



1
00:00:22,710 --> 00:00:19,440
nasa the national aeronautics and space

2
00:00:32,819 --> 00:00:22,720
administration presents aeronautics and

3
00:00:39,009 --> 00:00:36,130
march seven scientists took a good look

4
00:00:41,830 --> 00:00:39,019
at the Sun the occasion a total solar

5
00:00:46,479 --> 00:00:41,840
eclipse an event of such magnitude will

6
00:00:50,530 --> 00:00:46,489
not occur again until 2024 54 years from

7
00:00:53,469 --> 00:00:50,540
now another Tyros operational weather

8
00:00:55,060 --> 00:00:53,479
satellite was launched in 1970 it's

9
00:00:57,990 --> 00:00:55,070
looking at the Earth's cloud cover and

10
00:01:01,509 --> 00:00:58,000
returns daily weather information

11
00:01:04,899 --> 00:01:01,519
orbited also Nimbus an advanced weather

12
00:01:06,969 --> 00:01:04,909
researcher to communication satellites

13
00:01:13,030 --> 00:01:06,979

were successfully launched as part of a

14

00:01:15,520 --> 00:01:13,040

global communication satellite system in

15

00:01:17,980 --> 00:01:15,530

aeronautics NASA continued its research

16

00:01:20,260 --> 00:01:17,990

in wake turbulence these smoked our

17

00:01:22,450 --> 00:01:20,270

tests show how tornado-like patterns of

18

00:01:25,390 --> 00:01:22,460

air are churned up as a large plane

19

00:01:29,230 --> 00:01:25,400

passes by causing potential hazards for

20

00:01:31,630 --> 00:01:29,240

lighter aircraft nasa's earth resources

21

00:01:34,270 --> 00:01:31,640

planes made high-altitude pictures of

22

00:01:35,440 --> 00:01:34,280

peru's devastating earthquake pictures

23

00:01:40,059 --> 00:01:35,450

that will contribute to the remote

24

00:01:41,499 --> 00:01:40,069

sensing of future natural disasters they

25

00:01:43,059 --> 00:01:41,509

also made temperature and color

26
00:01:45,429 --> 00:01:43,069
measurements over the tuner rich fishing

27
00:01:47,770 --> 00:01:45,439
grounds near oregon an effort to assist

28
00:01:50,559 --> 00:01:47,780
pacific coast fishing plates to increase

29
00:01:53,169 --> 00:01:50,569
their catch while enroute to the moon

30
00:01:54,910 --> 00:01:53,179
the third manned lunar landing attempt

31
00:01:57,459 --> 00:01:54,920
was cancelled when an oxygen tank

32
00:02:00,010 --> 00:01:57,469
ruptured the Apollo 13 astronauts

33
00:02:01,929 --> 00:02:00,020
Louisville haze and swaggered were then

34
00:02:06,460 --> 00:02:01,939
safely recovered from the Pacific Ocean

35
00:02:11,980 --> 00:02:09,850
at 3pm September 30th the last of the

36
00:02:13,900 --> 00:02:11,990
huge first stage engines that lift the

37
00:02:18,280 --> 00:02:13,910
Saturn 5 moon rockets off the launch pad

38
00:02:20,520 --> 00:02:18,290

were successfully test-fired trying out

39

00:02:23,230 --> 00:02:20,530

life support systems for long-duration

40

00:02:25,600 --> 00:02:23,240

spaceflights of the future for college

41

00:02:28,060 --> 00:02:25,610

students from California spent 90 days

42

00:02:30,880 --> 00:02:28,070

confined in a space station simulator

43

00:02:32,770 --> 00:02:30,890

the crew drank water and breathe oxygen

44

00:02:35,050 --> 00:02:32,780

reclaimed from their body wastes and

45

00:02:37,880 --> 00:02:35,060

emerged after their confinement showing

46

00:02:41,369 --> 00:02:37,890

no apparent ill effects

47

00:02:43,830 --> 00:02:41,379

beginning october 18 soviet cosmonauts

48

00:02:46,350 --> 00:02:43,840

andrei Nikolaev and vitaly sebastian

49

00:02:48,690 --> 00:02:46,360

off toward the US and several NASA field

50

00:02:50,309 --> 00:02:48,700

centers during that same month the

51
00:02:52,920 --> 00:02:50,319
United States and the Soviet Union

52
00:02:54,839 --> 00:02:52,930
agreed to study ways that American and

53
00:02:59,280 --> 00:02:54,849
Russian space ships could meet and join

54
00:03:01,619 --> 00:02:59,290
in space 1970 was the year of lunar

55
00:03:03,530 --> 00:03:01,629
research now for the first time a

56
00:03:06,390 --> 00:03:03,540
special report on what we've learned

57
00:03:15,259 --> 00:03:06,400
reporter Sally Ann Haynes reviews the

58
00:03:20,819 --> 00:03:18,750
for more than 20 centuries the moon has

59
00:03:23,460 --> 00:03:20,829
been studied and investigated by skills

60
00:03:25,289 --> 00:03:23,470
and ingenious men they have come to

61
00:03:27,660 --> 00:03:25,299
realize that in comparing the moon with

62
00:03:30,750 --> 00:03:27,670
you we can learn more about the history

63
00:03:32,330 --> 00:03:30,760

of both and ultimately more about the

64

00:03:35,369 --> 00:03:32,340

history of the solar system as a whole

65

00:03:37,440 --> 00:03:35,379

in the process we would gain a new

66

00:03:46,360 --> 00:03:37,450

perspective about our own place and role

