
AB
GRAD
CON23

1
00:00:04,230 --> 00:00:10,930
[Music]

2
00:00:17,390 --> 00:00:14,770
hello everyone I'm Paola

3
00:00:19,970 --> 00:00:17,400
researcher from Lithuania currently

4
00:00:22,250 --> 00:00:19,980
located at Santa Cruz and my professor

5
00:00:25,490 --> 00:00:22,260
is Dave dimmer

6
00:00:28,490 --> 00:00:25,500
so organic compounds including building

7
00:00:30,589 --> 00:00:28,500
blocks of life may be synthesized in the

8
00:00:31,490 --> 00:00:30,599
accretion disk of newly forming solar

9
00:00:34,190 --> 00:00:31,500
system

10
00:00:36,889 --> 00:00:34,200
and may fall down to earth as a

11
00:00:39,530 --> 00:00:36,899
meteorites and thus

12
00:00:42,530 --> 00:00:39,540
phosphates

13
00:00:44,990 --> 00:00:42,540

ribose and all nuclear bases were all

14
00:00:47,450 --> 00:00:45,000
found in meteorites and under certain

15
00:00:49,790 --> 00:00:47,460
conditions May recombine into your

16
00:00:51,290 --> 00:00:49,800
nucleotides which are present in all

17
00:00:54,410 --> 00:00:51,300
contemporary life

18
00:00:58,810 --> 00:00:54,420
another essential compound is lipid

19
00:01:03,410 --> 00:00:58,820
which is a membrane forming

20
00:01:06,350 --> 00:01:03,420
molecule and the simple lipids were also

21
00:01:09,590 --> 00:01:06,360
found in carbonaceous chondrites and

22
00:01:12,649 --> 00:01:09,600
even though their structure was way more

23
00:01:17,090 --> 00:01:12,659
simple they can form

24
00:01:19,969 --> 00:01:17,100
vesicles so if these compounds fall down

25
00:01:22,370 --> 00:01:19,979
to the oceans they are lost in a dilute

26
00:01:25,969 --> 00:01:22,380
buffer but if we make it down to the

27
00:01:28,609 --> 00:01:25,979
surfaces of volcanic landmass they get a

28
00:01:30,950 --> 00:01:28,619
shot at Birth participating in the

29
00:01:33,530 --> 00:01:30,960
origin of life

30
00:01:37,190 --> 00:01:33,540
so compounds falling in from space

31
00:01:40,190 --> 00:01:37,200
synthesized in the biogenic atmosphere

32
00:01:42,590 --> 00:01:40,200
cooked up in hydrothermal systems

33
00:01:45,050 --> 00:01:42,600
or through work very through rock

34
00:01:47,450 --> 00:01:45,060
bevering may accumulate on the surface

35
00:01:49,190 --> 00:01:47,460
perhaps finding their way in a volcanic

36
00:01:51,649 --> 00:01:49,200
caldera

37
00:01:53,990 --> 00:01:51,659
the key to getting things to interact is

38
00:01:57,469 --> 00:01:54,000

concentration so

39
00:02:00,530 --> 00:01:57,479
small hot spring pools may be perfect

40
00:02:01,850 --> 00:02:00,540
place to go come cook up some soup of

41
00:02:04,249 --> 00:02:01,860
life

42
00:02:06,649 --> 00:02:04,259
and

43
00:02:08,809 --> 00:02:06,659
hydrothermal fields of interconnected

44
00:02:12,850 --> 00:02:08,819
pools could not only concentrate the

45
00:02:15,110 --> 00:02:12,860
compounds but intermix them between

46
00:02:17,390 --> 00:02:15,120
reservoirs subjecting them to different

47
00:02:23,089 --> 00:02:17,400
temperature pH

48
00:02:24,890 --> 00:02:23,099
uh Elemental and my mineral compositions

49
00:02:28,910 --> 00:02:24,900
and

50
00:02:31,610 --> 00:02:28,920
for any system to move from simple to

51
00:02:33,589 --> 00:02:31,620
more complex one is it must be subject

52
00:02:36,770 --> 00:02:33,599
to cycling

53
00:02:38,809 --> 00:02:36,780
and the flows of compounds including

54
00:02:41,869 --> 00:02:38,819
building blocks of membranes and

55
00:02:44,330 --> 00:02:41,879
polymers may find their way into a pool

56
00:02:47,630 --> 00:02:44,340
which fills up by a pulse from nearby

57
00:02:50,330 --> 00:02:47,640
geyser dries down and fills up again a

58
00:02:52,610 --> 00:02:50,340
cycle or an engine

59
00:02:57,470 --> 00:02:52,620
oh

60
00:03:04,610 --> 00:02:57,480
is then formed

61
00:03:11,990 --> 00:03:08,410
are synthesized and during rehydration

62
00:03:13,790 --> 00:03:12,000
they may assemble into membrane-bounded

63
00:03:16,910 --> 00:03:13,800

protocells

64
00:03:20,449 --> 00:03:16,920
and the stabilizing effects of polymers

65
00:03:23,570 --> 00:03:20,459
and membranes allow the protocells to be

66
00:03:27,770 --> 00:03:23,580
tested with some surviving next dry down

67
00:03:30,770 --> 00:03:27,780
as a protocell aggregate together they

68
00:03:32,330 --> 00:03:30,780
form gel like face where metabolic

69
00:03:34,970 --> 00:03:32,340
Cycles can arise

70
00:03:38,509 --> 00:03:34,980
and as a grade fully dries down

71
00:03:41,449 --> 00:03:38,519
the Proto cells can

72
00:03:44,170 --> 00:03:41,459
are merging and forming lamellar

73
00:03:48,229 --> 00:03:44,180
structures where polymers can

74
00:03:49,850 --> 00:03:48,239
resynthesize template and allocate so

75
00:03:52,729 --> 00:03:49,860
