 --> 00:42:44,630
question chicken and egg quality there

886
00:42:49,970 --> 00:42:48,000
any other any other questions there

887
00:42:53,300 --> 00:42:49,980
anyone else want to pop their hand up or

888
00:43:06,500 --> 00:42:53,310

type into the document type into the

889
00:43:08,420 --> 00:43:06,510
chat window okay um thank you very much

890
00:43:10,580 --> 00:43:08,430
if you give us a few minutes we will

891
00:43:15,950 --> 00:43:10,590
change the status of the document thank

892
00:43:18,740 --> 00:43:15,960
you to our presenters and and thank you

893
00:43:28,940 --> 00:43:18,750
too max arranged for bringing up the

894
00:43:31,040 --> 00:43:28,950
adobe connect system again I'm sorry run

895
00:43:37,940 --> 00:43:31,050
Bo who pretends another's breakfast

896
00:43:52,400 --> 00:43:37,950
screaming comments are still being

897
00:43:57,710 --> 00:43:52,410
titles there we go oh okay yeah all

898
00:44:01,010 --> 00:43:57,720
right okay um thank you very much let's

899
00:44:02,030 --> 00:44:01,020
let's wrap this up at that point we were

900
00:44:04,250 --> 00:44:02,040
going to change the status of the

901
00:44:07,400 --> 00:44:04,260
document and you the presenters thank

902
00:44:11,540 --> 00:44:07,410
you very much and our next session is

903
00:44:13,750 --> 00:44:11,550
tomorrow at the same time thank you