
NOD 2

1
00:00:07,909 --> 00:00:05,590
the international space station is a

2
00:00:10,150 --> 00:00:07,919
place that's getting us ready to go to

3
00:00:11,749 --> 00:00:10,160
mars in the future it's also a place

4
00:00:13,749 --> 00:00:11,759
where science is being done that's

5
00:00:15,589 --> 00:00:13,759
leading to some benefits for people who

6
00:00:17,430 --> 00:00:15,599
are on earth right now

7
00:00:20,310 --> 00:00:17,440
one of those experiments that hopes to

8
00:00:22,630 --> 00:00:20,320
make good on that second category is

9
00:00:24,070 --> 00:00:22,640
called advanced colloids experiment

10
00:00:26,470 --> 00:00:24,080
microscopy

11
00:00:28,310 --> 00:00:26,480
dr matthew lynch who is a principal

12
00:00:31,029 --> 00:00:28,320
scientist at procter gamble in

13
00:00:34,870 --> 00:00:31,039

cincinnati is the principal investigator

14
00:00:37,030 --> 00:00:34,880
for ace m m-1 he joins us this morning

15
00:00:39,430 --> 00:00:37,040
to talk about his research

16
00:00:41,510 --> 00:00:39,440
dr lynch your experiment is studying the

17
00:00:44,069 --> 00:00:41,520
coarsening of colloids with an eye

18
00:00:45,990 --> 00:00:44,079
toward making better and longer lasting

19
00:00:47,590 --> 00:00:46,000
products i've got to start by asking you

20
00:00:50,310 --> 00:00:47,600
to tell us what you're talking about

21
00:00:52,229 --> 00:00:50,320
what's a colloid and what is coarsening

22
00:00:54,069 --> 00:00:52,239
thanks pat great to be with you

23
00:00:56,470 --> 00:00:54,079
let me just describe just real briefly

24
00:00:58,470 --> 00:00:56,480
the problem that we have so as a company

25
00:00:59,910 --> 00:00:58,480
we make a lot of products are liquids

26
00:01:02,310 --> 00:00:59,920
you know tied

27
00:01:03,990 --> 00:01:02,320
fabric enhancers for example shampoos

28
00:01:04,630 --> 00:01:04,000
and if you think about it we put a lot

29
00:01:06,870 --> 00:01:04,640
of

30
00:01:08,630 --> 00:01:06,880
small drops actives into those into

31
00:01:10,550 --> 00:01:08,640
those liquids and much in the same way

32
00:01:12,550 --> 00:01:10,560
as if we put a beach ball in water it

33
00:01:14,390 --> 00:01:12,560
will pop back up all the products we

34
00:01:16,550 --> 00:01:14,400
make have a tendency to do that as well

35
00:01:18,789 --> 00:01:16,560
so what colloids are are they really

36
00:01:20,230 --> 00:01:18,799
very very very small particles i can't

37
00:01:21,990 --> 00:01:20,240
see them by eye you have to put them

38
00:01:23,429 --> 00:01:22,000

under a microscope to see them imagine

39
00:01:24,550 --> 00:01:23,439
that they fit on the head of a pin say

40
00:01:26,469 --> 00:01:24,560
for example

41
00:01:27,990 --> 00:01:26,479
and what we try to do then is change

42
00:01:30,310 --> 00:01:28,000
those little colloidal particles we put

43
00:01:31,910 --> 00:01:30,320
them inside the liquids that we want to

44
00:01:33,910 --> 00:01:31,920
uh inside the products

45
00:01:35,510 --> 00:01:33,920
and we change the chemistry or the

46
00:01:37,350 --> 00:01:35,520
physics of the on the surface of those

47
00:01:38,870 --> 00:01:37,360
colors to make them attractive

48
00:01:41,910 --> 00:01:38,880
and so the idea is when we put them in

49
00:01:43,510 --> 00:01:41,920
those fluids they assemble up they form

50
00:01:45,510 --> 00:01:43,520
little structures maybe not unlike a

51
00:01:48,230 --> 00:01:45,520
house or cards that we might think about

52
00:01:50,230 --> 00:01:48,240
and holds all of those drops in place

53
00:01:52,550 --> 00:01:50,240
and so those where collards are and they

54
00:01:54,310 --> 00:01:52,560
begin to change naturally in time those

55
00:01:56,069 --> 00:01:54,320
structures change much in the same way

56
00:01:57,670 --> 00:01:56,079
as that same analogy we'd pull the cards

57
00:01:59,429 --> 00:01:57,680
out of that house of card structure

58
00:02:02,149 --> 00:01:59,439
they'll fall down that becomes