67

00:03:51,180 --> 00:03:48,670

before mound Apollo flights to the moon

68

00:03:53,589 --> 00:03:51,190

we could only study it remotely

69

00:03:59,320 --> 00:03:53,599

primarily by way of instruments such as

70

00:04:08,440 --> 00:03:59,330

the telescope and recently in history by

71

00:04:11,170 --> 00:04:08,450

way of automated spacecraft early in the

72

00:04:13,180 --> 00:04:11,180

seventeenth century Galileo Galilei

73

00:04:15,430 --> 00:04:13,190

became the first of the great scientists

74

00:04:17,949 --> 00:04:15,440

to use the telescope a quite novel

75

00:04:23,020 --> 00:04:17,959

instrument at the time to study the moon

76

00:04:25,689 --> 00:04:23,030

I feel sure that the surface of the Moon

77

00:04:28,600 --> 00:04:25,699

is not perfectly smooth free from any

78

00:04:31,170 --> 00:04:28,610

qualities and exactly spherical has a

79

00:04:34,330 --> 00:04:31,180

large school of philosophers considers

80

00:04:37,480 --> 00:04:34,340

on the contrary it is full of

81

00:04:40,420 --> 00:04:37,490

inequalities uneven full of hollows and

82

00:04:43,810 --> 00:04:40,430

protuberances just like the surface of

83

00:04:45,850 --> 00:04:43,820

the earth itself his discoveries helped

84

00:04:49,029 --> 00:04:45,860

overturn andro Gnaeus beliefs popularly

85

00:04:53,430 --> 00:04:49,039

held and taught for 14th century and lay

86

00:04:58,060 --> 00:04:55,930

Galileo would be followed by a stream of

87

00:05:00,730 --> 00:04:58,070

other scientists and a mass of new

88

00:05:02,680 --> 00:05:00,740

information and knowledge the centuries

89

00:05:07,190 --> 00:05:02,690

of investigations produced a great deal

90

00:05:13,140 --> 00:05:10,590

for instance the moon orbiting once

91

00:05:15,720 --> 00:05:13,150

about every four weeks always keeping

92

00:05:17,490 --> 00:05:15,730

the same face toward Earth is far larger

93

00:05:19,350 --> 00:05:17,500

in more distance compared with its

94

00:05:21,060 --> 00:05:19,360

planet then are any of the other moons

95

00:05:23,880 --> 00:05:21,070

of our solar system compared with their

96

00:05:26,390 --> 00:05:23,890

plants in fact the moon is often

97

00:05:29,310 --> 00:05:26,400

considered a planet in its own right

98

00:05:31,170 --> 00:05:29,320

further some scientists believe that the

99

00:05:33,690 --> 00:05:31,180

moon is gradually pulling away from the

100

00:05:36,530 --> 00:05:33,700

earth which in turn is gradually

101
00:05:39,060 --> 00:05:36,540
revolving slower and slower on its axis

102
00:05:40,700 --> 00:05:39,070
there is at least some evidence that the

103
00:05:43,470 --> 00:05:40,710
moon was much nearer earth in the past

104
00:05:48,600 --> 00:05:43,480
although no one knows just how near it

105
00:05:53,739 --> 00:05:51,279
the surface of the Moon has actually

106
00:05:57,219 --> 00:05:53,749
been described as a cosmic battlefield a

107
00:05:59,320 --> 00:05:57,229
place terribly hostile to life it is

108
00:06:01,959 --> 00:05:59,330
alternately baked and frozen in

109
00:06:04,239 --> 00:06:01,969
temperatures ranging from some 250

110
00:06:07,450 --> 00:06:04,249
degrees fahrenheit above zero for some

111
00:06:11,200 --> 00:06:07,460
250 degrees below zero and it is seared

112
00:06:15,550 --> 00:06:14,020
as a whole the surface of the Moon may

113
00:06:18,010 --> 00:06:15,560

be divided into the heavily cratered

114

00:06:20,740 --> 00:06:18,020

Highlands which Galileo called the

115

00:06:25,779 --> 00:06:20,750

brighter spots and the Maria which

116

00:06:28,450 --> 00:06:25,789

Galileo called the dark spots the

117

00:06:32,879 --> 00:06:28,460

Highlands are far more rugged having 20

118

00:06:37,749 --> 00:06:35,710

this means that the formation of craters

119

00:06:43,499 --> 00:06:37,759

has slowed drastically by the time the

120

00:06:48,670 --> 00:06:46,570

in essence the highlands were formed

121

00:06:51,549 --> 00:06:48,680

when the moon was a growing dynamic body

122

00:06:57,549 --> 00:06:51,559

the maria when the moon was far less

123

00:07:00,279 --> 00:06:57,559

active in contrast with the moon's face

124

00:07:02,529 --> 00:07:00,289

the far side is almost totally covered

125

00:07:07,239 --> 00:07:02,539

with Highlands there simply are none of

126
00:07:09,339 --> 00:07:07,249
the great Mario telescopes and automated

127
00:07:12,279 --> 00:07:09,349
satellites brought us close up looks at

128
00:07:15,549 --> 00:07:12,289
many individual features for instance in

129
00:07:21,999 --> 00:07:15,559
the highlands craters which look much

130
00:07:24,360 --> 00:07:22,009
like certain volcanoes on Earth other

131
00:07:26,409 --> 00:07:24,370
