



1  
00:00:39,933 --> 00:00:45,933  
&gt;&gt;&gt; WELCOME TO TODAY'S VERSION

2  
00:00:45,933 --> 00:00:49,933  
OF LUNCH AND LEARN.

3  
00:00:49,933 --> 00:01:01,000  
SO WE WANT TO TALK ABOUT -- IF

4  
00:01:01,000 --> 00:01:02,000  
YOU MISSED IT IN 2004, UNLESS

5  
00:01:02,000 --> 00:01:05,000  
YOU PLAN TO LIVE TO BE ABOUT 150

6  
00:01:05,000 --> 00:01:06,000  
YEARS OLD, YOU'RE PROBABLY NOT

7  
00:01:06,000 --> 00:01:09,000  
GOING TO SEE THIS THING AGAIN,

8  
00:01:09,000 --> 00:01:12,000  
OR -- AND SO WE'RE GOING TO TALK

9  
00:01:12,000 --> 00:01:14,000  
ABOUT THE VENUS AND TRANSIT, AND

10  
00:01:14,000 --> 00:01:16,000  
WE'RE GOING TO DO A LITTLE BIT

11  
00:01:16,000 --> 00:01:25,000  
MORE THAN JUST TALK ABOUT THE

12  
00:01:25,000 --> 00:01:26,000  
TRANSIT.

13  
00:01:26,000 --> 00:01:31,933

WE ALSO WANT TO TALK ABOUT THE

14

00:01:31,933 --> 00:01:32,933

ASTRONOMICAL EVENT IN TERMS OF

15

00:01:32,933 --> 00:01:34,933

ITS IMPACT ON SPACE SCIENCE, AND

16

00:01:34,933 --> 00:01:36,933

THERE'S A VERY RICH HISTORY

17

00:01:36,933 --> 00:01:41,933

HERE, WHICH I HOPE YOU'LL ENJOY,

18

00:01:41,933 --> 00:01:42,800

AND IT'S MADE A SIGNIFICANT

19

00:01:42,800 --> 00:01:43,566

DIFFERENCE.

20

00:01:43,566 --> 00:01:44,933

AS YOU CAME IN, YOU WILL HAVE

21

00:01:44,933 --> 00:01:45,933

NOTICED THAT THERE'S SOME

22

00:01:45,933 --> 00:01:48,933

POSTERS AND ALSO SOME OF THESE

23

00:01:48,933 --> 00:01:50,933

VIEWING GLASSES, SO PLEASE

24

00:01:50,933 --> 00:01:52,266

WELCOME TO TAKE ONE -- TAKE ONLY

25

00:01:52,266 --> 00:01:53,000

ONE.

26  
00:01:53,000 --> 00:01:54,933  
DON'T TAKE 20 FOR ALL YOUR

27  
00:01:54,933 --> 00:01:55,933  
FAMILY AND FRIENDS TOMORROW

28  
00:01:55,933 --> 00:01:56,933  
BECAUSE A LOT OF PEOPLE ARE

29  
00:01:56,933 --> 00:01:58,933  
GOING TO SPREAD THESE OUT, AND

30  
00:01:58,933 --> 00:01:59,933  
WE'LL TALK A LITTLE BIT ABOUT

31  
00:01:59,933 --> 00:02:01,433  
THESE GLASSES HERE IN A LITTLE

32  
00:02:01,433 --> 00:02:02,766  
BIT, BUT IT'S VERY IMPORTANT

33  
00:02:02,766 --> 00:02:05,000  
THAT YOU GET SOME IF YOU WANT TO

34  
00:02:05,000 --> 00:02:08,000  
VIEW THE EVENT.

35  
00:02:08,000 --> 00:02:10,000  
SO LET'S GO AHEAD AND START AND

36  
00:02:10,000 --> 00:02:12,000  
TALK ABOUT THE VENUS IN TRANSIT.

37  
00:02:12,000 --> 00:02:14,000  
FIRST OF ALL, I WANT TO SAY THAT

38  
00:02:14,000 --> 00:02:17,000

THIS TALK THAT I GOT -- THAT I

39

00:02:17,000 --> 00:02:19,000

AM GOING TO PRESENT HERE IS

40

00:02:19,000 --> 00:02:21,000

LARGELY PUT TOGETHER BY DR. JIM

41

00:02:21,000 --> 00:02:22,000

GREEN, WHO IS THE PLANETARY

42

00:02:22,000 --> 00:02:25,000

SCIENCE DIVISION UP AT NASA

43

00:02:25,000 --> 00:02:26,000

HEADQUARTERS, AND HE SAT WITH

44

00:02:26,000 --> 00:02:28,933

CORKY AND I ON THURSDAY

45

00:02:28,933 --> 00:02:29,933

THIS GREAT THING I'M GOING TO BE

46

00:02:29,933 --> 00:02:31,933

PRESENTING TO THE EMPLOYEES OF

47

00:02:31,933 --> 00:02:33,933

THE DISCOVERY CHANNEL, AND AS

48

00:02:33,933 --> 00:02:34,933

CORKY AND I WERE LOOKING, WE

49

00:02:34,933 --> 00:02:36,933

THOUGHT, MAN, THIS IS GREAT.

50

00:02:36,933 --> 00:02:38,933

I WONDER IF WE COULD STEAL IT

51  
00:02:38,933 --> 00:02:40,066  
FROM YOU AND SHARE IT AT

52  
00:02:40,066 --> 00:02:40,700  
MARSHALL.

53  
00:02:40,700 --> 00:02:42,933  
HE SAID, GREAT, SURE.

54  
00:02:42,933 --> 00:02:44,933  
I ADJUSTED, BUT TO LARGE PART

55  
00:02:44,933 --> 00:02:46,933  
THIS WAS PUT TOGETHER BY JIM

56  
00:02:46,933 --> 00:02:47,933  
GREEN AND WITH SIGNIFICANT

57  
00:02:47,933 --> 00:02:51,933  
CONTRIBUTIONS ALSO FROM J.P.L.,

58  
00:02:51,933 --> 00:02:52,933  
AS YOU'LL SEE.

59  
00:02:52,933 --> 00:02:53,933  
FIRST OF ALL, LET'S TALK ABOUT

60  
00:02:53,933 --> 00:02:56,133  
WHAT A TRANSIT IS, AND IT'S VERY

61  
00:02:56,133 --> 00:02:56,933  
SIMPLE.

62  
00:02:56,933 --> 00:03:01,000  
IT'S BASICALLY WHEN -- IT'S LIKE

63  
00:03:01,000 --> 00:03:02,000

AN ECLIPSE WHERE AN OBJECT

64

00:03:02,000 --> 00:03:04,000

PASSES BETWEEN US AND THE SUN

65

00:03:04,000 --> 00:03:05,166

AND IT BLOCKS OUT PART OF THE

66

00:03:05,166 --> 00:03:05,966

LIGHT.

67

00:03:05,966 --> 00:03:08,000

NOW, WHEN A LUNAR ECLIPSE OCCURS

68

00:03:08,000 --> 00:03:09,000

OR SOLAR ECLIPSE, WHEN THE MOON

69

00:03:09,000 --> 00:03:12,000

GOES BETWEEN THE SUN AND THE

70

00:03:12,000 --> 00:03:14,000

EARTH, IT REALLY BLOCKS OUT

71

00:03:14,000 --> 00:03:16,000

ESSENTIALLY THE ENTIRE SUN.

72

00:03:16,000 --> 00:03:17,000

WELL, VENUS IS TOO CLOSE TO THE

73

00:03:17,000 --> 00:03:20,000

SUN TO ACTUALLY DO ALL THAT, BUT

74

00:03:20,000 --> 00:03:23,000

IT WILL GO ACROSS THE SUN, AND

75

00:03:23,000 --> 00:03:27,000

YOU WILL BE ABLE TO SEE ITS

76  
00:03:27,000 --> 00:03:28,933  
SHADOW AS IT PASSES ACROSS THE

77  
00:03:28,933 --> 00:03:31,933  
DISK OF THE SUN, AND SO THAT IS

78  
00:03:31,933 --> 00:03:34,933  
ESSENTIALLY WHAT A TRANSIT IS.

79  
00:03:34,933 --> 00:03:36,933  
WE ALL SEE THIS EVERY TIME VENUS

80  
00:03:36,933 --> 00:03:38,933  
GETS NEAR THE SUN BECAUSE THE

81  
00:03:38,933 --> 00:03:41,933  
ORBIT OF VENUS AND THE ORBIT OF

82  
00:03:41,933 --> 00:03:42,933  
EARTH AROUND THE SUN ARE

83  
00:03:42,933 --> 00:03:44,933  
SLIGHTLY TILTED TOWARDS EACH

84  
00:03:44,933 --> 00:03:45,933  
OTHER, SO THERE ARE TIMES WHEN

85  
00:03:45,933 --> 00:03:46,933  
VENUS GOES BETWEEN US AND THE

86  
00:03:46,933 --> 00:03:49,933  
SUN, BUT BECAUSE OF THE ANGLE,

87  
00:03:49,933 --> 00:03:51,266  
IT DOES NOT PASS IN FRONT OF THE

88  
00:03:51,266 --> 00:03:51,933

SUN.

89

00:03:51,933 --> 00:03:53,933

WE DON'T SEE A TRANSIT.

90

00:03:53,933 --> 00:03:55,933

OCCASIONALLY THIS DOES HAPPEN,

91

00:03:55,933 --> 00:03:57,933

AND IT ONLY HAPPENS EVERY SO

92

00:03:57,933 --> 00:03:59,933

OFTEN, AND HERE ARE THE DATES

93

00:03:59,933 --> 00:04:01,000

THAT YOU CAN SEE THE PREVIOUS

94

00:04:01,000 --> 00:04:02,000

TRANSITS AND, OF COURSE,

95

00:04:02,000 --> 00:04:05,000

TOMORROW IS THE ONE THAT'S GOING

96

00:04:05,000 --> 00:04:08,000

TO HAPPEN HERE, AND YOU'LL SEE

97

00:04:08,000 --> 00:04:11,000

ALSO THERE'S -- THAT IT DOESN'T

98

00:04:11,000 --> 00:04:16,000

HAPPEN ON A PERIODIC BASIS, AND

99

00:04:16,000 --> 00:04:18,000

THE REASON THAT IS IS BECAUSE ON

100

00:04:18,000 --> 00:04:19,000

TWO CONSECUTIVE OPPORTUNITIES

101  
00:04:19,000 --> 00:04:21,000  
WHERE VENUS IS BETWEEN US AND

102  
00:04:21,000 --> 00:04:22,200  
THE SUN, SOMETIMES IT'S SKIMMING

103  
00:04:22,200 --> 00:04:23,166  
THE TOP OF THE SUN, AND

104  
00:04:23,166 --> 00:04:25,000  
SOMETIMES IT'S SKIMMING THE

105  
00:04:25,000 --> 00:04:26,433  
BOTTOM OF THE SUN.

106  
00:04:26,433 --> 00:04:27,433  
THAT POINT.

107  
00:04:27,433 --> 00:04:31,933  
IF YOU LOOK AT THE PATH OF VENUS

108  
00:04:31,933 --> 00:04:35,933  
AND THE SKY IN 2004, THE LAST

109  
00:04:35,933 --> 00:04:36,933  
TIME THE TRANSIT OCCURRED, YOU

110  
00:04:36,933 --> 00:04:39,933  
CAN SEE THAT AT FIRST IT STARTED

111  
00:04:39,933 --> 00:04:41,933  
TRANSITING -- THIS IS THE SUN.

112  
00:04:41,933 --> 00:04:42,933  
FIRST IT STARTED TRANSITING

113  
00:04:42,933 --> 00:04:45,933

ABOVE THE SUN, AND THEN ITS

114

00:04:45,933 --> 00:04:46,933

PATHWAY, IF YOU WERE EXTENDED

115

00:04:46,933 --> 00:04:48,933

HERE, YOU COULD SEE IT WENT

116

00:04:48,933 --> 00:04:49,933

RIGHT ACROSS THE SUN.

117

00:04:49,933 --> 00:04:50,933

THEN THE NEXT TIME IT CAME BY,

118

00:04:50,933 --> 00:04:51,933

IT WAS BELOW THE SUN.

