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1
00:00:00,000 --> 00:00:07,316
Forty-five years ago, back in

2
00:00:07,351 --> 00:00:10,132
1968, two solar researchers

3
00:00:10,167 --> 00:00:12,035
George Simon and Nigel Weiss

4
00:00:12,070 --> 00:00:13,323
suggested that there ought to

5
00:00:13,358 --> 00:00:16,299
be these big giant cell flows

6
00:00:16,334 --> 00:00:20,372
on the sun. In 1975, just a

7
00:00:20,407 --> 00:00:21,740
few years after that, I was a

8
00:00:21,775 --> 00:00:23,596
summer intern at what was then

9
00:00:23,631 --> 00:00:24,700
called Sacramento Peak

10
00:00:24,735 --> 00:00:26,731
Observatory in Sunspot New

11
00:00:26,766 --> 00:00:28,507
Mexico and my advisor that

12
00:00:28,542 --> 00:00:30,604
summer was George Simon. So I

13
00:00:30,639 --> 00:00:31,852

show up at the beginning of

14
00:00:31,887 --> 00:00:32,859
the summer and George says

15
00:00:32,894 --> 00:00:34,772
“Let’s go look for giant cells.”

16
00:00:34,807 --> 00:00:37,299
Unfortunately, we didn’t have

17
00:00:37,334 --> 00:00:38,724
the data at the time so we, I

18
00:00:38,759 --> 00:00:40,076
spent much of the summer trying

19
00:00:40,111 --> 00:00:41,260
to figure out what they were

20
00:00:41,295 --> 00:00:42,667
and how we might try to find

21
00:00:42,702 --> 00:00:44,476
them. Over the years, I’ve

22
00:00:44,511 --> 00:00:45,980
developed techniques for

23
00:00:46,015 --> 00:00:47,236
trying to pull them out of

24
00:00:47,271 --> 00:00:48,484
the data, and the problem is

25
00:00:48,519 --> 00:00:51,068
these are really slow flows

26
00:00:51,103 --> 00:00:52,116
compared to everything else

27
00:00:52,151 --> 00:00:53,380
on the surface of the sun,

28
00:00:53,415 --> 00:00:56,052
normally 10-20 miles an hour

29
00:00:56,087 --> 00:00:57,356
when things are going around

30
00:00:57,391 --> 00:00:59,507
thousands of miles an hour.

31
00:00:59,542 --> 00:01:00,852
So they’re very difficult to

32
00:01:00,887 --> 00:01:05,020
see. Come ahead to this summer,

33
00:01:05,055 --> 00:01:06,460
I had a summer intern this

34
00:01:06,495 --> 00:01:09,100
summer. Owen Coldgrove shows

35
00:01:09,135 --> 00:01:10,932
up and my student Lisa Upton

36
00:01:10,967 --> 00:01:14,827
and I tell Owen “Let’s go look

37
00:01:14,862 --> 00:01:17,148
for giant cells.” So we spent

38
00:01:17,183 --> 00:01:18,980

the summer doing just that.

39
00:01:19,015 --> 00:01:20,292
The first half of the summer,

40
00:01:20,327 --> 00:01:22,764
unsuccessfully. We tried a

41
00:01:22,799 --> 00:01:24,460
technique that I had literally

42
00:01:24,495 --> 00:01:26,868
spent decades developing and

43
00:01:26,903 --> 00:01:29,235
it really didn’t work. So

44
00:01:29,270 --> 00:01:30,475
we tried another technique

45
00:01:30,510 --> 00:01:34,612
and first time, Owen came up

46
00:01:34,647 --> 00:01:36,068
to my office after running the

47
00:01:36,103 --> 00:01:37,539
programs over the night and

48
00:01:37,574 --> 00:01:40,348
when we looked at the data and

49
00:01:40,383 --> 00:01:41,692
we figured nah, this is it, we

50
00:01:41,727 --> 00:01:43,468
got it. We could see these

51
00:01:43,503 --> 00:01:45,699
big flow patterns on the surface

52
00:01:45,734 --> 00:01:47,148
of the sun that were persisting

53
00:01:47,183 --> 00:01:50,667
for months so we knew at that

54
00:01:50,702 --> 00:01:52,052
point, no we've got this.

55
00:01:52,087 --> 00:01:56,972
After 45 years of many people

56
00:01:57,007 --> 00:01:58,588
looking for it we finally

57
00:01:58,623 --> 00:02:00,467
found them. It was incredibly

58
00:02:00,502 --> 00:02:02,451
exciting to find these

59
00:02:02,486 --> 00:02:05,172
features on the sun. When we

60
00:02:05,207 --> 00:02:07,828
first found them, Owen and

61
00:02:07,863 --> 00:02:09,324
Dave and I were sitting in

62
00:02:09,359 --> 00:02:12,628
Dave's office and we were

63
00:02:12,663 --> 00:02:14,036

looking at the latest set of

64
00:02:14,071 --> 00:02:16,155
data that we had run the

65
00:02:16,190 --> 00:02:18,748
analysis on, and when the

66
00:02:18,783 --> 00:02:20,572
picture popped up on the

67
00:02:20,607 --> 00:02:21,804
screen, we knew immediately

68
00:02:21,839 --> 00:02:23,548
exactly what we had found and

69
00:02:23,583 --> 00:02:25,475
it was high-fives all around.

70
00:02:25,510 --> 00:02:26,756
It was just such a thrilling

71
00:02:26,791 --> 00:02:28,684
experience to find these

72
00:02:28,719 --> 00:02:30,396
features that had been sought

73
00:02:30,431 --> 00:02:31,907
after for such a long time.

74
00:02:31,942 --> 00:02:34,092
One hope is that by tracing

75
00:02:34,127 --> 00:02:35,468
these flows and seeing how

76
00:02:35,503 --> 00:02:37,500
they’re related to the emergence

77
00:02:37,535 --> 00:02:39,484
of sunspots, that we may get a

78
00:02:39,519 --> 00:02:40,948
better handle on that,

79
00:02:40,983 --> 00:02:44,148
predicting sunspots. But we

80
00:02:44,183 --> 00:02:46,563
know, just from how other flows

81
00:02:46,598 --> 00:02:48,595
move magnetic fields around on

82
00:02:48,630 --> 00:02:50,540
the surface of the sun, that

83
00:02:50,575 --> 00:02:52,172
these flows will do that as

84
00:02:52,207 --> 00:02:54,028
well, and that influences the

85
00:02:54,063 --> 00:02:56,804
sunspot cycle: how big the next

86
00:02:56,839 --> 00:02:58,476
cycle’s going to be, it

87
00:02:58,511 --> 00:02:59,764
influences the structure of

88
00:02:59,799 --> 00:03:01,076

the magnetic field throughout

89
00:03:01,111 --> 00:03:02,180
the solar system, that it

90
00:03:02,215 --> 00:03:04,211
comes off of the sun with the

91
00:03:04,246 --> 00:03:06,107
solar wind and influences how

92
00:03:06,142 --> 00:03:09,284
it impacts the Earth, how it

93
00:03:09,319 --> 00:03:11,300
impacts our satellites in