craters which look like impact sites

132
00:07:28,389 --> 00:07:26,419
sometimes with streaks of debris

133
00:07:32,739 --> 00:07:28,399
radiating hundreds of miles away from

134
00:07:34,570 --> 00:07:32,749
their centres mountain ranges which

135
00:07:38,850 --> 00:07:34,580
tower thousands of feet above the

136
00:07:46,090 --> 00:07:42,840
symmetrical Hills known as domes

137
00:07:52,000 --> 00:07:46,100
apparent red glows first seen in the

138
00:07:54,100 --> 00:07:52,010

1950s where the Highlands and Marya meet

139

00:07:55,900 --> 00:07:54,110

there are features which look much like

140

00:08:00,700 --> 00:07:55,910

ocean waves approaching a rugged

141

00:08:03,730 --> 00:08:00,710

shoreline the maurya basins are

142

00:08:06,159 --> 00:08:03,740

comparatively smooth and flat like into

143

00:08:08,770 --> 00:08:06,169

a frozen seen by the first men to orbit

144

00:08:11,380 --> 00:08:08,780

the moon and they are marked by

145

00:08:17,409 --> 00:08:11,390

so-called wrinkle ridges which have the

146

00:08:20,290 --> 00:08:17,419

appearance of frozen waves phantom

147

00:08:25,540 --> 00:08:20,300

craters evidently real craters virtually

148

00:08:27,790 --> 00:08:25,550

inundated by Mario materials then there

149

00:08:32,000 --> 00:08:27,800

are valleys which wander for hundreds of

150

00:08:36,530 --> 00:08:34,880

great fractures or thoughts which may

151
00:08:41,330 --> 00:08:36,540
slice across the moon's face for a

152
00:08:44,120 --> 00:08:41,340
hundred miles there are the newly

153
00:08:46,970 --> 00:08:44,130
discovered mass concentrations or mass

154
00:08:49,340 --> 00:08:46,980
cones buried beneath the circular Marya

155
00:08:51,350 --> 00:08:49,350
and their gravitational attraction

156
00:08:56,250 --> 00:08:51,360
actually distorts the flight path of

157
00:09:01,110 --> 00:08:59,040
from surveyor spacecraft there was even

158
00:09:09,540 --> 00:09:01,120
some knowledge of the nature of the soil

159
00:09:11,970 --> 00:09:09,550
and the chemistry of materials yet for

160
00:09:14,640 --> 00:09:11,980
all we had learned for all we had

161
00:09:16,770 --> 00:09:14,650
discovered even with unmanned space

162
00:09:19,350 --> 00:09:16,780
vehicles which landed on the surface and

163
00:09:22,080 --> 00:09:19,360

manned apollo vehicles which orbited

164

00:09:25,710 --> 00:09:22,090

above the surface the moon still somehow

165

00:09:35,210 --> 00:09:25,720

seemed remote and inaccessible until

166

00:09:42,079 --> 00:09:38,840

putting feet down two and a half

167

00:09:46,460 --> 00:09:42,089

three feet two and a half down make that

168

00:09:50,240 --> 00:09:46,470

0 for forward forward ripped into the

169

00:09:57,129 --> 00:09:50,250

right little ok and a half 30 second

170

00:09:57,139 --> 00:10:04,519

at the saddle up there I'm back right

171

00:10:12,679 --> 00:10:08,470

okay engine stop we copy you down eagle

172

00:10:16,850 --> 00:10:12,689

Griffin and gaudy babe here Hinkle air

173

00:10:19,220 --> 00:10:16,860

planted in a sense from this moment on

174

00:10:21,889 --> 00:10:19,230

the old moon that had once been the

175

00:10:25,249 --> 00:10:21,899

stuff of impossible dreams completely

176
00:10:27,410 --> 00:10:25,259
disappeared and the news of mountains

177
00:10:32,210 --> 00:10:27,420
and valleys and stoned earth and

178
00:10:35,600 --> 00:10:32,220
possible dreams took its place I will

179
00:10:38,269 --> 00:10:35,610
get to the details of what's around here

180
00:10:42,579 --> 00:10:38,279
but it looks like a collection of just

181
00:10:45,889 --> 00:10:42,589
about every variety of shape angularity

182
00:10:49,879 --> 00:10:45,899
granularity but every variety of rock

183
00:10:54,259 --> 00:10:49,889
you could find fairly large number of

184
00:10:59,449 --> 00:10:54,269
craters of the five to fifty foot

185
00:11:02,780 --> 00:10:59,459
variety and some reaches the small 2030

186
00:11:05,739 --> 00:11:02,790
feet I i would guess and literally

187
00:11:09,590 --> 00:11:05,749
thousands of little one and to put

188
00:11:14,110 --> 00:11:09,600

craters around the area there is a hill

189

00:11:17,540 --> 00:11:14,120

and you just about on the ground track

190

00:11:22,040 --> 00:11:17,550

ahead of it difficult to estimate but

191

00:11:24,860 --> 00:11:22,050

despite the a half a mile and throughout

192

00:11:27,949 --> 00:11:24,870

the world there was renewed Duluth not

193

00:11:30,390 --> 00:11:27,959

just in American technology but in human

194

00:11:33,210 --> 00:11:30,400

abilities

195

00:11:35,400 --> 00:11:33,220

thus in the moon Sea of Tranquility a

196

00:11:40,980 --> 00:11:35,410

new chapter in the history of science

