
S/N SM003
NASA
SPACESTATION
LIVE

1
00:00:08,230 --> 00:00:06,550
among the many different kinds of

2
00:00:10,390 --> 00:00:08,240
research being done on the international

3
00:00:12,150 --> 00:00:10,400
space station there are some experiments

4
00:00:14,390 --> 00:00:12,160
that are trying to develop new

5
00:00:17,670 --> 00:00:14,400
technologies that would benefit future

6
00:00:20,070 --> 00:00:17,680
deep space exploration or life on earth

7
00:00:22,550 --> 00:00:20,080
and then there are some where both of

8
00:00:25,029 --> 00:00:22,560
those things are the case one example in

9
00:00:27,429 --> 00:00:25,039
that latter category is an experiment

10
00:00:29,189 --> 00:00:27,439
that is known as synthetic muscle and

11
00:00:31,589 --> 00:00:29,199
that's flying on the international space

12
00:00:34,549 --> 00:00:31,599
station now in order to test how it

13
00:00:35,670 --> 00:00:34,559

holds up under the radiation that exists

14
00:00:37,510 --> 00:00:35,680
in space

15
00:00:39,590 --> 00:00:37,520
joining us this morning to tell us more

16
00:00:41,910 --> 00:00:39,600
about it is the principal investigator

17
00:00:43,830 --> 00:00:41,920
and developer of the product dr lenoir

18
00:00:46,950 --> 00:00:43,840
rasmussen the founder and chief

19
00:00:48,790 --> 00:00:46,960
technology officer at ras labs in quincy

20
00:00:49,990 --> 00:00:48,800
massachusetts good morning dr ross

21
00:00:52,549 --> 00:00:50,000
madison

22
00:00:55,270 --> 00:00:52,559
good morning pat your product synthetic

23
00:00:57,029 --> 00:00:55,280
muscle is intended to do i guess just

24
00:00:58,389 --> 00:00:57,039
what the name implies

25
00:01:01,029 --> 00:00:58,399
how did you become interested in

26
00:01:02,229 --> 00:01:01,039
developing a product like that

27
00:01:04,630 --> 00:01:02,239
um

28
00:01:06,390 --> 00:01:04,640
when i was in grad school i i have an

29
00:01:07,750 --> 00:01:06,400
agricultural background and one of my

30
00:01:09,350 --> 00:01:07,760
cousins was

31
00:01:10,710 --> 00:01:09,360
working on the farm and was injured

32
00:01:12,469 --> 00:01:10,720
pretty severely

33
00:01:14,230 --> 00:01:12,479
and as the resident scientist in the

34
00:01:15,749 --> 00:01:14,240
family i was put in charge of looking at

35
00:01:17,350 --> 00:01:15,759
prosthetics

36
00:01:19,429 --> 00:01:17,360
and um

37
00:01:21,670 --> 00:01:19,439
there are some wonderful solutions but i

38
00:01:24,230 --> 00:01:21,680

was kind of disappointed nonetheless and

39
00:01:26,469 --> 00:01:24,240
what i found and felt as a kind of young

40
00:01:27,910 --> 00:01:26,479
naive chemist at the time that if you

41
00:01:29,830 --> 00:01:27,920
could develop something that responded

42
00:01:31,749 --> 00:01:29,840
to electricity

43
00:01:33,749 --> 00:01:31,759
or some other stimulus you could kind of

44
00:01:35,429 --> 00:01:33,759
bridge that gap between form and

45
00:01:38,230 --> 00:01:35,439
function you could make a prosthetic

46
00:01:40,310 --> 00:01:38,240
that both looked and moved naturally

47
00:01:42,469 --> 00:01:40,320
now part of what i understand you're

48
00:01:45,109 --> 00:01:42,479
trying to develop this for is that that

49
00:01:46,870 --> 00:01:45,119
it will have an impact in robotics in

50
