
IMAX

1
00:00:08,810 --> 00:00:06,110
we're joined today by Vic Cooley who is

2
00:00:11,569 --> 00:00:08,820
the lead increment scientist for this

3
00:00:13,669 --> 00:00:11,579
expedition expedition 42 as well as the

4
00:00:15,890 --> 00:00:13,679
previous expedition expedition 41 and

5
00:00:17,359 --> 00:00:15,900
he's gonna talk to us a little bit today

6
00:00:18,710 --> 00:00:17,369
about one of the experiments that

7
00:00:20,779 --> 00:00:18,720
Samantha Christopher Eddie has been

8
00:00:23,179 --> 00:00:20,789
working on this morning the flute fruit

9
00:00:24,919 --> 00:00:23,189
fly lab experiment thanks so much for

10
00:00:26,720 --> 00:00:24,929
joining this bit thank you brandy I'm

11
00:00:28,669 --> 00:00:26,730
glad to be here all right well why don't

12
00:00:29,870 --> 00:00:28,679
we just start by telling give us a

13
00:00:32,720 --> 00:00:29,880

little background on what this

14
00:00:34,220 --> 00:00:32,730
experiment is well let me back up a

15
00:00:36,050 --> 00:00:34,230
little bit and tie it to what you were

16
00:00:38,090 --> 00:00:36,060
talking about the the to plant

17
00:00:41,510 --> 00:00:38,100
experiments the advanced plant

18
00:00:43,640 --> 00:00:41,520
experiment and the UNECE o2 Buell they

19
00:00:45,680 --> 00:00:43,650
both use the model organism the plant

20
00:00:48,500 --> 00:00:45,690
organism called Vale cress as you

21
00:00:50,870 --> 00:00:48,510
pointed out so that's a model a organism

22
00:00:53,840 --> 00:00:50,880
in the plant domain and of course we

23
00:00:58,100 --> 00:00:53,850
have a number of model organisms in the

24
00:01:00,800 --> 00:00:58,110
animal kingdom and you a person could

25
00:01:04,880 --> 00:01:00,810
argue that fruit flies are the most

26
00:01:06,410 --> 00:01:04,890
important or oldest model among all the

27
00:01:10,460 --> 00:01:06,420
model organisms in the animal kingdom

28
00:01:11,960 --> 00:01:10,470
and this is because when the biologists

29
00:01:14,060 --> 00:01:11,970
were first trying to understand how

30
00:01:16,460 --> 00:01:14,070
chromosomes passed along inherited

31
00:01:18,320 --> 00:01:16,470
characteristics the fruit fly was a very

32
00:01:22,250 --> 00:01:18,330
attractive model organism and this was

33
00:01:25,300 --> 00:01:22,260
because it was easy to grow it had a

34
00:01:28,130 --> 00:01:25,310
short generation of about ten days and

35
00:01:29,840 --> 00:01:28,140
you could you could see visible

36
00:01:31,730 --> 00:01:29,850
characteristics without you know

37
00:01:33,410 --> 00:01:31,740
dissecting and using a microscope you

38
00:01:36,830 --> 00:01:33,420

could see inherited characteristics like

39
00:01:39,380 --> 00:01:36,840
high color and wing length and wing

40
00:01:40,790 --> 00:01:39,390
color and things like that okay so all

41
00:01:42,740 --> 00:01:40,800
these characteristics made it very

42
00:01:44,469 --> 00:01:42,750
attractive and so about a hundred years

43
00:01:46,610 --> 00:01:44,479
ago at the turn of the century

44
00:01:51,710 --> 00:01:46,620
scientists started doing this research

45
00:01:53,510 --> 00:01:51,720
on fruit flies in their chromosomes it

46
00:01:55,760 --> 00:01:53,520
turns out that they have in their

47
00:01:58,399 --> 00:01:55,770
salivary glands some huge chromosomes

48
00:02:00,980 --> 00:01:58,409
relative to other chromosomes they're

49
00:02:04,100 --> 00:02:00,990
actually about one fiftieth of the

50
00:02:07,190 --> 00:02:04,110
thickness of a dime so it takes a just a

51
00:02:10,279 --> 00:02:07,200
very low powered microscope to actually

52
00:02:12,769 --> 00:02:10,289
find these chromosomes so for about two

53
00:02:13,970 --> 00:02:12,779
decades at Columbia University there was

54
00:02:16,070 --> 00:02:13,980
a lab and on the top

55
00:02:18,259 --> 00:02:16,080
or that lab it became known as the fly

56
00:02:20,750 --> 00:02:18,269
room because it's unpleasant

57
00:02:23,570 --> 00:02:20,760
all of these researchers had jars of

58
00:02:25,250 --> 00:02:23,580
flies fruit flies all over their desks -

59
00:02:27,830 --> 00:02:25,260
in various kinds of experiments and then

60
00:02:29,960 --> 00:02:27,840
in 1933 the professor of those

61
00:02:32,119 --> 00:02:29,970
experiments Thomas not Morgan went on to

62
00:02:35,030 --> 00:02:32,129
win the Nobel in in medicine or

63
00:02:37,880 --> 00:02:35,040

physiology for elucidating the role that

64
00:02:41,150 --> 00:02:37,890
chromosomes play and in passing along

65
00:02:43,009 --> 00:02:41,160
inherited characteristics so that just

66
00:02:46,369 --> 00:02:43,019
kind of gives you an idea why you might

67
00:02:51,410 --> 00:02:46,379
regard the fruit fly among fish and mice

68
00:02:54,289 --> 00:02:51,420
and roundworms C elegans as as the most

69
00:02:56,150 --> 00:02:54,299
important model organisms among the

70
00:02:57,770 --> 00:02:56,160
animals that we have as a model

71