197

00:11:42,720 --> 00:11:40,990

was begun simultaneously a carefully

198

00:11:44,790 --> 00:11:42,730

developed in planned programme of

199

00:11:48,470 --> 00:11:44,800

scientific investigation was set in

200

00:11:53,569 --> 00:11:50,990

there would be new information about the

201
00:11:55,490 --> 00:11:53,579
internal structure of the moon the

202
00:11:58,970 --> 00:11:55,500
chemical composition of the rocks and

203
00:12:03,470 --> 00:11:58,980
soil the dynamic processes at work and

204
00:12:06,800 --> 00:12:03,480
the ages of the materials scientists

205
00:12:09,110 --> 00:12:06,810
shared a great sense of excitement in

206
00:12:11,480 --> 00:12:09,120
the highest priority scientific

207
00:12:13,040 --> 00:12:11,490
undertaking the astronauts collected a

208
00:12:15,670 --> 00:12:13,050
selection of samples of the lunar

209
00:12:18,079 --> 00:12:15,680
surface the first extraterrestrial

210
00:12:22,340 --> 00:12:18,089
materials ever to be brought to work

211
00:12:24,949 --> 00:12:22,350
from a known context in an experience so

212
00:12:30,019 --> 00:12:24,959
new every fragment of information was of

213
00:12:33,889 --> 00:12:30,029

intense scientific interest define an

214

00:12:39,530 --> 00:12:33,899

artery I can pick it up loosely with my

215

00:12:43,699 --> 00:12:39,540

toe it says 'add here is fine layer like

216

00:12:48,860 --> 00:12:43,709

powdered charcoal to the full and size

217

00:12:50,660 --> 00:12:48,870

of my fruit I only go in a all action a

218

00:12:55,220 --> 00:12:50,670

maybe an eighth of an inch but I

219

00:13:02,930 --> 00:12:55,230

can see the footprints of my food from

220

00:13:05,030 --> 00:13:02,940

the trench and me fine antiparticle in

221

00:13:07,160 --> 00:13:05,040

the sentence of small craters the

222

00:13:09,319 --> 00:13:07,170

astronauts discovered strange features

223

00:13:11,669 --> 00:13:09,329

which looked much like splattered solder

224

00:13:14,379 --> 00:13:11,679

or glass

225

00:13:16,150 --> 00:13:14,389

the astronauts discovered rocks which

226

00:13:18,819 --> 00:13:16,160

had been hurled from neighboring crazies

227

00:13:21,429 --> 00:13:18,829

yet they saw no impact scars in a

228

00:13:23,350 --> 00:13:21,439

powdery surface for the rocks truck the

229

00:13:27,039 --> 00:13:23,360

scars had apparently been eroded away by

230

00:13:29,350 --> 00:13:27,049

an unknown process the astronauts set up

231

00:13:31,720 --> 00:13:29,360

an array of instruments in effect a

232

00:13:33,579 --> 00:13:31,730

miniature scientific station to return

233

00:13:37,809 --> 00:13:33,589

data to earth long after the men

234

00:13:39,970 --> 00:13:37,819

themselves had left one of the

235

00:13:42,369 --> 00:13:39,980

instruments relatively simple in concept

236

00:13:44,289 --> 00:13:42,379

was a reflecting device which would

237

00:13:50,229 --> 00:13:44,299

intercept a laser beam for Earth and

238

00:13:51,910 --> 00:13:50,239

send it back on itself measuring the

239

00:13:54,220 --> 00:13:51,920

time it took the beam to travel from the

240

00:13:55,689 --> 00:13:54,230

earth to the moon and back scientists

241

00:13:59,109 --> 00:13:55,699

could calculate the distance to the moon

242

00:14:00,910 --> 00:13:59,119

within a few inches they will be able to

243

00:14:03,549 --> 00:14:00,920

use such precise measurements in

244

00:14:05,979 --> 00:14:03,559

studying the earth for instance the

245

00:14:08,739 --> 00:14:05,989

variations in its rotation rate the

246

00:14:12,030 --> 00:14:08,749

wobble of its axis the drift of its

247

00:14:17,310 --> 00:14:14,490

another of the devices was a seismometer

248

00:14:19,920 --> 00:14:17,320

an instrument which detects vibrations

249

00:14:21,389 --> 00:14:19,930

of the lunar surface the vibrations

250

00:14:23,579 --> 00:14:21,399

reflect something of the nature of the

251
00:14:29,309 --> 00:14:23,589
internal structure and energy release of

252
00:14:31,920 --> 00:14:29,319
the moon a few months later when Apollo

253
00:14:33,809 --> 00:14:31,930
12 landed in the ocean of storms the

254
00:14:36,120 --> 00:14:33,819
astronauts given more time for

255
00:14:38,370 --> 00:14:36,130
scientific work on the surface were able

256
00:14:40,710 --> 00:14:38,380
to enlarge on all that the Apollo 11

257
00:14:43,590 --> 00:14:40,720
astronauts had accomplished they were

258
00:14:45,749 --> 00:14:43,600
able to range farther collect morn that

259
00:14:49,439 --> 00:14:45,759
are documented samples and set up a

260
00:14:51,449 --> 00:14:49,449
larger scientific station the scientific

261
00:14:57,180 --> 00:14:51,459
exploration of the moon was now well

262