59
00:02:03,670 --> 00:02:02,159
problematic for stability of a product

60
00:02:05,590 --> 00:02:03,680
and so fundamentally we just want to

61
00:02:07,990 --> 00:02:05,600
learn about how to structure with

62
00:02:09,830 --> 00:02:08,000
colloids and the coarsening how those

63
00:02:10,869 --> 00:02:09,840

change in time to make the products go

64
00:02:13,830 --> 00:02:10,879
unstable

65
00:02:15,589 --> 00:02:13,840
are you able to learn more about that or

66
00:02:17,430 --> 00:02:15,599
something different about that by

67
00:02:20,229 --> 00:02:17,440
studying them in weightlessness as

68
00:02:21,750 --> 00:02:20,239
opposed to on earth or or even doing a

69
00:02:23,510 --> 00:02:21,760
computer simulation

70
00:02:25,030 --> 00:02:23,520
yeah actually it's really important to

71
00:02:27,750 --> 00:02:25,040
do in weightless environments and the

72
00:02:29,190 --> 00:02:27,760
reason is this if i think about um if i

73
00:02:30,949 --> 00:02:29,200
think about these drops these drops have

74
00:02:32,790 --> 00:02:30,959
a tendency to change and move through

75
00:02:34,309 --> 00:02:32,800
the fluid very very fast

76
00:02:36,229 --> 00:02:34,319
and the time scales by which they

77
00:02:39,190 --> 00:02:36,239
coarsen these colloids that are meant to

78
00:02:41,430 --> 00:02:39,200
hold them coarsen is very very slow and

79
00:02:43,670 --> 00:02:41,440
so on experiments on earth

80
00:02:45,830 --> 00:02:43,680
everything switches and changes so fast

81
00:02:48,229 --> 00:02:45,840
i can't discover anything about how the

82
00:02:50,150 --> 00:02:48,239
colloids course and how they move

83
00:02:52,229 --> 00:02:50,160
that changes in zero gravity i put them

84
00:02:54,710 --> 00:02:52,239
in zero gravity now the the rates by

85
00:02:56,390 --> 00:02:54,720
which they separate are very slow

86
00:02:57,910 --> 00:02:56,400
and now i can begin to examine the

87
00:02:59,430 --> 00:02:57,920
coursing process of these small

88
00:03:01,670 --> 00:02:59,440

colloidal particles

89
00:03:02,869 --> 00:03:01,680
so yeah is that just the gravity itself

90
00:03:04,470 --> 00:03:02,879
because there's no gravity the

91
00:03:06,949 --> 00:03:04,480
separation is slower

92
00:03:09,670 --> 00:03:06,959
exactly exactly so we basically turn off

93
00:03:11,589 --> 00:03:09,680
gravity separations are very slow now i

94
00:03:13,990 --> 00:03:11,599
can begin to understand the coarsening

95
00:03:16,949 --> 00:03:14,000
behaviors and processes uh in our in our

96
00:03:18,390 --> 00:03:16,959
structure and so in our in our products

97
00:03:20,470 --> 00:03:18,400
what is it that that

98
00:03:22,869 --> 00:03:20,480
happens inside the the experiment

99
00:03:24,309 --> 00:03:22,879
apparatus on the station what goes on in

100
00:03:25,830 --> 00:03:24,319
there and and are what are the

101
00:03:27,110 --> 00:03:25,840
astronauts doing

102
00:03:29,190 --> 00:03:27,120
yeah so as i told you before these

103
00:03:31,270 --> 00:03:29,200
particles are very very small so we do

104
00:03:33,830 --> 00:03:31,280
unearth we we make these mixtures that

105
00:03:35,910 --> 00:03:33,840
represent what we find in our products

106
00:03:37,190 --> 00:03:35,920
all of that goes up to the nasa glenn

107
00:03:39,270 --> 00:03:37,200
research center and they they put them

108
00:03:41,350 --> 00:03:39,280
in little cells little holders for us

109
00:03:42,390 --> 00:03:41,360
all those are up masked onto station and

110
00:03:43,350 --> 00:03:42,400
then what a

111
00:03:45,830 --> 00:03:43,360
what the astronaut will do at the

112
00:03:48,309 --> 00:03:45,840
appropriate time is mix them all up so

113
00:03:50,710 --> 00:03:48,319

here's my imagine that i have a a bunch

114
00:03:52,229 --> 00:03:50,720
of colloids i'm going to randomize them

115
00:03:53,670 --> 00:03:52,239
again to restart an experiment that's

116
00:03:55,830 --> 00:03:53,680
what the astronaut kind of puts together