00:02:58,970 --> 00:02:57,780
organisms we have all those others in

72
00:03:01,250 --> 00:02:58,980
different experiments on the space

73
00:03:02,690 --> 00:03:01,260
station but this this particular

74
00:03:04,970 --> 00:03:02,700
experiment uses those fruit flies

75
00:03:06,589 --> 00:03:04,980
because of all those characteristics I

76
00:03:09,349 --> 00:03:06,599
mentioned and because we have this long

77
00:03:12,199 --> 00:03:09,359
heritage of we know the complete genome

78
00:03:13,970 --> 00:03:12,209
of the fruit fly since the year 2000

79
00:03:16,400 --> 00:03:13,980
actually remember doing fruit fly

80
00:03:19,309 --> 00:03:16,410
experiments in seventh grade biology I

81
00:03:21,530 --> 00:03:19,319
think so I guess anybody can do them uh

82
00:03:24,500 --> 00:03:21,540
so what specifically are they looking

83
00:03:28,009 --> 00:03:24,510
for in this particular experiment so the

84
00:03:32,360 --> 00:03:28,019
main focus is immunity and it turns out

85
00:03:36,170 --> 00:03:32,370
that 77% of known human disease genes

86
00:03:39,740 --> 00:03:36,180
have a recognizable counterpart among

87
00:03:44,089 --> 00:03:39,750
the genetic code of fruit flies and 50%

88
00:03:47,990 --> 00:03:44,099

of protein sequences in the fruit fly

89
00:03:52,270 --> 00:03:48,000
have a mammalian analog so there's a

90
00:03:54,770 --> 00:03:52,280
huge you know despite the disparate

91
00:03:56,809 --> 00:03:54,780
difference in the evolutionary tree you

92
00:04:00,020 --> 00:03:56,819
might think of between fruit flies and

93
00:04:01,699 --> 00:04:00,030
humans there's a significant overlap of

94
00:04:04,789 --> 00:04:01,709
the genetic material and basic

95
00:04:07,699 --> 00:04:04,799
biological processes are similar so for

96
00:04:10,819 --> 00:04:07,709
example immunity so it does help to if

97
00:04:14,509 --> 00:04:10,829
we can understand how immune processes

98
00:04:16,490 --> 00:04:14,519
are affected by microgravity and we

99
00:04:18,979 --> 00:04:16,500
might be able to extend that to humans

100
00:04:21,259 --> 00:04:18,989
and even more deeper than that

101
00:04:23,870 --> 00:04:21,269
you know microgravity acts as such a

102
00:04:26,640 --> 00:04:23,880
change in environment that it can it has

103
00:04:29,400 --> 00:04:26,650
a potential to change basic

104
00:04:31,800 --> 00:04:29,410
formation transfer processes that which

105
00:04:33,840 --> 00:04:31,810
is what chromosomes do they tell the new

106
00:04:35,850 --> 00:04:33,850
organisms how to create proteins that

107
00:04:38,730 --> 00:04:35,860
are fundamental for all aspects of life

108
00:04:41,010 --> 00:04:38,740
so there might be some basic discoveries

109
00:04:42,900 --> 00:04:41,020
yet to be made and fruit fly would be an

110
00:04:45,240 --> 00:04:42,910
easy model organism for those to be made

111
00:04:46,499 --> 00:04:45,250
in okay well what do they do the

112
00:04:48,689 --> 00:04:46,509
astronauts actually have to do with the

113
00:04:50,820 --> 00:04:48,699

fruit flies well in fact one of the

114
00:04:52,439 --> 00:04:50,830
things that samantha is doing today is

115
00:04:54,840 --> 00:04:52,449
feeding the fruit flies we have to

116
00:04:56,820 --> 00:04:54,850
change out the food trays every five

117
00:04:58,650 --> 00:04:56,830
days and it turns out this is pretty

118
00:05:00,689 --> 00:04:58,660
important we have to keep it on schedule

119
00:05:03,210 --> 00:05:00,699
for roughly a 20-day growing cycle

120
00:05:05,070 --> 00:05:03,220
so every five days we have to change out

121
00:05:07,680 --> 00:05:05,080
these food trays and give them fresh

122
00:05:13,230 --> 00:05:07,690
food okay I doesn't sound too

123
00:05:15,120 --> 00:05:13,240
labor-intensive well it's it it actually

124
00:05:17,939 --> 00:05:15,130
takes longer than you might think it's

125
00:05:22,080 --> 00:05:17,949
about a four hour activity over I think

126
00:05:24,450 --> 00:05:22,090
doing that actually here okay so there

127
00:05:28,260 --> 00:05:24,460
are several there are two main habitats

128
00:05:31,230 --> 00:05:28,270
one is just a micro G habitat for the

129
00:05:33,900 --> 00:05:31,240
fruit flies and another is a centrifuge

130
00:05:36,480 --> 00:05:33,910
which is simulating 1g so this acts as a

131
00:05:38,610 --> 00:05:36,490
control half of the fruit flies are in

132
00:05:40,469 --> 00:05:38,620
the suit centrifuge experiencing the

133
00:05:43,290 --> 00:05:40,479
gravity that we experience on earth and

134
00:05:45,180 --> 00:05:43,300
the other half are not in the centrifuge

135
00:05:47,820 --> 00:05:45,190
so they're experiencing microgravity and

136
00:05:49,770 --> 00:05:47,830
the radiation environment so the purpose

137
00:05:52,560 --> 00:05:49,780
of this control is to make sure that

138
00:05:55,189 --> 00:05:52,570

we're not confusing microgravity effects

139
00:05:56,969 --> 00:05:55,199
with perhaps radiation effects or other