00:15:00,030 --> 00:14:57,190
underway the lunar materials returned to

263
00:15:02,550 --> 00:15:00,040

earth were met with high excitement more

264

00:15:04,980 --> 00:15:02,560

than 140 scientists from this country

265

00:15:08,639 --> 00:15:04,990

and abroad pushed into painstaking and

266

00:15:11,100 --> 00:15:08,649

intensive investigation we're broadening

267

00:15:14,309 --> 00:15:11,110

our horizons we were never able to do

268

00:15:15,689 --> 00:15:14,319

that while the intense activity that

269

00:15:18,689 --> 00:15:15,699

took place on the surface of the earth

270

00:15:20,490 --> 00:15:18,699

when it was a young planet had wiped out

271

00:15:23,579 --> 00:15:20,500

the record of the first million years in

272

00:15:25,949 --> 00:15:23,589

his history the moon is now restored

273

00:15:28,800 --> 00:15:25,959

that missing record in Safari to related

274

00:15:30,900 --> 00:15:28,810

to the earth I think it had contact with

275

00:15:32,790 --> 00:15:30,910

the feelings of every person not merely

276

00:15:36,769 --> 00:15:32,800

the specialists regarding what are you

277

00:15:41,879 --> 00:15:39,210

typical of the detailed efforts were

278

00:15:44,100 --> 00:15:41,889

studies with electron microscopes which

279

00:15:53,040 --> 00:15:44,110

produced magnifications up to 1 million

280

00:15:57,819 --> 00:15:56,109

for some of these studies samples were

281

00:16:00,669 --> 00:15:57,829

sectioned with a knife which has the

282

00:16:09,489 --> 00:16:00,679

sharpest edge known it can split a hare

283

00:16:11,559 --> 00:16:09,499

into 10,000 sections the scientists

284

00:16:15,400 --> 00:16:11,569

often felt a sense of wonder what they

285

00:16:17,220 --> 00:16:15,410

saw this dust which looks like gray

286

00:16:19,749 --> 00:16:17,230

material without interest has

287

00:16:21,639 --> 00:16:19,759

exceedingly beautiful and varied forms

288

00:16:23,169 --> 00:16:21,649

just from an aesthetic standpoint as

289

00:16:24,699 --> 00:16:23,179

well of course from a scientific

290

00:16:26,679 --> 00:16:24,709

standpoint when you put it under the

291

00:16:28,749 --> 00:16:26,689

microscope the material is just

292

00:16:33,309 --> 00:16:28,759

beautiful aesthetically and of course

293

00:16:35,319 --> 00:16:33,319

it's beautiful scientifically among the

294

00:16:37,780 --> 00:16:35,329

materials there are crystalline rocks

295

00:16:40,780 --> 00:16:37,790

clearly marked as igneous by bubble like

296

00:16:42,639 --> 00:16:40,790

cavities and by their chemistry they

297

00:16:45,249 --> 00:16:42,649

were crystallized from molten silicon

298

00:16:47,350 --> 00:16:45,259

material in a lunar Inferno with

299

00:16:53,319 --> 00:16:47,360

temperatures well over 2,000 degrees

300

00:16:54,939 --> 00:16:53,329

Fahrenheit there are other rocks which

301

00:16:57,999 --> 00:16:54,949

consist of fragments of the igneous

302

00:17:00,429 --> 00:16:58,009

rocks embedded in lunar soil call brick

303

00:17:02,980 --> 00:17:00,439

Sia's they were formed when meteorites

304

00:17:05,079 --> 00:17:02,990

impacted on the surface producing such

305

00:17:12,699 --> 00:17:05,089

tremendous pressures that rubble and

306

00:17:14,919 --> 00:17:12,709

soil were welded into solid rock both

307

00:17:17,019 --> 00:17:14,929

the igneous rocks and the breakfast fare

308

00:17:20,079 --> 00:17:17,029

clear witness to prolonged meteorite

309

00:17:22,500 --> 00:17:20,089

bombardment they have been rounded as if

310

00:17:24,789 --> 00:17:22,510

they had been severely sandblasted

311

00:17:26,799 --> 00:17:24,799

fitted where they have been struck by

312

00:17:31,130 --> 00:17:26,809

micro meteorites traveling with high

313

00:17:38,130 --> 00:17:36,480

and some coated with floss a material

314

00:17:48,510 --> 00:17:38,140

which had been melted and splashed by

315

00:17:50,730 --> 00:17:48,520

meteorite impact rocks from Apollo 11

316

00:17:53,220 --> 00:17:50,740

and Apollo 12 are in some ways similar

317

00:17:55,410 --> 00:17:53,230

but there were important differences in

318

00:17:58,560 --> 00:17:55,420

chemistry mineral composition and

319

00:18:00,600 --> 00:17:58,570

texture further the minerals of the

320

00:18:03,560 --> 00:18:00,610

Apollo 11 rocks took on their present

321

00:18:06,120 --> 00:18:03,570

arrangement about 3.7 billion years ago

322

00:18:10,410 --> 00:18:06,130

the minerals of the Apollo 12 rocks

323

00:18:12,630 --> 00:18:10,420

about 3.3 or 3.4 billion years ago an

324

00:18:14,790 --> 00:18:12,640

indication of two different events

325

00:18:17,850 --> 00:18:14,800

separated by several hundred million

326

