



1
00:00:03,303 --> 00:00:04,904
>> FOR THOUSANDS OF YEARS,

2
00:00:04,904 --> 00:00:06,306
MANKIND HAS WONDERED

3
00:00:06,306 --> 00:00:07,273
"ARE THERE PLANETS AROUND

4
00:00:07,273 --> 00:00:09,175
OTHER STARS?

5
00:00:09,175 --> 00:00:11,277
IS THERE LIFE OUT THERE?"

6
00:00:11,277 --> 00:00:12,479
BUT WE DIDN'T KNOW.

7
00:00:12,479 --> 00:00:13,480
WE DIDN'T KNOW IF THERE WERE

8
00:00:13,480 --> 00:00:16,783
ANY PLANETS AROUND OTHER STARS.

9
00:00:16,783 --> 00:00:18,518
>> ZERO AND LIFTOFF

10
00:00:18,518 --> 00:00:19,786
OF THE DELTA TWO ROCKET

11
00:00:19,786 --> 00:00:21,554
WITH KEPLER, ON A SEARCH

12
00:00:21,554 --> 00:00:23,356
FOR PLANETS IN SOME WAY

13
00:00:23,356 --> 00:00:24,924

LIKE OUR OWN.

14

00:00:24,924 --> 00:00:26,559

>> BEFORE THE LAUNCH OF KEPLER,

15

00:00:26,559 --> 00:00:27,594

MOST OF THE PLANETS

16

00:00:27,594 --> 00:00:28,595

WE KNEW ABOUT WERE REALLY

17

00:00:28,595 --> 00:00:30,930

BIG PLANETS, LIKE JUPITER.

18

00:00:30,930 --> 00:00:32,499

BUT KEPLER WAS SO SENSITIVE,

19

00:00:32,499 --> 00:00:33,533

THAT WE STARTED FINDING

20

00:00:33,533 --> 00:00:35,435

SMALLER AND SMALLER PLANETS.

21

00:00:35,435 --> 00:00:37,003

>> WE DISCOVERED PLANETS

22

00:00:37,003 --> 00:00:38,371

SMALLER THAN HAD EVER

23

00:00:38,371 --> 00:00:39,506

BEEN DISCOVERED BEFORE

24

00:00:39,506 --> 00:00:42,142

AND JUST, MANY OF THEM.

25

00:00:42,142 --> 00:00:43,376

INDICATING THAT THE GALAXY

26

00:00:43,376 --> 00:00:45,211
IS FULL OF PLANETS.

27

00:00:45,211 --> 00:00:46,646
CRAZY WORLDS THAT WE

28

00:00:46,646 --> 00:00:48,114
DIDN'T PREDICT, THINGS

29

00:00:48,114 --> 00:00:50,116
THAT WE HADN'T IMAGINED.

30

00:00:50,116 --> 00:00:51,418
WE FIND PLANETS ORBITING

31

00:00:51,418 --> 00:00:53,186
SO CLOSE TO THEIR PARENT STAR

32

00:00:53,186 --> 00:00:54,754
THAT THE STAR-FACING SIDE

33

00:00:54,754 --> 00:00:56,055
HAS TEMPERATURES IN EXCESS

34

00:00:56,055 --> 00:00:58,425
OF THAT REQUIRED TO MELT IRON.

35

00:00:58,425 --> 00:00:59,459
THESE PLANETS HAVE

36

00:00:59,459 --> 00:01:00,593
AN ENTIRE HEMISPHERE

37

00:01:00,593 --> 00:01:01,995
THAT'S LIKE A LIQUID OCEAN.

38

00:01:01,995 --> 00:01:03,463

BUT IT'S NOT AN OCEAN OF WATER.

39

00:01:03,463 --> 00:01:06,699

IT'S AN OCEAN OF MOLTEN ROCK.

40

00:01:06,699 --> 00:01:08,134

WE SEE PLANETS THAT ARE

41

00:01:08,134 --> 00:01:10,904

ORBITING NOT ONE BUT TWO STARS.

42

00:01:10,904 --> 00:01:12,238

THAT IS, IF YOU LOOK IN

43

00:01:12,238 --> 00:01:13,740

THE EAST YOU WOULD SEE

44

00:01:13,740 --> 00:01:15,975

NOT ONE STAR RISE BUT TWO.

45

00:01:20,613 --> 00:01:21,881

>> ALMOST ALL THE ASTRONOMERS

46

00:01:21,881 --> 00:01:23,583

THAT I KNOW GREW UP

47

00:01:23,583 --> 00:01:25,218

READING SCIENCE FICTION.

48

00:01:25,218 --> 00:01:26,286

THAT'S WHY A LOT OF THEM

49

00:01:26,286 --> 00:01:27,520

GOT INTO THE BUSINESS OF

50

00:01:27,520 --> 00:01:28,788

LOOKING FOR PLANETS

51

00:01:28,788 --> 00:01:30,256
IN THE FIRST PLACE.