119

00:04:51,933 --> 00:04:53,933

SO BECAUSE OF THE ANGLE WE DON'T

120

00:04:53,933 --> 00:04:57,933

GET THIS TRANSIT EVERY TIME

121

00:04:57,933 --> 00:05:01,000

OBSERVED EVERY TIME, BUT

122

00:05:01,000 --> 00:05:02,000

TOMORROW IS THE FIRST ONE -- OR

123

00:05:02,000 --> 00:05:04,000

IT WILL BE THE LAST ONE FOR

124

00:05:04,000 --> 00:05:06,466

ANOTHER 100 OR SO SOME ODD

125

00:05:06,466 --> 00:05:07,300

YEARS.

126  
00:05:07,300 --> 00:05:09,500  
NOW, THIS IS OBVIOUSLY NOT A NEW

127  
00:05:09,500 --> 00:05:10,233  
EVENT.

128  
00:05:10,233 --> 00:05:14,000  
THERE'S EVIDENCE THAT -- OF

129  
00:05:14,000 --> 00:05:16,000  
VENUS TRANSITS IN HISTORY.

130  
00:05:16,000 --> 00:05:19,000  
BACK TO THE BABYLONIAN DAYS IN

131  
00:05:19,000 --> 00:05:23,000  
1500 B.C. AND EVEN THE AZTECS,

132  
00:05:23,000 --> 00:05:24,000  
MONTEZUMA AND SOME OF THEIR

133  
00:05:24,000 --> 00:05:24,700  
RECORDINGS, THERE'S EVIDENCE OF

134  
00:05:24,700 --> 00:05:25,466  
THAT.

135  
00:05:25,466 --> 00:05:26,000  
I KNOW THIS IS TRUE BECAUSE I

136  
00:05:26,000 --> 00:05:28,933  
GOT THIS ON THE WEB.

137  
00:05:28,933 --> 00:05:29,933  
SO, THEREFORE, IT MUST BE

138  
00:05:29,933 --> 00:05:31,933

OBVIOUSLY TRUE.

139

00:05:31,933 --> 00:05:33,933

NOW, SERIOUSLY, IT'S NOT

140

00:05:33,933 --> 00:05:35,933

CONCLUSIVE EVIDENCE, BUT PEOPLE

141

00:05:35,933 --> 00:05:38,933

WHO REALLY UNDERSTAND THIS DO

142

00:05:38,933 --> 00:05:40,933

BELIEVE THAT THEY WERE

143

00:05:40,933 --> 00:05:41,933

REFERENCING OR A STRONG

144

00:05:41,933 --> 00:05:43,933

POSSIBILITY THAT THEY WERE

145

00:05:43,933 --> 00:05:46,933

REFERENCING A VENUS TRANSIT.

146

00:05:46,933 --> 00:05:47,933

OUR VERY FIRST -- LET'S TALK

147

00:05:47,933 --> 00:05:50,933

ABOUT THE IMPACT OF THIS VENUS

148

00:05:50,933 --> 00:05:51,933

TRANSIT TO SPACE SCIENCE.

149

00:05:51,933 --> 00:05:55,933

I'M GOING TO MAKE THE CASE THAT

150

00:05:55,933 --> 00:05:56,933

NASA IN TERMS THAT THEY TALK

151  
00:05:56,933 --> 00:06:01,000  
ABOUT THE SCIENCE MISSION

152  
00:06:01,000 --> 00:06:02,000  
DIRECTORY THAT WE HAVE

153  
00:06:02,000 --> 00:06:04,000  
ASTROPHYSICS AND PLANETARY

154  
00:06:04,000 --> 00:06:05,000  
SCIENCE AND EARTH SCIENCE, AND

155  
00:06:05,000 --> 00:06:08,000  
WE HAVE HELIOPHYSICS, AND I'M

156  
00:06:08,000 --> 00:06:09,000  
GOING TO TRY TO MAKE THE CASE

157  
00:06:09,000 --> 00:06:12,000  
TODAY THAT IN EVERY ONE OF THESE

158  
00:06:12,000 --> 00:06:14,000  
AREAS, THIS PARTICULAR EVENT

159  
00:06:14,000 --> 00:06:15,000  
THROUGHOUT TIME HAS PLAYED A

160  
00:06:15,000 --> 00:06:17,533  
ROLE IN EACH OF THOSE SCIENCE

161  
00:06:17,533 --> 00:06:18,766  
DISCIPLINES.

162  
00:06:18,766 --> 00:06:24,000  
BEGINNING IN 1610 WITH GALILEO

163  
00:06:24,000 --> 00:06:25,000

AND HIS -- AND THE DEVELOPMENT

164

00:06:25,000 --> 00:06:29,933

OF THE TELESCOPE, HE WAS ABLE TO

165

00:06:29,933 --> 00:06:32,933

LIKE WE SEE THE LUNAR PHASES AND

166

00:06:32,933 --> 00:06:34,933

DETERMINE THAT THAT BRIGHT

167

00:06:34,933 --> 00:06:35,933

OBJECT IN THE SKY WAS NOT JUST A

168

00:06:35,933 --> 00:06:37,933

POINT, BUT IT WAS ACTUALLY A

169

00:06:37,933 --> 00:06:40,933

DISK OR A BALL, AND HE COULD

170

00:06:40,933 --> 00:06:43,933

OBSERVE THE PHASES OF VENUS, AND

171

00:06:43,933 --> 00:06:45,933

THIS WAS VERY SIGNIFICANT AT

172

00:06:45,933 --> 00:06:48,933

THAT PERIOD OF TIME BECAUSE IT

173

00:06:48,933 --> 00:06:54,933

FURTHER CONFIRMS THE CAPERNICUS

174

00:06:54,933 --> 00:06:56,933

IDEA THAT THE PLANETS REVOLVED

175

00:06:56,933 --> 00:06:57,933

AROUND THE SUN AND NOT

176  
00:06:57,933 --> 00:06:59,933  
EVERYTHING AROUND THE EARTH, SO

177  
00:06:59,933 --> 00:07:01,000  
YOU ALL KNOW A LITTLE BIT ABOUT

178  
00:07:01,000 --> 00:07:03,000  
THE TRIALS AND TRIBULATIONS THAT

179  
00:07:03,000 --> 00:07:08,000  
GALILEO WENT THROUGH ON THAT,

180  
00:07:08,000 --> 00:07:10,000  
BUT, NEVERTHELESS, THE

181  
00:07:10,000 --> 00:07:15,000  
OBSERVATIONS OF VENUS WERE

182  
00:07:15,000 --> 00:07:18,000  
SIGNIFICANT IN THAT SENSE.

183  
00:07:18,000 --> 00:07:20,000  
THERE'S A TON OF DATA OF THESE

184  
00:07:20,000 --> 00:07:20,800  
PLANETS AS THEY WERE BEING

185  
00:07:20,800 --> 00:07:21,566  
DISCOVERED.

186  
00:07:21,566 --> 00:07:23,000  
I'M TRYING TO UNDERSTAND WHAT

187  
00:07:23,000 --> 00:07:26,000  
THEIR MOTION WAS AND, OF COURSE,

188  
00:07:26,000 --> 00:07:30,000

KEPLER CAME UP WITH THE THEORY

189

00:07:30,000 --> 00:07:34,000

OF ORBITAL MECHANICS, AND IN

190

00:07:34,000 --> 00:07:37,000

DOING SO HE PREDICTED A VENUS

191

00:07:37,000 --> 00:07:40,000

TRANSIT IN 1631.

192

00:07:40,000 --> 00:07:41,000

NOW, UNFORTUNATELY, THIS

193

00:07:41,000 --> 00:07:42,000

PARTICULAR TRANSIT WAS NOT

194

00:07:42,000 --> 00:07:44,000

VISIBLE IN EUROPE, SO THERE'S NO

195

00:07:44,000 --> 00:07:45,000

RECORDED EVIDENCE ABOUT ANYBODY

196

00:07:45,000 --> 00:07:46,000

HAVING SEEN IT AND, OF COURSE,

197

00:07:46,000 --> 00:07:48,000

THERE MAY HAVE BEEN A LITTLE BIT

198

00:07:48,000 --> 00:07:50,000

OF DISAPPOINTMENT FROM THE FOLKS

199

00:07:50,000 --> 00:07:52,000

AT THAT POINT.

200

00:07:52,000 --> 00:07:53,000

HOWEVER, EIGHT YEARS LATER, YOU

201  
00:07:53,000 --> 00:07:54,000  
KNOW, THIS IS KIND OF THAT

202  
00:07:54,000 --> 00:07:57,000  
SECOND PAIR OF THE TRANSIT.

203  
00:07:57,000 --> 00:08:01,066  
IT WAS OBSERVED.

204  
00:08:01,066 --> 00:08:02,066  
JEREMIAH CORRECTLY PREDICTS AND

205  
00:08:02,066 --> 00:08:03,066  
FIRST OEBZ THE VENUS TRANSIT AND

206  
00:08:03,066 --> 00:08:07,066  
HIS BUDDY WILLIAM CRABTREE DID

207  
00:08:07,066 --> 00:08:08,066  
THE SAME.

208  
00:08:08,066 --> 00:08:12,066  
THIS IS THE FIRST TIME WHERE WE

209  
00:08:12,066 --> 00:08:13,066  
GET REALLY STRONG EVIDENCE OF

210  
00:08:13,066 --> 00:08:15,066  
THE FIRST UNMISTAKABLE

211  
00:08:15,066 --> 00:08:17,066  
OBSERVATIONS OF THE TRANSIT

212  
00:08:17,066 --> 00:08:19,066  
ACROSS THE SUN, AND SO IN

213  
00:08:19,066 --> 00:08:20,066

## PLANETARY SCIENCE WE'RE GOING

214

00:08:20,066 --> 00:08:22,066

BEGINNING TO SEE THAT FOLKS ARE

215

00:08:22,066 --> 00:08:23,066

GETTING A HANDLE ABOUT HOW THE

216

00:08:23,066 --> 00:08:26,066

PLANETS MOVE AND WHERE THEY ARE

217

00:08:26,066 --> 00:08:30,000

AND SO IT HAD -- IT PLAYS A

218

00:08:30,000 --> 00:08:31,000

SCIENCE.

219

00:08:31,000 --> 00:08:33,000

NOW, THE FOLLOWING YEAR WE SEE

220

00:08:33,000 --> 00:08:34,600

THAT -- HOW DO I GO BACK?

221

00:08:34,600 --> 00:08:36,033

ANYWAY, THE FOLLOWING

222

00:08:36,033 --> 00:08:40,000

OPPORTUNITY FOR THE TRANSIT NOW

223

00:08:40,000 --> 00:08:42,000

IN 1761 NOW THAT PEOPLE ARE ABLE

224

00:08:42,000 --> 00:08:45,000

TO PREDICT IT, IT WAS OBSERVED

225

00:08:45,000 --> 00:08:51,000

BY SEVERAL PEOPLE, 176, BUT WE

226

00:08:51,000 --> 00:08:53,000

MADE A NEW DISCOVERY.

227

00:08:53,000 --> 00:08:56,000

WE OBSERVED THAT AS THE PLANET

228

00:08:56,000 --> 00:09:00,000

WAS APPROACHING THE EDGE OF THE

229

00:09:00,000 --> 00:09:02,000

SOLAR DISK AND AS IT WAS EXITING

230

00:09:02,000 --> 00:09:06,000

THAT THE LIGHT APPEARED TO BE

231

00:09:06,000 --> 00:09:09,000

BENT AROUND THE PLANET IN THIS

232

00:09:09,000 --> 00:09:10,000

FASHION, AND YOU CAN KIND OF SEE

233

00:09:10,000 --> 00:09:12,000

IT OBSERVED RIGHT HERE, SEE THAT

234

00:09:12,000 --> 00:09:15,000

LITTLE LIGHT AREA RIGHT THERE,

235

00:09:15,000 --> 00:09:16,000

AND SO WHEN THAT WAS FIRST

236

00:09:16,000 --> 00:09:17,000

OBSERVED, PEOPLE WERE SAYING

237

00:09:17,000 --> 00:09:18,000

WHAT'S GOING ON HERE?