00:18:20,520 --> 00:18:17,860

years the ages were far greater than

327

00:18:22,710 --> 00:18:20,530

many expected it was probably during

328

00:18:25,910 --> 00:18:22,720

this time more than three billion years

329

00:18:28,950 --> 00:18:25,920

ago but the maurya basins were filmed

330

00:18:31,050 --> 00:18:28,960

while the Apollo 12 rocks were generally

331

00:18:33,180 --> 00:18:31,060

somewhat younger the collection did

332

00:18:36,930 --> 00:18:33,190

needed one unique and quite complicated

333

00:18:40,380 --> 00:18:36,940

rocks number 13 now famous in lunar

334

00:18:43,980 --> 00:18:40,390

science portions of rock 13 proved to be

335

00:18:47,130 --> 00:18:43,990

some 4.6 billion years old very nearly

336

00:18:49,290 --> 00:18:47,140

the age of the solar system itself this

337

00:18:53,310 --> 00:18:49,300

may be some indication of what to expect

338

00:18:55,860 --> 00:18:53,320

from the lunar Highlands another type of

339

00:18:57,840 --> 00:18:55,870

material is the lunar soil created

340

00:19:01,530 --> 00:18:57,850

apparently as rocks had been pulverized

341

00:19:04,110 --> 00:19:01,540

by bombardment one core tube sample from

342

00:19:06,480 --> 00:19:04,120

the Apollo 12 landing site showed the

343

00:19:08,490 --> 00:19:06,490

soil was stratified or layered with

344

00:19:10,830 --> 00:19:08,500

lighter and darker bands of material

345

00:19:15,420 --> 00:19:10,840

they even seem that one layer might have

346

00:19:17,520 --> 00:19:15,430

a mixture of volcanic ash under the

347

00:19:19,940 --> 00:19:17,530

microscope it can be seen that the soil

348

00:19:22,350 --> 00:19:19,950

consists of tiny fragments of rocks

349

00:19:24,960 --> 00:19:22,360

particles of glass and bits of

350

00:19:27,810 --> 00:19:24,970

meteorites even the soil shows evidence

351
00:19:30,270 --> 00:19:27,820
of bombardment some of the individual

352
00:19:32,220 --> 00:19:30,280
grains have been so pitted in fact that

353
00:19:37,150 --> 00:19:32,230
they look almost like tiny replicas of

354
00:19:41,990 --> 00:19:39,770
in examining the lunar soils and

355
00:19:43,670 --> 00:19:42,000
breakfast scientists have found an

356
00:19:46,370 --> 00:19:43,680
abundance of products of the solar wind

357
00:19:53,390 --> 00:19:46,380
the streams of particles flung off the

358
00:19:55,220 --> 00:19:53,400
Sun they have found in fact that if an

359
00:19:57,500 --> 00:19:55,230
ounce of lunar soil is heated to about

360
00:19:59,240 --> 00:19:57,510
1,800 degrees Fahrenheit at an

361
00:20:02,090 --> 00:19:59,250
atmospheric pressure equal to that at

362
00:20:04,460 --> 00:20:02,100
sea level about 12 cubic inches of gas

363
00:20:08,000 --> 00:20:04,470

will be produced primarily hydrogen

364

00:20:10,640 --> 00:20:08,010

helium directly from the Sun it is

365

00:20:13,510 --> 00:20:10,650

possible using the moon materials to go

366

00:20:15,620 --> 00:20:13,520

back and trace the behavior of the Sun

367

00:20:18,050 --> 00:20:15,630

almost back to the beginning of the

368

00:20:20,390 --> 00:20:18,060

solar system the interesting part about

369

00:20:23,150 --> 00:20:20,400

the solar wind is that it represents the

370

00:20:25,610 --> 00:20:23,160

actual stuff of the Sun as if you had in

371

00:20:28,130 --> 00:20:25,620

your hands you're able to dip into the

372

00:20:31,940 --> 00:20:28,140

Sun and reach out and take this material

373

00:20:33,740 --> 00:20:31,950

and bring it back to your laboratory the

374

00:20:36,170 --> 00:20:33,750

lunar materials have also been closely

375

00:20:38,600 --> 00:20:36,180

searched for any trace of life or even

376

00:20:40,550 --> 00:20:38,610

for any materials with organic contents

377

00:20:42,290 --> 00:20:40,560

it has been a search which the

378

00:20:49,590 --> 00:20:42,300

scientists have so far found to be

379

00:20:53,970 --> 00:20:51,570

scientists have found the results more

380

00:20:57,150 --> 00:20:53,980

interesting however when earth organisms

381

00:21:00,930 --> 00:20:57,160

have been exposed to lunar materials of

382

00:21:03,990 --> 00:21:00,940

the variety of biological systems that

383

00:21:06,570 --> 00:21:04,000

we tested with the lunar material the

384

00:21:09,870 --> 00:21:06,580

plants were most unique in their

385

00:21:12,659 --> 00:21:09,880

response for example the five jars of

386

00:21:16,110 --> 00:21:12,669

liverworts you see illustrated on the

387

00:21:18,810 --> 00:21:16,120

top gave much increased growth in the

388

00:21:21,630 --> 00:21:18,820

presence of lunar material this effect

389

00:21:24,049 --> 00:21:21,640

was noted for ferns a number of tissue

390

00:21:26,580 --> 00:21:24,059