00:01:48,789 --> 00:01:46,880
space

51
00:01:51,109 --> 00:01:48,799
why would a synthetic muscle improve the

52
00:01:53,590 --> 00:01:51,119
performance of a robot

53
00:01:56,230 --> 00:01:53,600
several reasons part of what i'm trying

54
00:01:58,870 --> 00:01:56,240
to do is to produce human-like grasp

55
00:02:00,709 --> 00:01:58,880
which is both gentle and firm

56
00:02:03,030 --> 00:02:00,719
and for robotics particularly for

57
00:02:05,590 --> 00:02:03,040
grippers that remains a challenge also

58
00:02:07,590 --> 00:02:05,600
our materials are self-sensing which

59
00:02:09,350 --> 00:02:07,600
means when there's mechanical pressure

60
00:02:11,910 --> 00:02:09,360
the impedance changes

61
00:02:14,070 --> 00:02:11,920
so not just for prosthetics to move

62
00:02:16,390 --> 00:02:14,080
naturally and to be able to

63
00:02:18,790 --> 00:02:16,400

sense what's going on but for robotics

64
00:02:21,430 --> 00:02:18,800
that that element that is often missing

65
00:02:23,750 --> 00:02:21,440
is touch that these can be integrated

66
00:02:26,390 --> 00:02:23,760
into one solution

67
00:02:27,990 --> 00:02:26,400
would revolutionize the way we look at

68
00:02:30,470 --> 00:02:28,000
at motion

69
00:02:32,710 --> 00:02:30,480
now you got some help from cases in

70
00:02:33,670 --> 00:02:32,720
order to get this experiment on orbit

71
00:02:34,949 --> 00:02:33,680
right

72
00:02:38,309 --> 00:02:34,959
correct

73
00:02:40,229 --> 00:02:38,319
yeah cases was very useful um actually

74
00:02:41,750 --> 00:02:40,239
in mentoring i i was one of the mass

75
00:02:44,949 --> 00:02:41,760
challenge

76
00:02:46,949 --> 00:02:44,959
2013 global accelerator went through

77
00:02:49,589 --> 00:02:46,959
that program and that's where i met

78
00:02:51,670 --> 00:02:49,599
cases um they one of the uh cynthia

79
00:02:52,710 --> 00:02:51,680
bohot was one of my mentors

80
00:02:55,030 --> 00:02:52,720
and

81
00:02:57,190 --> 00:02:55,040
my materials though i'm kind of

82
00:02:58,949 --> 00:02:57,200
my focus was on the prosthetic community

83
00:03:01,190 --> 00:02:58,959
i have done extreme temperature

84
00:03:04,869 --> 00:03:01,200
conditions prior to that when i was you

85
00:03:06,710 --> 00:03:04,879
know back in the princeton area um these

86
00:03:08,470 --> 00:03:06,720
materials lend themselves to being

87
00:03:10,470 --> 00:03:08,480
radiation resistant the class of

88
00:03:12,390 --> 00:03:10,480

polymers that they're in plus we did

89
00:03:14,470 --> 00:03:12,400
some additives and coatings on the

90
00:03:16,790 --> 00:03:14,480
iss experiment

91
00:03:19,030 --> 00:03:16,800
so that just was was just it was a great

92
00:03:20,470 --> 00:03:19,040
fit it's been a wonderful

93
00:03:22,949 --> 00:03:20,480
experience

94
00:03:25,030 --> 00:03:22,959
explain to me what it is that is is

95
00:03:26,309 --> 00:03:25,040
happening with your experiment on orbit

96
00:03:28,550 --> 00:03:26,319
now

97
00:03:29,430 --> 00:03:28,560
okay i actually have a mock experiment

98
00:03:33,509 --> 00:03:29,440
that

99
00:03:35,270 --> 00:03:33,519
just to show people there are four um

100
00:03:37,110 --> 00:03:35,280
kind of protective cages a little more

101
00:03:39,190 --> 00:03:37,120
sophisticated than this but they have