238

00:09:18,000 --> 00:09:20,000

WELL, IT TURNS OUT THAT NOW THIS

239

00:09:20,000 --> 00:09:22,000

IS BASICALLY THE DISCOVERY OF

240

00:09:22,000 --> 00:09:24,000

THE ATMOSPHERE OF VENUS, AND

241

00:09:24,000 --> 00:09:27,000

MUCH LIKE OUR ATMOSPHERE HERE ON

242

00:09:27,000 --> 00:09:28,933

EARTH, BEND, LIGHTS, RAYS AS IT

243

00:09:28,933 --> 00:09:29,933

COMES THROUGH, THIS IS WHAT WE

244

00:09:29,933 --> 00:09:31,933

ARE RECORDING HERE, THAT THE

245

00:09:31,933 --> 00:09:32,933

ATMOSPHERE OF VENUS IS NOW

246

00:09:32,933 --> 00:09:34,633

BENDING THE LIGHT RAYS AS IT

247

00:09:34,633 --> 00:09:36,466

COMES AROUND AND COMES THROUGH

248

00:09:36,466 --> 00:09:39,933

AS A LENSING EFFECT, AND SO NOW

249

00:09:39,933 --> 00:09:41,933

WE HAVE THE DISCOVERY THAT

250

00:09:41,933 --> 00:09:43,933

ANOTHER PLANET HAS SOME SORT OF

251

00:09:43,933 --> 00:09:44,933

EARTH-LIKE PROPERTIES.

252

00:09:44,933 --> 00:09:45,933

NOW, WE NOW KNOW THAT THE

253

00:09:45,933 --> 00:09:47,933

ATMOSPHERE OF VENUS IS VERY,

254

00:09:47,933 --> 00:09:48,733

VERY DIFFERENT, BUT

255

00:09:48,733 --> 00:09:49,800

NEVERTHELESS, THE DISCOVERY OF

256

00:09:49,800 --> 00:09:51,933

THE FACT THAT ONE OF THE PLANETS

257

00:09:51,933 --> 00:09:54,933

HAD AN ATMOSPHERE WAS VERY

258

00:09:54,933 --> 00:09:56,200

SIGNIFICANT IN MANY WAYS, BUT

259

00:09:56,200 --> 00:09:57,233

CERTAINLY -- THAT'S MY

260

00:09:57,233 --> 00:09:59,933

CONNECTION TO EARTH SCIENCE, AND

261

00:09:59,933 --> 00:10:02,000

THAT'S AS FAR AS WE CAN GET, BUT

262

00:10:02,000 --> 00:10:03,000

ANYWAY, THAT'S -- I'M GOING TO

263

00:10:03,000 --> 00:10:07,000

GO WITH THAT.

264

00:10:07,000 --> 00:10:10,000

AND SO IT'S 1761.

265

00:10:10,000 --> 00:10:12,000

THAT DISCOVERY WAS MADE.

266

00:10:12,000 --> 00:10:15,000

NOW THE NEXT TIME THE TRANSIT

267

00:10:15,000 --> 00:10:19,000

OCCURRED, EIGHT YEARS LATER,

268

00:10:19,000 --> 00:10:20,000

THERE WERE PEOPLE THAT HAD

269

00:10:20,000 --> 00:10:21,000

BEGUN -- THE SCIENTIFIC

270

00:10:21,000 --> 00:10:22,000

COMMUNITY HAD BEGUN TO RALLY

271

00:10:22,000 --> 00:10:24,000

AROUND THIS A BIT.

272

00:10:24,000 --> 00:10:25,000

IT WAS PREDICTED.

273

00:10:25,000 --> 00:10:27,000

THERE WERE OVER 400 SIGHTINGS.

274

00:10:27,000 --> 00:10:28,933

PROBABLY THE MOST INTERESTING

275

00:10:28,933 --> 00:10:30,933

ONE WAS CAPTAIN COOK AS HE WAS

276  
00:10:30,933 --> 00:10:32,333  
OVER IN THE TAHITI ISLANDS, SET

277  
00:10:32,333 --> 00:10:33,600  
UP AN OBSERVATION POINT AND

278  
00:10:33,600 --> 00:10:35,933  
OBSERVED IT FROM TAHITI.

279  
00:10:35,933 --> 00:10:36,933  
BASICALLY PEOPLE THAT WERE

280  
00:10:36,933 --> 00:10:38,933  
OBSERVING THAT ALL OVER THE

281  
00:10:38,933 --> 00:10:41,933  
EARTH, SO NOW YOU'RE BEGINNING

282  
00:10:41,933 --> 00:10:44,933  
TO GET A SENSE OF, YOU KNOW,

283  
00:10:44,933 --> 00:10:46,933  
WHAT EXTENT THIS IS AND MAYBE

284  
00:10:46,933 --> 00:10:48,933  
EVEN USE THAT INFORMATION TO

285  
00:10:48,933 --> 00:10:50,933  
HELP US CALCULATE THE DISTANCE

286  
00:10:50,933 --> 00:10:55,933  
BETWEEN THE EARTH AND THE SUN.

287  
00:10:55,933 --> 00:10:56,933  
IN PENNSYLVANIA YOU CAN SEE THIS

288  
00:10:56,933 --> 00:11:01,000

KIND OF GIVES YOU A SENSE OF THE

289

00:11:01,000 --> 00:11:02,000

TYPE OF DATA THAT THEY WERE

290

00:11:02,000 --> 00:11:06,000

COLLECTING AT THAT POINT, AND

291

00:11:06,000 --> 00:11:09,000

THIS GUY FROM PENNSYLVANIA MADE

292

00:11:09,000 --> 00:11:11,000

VERY, VERY DETAILED CALCULATIONS

293

00:11:11,000 --> 00:11:12,566

OF WHERE IT WAS AND AT WHAT

294

00:11:12,566 --> 00:11:13,266

TIME.

295

00:11:13,266 --> 00:11:16,000

I CAN'T READ ALL THAT, SO

296

00:11:16,000 --> 00:11:17,300

OBVIOUSLY THERE'S A LOT OF

297

00:11:17,300 --> 00:11:18,233

INFORMATION THERE.

298

00:11:18,233 --> 00:11:21,000

THE NEXT OPPORTUNITY FOR THE

299

00:11:21,000 --> 00:11:23,000

TRANSIT NOW, NOW THE FEDERAL

300

00:11:23,000 --> 00:11:25,000

GOVERNMENT GETS INVOLVED, SO NOW

301  
00:11:25,000 --> 00:11:29,933  
WE KNOW WE'RE IN REALLY GOOD BIG

302  
00:11:29,933 --> 00:11:31,933  
TECHNOLOGY OF THE PHOTOGRAPHIC

303  
00:11:31,933 --> 00:11:32,933  
TECHNOLOGY WAS BEING DEVELOPED,

304  
00:11:32,933 --> 00:11:37,933  
SO NOW THE OBSERVATIONS ARE MADE

305  
00:11:37,933 --> 00:11:40,933  
IN THE SENSE THAT THEY CAN BE

306  
00:11:40,933 --> 00:11:41,933  
VERY CAREFULLY MADE AND MORE

307  
00:11:41,933 --> 00:11:45,933  
EXACTING, AND, IN FACT, IN 1874

308  
00:11:45,933 --> 00:11:46,933  
FOR THE FIRST TIME CONGRESS

309  
00:11:46,933 --> 00:11:52,933  
ALLOCATES \$75,000 FOR SPACE

310  
00:11:52,933 --> 00:11:53,933  
SCIENCE RESEARCH.

311  
00:11:53,933 --> 00:11:55,933  
THAT'S KIND OF A PREVIEW OF

312  
00:11:55,933 --> 00:11:56,933  
THINGS TO COME.

313  
00:11:56,933 --> 00:11:58,933

BACK IN 1874 IT'S THE FIRST TIME

314

00:11:58,933 --> 00:11:59,933

THAT THAT OCCURRED.

315

00:11:59,933 --> 00:12:04,000

AND WITH ALL OF THOSE

316

00:12:04,000 --> 00:12:09,000

OBSERVATIONS, THEY BEGAN TO

317

00:12:09,000 --> 00:12:10,000

PUBLISH THE CALCULATED DISTANCE

318

00:12:10,000 --> 00:12:14,000

BETWEEN THAT AND THE SUN AND IN

319

00:12:14,000 --> 00:12:16,000

1872 THEY CALCULATE THE 91

320

00:12:16,000 --> 00:12:17,000

MILLION MILES, AND THIS IS DONE

321

00:12:17,000 --> 00:12:21,000

WITH THE TRIANGULIZATION AND THE

322

00:12:21,000 --> 00:12:22,000

OBSERVATIONS OF THE VERY

323

00:12:22,000 --> 00:12:23,000

EXTREMES OF THE EARTH FROM ONE

324

00:12:23,000 --> 00:12:29,933

SIDE TO THE OTHER, AND WHEN THE

325

00:12:29,933 --> 00:12:30,933

HERE IS SOME PHOTOGRAPHIC

326

00:12:30,933 --> 00:12:33,933

OBSERVATIONS THAT WERE MADE BY

327

00:12:33,933 --> 00:12:38,933

THE -- IN CALIFORNIA WHERE THEY

328

00:12:38,933 --> 00:12:41,933

PIECE TOGETHER THE PHOTOGRAPHIC

329

00:12:41,933 --> 00:12:49,933

PLATE AND BY -- TAKEN BY VASSER

330

00:12:49,933 --> 00:12:54,933

COLLEGE.

331

00:12:54,933 --> 00:12:57,933

THEY'RE BEGINNING TO GET

332

00:12:57,933 --> 00:12:58,933

INVOLVED WITH TRYING TO

333

00:12:58,933 --> 00:13:02,333

UNDERSTAND AND LEARN ABOUT THIS

334

00:13:02,333 --> 00:13:03,333

EVENT.

335

00:13:03,333 --> 00:13:09,000

WITH ALL OF THESE THE

336

00:13:09,000 --> 00:13:10,100

ASTRONOMICAL UNIT, THAT IS THE

337

00:13:10,100 --> 00:13:11,200

DISTANCE BETWEEN THE EARTH AND

338

00:13:11,200 --> 00:13:13,000

THE SUN, IT S KIND OF A

339

00:13:13,000 --> 00:13:15,000

FUNDAMENTAL UNIT USED IN

340

00:13:15,000 --> 00:13:19,000

PLANETARY AND WITH HELIOPHYSICS.

341

00:13:19,000 --> 00:13:21,000

IT'S BEGINNING TO BE NARROWED

342

00:13:21,000 --> 00:13:25,000

DOWN, AND IN 1882 THE BEST

343

00:13:25,000 --> 00:13:28,933

CALCULATION PUT IT AT ABOUT

344

00:13:28,933 --> 00:13:29,933

92,720,000 MILES.

345

00:13:29,933 --> 00:13:30,933

WE NOW KNOW THAT BASED ON

346

00:13:30,933 --> 00:13:34,933

THOSE -- SOME OF THE RADAR

347

00:13:34,933 --> 00:13:35,933

STUDIES AND SOME OF THE MISSIONS

348

00:13:35,933 --> 00:13:40,933

THAT WE HAVE IT AT 92,957,209

349

00:13:40,933 --> 00:13:42,933

MILES, AND SO BACK IN 1882 THEY

350

00:13:42,933 --> 00:13:44,933

GOT IT WITH THE .3% OF WHAT WE

351  
00:13:44,933 --> 00:13:45,933  
KNOW IS THE DISTANCE BETWEEN THE

352  
00:13:45,933 --> 00:13:47,933  
EARTH AND THE SUN, AND THAT'S

353  
00:13:47,933 --> 00:13:48,933  
REALLY QUITE REMARKABLE

354  
00:13:48,933 --> 00:13:50,933  
CONSIDERING THE TECHNOLOGY THAT

355  
00:13:50,933 --> 00:13:52,933  
THEY HAD AT THEIR DISPOSAL AT

356  
00:13:52,933 --> 00:13:55,933  
THAT TIME.