117
00:03:57,030 --> 00:03:55,840
for us and he loads it into a microscope

118
00:03:58,550 --> 00:03:57,040
and these things again are so small i

119
00:03:59,910 --> 00:03:58,560
can't see them so i put them in a

120
00:04:03,110 --> 00:03:59,920
microscope so then we can begin to

121
00:04:05,030 --> 00:04:03,120
visualize how they change over time

122
00:04:06,470 --> 00:04:05,040
all that work is done up with nasa glenn

123
00:04:08,710 --> 00:04:06,480
we go up we spend time at mission

124
00:04:11,110 --> 00:04:08,720
control up there and help them work the

125
00:04:12,949 --> 00:04:11,120
experiments and and to understand the

126
00:04:15,190 --> 00:04:12,959
science going forward from that point on

127
00:04:17,590 --> 00:04:15,200
so you have the opportunity to talk with

128
00:04:20,229 --> 00:04:17,600
them directly and and

129
00:04:21,509 --> 00:04:20,239
can they give you feedback at the time

130
00:04:24,790 --> 00:04:21,519
yeah

131
00:04:26,629 --> 00:04:24,800
past uh we actually call up the station

132
00:04:28,870 --> 00:04:26,639
maybe the last questions talk to the

133
00:04:30,150 --> 00:04:28,880
astronauts directly and be able to

134
00:04:32,070 --> 00:04:30,160
provide some feedback about how they're

135
00:04:33,990 --> 00:04:32,080
stirring and how they're mixing and if

136
00:04:35,830 --> 00:04:34,000
things are positioned properly so it's

137
00:04:37,990 --> 00:04:35,840
actually a really fun and exciting kind

138
00:04:40,629 --> 00:04:38,000

of time to do that as you might imagine

139
00:04:42,310 --> 00:04:40,639
now have you been able to get results so

140
00:04:44,310 --> 00:04:42,320
far or are you still waiting for are you

141
00:04:46,469 --> 00:04:44,320
waiting for samples to come back

142
00:04:48,390 --> 00:04:46,479
oh no um all the results come down off

143
00:04:50,390 --> 00:04:48,400
station by by you know by by

144
00:04:52,390 --> 00:04:50,400
transmission um and so we've learned a

145
00:04:53,830 --> 00:04:52,400
lot of interesting things actually we

146
00:04:56,070 --> 00:04:53,840
the colloids that we use are kind of

147
00:04:58,070 --> 00:04:56,080
mixtures of big and small things that's

148
00:05:00,150 --> 00:04:58,080
kind of replicating a commercial mixture

149
00:05:02,310 --> 00:05:00,160
of things that we might actually use

150
00:05:03,990 --> 00:05:02,320
and we find that not all colors are

151
00:05:05,670 --> 00:05:04,000
created equal so ones that are a little

152
00:05:07,749 --> 00:05:05,680
bit bigger behave a little different

153
00:05:09,510 --> 00:05:07,759
than ones are a little bit smaller and

154
00:05:11,749 --> 00:05:09,520
it's provide us a unique opportunity to

155
00:05:13,350 --> 00:05:11,759
start thinking about how we design

156
00:05:15,590 --> 00:05:13,360
mixtures of big and small to do the

157
00:05:17,029 --> 00:05:15,600
kinds of things that we want

158
00:05:18,950 --> 00:05:17,039
you're learning about the

159
00:05:21,909 --> 00:05:18,960
the microscopic behavior of these

160
00:05:24,629 --> 00:05:21,919
particles presumably because that

161
00:05:25,909 --> 00:05:24,639
that teaches you about how they

162
00:05:28,550 --> 00:05:25,919
behave

163
00:05:30,230 --> 00:05:28,560

on earth when there is gravity exactly

164
00:05:31,830 --> 00:05:30,240
exactly so you know in a sense what

165
00:05:33,110 --> 00:05:31,840
we're doing is you can imagine a number

166
00:05:35,270 --> 00:05:33,120
of things happen

167
00:05:36,790 --> 00:05:35,280
simultaneously and we're going to remove

168
00:05:38,710 --> 00:05:36,800
one of those processes so that we can

169
00:05:41,029 --> 00:05:38,720
study the other processes independent of

170
00:05:42,230 --> 00:05:41,039
that all of it happens again on earth

171
00:05:43,670 --> 00:05:42,240
you know what what causes these

172
00:05:45,749 --> 00:05:43,680
colleagues of course and is thermal

173
00:05:48,310 --> 00:05:45,759