cultures such as tobacco and corn and

391

00:21:29,909 --> 00:21:26,590

certain higher plant species such as

392

00:21:32,549 --> 00:21:29,919

lettuce now the exact reasons for this

393

00:21:36,600 --> 00:21:32,559

beneficial response are unknown at the

394

00:21:40,770 --> 00:21:36,610

present however it is likely that some

395

00:21:42,890 --> 00:21:40,780

trace mineral or perhaps even a physical

396

00:21:45,360 --> 00:21:42,900

property of the lunar material is

397

00:21:48,240 --> 00:21:45,370

interacting with the minerals we furnish

398

00:21:51,180 --> 00:21:48,250

to give a more desirable medium for

399

00:21:53,789 --> 00:21:51,190

plant growth this is a very exciting

400

00:21:56,850 --> 00:21:53,799

discovery and one that was totally

401
00:22:02,159 --> 00:21:56,860
unexpected in the tests conducted in the

402
00:22:04,260 --> 00:22:02,169
lunar receiving laboratory the flood of

403
00:22:06,930 --> 00:22:04,270
information derived lunar materials

404
00:22:12,419 --> 00:22:06,940
alone or required decades to interpret

405
00:22:14,039 --> 00:22:12,429
fully in the meantime however still more

406
00:22:15,720 --> 00:22:14,049
information is flowing in from the

407
00:22:18,480 --> 00:22:15,730
scientific instruments set up by the

408
00:22:20,310 --> 00:22:18,490
astronauts scientists receive one of

409
00:22:22,649 --> 00:22:20,320
their biggest surprises when the Apollo

410
00:22:24,899 --> 00:22:22,659
12 seismometer told the story of how the

411
00:22:28,740 --> 00:22:24,909
moon vibrated when it was struck by the

412
00:22:32,580 --> 00:22:28,750
astronauts abandoned lunar module it is

413
00:22:35,850 --> 00:22:32,590

as though one had struck a belt in the

414

00:22:38,279 --> 00:22:35,860

belfry of the church a single blow and

415

00:22:41,610 --> 00:22:38,289

found that the reverberation from it

416

00:22:43,440 --> 00:22:41,620

continued for 30 minutes thus it will

417

00:22:46,409 --> 00:22:43,450

seem to indicate that the energy of the

418

00:22:48,260 --> 00:22:46,419

impact scattered greatly on one hand but

419

00:22:50,880 --> 00:22:48,270

had a prolonged duration on the other

420

00:22:53,390 --> 00:22:50,890

such a combination of characteristics

421

00:22:56,010 --> 00:22:53,400

simply does not occur on earth

422

00:22:58,350 --> 00:22:56,020

subsequently signals of a similar nature

423

00:23:02,640 --> 00:22:58,360

will receive from other impacts both

424

00:23:07,480 --> 00:23:05,530

after analyzing signals recorded over

425

00:23:10,180 --> 00:23:07,490

several months scientists also

426

00:23:12,130 --> 00:23:10,190

discovered evidence of moonquakes these

427

00:23:13,810 --> 00:23:12,140

occurred each time the moon pass through

428

00:23:15,670 --> 00:23:13,820

the point of its orbit closest to Earth

429

00:23:18,030 --> 00:23:15,680

when there was maximum gravitational

430

00:23:20,470 --> 00:23:18,040

attraction between the two bodies

431

00:23:22,600 --> 00:23:20,480

apparently the attraction triggered the

432

00:23:27,190 --> 00:23:22,610

quakes and they were possibly a volcanic

433

00:23:28,900 --> 00:23:27,200

origin so far however the seismometer

434

00:23:31,000 --> 00:23:28,910

detected those signals that would

435

00:23:33,580 --> 00:23:31,010

indicate events originating deep within

436

00:23:38,770 --> 00:23:33,590

the moon such events occur frequently

437

00:23:42,190 --> 00:23:38,780

under the upshot is that the main of the

438

00:23:44,230 --> 00:23:42,200

signals is far from understood from

439

00:23:46,800 --> 00:23:44,240

other instruments scientists are

440

00:23:49,090 --> 00:23:46,810

harvesting rich new information on the

441

00:23:52,780 --> 00:23:49,100

magnetic fields of the moon and the

442

00:23:55,690 --> 00:23:52,790

earth they extremely thin atmosphere of

443

00:23:59,830 --> 00:23:55,700

the moon the rate at which particle

444

00:24:02,170 --> 00:23:59,840

stream away from the Sun for a long time

445

00:24:04,450 --> 00:24:02,180

to come scientists will be putting bits

446

00:24:07,300 --> 00:24:04,460

and pieces together searching out the

447

00:24:09,220 --> 00:24:07,310

answers to a long list of questions but

448

00:24:12,540 --> 00:24:09,230

already certain parts of the whole

449

00:24:15,670 --> 00:24:12,550

picture are beginning to take shape and

450

00:24:20,910 --> 00:24:15,680

the moon is by far our more interesting

451
00:24:26,560 --> 00:24:23,410
although every current theory about the

452
00:24:28,660 --> 00:24:26,570
moon's origin has major flaws it does

453
00:24:30,400 --> 00:24:28,670
seem probable with the major events in a

454
00:24:33,160 --> 00:24:30,410
formation and evolution of the moon