357  
00:13:55,933 --> 00:13:57,933  
HERE WE SEE A LOT OF GOOD

358  
00:13:57,933 --> 00:13:58,933  
HELIOPHYSICS COMING IN WHERE

359  
00:13:58,933 --> 00:13:59,933  
THEY ARE REALLY NAILING DOWN THE

360  
00:13:59,933 --> 00:14:03,000  
DISTANCE BETWEEN THE EARTH AND

361  
00:14:03,000 --> 00:14:05,000  
THE SUN.

362  
00:14:05,000 --> 00:14:06,000  
BY THIS TIME NOW IT HAS CAUGHT

363  
00:14:06,000 --> 00:14:09,000

THE PUBLIC'S IMAGINATION, AND SO

364

00:14:09,000 --> 00:14:12,000

FOR THE TRANSIT IN 1882 ABOUT

365

00:14:12,000 --> 00:14:14,000

EVERY NATIONAL NEWSPAPER AND

366

00:14:14,000 --> 00:14:16,000

INTERNATIONAL NEWSPAPER

367

00:14:16,000 --> 00:14:17,000

HEADLINED THE EVENT.

368

00:14:17,000 --> 00:14:19,000

YOU KNOW, POLITICAL CARTOONS,

369

00:14:19,000 --> 00:14:21,000

I'M SURE, WERE RAMPANT AT THAT

370

00:14:21,000 --> 00:14:23,000

TIME, BUT ALSO THE FAMOUS JOHN

371

00:14:23,000 --> 00:14:26,000

PHILLIP SUSA, THE MARCH BAND

372

00:14:26,000 --> 00:14:28,933

COMPOSER COMPOSED A MARCH CALLED

373

00:14:28,933 --> 00:14:30,933

"VENUS" AND IF YOU GO ON THE WEB

374

00:14:30,933 --> 00:14:31,933

AND CLICK IT AS YOU'RE WATCHING

375

00:14:31,933 --> 00:14:32,933

THE TRANSIT TOMORROW AFTERNOON,

376

00:14:32,933 --> 00:14:34,933

ULENE BE MORE INSPIRED TO ENJOY

377

00:14:34,933 --> 00:14:36,933

THE EVENT.

378

00:14:36,933 --> 00:14:39,933

NOT ONLY THAT, BUT SCIENCE

379

00:14:39,933 --> 00:14:41,933

FICTION NOW HAS CAUGHT HOLD, AND

380

00:14:41,933 --> 00:14:46,933

EDDIE RICE BURROW OF TARZAN FAME

381

00:14:46,933 --> 00:14:47,933

AND JOHN CARTER FAME, MOST

382

00:14:47,933 --> 00:14:50,933

RECENTLY IN A MOVIE, ALSO WROTE

383

00:14:50,933 --> 00:14:51,933

ABOUT VENUS.

384

00:14:51,933 --> 00:14:53,933

NOW, THIS WAS CARTON NAPIER, WHO

385

00:14:53,933 --> 00:14:54,933

IS THE HERO HERE, SO STAY TUNED

386

00:14:54,933 --> 00:14:56,933

FOR HOLLYWOOD ON THAT, BUT

387

00:14:56,933 --> 00:14:58,933

NEVERTHELESS, IT DID CATCH THE

388

00:14:58,933 --> 00:15:03,000

PEOPLE'S IMAGINATION, AND FOLKS

389

00:15:03,000 --> 00:15:06,000

WERE VERY INTERESTED IN WHAT --

390

00:15:06,000 --> 00:15:07,000

IN WHAT WAS HAPPENING THERE.

391

00:15:07,000 --> 00:15:08,000

NOW THE EVENT OF THE SPACE AGE,

392

00:15:08,000 --> 00:15:11,000

OF COURSE, THIS IS GOING TO BE

393

00:15:11,000 --> 00:15:12,000

ONE OF THE PLACES THAT WE WANT

394

00:15:12,000 --> 00:15:17,000

TO GO VISIT, AND, IN FACT, IN

395

00:15:17,000 --> 00:15:19,000

1762 THERE WAS A MISSION FROM

396

00:15:19,000 --> 00:15:21,000

NASA, AND IT WAS NASA'S FIRST

397

00:15:21,000 --> 00:15:23,000

FORAY OUT BEYOND THE EARTH-MOON

398

00:15:23,000 --> 00:15:24,000

SYSTEM.

399

00:15:24,000 --> 00:15:27,000

BASICALLY THE FIRST NASA PROBE

400

00:15:27,000 --> 00:15:28,933

THAT LEFT AN ERLT ENVIRONMENT TO

401  
00:15:28,933 --> 00:15:31,233  
GO EXPLORE ELSEWHERE WENT TO

402  
00:15:31,233 --> 00:15:32,966  
VENUS ON THE MISSION.

403  
00:15:32,966 --> 00:15:35,933  
THE RUSSIANS WERE HEAVILY

404  
00:15:35,933 --> 00:15:36,933  
ENGAGED.

405  
00:15:36,933 --> 00:15:42,933  
RUSSIANS WERE HEAVILY ENGAGED IN

406  
00:15:42,933 --> 00:15:44,933  
THIS ACTIVITY ALSO.

407  
00:15:44,933 --> 00:15:46,933  
WITH SEVERAL LANDERS THAT THEY

408  
00:15:46,933 --> 00:15:49,933  
SENT IN 1881 AND THEN IN 1884

409  
00:15:49,933 --> 00:15:53,933  
THEY LAUNCHED SOME BALLOONS.

410  
00:15:53,933 --> 00:15:56,933  
NOW WE HAVE OBSERVATIONS OF THIS

411  
00:15:56,933 --> 00:16:02,000  
VERY DENSELY COATED ATMOSPHERE

412  
00:16:02,000 --> 00:16:06,000  
PLANET, AND UNDERSTANDING WHAT

413  
00:16:06,000 --> 00:16:09,000

LAIID BELOW THAT DENSE FOG

414

00:16:09,000 --> 00:16:11,000

ESSENTIALLY WE KNOW NOW A

415

00:16:11,000 --> 00:16:12,000

SULFURIC ACID -- WHAT LAY

416

00:16:12,000 --> 00:16:16,000

BENEATH IT WAS A VERY GRADIENT

417

00:16:16,000 --> 00:16:19,000

INTEREST, MAGELLAN WITH ITS

418

00:16:19,000 --> 00:16:21,000

RADAR WAS ABLE TO MAP THE

419

00:16:21,000 --> 00:16:24,000

SURFACE OF VENUS AND MORE

420

00:16:24,000 --> 00:16:26,000

RECENTLY THE VENUS EXPRESS

421

00:16:26,000 --> 00:16:31,933

MISSION WITH NASA COLLABORATION

422

00:16:31,933 --> 00:16:35,933

MORE ABOUT THE HISTORY OF THAT

423

00:16:35,933 --> 00:16:36,933

TOPOGRAPHY AND THE HISTORY OF

424

00:16:36,933 --> 00:16:42,933

THE SURFACE OF VENUS.

425

00:16:42,933 --> 00:16:45,933

SO WHEN WE FIRST OPTICALLY

426  
00:16:45,933 --> 00:16:47,933  
OPENED VENUS, THIS IS BASICALLY

427  
00:16:47,933 --> 00:16:48,933  
WHAT IT LOOKED LIKE.

428  
00:16:48,933 --> 00:16:51,933  
IT HAD A THICK ATMOSPHERE OVER

429  
00:16:51,933 --> 00:16:54,933  
IT, AND -- TRYING TO FIGURE OUT

430  
00:16:54,933 --> 00:16:56,933  
HOW TO -- BUT WITH THE RADARS

431  
00:16:56,933 --> 00:16:59,933  
NOW, WE CAN SEE DOWN BELOW, AND

432  
00:16:59,933 --> 00:17:05,000  
WE SEE A VERY HEAVILY STRUCTURED

433  
00:17:05,000 --> 00:17:07,000  
SURFACE WHERE THE GREEN AND THE

434  
00:17:07,000 --> 00:17:09,000  
BLUES IDENTIFY THE HIGHER -- THE

435  
00:17:09,000 --> 00:17:12,000  
LOWER ELEVATIONS AND THE LIGHT

436  
00:17:12,000 --> 00:17:15,000  
COLORED REDDER ARE THE HIGHER

437  
00:17:15,000 --> 00:17:19,000  
ELEVATIONS OF VENUS, AND THIS IS

438  
00:17:19,000 --> 00:17:21,000

A VERY PROMINENT LARGE MOUNTAIN.

439

00:17:21,000 --> 00:17:29,000

TURNS OUT TO BE A VOLCANO.

440

00:17:29,000 --> 00:17:30,000

SO THIS RIGHT HERE GIVES A

441

00:17:30,000 --> 00:17:32,000

SENSE -- THIS IS A MOVIE PUT

442

00:17:32,000 --> 00:17:34,000

TOGETHER BY J.P.L. AND GIVES YOU

443

00:17:34,000 --> 00:17:38,000

A SENSE OF WHAT THE PLANET

444

00:17:38,000 --> 00:17:41,000

LOOKED LIKE IN ITS SURFACE AS WE

445

00:17:41,000 --> 00:17:43,000

FIRST OBSERVED VENUS OPTICALLY,

446

00:17:43,000 --> 00:17:46,000

BUT NOW IF WE CAN SEE THROUGH

447

00:17:46,000 --> 00:17:49,000

THAT WITH THE RADAR, WE SEE A

448

00:17:49,000 --> 00:17:53,000

HIGHLY STRUCTURED PLANET THAT

449

00:17:53,000 --> 00:17:58,000

HAS A RICH HISTORY IN TERMS OF

450

00:17:58,000 --> 00:18:03,066

CRATERING AS WELL AS ACTIVITY

451  
00:18:03,066 --> 00:18:09,066  
THAT'S IN THERE.

452  
00:18:09,066 --> 00:18:10,066  
ANOTHER MOVIE HERE THAT WAVE PUT

453  
00:18:10,066 --> 00:18:14,066  
TOGETHER KIND OF GIVES YOU A

454  
00:18:14,066 --> 00:18:17,066  
SENSE OF WHAT -- OF HOW THE

455  
00:18:17,066 --> 00:18:20,066  
INTERNATIONAL COLLABORATION HAS

456  
00:18:20,066 --> 00:18:22,066  
REALLY SERBED US WELL.

457  
00:18:22,066 --> 00:18:27,066  
THIS IS A 3-D RENDERING DONE BY

458  
00:18:27,066 --> 00:18:29,000  
J.P.L. OF ONE OF THE ACTIVE --

459  
00:18:29,000 --> 00:18:30,000  
OR LARGE MOUNTAINS ON THE

460  
00:18:30,000 --> 00:18:33,000  
SURFACE, AND IT TURNS OUT TO BE

461  
00:18:33,000 --> 00:18:36,000  
AN ACTIVE REGION BECAUSE AS ESA

462  
00:18:36,000 --> 00:18:38,000  
WENT AND MEASURED THE

463  
00:18:38,000 --> 00:18:41,000

TEMPERATURE OF THE SURFACE, YOU

464

00:18:41,000 --> 00:18:42,000

COULD -- WITH ITS COLOR OVERLAY,

465

00:18:42,000 --> 00:18:43,000

YOU COULD SEE THAT THE

466

00:18:43,000 --> 00:18:46,000

PRESSURE -- THE RED AND THE

467

00:18:46,000 --> 00:18:51,000

YELLOW ARE THE MORE RECENT AND

468

00:18:51,000 --> 00:18:52,000

HOTTER TEMPERATURES, REGIONS

469

00:18:52,000 --> 00:18:54,000

INDICATING PERHAPS A RECENT LAVA

470

00:18:54,000 --> 00:18:56,000

FLOW OFF THE MOUNTAIN -- OFF THE

471

00:18:56,000 --> 00:18:57,000

VOLCANO, AND BASICALLY THAT IS

472

00:18:57,000 --> 00:19:02,000

INDICATING THAT VENUS IS A VERY

473

00:19:02,000 --> 00:19:04,000

ACTIVE IS PERHAPS MORE ACTIVE

474

00:19:04,000 --> 00:19:05,000

THAN WHAT WE SAW.

475

00:19:05,000 --> 00:19:07,000

THERE ARE A LOT OF THINGS WE'VE

476

00:19:07,000 --> 00:19:10,000

LEARNED ABOUT VENUS.