energy that's the heat

174
00:05:50,310 --> 00:05:48,320
that he is here on earth as well as it

175
00:05:52,629 --> 00:05:50,320
is up on station as well so

176
00:05:54,790 --> 00:05:52,639
the process is all the same

177
00:05:57,029 --> 00:05:54,800
and you're doing this with an eye toward

178
00:05:58,230 --> 00:05:57,039
building well better products better in

179
00:05:59,990 --> 00:05:58,240
what way

180
00:06:01,990 --> 00:06:00,000
exactly so well you know you think about

181
00:06:05,029 --> 00:06:02,000
it this way we make products that really

182
00:06:06,710 --> 00:06:05,039
um uh improve the lives of people and

183
00:06:08,150 --> 00:06:06,720
when they fail

184
00:06:09,990 --> 00:06:08,160
we no longer can improve the lives of

185
00:06:11,270 --> 00:06:10,000
people right i mean that's the idea so

186
00:06:13,830 --> 00:06:11,280
um

187
00:06:15,990 --> 00:06:13,840
where we have problems is where things

188
00:06:18,070 --> 00:06:16,000

separate out that causes failure and

189
00:06:20,230 --> 00:06:18,080
that causes our inability then to

190
00:06:21,670 --> 00:06:20,240
deliver something of value to them to

191
00:06:23,350 --> 00:06:21,680
people

192
00:06:24,710 --> 00:06:23,360
so what's your next step in in this

193
00:06:25,830 --> 00:06:24,720
experiment

194
00:06:27,510 --> 00:06:25,840
well so

195
00:06:29,830 --> 00:06:27,520
we have the facilities on station right

196
00:06:31,189 --> 00:06:29,840
now uh are fantastic it gives us some

197
00:06:32,950 --> 00:06:31,199
really some really good insights where

198
00:06:34,150 --> 00:06:32,960
to go further uh what we really would

199
00:06:36,150 --> 00:06:34,160
like to do though there's a next set of

200
00:06:37,990 --> 00:06:36,160
experiments coming along that use a

201
00:06:39,749 --> 00:06:38,000
slightly different facility gives us a

202
00:06:41,430 --> 00:06:39,759
lot more fidelity in terms of

203
00:06:43,350 --> 00:06:41,440
understanding where our particles are

204
00:06:44,870 --> 00:06:43,360
seeing those particles understanding how

205
00:06:46,790 --> 00:06:44,880
they move measuring three-dimensional

206
00:06:48,870 --> 00:06:46,800
structures that we just can't do right

207
00:06:50,870 --> 00:06:48,880
now so we're going to learn from these

208
00:06:52,710 --> 00:06:50,880
past experiments we're going to design

209
00:06:55,270 --> 00:06:52,720
other experiments that help us

210
00:06:56,710 --> 00:06:55,280
to get better resolution better fidelity

211
00:06:58,870 --> 00:06:56,720
of our experiments and go push that

212
00:07:01,110 --> 00:06:58,880
science even further at the same time

213
00:07:02,870 --> 00:07:01,120

we're working with a group of cases

214
00:07:05,110 --> 00:07:02,880
in and cases is providing us the ability

215
00:07:06,150 --> 00:07:05,120
to measure not simply microscopic

216
00:07:10,230 --> 00:07:06,160
properties

217
00:07:11,990 --> 00:07:10,240
kind of connect the big and the small

218
00:07:13,350 --> 00:07:12,000
together under the same set of

219
00:07:15,110 --> 00:07:13,360
environments with the same system so

220
00:07:17,189 --> 00:07:15,120
that's going to be very powerful i think

221
00:07:20,309 --> 00:07:17,199
you have a timetable for when that new

222
00:07:22,390 --> 00:07:20,319
uh facility new hardware is going to fly

223
00:07:25,029 --> 00:07:22,400
i i believe it's about two years about

224
00:07:27,029 --> 00:07:25,039
two years uh 2016. i think we're second

225
00:07:29,029 --> 00:07:27,039
on the manifest so we're excited about

226
00:07:31,670 --> 00:07:29,039
uh being able to use that new facility

227
00:07:33,909 --> 00:07:31,680
all right well good luck uh as you apply

228
00:07:35,909 --> 00:07:33,919
your findings and uh and on the the

229
00:07:37,270 --> 00:07:35,919
future experiments and thank you for for

230
00:07:38,070 --> 00:07:37,280
taking the time to talk with us about it

231
00:07:39,350 --> 00:07:38,080
today