102
00:03:42,309 --> 00:03:39,200
each have eight samples

103
00:03:43,670 --> 00:03:42,319
one of them is my synthetic muscle

104
00:03:46,149 --> 00:03:43,680
um

105
00:03:48,229 --> 00:03:46,159
then the next two slots have different

106
00:03:51,190 --> 00:03:48,239
additives to enhance the radiation

107
00:03:53,429 --> 00:03:51,200
effect then the next few slots have

108
00:03:55,509 --> 00:03:53,439
coatings various coatings such as the

109
00:03:58,149 --> 00:03:55,519
mylar that's currently being used in

110
00:04:00,630 --> 00:03:58,159
space suit technology also some

111
00:04:03,910 --> 00:04:00,640
specialized coding from the us army

112
00:04:06,550 --> 00:04:03,920
natick labs and then the last

113
00:04:10,149 --> 00:04:06,560

the last spot the last two spots have

114
00:04:12,070 --> 00:04:10,159
combinations of inhibitors and coatings

115
00:04:14,390 --> 00:04:12,080
there's four of these two of them are my

116
00:04:16,550 --> 00:04:14,400
generation three material two of these

117
00:04:18,629 --> 00:04:16,560
cages up there are my generation four

118
00:04:20,390 --> 00:04:18,639
materials and then in these micro

119
00:04:22,790 --> 00:04:20,400
environments they're all encapsulated

120
00:04:24,469 --> 00:04:22,800
separately there's like one

121
00:04:27,909 --> 00:04:24,479
teflon bag around it

122
00:04:30,870 --> 00:04:27,919
so um each of the generations has a dry

123
00:04:32,469 --> 00:04:30,880
and a moist environment in order for the

124
00:04:35,030 --> 00:04:32,479
synthetic muscle to work it operates

125
00:04:35,909 --> 00:04:35,040
best moist just like real human tissue

126
00:04:38,070 --> 00:04:35,919
um

127
00:04:39,749 --> 00:04:38,080
but it can be dried and then rehydrated

128
00:04:43,510 --> 00:04:39,759
so that's one thing to consider for

129
00:04:45,350 --> 00:04:43,520
traveling is could it be you know

130
00:04:47,189 --> 00:04:45,360
desiccated dried out and then wherever

131
00:04:48,390 --> 00:04:47,199
it lands you know be reactivated with

132
00:04:51,670 --> 00:04:48,400
moisture

133
00:04:55,030 --> 00:04:51,680
and then um of the four uh experiments

134
00:04:56,790 --> 00:04:55,040
up there i also have four on earth under

135
00:04:57,590 --> 00:04:56,800
the same conditions as kind of like the

136
00:05:01,270 --> 00:04:57,600
twin

137
00:05:03,909 --> 00:05:01,280
study so there's

138
00:05:06,070 --> 00:05:03,919

32 samples and four protective cages on

139
00:05:07,990 --> 00:05:06,080
the iss and the same here on earth in

140
00:05:10,230 --> 00:05:08,000
our quincy lab

141
00:05:12,230 --> 00:05:10,240
it'll be very interesting for you to to

142
00:05:14,070 --> 00:05:12,240
get those samples back and and move on

143
00:05:15,830 --> 00:05:14,080
to that next step uh thank you for

144
00:05:17,670 --> 00:05:15,840
taking the time to tell us about it this

145
00:05:20,310 --> 00:05:17,680
morning i appreciate that

146
00:05:22,550 --> 00:05:20,320
oh thank you yes i can hardly wait to um

147
00:05:25,110 --> 00:05:22,560
and the most the analysis will be back

148
00:05:27,510 --> 00:05:25,120
here on earth

149
00:05:29,510 --> 00:05:27,520
dr lenoir rasmussen is the principal

150
00:05:31,510 --> 00:05:29,520
investigator of the synthetic muscle