455
00:24:34,630 --> 00:24:33,170
occurred early in its history and that

456
00:24:37,750 --> 00:24:34,640
relatively little has happened since

457
00:24:39,460 --> 00:24:37,760
then one indication of this is the far

458
00:24:41,680 --> 00:24:39,470
greater frequency of craters in the

459
00:24:44,380 --> 00:24:41,690
highlands and in amariah which are

460
00:24:46,630 --> 00:24:44,390
themselves very old and it means the

461
00:24:47,950 --> 00:24:46,640
moon may hold records of events which

462
00:24:53,080 --> 00:24:47,960
have long since been obliterated

463
00:24:55,180 --> 00:24:53,090

four-month by erosion structurally the

464

00:24:57,970 --> 00:24:55,190

moon compared with you earth is an

465

00:24:59,470 --> 00:24:57,980

extremely strong and rigid body as it

466

00:25:03,190 --> 00:24:59,480

would have to be to support the great

467

00:25:06,400 --> 00:25:03,200

mass concentrations mass Connors so near

468

00:25:10,460 --> 00:25:08,630

scientists have seen that great heating

469

00:25:13,820 --> 00:25:10,470

has played a major role in shaping the

470

00:25:17,299 --> 00:25:13,830

moon's face in fact the Mario basins

471

00:25:19,490 --> 00:25:17,309

were filled with the lava flows they

472

00:25:23,289 --> 00:25:19,500

have also seen that impact has played a

473

00:25:29,900 --> 00:25:23,299

major role both on a gigantic scale and

474

00:25:31,970 --> 00:25:29,910

on a microscopic scale contrary to what

475

00:25:36,230 --> 00:25:31,980

many expected there has been no evidence

476
00:25:38,539 --> 00:25:36,240
of water and as most expected there has

477
00:25:41,810 --> 00:25:38,549
been no trace of life and there seems

478
00:25:43,789 --> 00:25:41,820
little chance of finding any but as

479
00:25:45,919 --> 00:25:43,799
often happens in science the

480
00:25:47,270 --> 00:25:45,929
investigation so far have raised more

481
00:25:50,480 --> 00:25:47,280
questions than they have provided

482
00:25:53,330 --> 00:25:50,490
answers for instance what is the

483
00:25:54,740 --> 00:25:53,340
interior of the moon like what is the

484
00:25:57,620 --> 00:25:54,750
source of the heat that produced the

485
00:26:00,409 --> 00:25:57,630
lava was it produced in some way and the

486
00:26:03,890 --> 00:26:00,419
interior of the moon or was it generated

487
00:26:05,750 --> 00:26:03,900
by meteoroid impacts what lies behind

488
00:26:07,850 --> 00:26:05,760

the fact that it is the side of the moon

489

00:26:13,210 --> 00:26:07,860

with the maurya basis that faces us on

490

00:26:17,540 --> 00:26:15,800

what in the tail are the relative

491

00:26:20,690 --> 00:26:17,550

differences between the highlands and

492

00:26:25,190 --> 00:26:20,700

the maurya and the question one always

493

00:26:27,650 --> 00:26:25,200

returns to how was the moon created in

494

00:26:29,180 --> 00:26:27,660

essence the scientific investigation of

495

00:26:34,840 --> 00:26:29,190

the moon is one of the great

496

00:26:37,670 --> 00:26:34,850

intellectual adventures of our time and

497

00:26:39,980 --> 00:26:37,680

a major chapter was written at the first

498

00:26:43,280 --> 00:26:39,990

conference for lunar science early in

499

00:26:44,690 --> 00:26:43,290

the year nineteen seventy well we've

500

00:26:46,010 --> 00:26:44,700

come an awful long way and I think we've

501
00:26:49,040 --> 00:26:46,020
learned some very interesting things but

502
00:26:50,420 --> 00:26:49,050
there's still an enormous amount first

503
00:26:52,940 --> 00:26:50,430
to learn about the moon before we fully

504
00:26:54,850 --> 00:26:52,950
understand it when we go to the

505
00:26:57,470 --> 00:26:54,860
Highlands we will go to the Highlands

506
00:26:59,630 --> 00:26:57,480
that they're going to be even more

507
00:27:01,190 --> 00:26:59,640
interesting from this point of view of

508
00:27:03,530 --> 00:27:01,200
the fundamental history of the solar

509
00:27:06,230 --> 00:27:03,540
system then the parts that we have

510
00:27:07,940 --> 00:27:06,240
already visited it is only through the

511
00:27:10,400 --> 00:27:07,950
understanding of the interior of this

512
00:27:12,500 --> 00:27:10,410
planet that we begin to start to

513
00:27:16,850 --> 00:27:12,510

understand some of the processes that we

514

00:27:18,830 --> 00:27:16,860

see on the surface of years in fact we

515

00:27:21,290 --> 00:27:18,840

are taking a step in our understanding

516

00:27:23,270 --> 00:27:21,300

of the solar system and the earth that

517

00:27:25,460 --> 00:27:23,280

is comparable to the one taken by

518

00:27:31,930 --> 00:27:25,470

Galileo when he first pointed the

519

00:27:37,729 --> 00:27:35,299

this has been a special report brought