477

00:19:10,000 --> 00:19:12,000

ONE OF THE THINGS THAT IS VERY

478

00:19:12,000 --> 00:19:13,000

HOT THERE.

479

00:19:13,000 --> 00:19:15,000

HERE'S A TEMPERATURE AS A

480

00:19:15,000 --> 00:19:17,000

FUNCTION OF ALTITUDE.

481

00:19:17,000 --> 00:19:18,000

SO ON THE SURFACE WE'RE TALKING

482

00:19:18,000 --> 00:19:20,000

ABOUT CLOSE TO 800 DEGREES

483

00:19:20,000 --> 00:19:21,000

FAHRENHEIT.

484

00:19:21,000 --> 00:19:22,000

VERY, VERY HOT.

485

00:19:22,000 --> 00:19:24,000

KIND OF A NASTY ENVIRONMENT

486

00:19:24,000 --> 00:19:25,000

HERE.

487

00:19:25,000 --> 00:19:26,000

HERE'S SULFURIC ACID.

488

00:19:26,000 --> 00:19:31,933

THERE'S A STRONG LAYER OF

489

00:19:31,933 --> 00:19:32,933

KILOMETERS, AND THEN THE

490

00:19:32,933 --> 00:19:35,933

PRESSURE IS ALSO VERY -- IT'S

491

00:19:35,933 --> 00:19:37,933

VERY DENSE THERE WITH THE

492

00:19:37,933 --> 00:19:38,933

PRESSURE GETTING ABOUT 90 TIMES

493

00:19:38,933 --> 00:19:39,933

GREATER THAN THE PRESSURE HERE

494

00:19:39,933 --> 00:19:41,933

ON THE SURFACE OF THE EARTH, SO

495

00:19:41,933 --> 00:19:43,200

THINK OF YOURSELF IN A PRESSURE

496

00:19:43,200 --> 00:19:44,000

COOKER.

497

00:19:44,000 --> 00:19:45,933

THAT'S WHAT YOU WOULD BE LIKE IF

498

00:19:45,933 --> 00:19:46,933

YOU WERE SITTING ON VENUS.

499

00:19:46,933 --> 00:19:48,933

IT'S A VERY NASTY ENVIRONMENT

500

00:19:48,933 --> 00:19:53,933

FROM A HUMAN'S PERSPECTIVE.

501  
00:19:53,933 --> 00:19:54,933  
THE LAST AREA THAT I WANT TO

502  
00:19:54,933 --> 00:19:56,933  
TALK ABOUT IN TERMS OF THE

503  
00:19:56,933 --> 00:19:58,933  
APPLICATION IS ASTROPHYSICS, AND

504  
00:19:58,933 --> 00:20:01,000  
I WANT TO DRAW YOUR ATTENTION TO

505  
00:20:01,000 --> 00:20:04,000  
THE KEPLER MISSION WHERE THE

506  
00:20:04,000 --> 00:20:05,000  
KEPLER MISSION MISSION, AS YOU

507  
00:20:05,000 --> 00:20:07,000  
MAY RECALL, IS A MISSION THAT'S

508  
00:20:07,000 --> 00:20:10,000  
LOOKING FOR EXO PLANETS, THAT IS

509  
00:20:10,000 --> 00:20:12,000  
PLANETS BEYOND OUR SOLAR SYSTEM.

510  
00:20:12,000 --> 00:20:13,000  
THE PRIMARY BAYWAY THEY DO THAT

511  
00:20:13,000 --> 00:20:15,000  
IS LOOK AT STARS WITHIN OUR

512  
00:20:15,000 --> 00:20:18,000  
GALAXY, AND LOOK AT THE

513  
00:20:18,000 --> 00:20:19,000

BRIGHTNESS OF THAT STAR AND ONCE

514

00:20:19,000 --> 00:20:21,000

IN A WHILE THEY'LL SEE A DIP IN

515

00:20:21,000 --> 00:20:22,000

THE BRIGHTNESS OF THE STAR, AND

516

00:20:22,000 --> 00:20:24,000

THEN IT WILL COME BACK, AND

517

00:20:24,000 --> 00:20:26,000

THAT'S BASICALLY WHEN A PLANET

518

00:20:26,000 --> 00:20:27,000

IS TRANSITING JUST LIKE VENUS IS

519

00:20:27,000 --> 00:20:28,900

GOING TO BE DOING ACROSS THAT

520

00:20:28,900 --> 00:20:29,700

STAR.

521

00:20:29,700 --> 00:20:32,933

SO BASICALLY THEY HAVE -- THEY

522

00:20:32,933 --> 00:20:35,933

ARE OBSERVING PLANETARY

523

00:20:35,933 --> 00:20:37,266

TRANSITS, YOU KNOW, THOUSANDS OF

524

00:20:37,266 --> 00:20:38,600

LIGHT YEARS AWAY IN THE SAME WAY

525

00:20:38,600 --> 00:20:40,933

THAT WE ARE GOING TO BE

526  
00:20:40,933 --> 00:20:44,933  
OBSERVING THE PLANETARY -- THE

527  
00:20:44,933 --> 00:20:45,933  
VENUS TRANSIT.

528  
00:20:45,933 --> 00:20:46,933  
IT'S THE SAME TECHNIQUE.

529  
00:20:46,933 --> 00:20:48,933  
IF YOU UNDERSTAND THAT.

530  
00:20:48,933 --> 00:20:50,066  
AND SO KEPLER HAS BEEN VERY

531  
00:20:50,066 --> 00:20:50,800  
SUCCESSFUL.

532  
00:20:50,800 --> 00:20:52,933  
PERIODICALLY YOU HEAR ABOUT

533  
00:20:52,933 --> 00:20:54,933  
UPDATES ABOUT THE LATEST COUNT.

534  
00:20:54,933 --> 00:20:56,933  
IT'S OVER 2,000 CANDIDATE

535  
00:20:56,933 --> 00:20:58,933  
SYSTEMS WITH ALMOST 700 OF THEM

536  
00:20:58,933 --> 00:21:00,066  
CONFIRMED HAVING PLANETARY

537  
00:21:00,066 --> 00:21:00,866  
SYSTEMS.

538  
00:21:00,866 --> 00:21:03,000

AGAIN, THEY'RE LOOKING AT THINGS

539

00:21:03,000 --> 00:21:07,000

THAT ARE 1,000 LIGHT YEARS AWAY.

540

00:21:07,000 --> 00:21:11,000

WHEREAS HERE, WHAT WE'RE DOING

541

00:21:11,000 --> 00:21:12,233

IS VERY MUCH -- IS VERY CLOSE

542

00:21:12,233 --> 00:21:13,000

BY.

543

00:21:13,000 --> 00:21:15,000

IT'S ONLY EIGHT LIGHT MINUTES

544

00:21:15,000 --> 00:21:16,000

AWAY, BUT HUBBELL TELESCOPE IS

545

00:21:16,000 --> 00:21:18,000

BASICALLY GOING TO DO THE SAME

546

00:21:18,000 --> 00:21:24,000

THING ON THIS VENUS AND THIS

547

00:21:24,000 --> 00:21:25,000

TRANSIT TOMORROW.

548

00:21:25,000 --> 00:21:26,000

THEY'RE NOT GOING TO LOOK

549

00:21:26,000 --> 00:21:29,933

DIRECTLY AT THE SUN BECAUSE THAT

550

00:21:29,933 --> 00:21:30,933

GOING TO DO IS THEY ARE GOING TO

551  
00:21:30,933 --> 00:21:33,933  
LOOK AT OFF THE SURFACE OF THE

552  
00:21:33,933 --> 00:21:34,933  
MOON, AND THEY'VE ALREADY TAKEN

553  
00:21:34,933 --> 00:21:36,933  
A BACKGROUND MEASUREMENT AND A

554  
00:21:36,933 --> 00:21:37,933  
PARTICULAR REGION OF THE MOON,

555  
00:21:37,933 --> 00:21:40,933  
THE TYCO CRATER HERE TAKEN VERY

556  
00:21:40,933 --> 00:21:43,933  
GOOD OBSERVATIONS AND BASICALLY

557  
00:21:43,933 --> 00:21:46,933  
HAVE GOTTEN A BACKGROUND

558  
00:21:46,933 --> 00:21:48,933  
REFLECTION OF IT AS VENUS

559  
00:21:48,933 --> 00:21:49,933  
TRANSITS ACROSS THE SUN, THEY'RE

560  
00:21:49,933 --> 00:21:52,933  
GOING TO SEE A DROP IN THAT

561  
00:21:52,933 --> 00:21:53,933  
BACKGROUND, AN INTENSITY, AND

562  
00:21:53,933 --> 00:21:56,566  
THEN THEY'LL SEE IT GO BACK UP

563  
00:21:56,566 --> 00:21:57,366

AGAIN.

564

00:21:57,366 --> 00:21:58,833  
BY LOOKING AT ESSENTIALLY A

565

00:21:58,833 --> 00:22:00,200  
REFLECTOSPHERE WHICH IS

566

00:22:00,200 --> 00:22:03,000  
BASICALLY GOING TO BE A PROXY

567

00:22:03,000 --> 00:22:04,000  
FOR LOOKING AT THE SUN.

568

00:22:04,000 --> 00:22:05,000  
THEY'RE GOING TO DO MORE THAN

569

00:22:05,000 --> 00:22:06,000  
THAT.

570

00:22:06,000 --> 00:22:07,000  
HUBBELL IS VERY CAPABLE ASSET,

571

00:22:07,000 --> 00:22:09,000  
AS YOU KNOW, AND THEY CAN ALSO

572

00:22:09,000 --> 00:22:12,000  
LOOK AT THE SPECTRAL

573

00:22:12,000 --> 00:22:13,000  
CHARACTERISTICS OF THAT LIGHT.

574

00:22:13,000 --> 00:22:15,000  
THEY CAN LOOK AT THE COLOR OR

575

00:22:15,000 --> 00:22:16,000  
THE WAVE LENGTH DISTRIBUTION

576  
00:22:16,000 --> 00:22:18,000  
THAT'S COMING OFF THE LUNAR

577  
00:22:18,000 --> 00:22:19,000  
SURFACE.

578  
00:22:19,000 --> 00:22:20,000  
NOW, REMEMBER WHEN VENUS

579  
00:22:20,000 --> 00:22:22,000  
TRANSITS ACROSS THE SUN, IT'S

580  
00:22:22,000 --> 00:22:24,000  
GOT AN ATMOSPHERE, AND PART OF

581  
00:22:24,000 --> 00:22:25,000  
THE LIGHT THAT COMES -- THAT'S

582  
00:22:25,000 --> 00:22:26,000  
GOING TO STRIKE THE MOON IS

583  
00:22:26,000 --> 00:22:28,933  
GOING TO BE GOING THROUGH THAT

584  
00:22:28,933 --> 00:22:30,933  
ATMOSPHERE, AND SO SOME OF THE

585  
00:22:30,933 --> 00:22:32,933  
SUNLIGHT THAT HUBBELL IS GOING

586  
00:22:32,933 --> 00:22:35,933  
TO OBSERVE AS THE VENUS GOES

587  
00:22:35,933 --> 00:22:37,933  
ACROSS IS GOING TO BE ALTERED

588  
00:22:37,933 --> 00:22:38,933

SLIGHTLY BY THE LIGHT GOING

589

00:22:38,933 --> 00:22:40,933

THROUGH VENUS'S ATMOSPHERE AND

590

00:22:40,933 --> 00:22:42,933

MAYBE GETTING ABSORBED BY SOME

591

00:22:42,933 --> 00:22:43,933

OF THE CONSTITUENTS IN THE VENUS

592

00:22:43,933 --> 00:22:44,933

ATMOSPHERE, SO THEY'RE GOING TO

593

00:22:44,933 --> 00:22:47,933

BE ABLE TO ALSO UNDERSTAND --

594

00:22:47,933 --> 00:22:50,933

AGAIN, MEASURE IN AN INDIRECT

595

00:22:50,933 --> 00:22:57,933

WAY SOME OF THE ATMOSPHER

596

00:22:57,933 --> 00:22:58,933

CONSTITUENTS OF DOING THIS WAY.