after many search Cycles simple

76
00:03:55,430 --> 00:03:52,739
biological functions can emerge

77
00:03:58,309 --> 00:03:57,110
uh

78
00:04:01,250 --> 00:03:58,319
yeah

79
00:04:05,809 --> 00:04:01,260
a simple biological functions can emerge

80
00:04:10,390 --> 00:04:05,819
and these ideas are backed by many

81
00:04:13,210 --> 00:04:10,400
studies and here you can see a model of

82
00:04:15,550 --> 00:04:13,220
lasagna of life

83
00:04:18,110 --> 00:04:15,560
were

84
00:04:21,289 --> 00:04:18,120
nucleotides are trapped between layers

85
00:04:24,170 --> 00:04:21,299
of lipid membranes and such structures

86
00:04:25,909 --> 00:04:24,180
are confirmed by x-ray diffraction

87
00:04:29,570 --> 00:04:25,919
experiment

88
00:04:34,909 --> 00:04:29,580

and the trapping of nucleotides between

89
00:04:37,610 --> 00:04:34,919
the layers are beneficial because uh

90
00:04:38,810 --> 00:04:37,620
search structures allow pre-polymers to

91
00:04:41,110 --> 00:04:38,820
form

92
00:04:46,129 --> 00:04:41,120
and not only that

93
00:04:49,610 --> 00:04:46,139
here you can see that the blue lines are

94
00:04:53,510 --> 00:04:49,620
with lipid present and if we compo

95
00:04:55,790 --> 00:04:53,520
compare the deporination reactions which

96
00:04:57,430 --> 00:04:55,800
are degradation of purine nuclear

97
00:05:00,950 --> 00:04:57,440
nucleotides

98
00:05:05,749 --> 00:05:00,960
in the samples with lipid present those

99
00:05:08,510 --> 00:05:05,759
reactions are really inhibited

100
00:05:11,450 --> 00:05:08,520
uh if we cook up such lasagna at

101
00:05:14,469 --> 00:05:11,460
sufficiently high temperatures you can

102
00:05:19,570 --> 00:05:14,479
see in the last graph at 90 degrees

103
00:05:22,909 --> 00:05:19,580
of the nucleotides can really undergo

104
00:05:26,870 --> 00:05:22,919
condensation reactions and become well

105
00:05:29,390 --> 00:05:26,880
oligon are nucleotides so RNA or DNA

106
00:05:32,810 --> 00:05:29,400
like molecules

107
00:05:35,270 --> 00:05:32,820
and uh the most important message from

108
00:05:37,969 --> 00:05:35,280
all this presentation is that this is a

109
00:05:41,210 --> 00:05:37,979
real system like you can take your

110
00:05:43,370 --> 00:05:41,220
Prebiotic soup and go to Kamchatka or

111
00:05:45,830 --> 00:05:43,380
New Zealand or even in California the

112
00:05:48,710 --> 00:05:45,840
hot spring pools pour it down and after

113
00:05:51,590 --> 00:05:48,720

a couple of Cycles you will see like

114
00:05:53,930 --> 00:05:51,600
real Proto cells with oligonucleotides

115
00:05:56,930 --> 00:05:53,940
which are of sufficient length to

116
00:05:59,390 --> 00:05:56,940
already have enzymatic functions

117
00:06:01,310 --> 00:05:59,400
so my goal for a rest of air is to use

118
00:06:05,390 --> 00:06:01,320
nanopore sequencing to study those

119
00:06:09,610 --> 00:06:05,400
sequences to check whether I can find

120
00:06:12,590 --> 00:06:09,620
some functional ones

121
00:06:16,490 --> 00:06:12,600
so these ideas and results brought our

122
00:06:18,950 --> 00:06:16,500
team to a city where we are running a

123
00:06:21,650 --> 00:06:18,960
Genesis engine which is simulation

124
00:06:23,570 --> 00:06:21,660
chamber of volcanic land mass with a lot

125
00:06:24,710 --> 00:06:23,580
of poles where we can test the different

126
00:06:27,590 --> 00:06:24,720
conditions

127
00:06:30,409 --> 00:06:27,600
and our goal is to

128
00:06:33,350 --> 00:06:30,419
understand what fraction of habitable

129
00:06:35,029 --> 00:06:33,360
planets are actually durable and by

130
00:06:37,309 --> 00:06:35,039
durable I mean

131
00:06:39,710 --> 00:06:37,319
what fraction of habitat in what

132
00:06:42,529 --> 00:06:39,720
fraction of habitable planets the life

133
00:06:44,330 --> 00:06:42,539
can actually start

134
00:06:47,390 --> 00:06:44,340
not many people are talking about that

135
00:06:48,950 --> 00:06:47,400
but conditions for a life to start will

136
00:06:51,529 --> 00:06:48,960
be very different

137
00:06:53,150 --> 00:06:51,539
than the conditions which are needed for

138
00:06:54,590 --> 00:06:53,160

our life to thrive

139
00:06:56,510 --> 00:06:54,600
yes

140
00:06:59,990 --> 00:06:56,520
so if you are interested in this project

141
00:07:02,629 --> 00:07:00,000
you can learn more on a set website or

142
00:07:05,029 --> 00:07:02,639
and I invite you to stop by my poster

143
00:07:08,029 --> 00:07:05,039
where we can discuss how we can cook

144
00:07:10,189 --> 00:07:08,039
some soup of life and maybe even start

145
00:07:10,540 --> 00:07:10,199
the second Genesis so thank you very

146
00:07:14,460 --> 00:07:10,550
much

147
00:07:15,000 --> 00:07:14,470
[Applause]

148
00:07:31,320 --> 00:07:15,010
[Music]