52

00:01:30,256 --> 00:01:31,658
TO FIND OUT IF ANY OF

53

00:01:31,658 --> 00:01:33,226
THIS, YOU KNOW, FANTASTIC

54

00:01:33,226 --> 00:01:35,595
SPECULATION THAT INSPIRED US,

55

00:01:35,595 --> 00:01:37,330
COULD BE TRUE.

56

00:01:37,330 --> 00:01:39,032
AND NOW WE FIND OUT THAT,

57

00:01:39,032 --> 00:01:40,867
YEAH, IT COULD BE TRUE.

58

00:01:40,867 --> 00:01:42,068
>> WE LEARNED FROM KEPLER

59

00:01:42,068 --> 00:01:43,102
THAT THE MOST COMMON TYPES

60

00:01:43,102 --> 00:01:44,304
OF PLANETS IN THE GALAXY

61

00:01:44,304 --> 00:01:45,305
ARE UNLIKE THE PLANETS

62

00:01:45,305 --> 00:01:47,440
IN OUR OWN SOLAR SYSTEM.

63

00:01:47,440 --> 00:01:48,341

THESE WORLDS ARE

64

00:01:48,341 --> 00:01:49,342

INTERMEDIATE IN SIZE

65

00:01:49,342 --> 00:01:51,377

BETWEEN THE EARTH AND NEPTUNE,

66

00:01:51,377 --> 00:01:52,479

BUT WE'RE NOT EXACTLY SURE

67

00:01:52,479 --> 00:01:54,347

WHAT THEY'RE MADE OF.

68

00:01:54,347 --> 00:01:55,348

>> WHAT ARE THE THINGS

69

00:01:55,348 --> 00:01:56,349

THAT WE KNOW NOW,

70

00:01:56,349 --> 00:01:57,617

THAT WE DIDN'T KNOW THEN?

71

00:01:57,617 --> 00:01:58,585

I MEAN, THINGS LIKE PLANETS

72

00:01:58,585 --> 00:01:59,819

ARE UBIQUITOUS.

73

00:01:59,819 --> 00:02:01,488

PLANETS ARE DIVERSE.

74

00:02:01,488 --> 00:02:02,589

THE STARS THAT WE FIND

75

00:02:02,589 --> 00:02:04,757

PLANETS AROUND ARE DIVERSE.

76
00:02:04,757 --> 00:02:06,493
THE SYSTEMS THAT PLANETS

77
00:02:06,493 --> 00:02:09,762
LIVE IN VARY WIDELY.

78
00:02:09,762 --> 00:02:11,931
>> IT WAS BREATH-TAKING TO SEE

79
00:02:11,931 --> 00:02:13,867
ALL THE PLANETS COME ROLLING IN

80
00:02:13,867 --> 00:02:15,301
FROM THIS EXQUISITE DATA

81
00:02:15,301 --> 00:02:16,269
OVER THE YEARS THAT

82
00:02:16,269 --> 00:02:17,103
WE WERE COLLECTING DATA

83
00:02:17,103 --> 00:02:18,338
WITH KEPLER.

84
00:02:18,338 --> 00:02:19,272
IN THE END, WE FOUND

85
00:02:19,272 --> 00:02:21,074
DOZENS OF SMALL, POTENTIALLY

86
00:02:21,074 --> 00:02:23,209
ROCKY WORLDS ORBITING IN

87
00:02:23,209 --> 00:02:24,177
THE "GOLDILOCKS ZONE"

88
00:02:24,177 --> 00:02:24,844

OF THEIR STARS.

89

00:02:24,844 --> 00:02:26,546

THAT DISTANCE AT WHICH YOU

90

00:02:26,546 --> 00:02:27,914

COULD HAVE LIQUID WATER POOLING

91

00:02:27,914 --> 00:02:30,416

ON THE SURFACE OF THE PLANET,

92

00:02:30,416 --> 00:02:31,351

CAPABLE OF SUPPORTING

93

00:02:31,351 --> 00:02:33,219

LIFE AS WE KNOW IT.

94

00:02:33,219 --> 00:02:34,554

>> THE SCIENCE VALUE OF

95

00:02:34,554 --> 00:02:36,422

THE COLLECTED DATA SPANS

96

00:02:36,422 --> 00:02:38,992

ALMOST EVERY FIELD OF ASTRONOMY

97

00:02:38,992 --> 00:02:40,860

AND PLANETARY SCIENCE.

98

00:02:40,860 --> 00:02:42,695

IT REVOLUTIONIZED NOT JUST

99

00:02:42,695 --> 00:02:44,831

EXOPLANETS, NOT JUST STARS,

100

00:02:44,831 --> 00:02:46,165

BUT A LARGE NUMBER OF

101
00:02:46,165 --> 00:02:47,300
THE SCIENTIFIC FIELDS

102
00:02:47,300 --> 00:02:49,302
OF ASTRONOMY TODAY.