597

00:22:58,933 --> 00:23:02,000

KEPLER IS GOING TO DO THE SAME

598

00:23:02,000 --> 00:23:03,200

THING FOR SYSTEMS LIGHT YEARS

599

00:23:03,200 --> 00:23:03,966

AWAY.

600

00:23:03,966 --> 00:23:06,000

THIS GIVES YOU A SENSE OF HOW

601  
00:23:06,000 --> 00:23:07,000  
DIFFICULT THE OBSERVATIONS ARE

602  
00:23:07,000 --> 00:23:09,000  
THAT KEPLER IS MAKING AS WELL AS

603  
00:23:09,000 --> 00:23:12,000  
THE POWER OF REALLY STUDYING

604  
00:23:12,000 --> 00:23:12,733  
VERY CAREFULLY WHENEVER WE

605  
00:23:12,733 --> 00:23:13,500  
LAUNCH THESE MISSIONS AND

606  
00:23:13,500 --> 00:23:15,000  
LOOKING AT THE DATA IN EVERY

607  
00:23:15,000 --> 00:23:18,000  
WHICH WAY POSSIBLE TO MAXIMIZE

608  
00:23:18,000 --> 00:23:21,000  
THE OUTPUT THAT WE GET FROM IT.

609  
00:23:21,000 --> 00:23:22,000  
NOW LET'S TALK ABOUT WHAT'S

610  
00:23:22,000 --> 00:23:24,000  
GOING TO HAPPEN TOMORROW.

611  
00:23:24,000 --> 00:23:27,000  
TOMORROW AFTERNOON BASICALLY

612  
00:23:27,000 --> 00:23:30,933  
BEGINNING AROUND 5:00 THE VENUS

613  
00:23:30,933 --> 00:23:33,933

THE LOCAL TIME HERE.

614

00:23:33,933 --> 00:23:36,933

CUT ACROSS THE -- THE SUN'S

615

00:23:36,933 --> 00:23:38,733

SURFACE, SOLAR DISK, AND HERE'S

616

00:23:38,733 --> 00:23:40,333

A MASS OF THE WORLD KIND OF

617

00:23:40,333 --> 00:23:43,933

INDICATING ABOUT WHERE -- WHO IS

618

00:23:43,933 --> 00:23:44,933

GOING TO BE ABLE TO SEE IT, AND

619

00:23:44,933 --> 00:23:45,933

SO IF YOU ARE IN THIS PART OF

620

00:23:45,933 --> 00:23:46,933

THE WORLD, YOU'RE GOING TO BE

621

00:23:46,933 --> 00:23:50,933

ABLE TO SEE THE TRANSIT

622

00:23:50,933 --> 00:23:51,733

BASICALLY BEGINNING AT SUNRISE.

623

00:23:51,733 --> 00:23:52,500

UNFORTUNATELY, IF YOU'RE IN THIS

624

00:23:52,500 --> 00:23:53,933

PART OF THE WORLD, YOU'RE NOT

625

00:23:53,933 --> 00:23:56,933

GOING TO GET TO SEE IT AT ALL,

626  
00:23:56,933 --> 00:23:58,866  
BUT HERE WE ARE, AND IN THIS

627  
00:23:58,866 --> 00:24:00,966  
PART OF THE WORLD WHERE ARE WE

628  
00:24:00,966 --> 00:24:05,000  
GOING TO SEE IT AT SUNSET, AND

629  
00:24:05,000 --> 00:24:06,000  
SO BASICALLY WE'LL BE ABLE TO

630  
00:24:06,000 --> 00:24:08,000  
SEE IT BEGINNING, LIKE I SAID,

631  
00:24:08,000 --> 00:24:10,000  
AT 5:00 LOCAL TIME ALL THE WAY

632  
00:24:10,000 --> 00:24:11,000  
THROUGH SUNSET.

633  
00:24:11,000 --> 00:24:14,000  
THE VENUS -- IT WILL NOT TRANSIT

634  
00:24:14,000 --> 00:24:15,000  
ALL THE WAY BY SUNSET.

635  
00:24:15,000 --> 00:24:17,000  
IF YOU'RE IN THE GREEN PART, YOU

636  
00:24:17,000 --> 00:24:22,000  
GET TO SEE THE ENTIRE TRANSIT,

637  
00:24:22,000 --> 00:24:24,000  
AND SO NOTICE THE HAWAII OUT

638  
00:24:24,000 --> 00:24:26,000

HERE IN THIS REGION, AND SO NASA

639

00:24:26,000 --> 00:24:28,933

IS ARRANGED AND FOR SEVERAL

640

00:24:28,933 --> 00:24:29,933

FEEDS, AND WE'LL TALK ABOUT THAT

641

00:24:29,933 --> 00:24:30,933

IN A LITTLE BIT, BUT YOU'LL BE

642

00:24:30,933 --> 00:24:32,933

ABLE TO SEE THE TRANSIT THE

643

00:24:32,933 --> 00:24:33,933

ENTIRE TIME IF YOU WANT TO WATCH

644

00:24:33,933 --> 00:24:36,933

IT ON THE WEB AFTER THE SUN SETS

645

00:24:36,933 --> 00:24:39,933

WHEREVER YOU HAPPEN TO BE.

646

00:24:39,933 --> 00:24:40,933

SO IT IS KIND OF -- AND A POSTER

647

00:24:40,933 --> 00:24:42,933

THAT YOU CAN PICK UP THAT

648

00:24:42,933 --> 00:24:47,933

BASICALLY HAS THIS IMAGE WHERE

649

00:24:47,933 --> 00:24:50,933

BEGINNING AT 5:09 U.T., WHICH IS

650

00:24:50,933 --> 00:24:55,933

BASICALLY 5:10 OR 5:09 LOCAL

651  
00:24:55,933 --> 00:25:02,000  
TIME HERE -- ALL THE WAY TO 4:49

652  
00:25:02,000 --> 00:25:02,900  
U.T., WHICH IS MIDNIGHT LOCAL

653  
00:25:02,900 --> 00:25:03,633  
TIME.

654  
00:25:03,633 --> 00:25:05,000  
OF COURSE, THE SUN WON'T BE

655  
00:25:05,000 --> 00:25:06,000  
VISIBLE, SO IT'S NOT LIKE WE'RE

656  
00:25:06,000 --> 00:25:08,000  
GOING TO BE ABLE TO SEE IT.

657  
00:25:08,000 --> 00:25:08,633  
OKAY.

658  
00:25:08,633 --> 00:25:12,000  
NOW, VIEWING TIPS.

659  
00:25:12,000 --> 00:25:13,000  
THIS IS THE SAFETY MOMENT.

660  
00:25:13,000 --> 00:25:14,333  
ANOTHER SAFETY MOMENT.

661  
00:25:14,333 --> 00:25:16,133  
DO NOT LOOK AT THE SUN WITH YOUR

662  
00:25:16,133 --> 00:25:16,866  
NAKED EYE.

663  
00:25:16,866 --> 00:25:19,000

OKAY?

664

00:25:19,000 --> 00:25:21,000

WHAT I MEAN BY THAT IS DON'T

665

00:25:21,000 --> 00:25:22,400

LOOK AT THE SUN WITH YOUR NAKED

666

00:25:22,400 --> 00:25:22,966

EYE.

667

00:25:22,966 --> 00:25:25,000

JUST DON'T DO IT.

668

00:25:25,000 --> 00:25:26,000

THAT'S WHAT THESE LITTLE GLASSES

669

00:25:26,000 --> 00:25:29,933

ARE FOR, AND SO I WANT TO DO AN

670

00:25:29,933 --> 00:25:34,933

GLASSES, AND I WANT YOU TO PUT

671

00:25:34,933 --> 00:25:38,933

THEM ON.

672

00:25:38,933 --> 00:25:40,933

AND NOW THIS IS WHAT IT LOOKS

673

00:25:40,933 --> 00:25:42,933

LIKE WHEN THE POWER GOES OUT.

674

00:25:42,933 --> 00:25:44,933

BASICALLY YOU CAN'T SEE

675

00:25:44,933 --> 00:25:45,700

ANYTHING, OKAY?

676  
00:25:45,700 --> 00:25:46,566  
SO THESE ARE NOT YOUR TYPICAL

677  
00:25:46,566 --> 00:25:47,933  
SUNGLASSES.

678  
00:25:47,933 --> 00:25:49,933  
NOW YOU CAN TAKE THEM OFF.

679  
00:25:49,933 --> 00:25:51,933  
BASICALLY YOU CAN'T SEE

680  
00:25:51,933 --> 00:25:52,933  
ANYTHING, ALL RIGHT?

681  
00:25:52,933 --> 00:25:53,933  
THEY'RE INCREDIBLY DENSE.

682  
00:25:53,933 --> 00:25:54,933  
YOU ARE ONLY GOING TO SEE

683  
00:25:54,933 --> 00:25:55,933  
SOMETHING IF YOU ARE LOOKING AT

684  
00:25:55,933 --> 00:25:57,933  
SOMETHING AS BRIGHT AS THE SUN,

685  
00:25:57,933 --> 00:25:58,933  
AND VERY FEW THINGS ARE AS

686  
00:25:58,933 --> 00:26:01,000  
BRIGHT AS THE SUN.

687  
00:26:01,000 --> 00:26:03,000  
THAT ALSO SAYS THAT VERY FEW

688  
00:26:03,000 --> 00:26:05,000

THINGS BLOCK OUT THE LIGHT THIS

689

00:26:05,000 --> 00:26:08,000

WAY AS WELL, SO DON'T USE YOUR

690

00:26:08,000 --> 00:26:09,000

NORMAL SUNGLASSES OR DON'T TRY

691

00:26:09,000 --> 00:26:09,900

TO SQUINT OR SOMETHING LIKE

692

00:26:09,900 --> 00:26:10,666

THAT.

693

00:26:10,666 --> 00:26:12,000

USE THESE GLASSES, OR IF YOU

694

00:26:12,000 --> 00:26:14,000

HAPPEN TO BE IN THE WELDING

695

00:26:14,000 --> 00:26:16,000

BUSINESS OR MARRIED TO A WELDER,

696

00:26:16,000 --> 00:26:18,000

WHATEVER, YOU CAN USE YOUR

697

00:26:18,000 --> 00:26:21,000

WELDING GLASSES, SO LONG AS MAKE

698

00:26:21,000 --> 00:26:23,066

SURE -- I KEEP PUSHING THE WRONG

699

00:26:23,066 --> 00:26:23,866

BUTTON.

700

00:26:23,866 --> 00:26:27,000

MAKE SURE THAT YOU HAVE A NUMBER

701

00:26:27,000 --> 00:26:29,933

14 WELDERS GLASS.

702

00:26:29,933 --> 00:26:30,933

NOW, OBVIOUSLY, YOU CAN SEE THIS

703

00:26:30,933 --> 00:26:31,933

MAKES IT A LOT EASIER BECAUSE

704

00:26:31,933 --> 00:26:33,933

NOW YOU CAN BRING YOUR

705

00:26:33,933 --> 00:26:35,933

BINOCULARS UP TO YOUR EYES TO

706

00:26:35,933 --> 00:26:37,233

LOOK AT IT WHENEVER, BUT USE

707

00:26:37,233 --> 00:26:38,033

THESE GLASSES.

708

00:26:38,033 --> 00:26:39,933

THE TRANSIT IS GOING TO TAKE A

709

00:26:39,933 --> 00:26:40,933

LONG TIME.

710

00:26:40,933 --> 00:26:42,466

SUNSET IS, YOU KNOW, NOT FOR A

711

00:26:42,466 --> 00:26:44,033

COUPLE OF HOURS AFTER IT BEGINS,

712

00:26:44,033 --> 00:26:44,900

SO YOU CAN KIND OF SHARE IT

713

00:26:44,900 --> 00:26:45,566

AROUND.

714

00:26:45,566 --> 00:26:46,933

EVERYBODY CAN ENJOY IT.

715

00:26:46,933 --> 00:26:47,933

THERE ARE OTHER WAYS TO LOOK AT

716

00:26:47,933 --> 00:26:49,933

THE TRANSIT AS WELL.