103
00:02:49,302 --> 00:02:50,203
>> THERE WAS ONE SUMMER WHERE

104
00:02:50,203 --> 00:02:51,137
I WORKED AT AN OBSERVATORY

105
00:02:51,137 --> 00:02:52,672
AND I WOULD GO OUTSIDE AT NIGHT

106
00:02:52,672 --> 00:02:53,706
AND LOOK UP AT THE STARS

107
00:02:53,706 --> 00:02:55,041
AND JUST BE BLOWN AWAY

108
00:02:55,041 --> 00:02:58,678
AT HOW VAST SPACE WAS.

109
00:02:58,678 --> 00:02:59,746
AND I ACTUALLY FELT

110
00:02:59,746 --> 00:03:02,315
A LITTLE LONELY.

111
00:03:02,315 --> 00:03:03,516
AND WHEN I GO OUT AND I LOOK

112
00:03:03,516 --> 00:03:05,385
AT THE NIGHT SKY NOW,

113
00:03:05,385 --> 00:03:06,519

RATHER THAN BEING AWESTRUCK

114

00:03:06,519 --> 00:03:07,687

BY THE VASTNESS, I'M AWESTRUCK

115

00:03:07,687 --> 00:03:09,155

BY THE POSSIBILITY.

116

00:03:09,155 --> 00:03:10,156

>> THERE AREN'T THAT

117

00:03:10,156 --> 00:03:12,258

MANY OPPORTUNITIES IN LIFE

118

00:03:12,258 --> 00:03:13,626

WHERE YOU GET TO PARTICIPATE

119

00:03:13,626 --> 00:03:15,929

IN A PROJECT AS IMPORTANT

120

00:03:15,929 --> 00:03:17,697

AS KEPLER IS THAT ANSWERS

121

00:03:17,697 --> 00:03:19,532

SUCH A FUNDAMENTAL QUESTION

122

00:03:19,532 --> 00:03:20,633

THAT WE'VE BEEN ASKING

123

00:03:20,633 --> 00:03:22,969

OURSELVES FOR SO LONG.

124

00:03:22,969 --> 00:03:24,103

NOW WE KNOW WHEN WE LOOK UP

125

00:03:24,103 --> 00:03:25,071

INTO THE NIGHT SKY

126
00:03:25,071 --> 00:03:26,773
THAT EVERY STAR WE SEE HAS,

127
00:03:26,773 --> 00:03:28,641
ON AVERAGE, AT LEAST ONE PLANET.

128
00:03:28,641 --> 00:03:30,243
AND THAT MANY OF THOSE PLANETS

129
00:03:30,243 --> 00:03:32,412
ARE SIMILAR IN SIZE TO THE EARTH

130
00:03:32,412 --> 00:03:33,379
AND A CHANCE FOR LIFE

131
00:03:33,379 --> 00:03:35,515
AS WE KNOW IT ELSEWHERE.

132
00:03:35,515 --> 00:03:37,083
>> SEARCHING FOR LIFE ELSEWHERE

133
00:03:37,083 --> 00:03:38,785
IS ONE OF THE KEY THEMES

134
00:03:38,785 --> 00:03:41,020
THAT DRIVE OUR SCIENCE PORTFOLIO

135
00:03:41,020 --> 00:03:43,289
AND AT THE CENTER OF THAT

136
00:03:43,289 --> 00:03:45,158
IS KEPLER.

137
00:03:45,158 --> 00:03:46,593
NEW MISSIONS LIKE

138
00:03:46,593 --> 00:03:47,727

THE TRANSITING EXOPLANET

139

00:03:47,727 --> 00:03:49,896
SURVEY SATELLITE, TESS,

140

00:03:49,896 --> 00:03:51,097
AND THE JAMES WEBB SPACE

141

00:03:51,097 --> 00:03:52,665
TELESCOPE WILL BUILD ON

142

00:03:52,665 --> 00:03:54,400
KEPLER'S SUCCESS AND TAKE

143

00:03:54,400 --> 00:03:56,069
OUR SEARCH FOR LIFE

144

00:03:56,069 --> 00:03:58,905
TO NEW HEIGHTS.

145

00:03:58,905 --> 00:03:59,906
>> IT HAS BEEN EXTREMELY

146

00:03:59,906 --> 00:04:02,342
GRATIFYING TO SEE THE DATA

147

00:04:02,342 --> 00:04:04,243
COME BACK FROM THE MISSION

148

00:04:04,243 --> 00:04:06,379
AND SHOW WHAT WE WANTED TO KNOW,

149

00:04:06,379 --> 00:04:07,847
GIVE US THE ANSWER.

150

00:04:07,847 --> 00:04:10,316
MANY STARS HAVE PLANETS,

151

00:04:10,316 --> 00:04:11,584

A LOT OF THESE PLANETS

152

00:04:11,584 --> 00:04:13,519

ARE EARTH-SIZED.

153

00:04:13,519 --> 00:04:14,821

THAT'S KEPLER'S LEGACY.

154

00:04:14,821 --> 00:04:16,623

THIS NEW KNOWLEDGE