717

00:26:49,933 --> 00:26:51,933

YOU CAN LOOK AT -- YOU CAN USE A

718

00:26:51,933 --> 00:26:54,933

TELESCOPE SO LONG AS YOU HAVE A

719

00:26:54,933 --> 00:26:56,933

GOOD SOLAR FILM DRUM, AND

720

00:26:56,933 --> 00:26:57,933

BASICALLY THIS WELDING GLASSES

721

00:26:57,933 --> 00:26:58,933

IS YOUR SOLAR FILTER.

722

00:26:58,933 --> 00:27:01,000

PUT IT ON THE FRONT END OF THE

723

00:27:01,000 --> 00:27:01,800

TELESCOPE.

724

00:27:01,800 --> 00:27:02,566

NOT ON THE BACK END BECAUSE THE

725

00:27:02,566 --> 00:27:04,000

LIGHT IS REALLY CONCENTRATED

726  
00:27:04,000 --> 00:27:05,233  
THERE, AND IT MAY NOT WORK QUITE

727  
00:27:05,233 --> 00:27:06,000  
AS WELL.

728  
00:27:06,000 --> 00:27:08,000  
PUT IT ON THE FRONT END, AND

729  
00:27:08,000 --> 00:27:11,000  
THEN YOU CAN LOOK THROUGH YOUR

730  
00:27:11,000 --> 00:27:12,000  
TELESCOPE OR YOUR BINOCULARS.

731  
00:27:12,000 --> 00:27:15,000  
THIRD WAY IS INDIRECT VIEWING.

732  
00:27:15,000 --> 00:27:16,000  
THIS IS BASICALLY A COUPLE OF

733  
00:27:16,000 --> 00:27:19,000  
WAYS YOU CAN DO IT.

734  
00:27:19,000 --> 00:27:20,000  
EITHER WITH A TELESCOPE INSTEAD

735  
00:27:20,000 --> 00:27:21,000  
OF LOOKING THROUGH THE EYE

736  
00:27:21,000 --> 00:27:23,000  
PIECE, YOU PROJECT THAT IMAGE

737  
00:27:23,000 --> 00:27:25,000  
DOWN ON TO THE GROUND OR A PIECE

738  
00:27:25,000 --> 00:27:27,000

OF PAPER OR YOU CAN USE A PIN

739

00:27:27,000 --> 00:27:28,000

HOLE CAMERA.

740

00:27:28,000 --> 00:27:30,000

IT'S NOT QUITE AS -- IT'S VERY

741

00:27:30,000 --> 00:27:31,000

EASY TO DO.

742

00:27:31,000 --> 00:27:34,000

GET LIKE A PAPER PLATE OR A

743

00:27:34,000 --> 00:27:35,000

SHEET OF PAPER OR CARDBOARD.

744

00:27:35,000 --> 00:27:36,000

JUST POKE A LITTLE PIN HOLE IN

745

00:27:36,000 --> 00:27:37,000

IT, AND THEN PUT ANOTHER PIECE

746

00:27:37,000 --> 00:27:40,000

OF PAPER BEHIND IT, AND THAT

747

00:27:40,000 --> 00:27:42,000

WILL SERVE -- THAT WILL LEND --

748

00:27:42,000 --> 00:27:44,000

THAT WILL IMAGE THE SUN BACK ON

749

00:27:44,000 --> 00:27:46,000

TO THAT SECOND SHEET OF PAPER,

750

00:27:46,000 --> 00:27:48,000

AND YOU CAN KIND OF MOVE IT

751  
00:27:48,000 --> 00:27:49,866  
FARTHER APART IF YOU WANT TO

752  
00:27:49,866 --> 00:27:50,966  
MAKE IT LARGER.

753  
00:27:50,966 --> 00:27:55,000  
IT'S NOT IDEAL, BUT IT'S AN EASY

754  
00:27:55,000 --> 00:27:55,966  
THING TO DO, AND A SAFE THING TO

755  
00:27:55,966 --> 00:27:56,733  
DO.

756  
00:27:56,733 --> 00:27:58,000  
NOT ONLY CAN YOU LOOK AT THE

757  
00:27:58,000 --> 00:27:59,000  
TRANSIT THIS WAY, BUT YOU CAN

758  
00:27:59,000 --> 00:28:00,066  
LOOK AT SUN SPOTS.

759  
00:28:00,066 --> 00:28:01,800  
WHEN WE GET A LOT OF SUN SPOTS

760  
00:28:01,800 --> 00:28:02,600  
COMING UP.

761  
00:28:02,600 --> 00:28:04,233  
IT'S I NOOE EH NEAT WAY TO LOOK

762  
00:28:04,233 --> 00:28:05,000  
AT THE SUN.

763  
00:28:05,000 --> 00:28:08,066

I WOULD TELL YOU THAT IN THE

764

00:28:08,066 --> 00:28:10,066

PARKING LOT OF 4600 TOMORROW

765

00:28:10,066 --> 00:28:10,733

AFTERNOON ON YOUR WAY HOME, STOP

766

00:28:10,733 --> 00:28:11,533

BY.

767

00:28:11,533 --> 00:28:12,266

THEY'RE GOING TO BE TELESCOPES

768

00:28:12,266 --> 00:28:16,066

OUT THERE WHERE YOU CAN BE

769

00:28:16,066 --> 00:28:18,033

VIEWING THE TRANSIT, AND SO A

770

00:28:18,033 --> 00:28:19,333

GREAT OPPORTUNITY.

771

00:28:19,333 --> 00:28:22,066

AGAIN, ONCE IN A LIFETIME.

772

00:28:22,066 --> 00:28:22,833

DON'T FORGET.

773

00:28:22,833 --> 00:28:24,266

THE MAIN THING ABOUT THIS IS

774

00:28:24,266 --> 00:28:25,800

DON'T LOOK AT THE SUN WITH YOUR

775

00:28:25,800 --> 00:28:27,066

NAKED EYE.

776  
00:28:27,066 --> 00:28:30,000  
ALL RIGHT.

777  
00:28:30,000 --> 00:28:31,400  
REALLY HEAVILY ENGAGED IN THIS

778  
00:28:31,400 --> 00:28:32,200  
THING.

779  
00:28:32,200 --> 00:28:33,233  
THERE'S A LOT OF INFORMATION OUT

780  
00:28:33,233 --> 00:28:35,000  
THERE ON THE WEB.

781  
00:28:35,000 --> 00:28:38,000  
IF YOU GO TO VENUS

782  
00:28:38,000 --> 00:28:39,000  
TRANSIT.NASA.GOV, THERE WILL

783  
00:28:39,000 --> 00:28:41,000  
BE -- THERE'S A HOST OF

784  
00:28:41,000 --> 00:28:42,200  
INFORMATION AVAILABLE ON THIS

785  
00:28:42,200 --> 00:28:43,000  
WEBSITE.

786  
00:28:43,000 --> 00:28:45,000  
SOME OF THE ACTIVITIES THAT ARE

787  
00:28:45,000 --> 00:28:47,000  
GOING TO BE TAKING PLACE,

788  
00:28:47,000 --> 00:28:48,000

THEY'RE SPONSORED BY NASA AND

789

00:28:48,000 --> 00:28:50,000

INCLUDE A LIVE WEB CHAT FROM

790

00:28:50,000 --> 00:28:52,000

MARSHALL, AND I'LL TALK A LITTLE

791

00:28:52,000 --> 00:28:53,000

BIT ABOUT THAT.

792

00:28:53,000 --> 00:28:55,000

THERE WILL BE WEB CASTS FROM UP

793

00:28:55,000 --> 00:28:56,000

TO TEN LOCATIONS WHERE DEPENDING

794

00:28:56,000 --> 00:28:58,000

ON WHERE YOU ARE ACROSS THE

795

00:28:58,000 --> 00:29:00,000

SURFACE OF THE EARTH, YOU'LL BE

796

00:29:00,000 --> 00:29:03,000

ABLE TO -- THEY'LL BE ABLE TO

797

00:29:03,000 --> 00:29:05,000

FOLLOW THE ENTIRE TRANSIT BEING

798

00:29:05,000 --> 00:29:06,000

BROADCAST LIVE -- THEY'LL BE

799

00:29:06,000 --> 00:29:10,000

BROADCAST ON NASA TV.

800

00:29:10,000 --> 00:29:11,000

IMAGES FROM THE SPACE STATION,

801  
00:29:11,000 --> 00:29:12,000  
DON PETTITTE, WHO DOES A GREAT

802  
00:29:12,000 --> 00:29:15,000  
JOB IN TERMS OF PROVIDING US

803  
00:29:15,000 --> 00:29:18,000  
INFORMATION AND IMAGES AND VERY

804  
00:29:18,000 --> 00:29:19,000  
INTERESTING ACTIVITIES FROM THE

805  
00:29:19,000 --> 00:29:20,000  
SPACE STATION IS GOING TO BE

806  
00:29:20,000 --> 00:29:21,000  
PARTICIPATING AS WELL AS SOME OF

807  
00:29:21,000 --> 00:29:24,000  
OUR SOLAR MISSIONS, THE SOLAR

808  
00:29:24,000 --> 00:29:25,000  
DYNAMIC OBSERVE STORY WILL BE

809  
00:29:25,000 --> 00:29:26,000  
OBSERVING THIS.

810  
00:29:26,000 --> 00:29:27,000  
A LOT OF ACTIVITY ON THE SOCIAL

811  
00:29:27,000 --> 00:29:28,933  
MEDIA, ON YOUR IPHONE.

812  
00:29:28,933 --> 00:29:29,933  
THERE'S A PATH THAT YOU CAN

813  
00:29:29,933 --> 00:29:31,266

DOWNLOAD IF YOU GO TO THIS

814

00:29:31,266 --> 00:29:31,866  
WEBSITE.

815

00:29:31,866 --> 00:29:33,933  
JUST A TON OF STUFF.

816

00:29:33,933 --> 00:29:36,933  
OH, AND HERE YOU GO.

817

00:29:36,933 --> 00:29:37,933  
HERE'S THE MARCH.

818

00:29:37,933 --> 00:29:39,933  
MAKE SURE AND LISTEN TO THAT.

819

00:29:39,933 --> 00:29:45,933  
AGAIN, VENUS TRANSIT.NASA.GOV.

820

00:29:45,933 --> 00:29:46,500  
GO THERE.

821

00:29:46,500 --> 00:29:47,300  
NOW THE WEB CHAT.

822

00:29:47,300 --> 00:29:49,933  
THIS IS SOMETHING THAT MARSHALL

823

00:29:49,933 --> 00:29:50,933  
HAS DONE PARTICULARLY WITH THE

824

00:29:50,933 --> 00:29:51,933  
SCIENCE MISSION DIRECTORY THAT

825

00:29:51,933 --> 00:29:53,866  
HAS RECEIVED A VERY GOOD

826

00:29:53,866 --> 00:29:54,800

RESPONSE.

827

00:29:54,800 --> 00:29:58,933

IN FACT, AS OF LAST WEEK WE

828

00:29:58,933 --> 00:29:59,933

PRESENTED A WHOLE SPECIAL

829

00:29:59,933 --> 00:30:02,000

FEATURE ON THE MARSHALL WEB CHAT

830

00:30:02,000 --> 00:30:06,000

AND HOW SUCCESSFUL THEY'VE BEEN

831

00:30:06,000 --> 00:30:07,000

AND WHILE MARSHALL IS KIND OF

832

00:30:07,000 --> 00:30:08,100

FOCUSED, IT'S BELIEVE ONLY A

833

00:30:08,100 --> 00:30:08,900

MARSHALL THING.

834

00:30:08,900 --> 00:30:11,000

IT'S THAT THAT TENDS TO BE WHERE

835

00:30:11,000 --> 00:30:13,000

WE'VE KIND OF REALLY TAKEN

836

00:30:13,000 --> 00:30:14,000

ADVANTAGE OF THIS ONE PARTICULAR

837

00:30:14,000 --> 00:30:17,000

MEDIA, AND OUR FOLKS HAVE DONE A

838

00:30:17,000 --> 00:30:19,000

GREAT JOB ON MANY ACTIVITIES,

839

00:30:19,000 --> 00:30:21,000

MANY DIFFERENT EVENTS THAT HAVE

840

00:30:21,000 --> 00:30:22,000

OCCURRED, AND WE'RE GOING TO DO

841

00:30:22,000 --> 00:30:24,000

IT AGAIN TOMORROW AFTERNOON

842

00:30:24,000 --> 00:30:26,000

BEGINNING AT 3:30 P.M. LOCAL

843

00:30:26,000 --> 00:30:27,000

TIME.

844

00:30:27,000 --> 00:30:28,933

IT'S GOING TO BEGIN WITH --

845

00:30:28,933 --> 00:30:32,933

BASICALLY YOU LOG ON TO THIS WEB

846

00:30:32,933 --> 00:30:37,933

CHAT ADDRESS RIGHT HERE.

847

00:30:37,933 --> 00:30:41,933

NASA.GOV/CHAT/VENUS TRANSIT, AND

848

00:30:41,933 --> 00:30:43,933

AT 3:30 DR. CARYN FROM AMES ON

849

00:30:43,933 --> 00:30:45,933

THE KEPLER MISSION, SHE'LL BEGIN

850

00:30:45,933 --> 00:30:47,933

THE WEB CHAT BEGINNING AT THAT

851  
00:30:47,933 --> 00:30:50,933  
TIME, AND THROUGHOUT THE EVENING

852  
00:30:50,933 --> 00:30:51,933  
WE'LL HAVE VARIOUS OTHER

853  
00:30:51,933 --> 00:30:52,933  
SCIENTISTS, DR. MELISSA McGRAPH

854  
00:30:52,933 --> 00:30:55,933  
HERE FROM MARSHALL, JOHN -- DR.

855  
00:30:55,933 --> 00:30:57,933  
JOHN ALSO HERE FROM MARSHALL,

856  
00:30:57,933 --> 00:30:59,933  
DR. WEBER FROM MARSHALL AND

857  
00:30:59,933 --> 00:31:01,000  
MITSY ADAMS FROM MARSHALL WILL

858  
00:31:01,000 --> 00:31:02,266  
BE CHIMING IN THROUGHOUT THE

859  
00:31:02,266 --> 00:31:03,066  
EVENING.

860  
00:31:03,066 --> 00:31:04,066  
IT'S A GREAT OPPORTUNITY TO GO

861  
00:31:04,066 --> 00:31:06,000  
IN IF YOU HAVE A QUESTION.

862  
00:31:06,000 --> 00:31:07,000  
JUST SEND IT IN.

863  
00:31:07,000 --> 00:31:08,000

THEY'LL ANSWER IT OR POINT YOU

864

00:31:08,000 --> 00:31:12,000

IN THE RIGHT DIRECTION IF THEY

865

00:31:12,000 --> 00:31:13,000

DON'T KNOW THE ANSWER.

866

00:31:13,000 --> 00:31:16,000

A GREAT WAY TO KIND OF GET

867

00:31:16,000 --> 00:31:18,000

INVOLVED IN THE ACTIVITY.

868

00:31:18,000 --> 00:31:20,000

NOW, IT'S REALLY INTERESTING.

869

00:31:20,000 --> 00:31:21,000

JIM GREEN FOUND THIS QUOTE FROM

870

00:31:21,000 --> 00:31:24,000

THE LAST -- FROM THE LAST SET OF

871

00:31:24,000 --> 00:31:27,000

TRANSITS THAT OCCURRED IN 1882

872

00:31:27,000 --> 00:31:28,933

VIA WILLIAM HARTNESS AT THE U.S.

873

00:31:28,933 --> 00:31:29,933

NAVAL OBSERVATORY.

874

00:31:29,933 --> 00:31:30,933

HE SAYS THERE WILL BE ANOTHER

875

00:31:30,933 --> 00:31:31,933

TRANSIT OF VENUS.

876

00:31:31,933 --> 00:31:32,933

THERE WILL BE NO OTHER TRANSIT

877

00:31:32,933 --> 00:31:36,933

OF VENUS UNTIL THE 21st CENTURY

878

00:31:36,933 --> 00:31:39,933

OF OUR ERA HAS DAWNED UPON THE

879

00:31:39,933 --> 00:31:40,933

EARTH, AND JUNE FLOWERS ARE

880

00:31:40,933 --> 00:31:42,933

BLOOMING IN 2004.

881

00:31:42,933 --> 00:31:43,933

WELL, THIS IS 2012.

882

00:31:43,933 --> 00:31:47,933

JUNE FLOWERS ARE BLOOMING, AND

883

00:31:47,933 --> 00:31:48,933

THE INTERESTING STATEMENT IS

884

00:31:48,933 --> 00:31:50,933

WHAT WILL THE STATE OF

885

00:31:50,933 --> 00:31:52,933

SCIENCE -- WHAT WILL BE THE

886

00:31:52,933 --> 00:31:56,933

STATE OF SCIENCE WHEN THE NEXT

887

00:31:56,933 --> 00:31:57,933

TRANSIT SEASON ARRIVES?

888

00:31:57,933 --> 00:31:58,933

GOD ONLY KNOWS.

889

00:31:58,933 --> 00:32:01,000

AS I READ THAT, I THOUGHT, WELL,

890

00:32:01,000 --> 00:32:03,000

GEE, I WONDER WHAT THE STATE OF

891

00:32:03,000 --> 00:32:06,000

SCIENCE IS GOING TO BE IN 2117

892

00:32:06,000 --> 00:32:10,000

WHEN THE NEXT ONE COMES.

893

00:32:10,000 --> 00:32:12,000

WE DON'T KNOW, BUT GOD KNOWS.

894

00:32:12,000 --> 00:32:13,000

ALL RIGHT.

895

00:32:13,000 --> 00:32:17,000

THAT'S THE PRESENTATION.

896

00:32:17,000 --> 00:32:19,000

ANY QUESTIONS?

897

00:32:19,000 --> 00:32:20,000

YOU ALL READY TO GO SEE THE

898

00:32:20,000 --> 00:32:21,000

TRANSIT?

899

00:32:21,000 --> 00:32:22,000

ALL RIGHT.

900

00:32:22,000 --> 00:32:26,000

OKAY.

901  
00:32:26,000 --> 00:32:27,000  
YES.

902  
00:32:27,000 --> 00:32:30,933  
QUESTION?

903  
00:32:30,933 --> 00:32:32,100  
THE QUESTION IS THAT ON THE

904  
00:32:32,100 --> 00:32:33,433  
FIRST PREDICTION THEY PREDICTED

905  
00:32:33,433 --> 00:32:35,933  
IT, BUT THEY COULDN'T SEE IT

906  
00:32:35,933 --> 00:32:39,933  
FROM EUROPE, AND THE REASON IS

907  
00:32:39,933 --> 00:32:41,933  
NOT THE ENTIRE GLOBE -- THE

908  
00:32:41,933 --> 00:32:45,933  
VENUS TRANSIT ONLY LASTS FOR A

909  
00:32:45,933 --> 00:32:46,933  
CERTAIN PERIOD OF TIME, AND SO

910  
00:32:46,933 --> 00:32:48,933  
THE ENTIRE GLOBE DOESN'T SEE IT

911  
00:32:48,933 --> 00:32:49,933  
AT ALL TIMES, AND SO WHENEVER

912  
00:32:49,933 --> 00:32:52,933  
THAT WAS IN 1882 OR SOMETHING

913  
00:32:52,933 --> 00:32:54,933

LIKE THAT, EUROPE HAPPENS TO BE

914

00:32:54,933 --> 00:32:56,933

IN THIS NO VISIBLE ZONE BECAUSE,

915

00:32:56,933 --> 00:32:58,933

YOU KNOW, IF IT TOOK, LIKE, 24

916

00:32:58,933 --> 00:32:59,933

HOURS TO GO ACROSS THE SUN,

917

00:32:59,933 --> 00:33:02,000

WHICH IS THE TIME IT TAKES FOR

918

00:33:02,000 --> 00:33:03,000

THE EARTH TO ROTATE, THEN

919

00:33:03,000 --> 00:33:04,000

EVERYBODY COULD SEE IT, BUT IT'S

920

00:33:04,000 --> 00:33:06,000

LESS THAN THAT, AND SO SOME

921

00:33:06,000 --> 00:33:12,000

PARTS OF THE EARTH JUST DON'T

922

00:33:12,000 --> 00:33:14,266

GET TO SEE IT.

923

00:33:14,266 --> 00:33:15,300

YES.

924

00:33:15,300 --> 00:33:18,733

I THINK IT'S GOING TO BE THAT

925

00:33:18,733 --> 00:33:20,033

PICTURE.

926  
00:33:20,033 --> 00:33:27,000  
NOW -- YEAH, I THINK IT BEGINS

927  
00:33:27,000 --> 00:33:29,933  
AT THE TOP OF THAT -- I THINK

928  
00:33:29,933 --> 00:33:30,933  
THAT THIS IS AN ACCURATE

929  
00:33:30,933 --> 00:33:31,933  
DEPICTION THAT WHEN YOU LOOK AT

930  
00:33:31,933 --> 00:33:33,933  
THE SOLAR DISK THROUGH YOUR

931  
00:33:33,933 --> 00:33:37,933  
GLASSES, IT WOULD BEGIN UP HERE,

932  
00:33:37,933 --> 00:33:40,933  
AND IT WILL GO ACROSS THIS WAY.

933  
00:33:40,933 --> 00:33:41,933  
THAT'S -- I'M JUST GOING TO

934  
00:33:41,933 --> 00:33:47,933  
TRUST THE POSTER IS RIGHT.

935  
00:33:47,933 --> 00:33:48,933  
YOU DON'T NEED YOUR BINOCULARS.

936  
00:33:48,933 --> 00:33:50,933  
YOU DON'T NEED A TELESCOPE.

937  
00:33:50,933 --> 00:33:51,933  
YOU'LL SEE A LITTLE DOT GOING

938  
00:33:51,933 --> 00:33:52,933

ACROSS.

939

00:33:52,933 --> 00:33:53,933

OF COURSE, IT'S A LOT BETTER IF

940

00:33:53,933 --> 00:33:57,366

YOU DO HAVE IT PROJECTED IN SOME

941

00:33:57,366 --> 00:33:58,200

WAY.

942

00:33:58,200 --> 00:34:02,000

ANY OTHER QUESTIONS?

943

00:34:02,000 --> 00:34:05,000

ALL RIGHT.

944

00:34:05,000 --> 00:34:07,000

WELL, I WANT TO THANK YOU, SHARE

945

00:34:07,000 --> 00:34:08,000

YOUR KNOWLEDGE OF THINGS YOU

946

00:34:08,000 --> 00:34:10,000

HAVE LEARNED TODAY WITH YOUR

947

00:34:10,000 --> 00:34:15,000

COHORTS AT WORK AS WELL, AND IF

948

00:34:15,000 --> 00:34:17,000

THERE IS SOME GLASSES LEFT OVER,

949

00:34:17,000 --> 00:34:19,000

NOW I'M GOING TO WING IT.

950

00:34:19,000 --> 00:34:20,000

I'M NOT SURE HOW WE'RE GOING TO

951

00:34:20,000 --> 00:34:22,000

GET IT TO EVERYBODY, BUT I'M

952

00:34:22,000 --> 00:34:24,000

GOING TO GIVE -- ASK JANET

953

00:34:24,000 --> 00:34:26,000

ANDERSON TO BE KIND OF THE POINT

954

00:34:26,000 --> 00:34:27,000

OF CONTACT AND SO IF YOU GET

955

00:34:27,000 --> 00:34:30,933

BACK TO YOUR OFFICE AND YOU WANT

956

00:34:30,933 --> 00:34:32,933

PEOPLE TO -- AND SOMEONE

957

00:34:32,933 --> 00:34:34,933

EXPRESSES AN INTEREST AND SAY,

958

00:34:34,933 --> 00:34:36,933

OH, GEE, I WANT THOSE GLASSES,

959

00:34:36,933 --> 00:34:38,933

CONTACT JANET ANDERSON AND

960

00:34:38,933 --> 00:34:40,933

SOMEHOW WE'LL GET THOSE TO YOU