

PUBLIC LECTURE SERIES

4000 Years of Women in Science

Featuring Guest Speaker:
Sethanne Howard



1
00:00:07,829 --> 00:00:05,110
welcome to the space telescope public

2
00:00:11,030 --> 00:00:07,839
lecture series tonight's talk

3
00:00:13,270 --> 00:00:11,040
4 000 years of women in science by seth

4
00:00:15,270 --> 00:00:13,280
ann howard of the washington academy of

5
00:00:17,029 --> 00:00:15,280
sciences

6
00:00:19,670 --> 00:00:17,039
i'm your host dr frank summers of the

7
00:00:21,670 --> 00:00:19,680
space telescope science institute and i

8
00:00:23,509 --> 00:00:21,680
will remind you as i've done every month

9
00:00:25,670 --> 00:00:23,519
during the pandemic that the space

10
00:00:28,470 --> 00:00:25,680
telescope public lecture series will be

11
00:00:31,109 --> 00:00:28,480
online only until further notice

12
00:00:34,069 --> 00:00:31,119
i also have to thank the amazing tech

13
00:00:36,630 --> 00:00:34,079

team thomas marufu and grant justice who

14

00:00:40,069 --> 00:00:36,640

allow us to do this elaborate production

15

00:00:44,549 --> 00:00:40,079

from the comfort of my basement

16

00:00:47,350 --> 00:00:44,559

our upcoming talks on december 7th we

17

00:00:49,110 --> 00:00:47,360

will have the james webb space telescope

18

00:00:52,470 --> 00:00:49,120

countdown to launch

19

00:00:55,590 --> 00:00:52,480

by dr jw know-it-all

20

00:00:58,150 --> 00:00:55,600

okay so that's not really his name but i

21

00:01:00,310 --> 00:00:58,160

was promised i would have a speaker's

22

00:01:01,430 --> 00:01:00,320

name by the end of this week

23

00:01:05,670 --> 00:01:01,440

so

24

00:01:08,070 --> 00:01:05,680

mission telling you about this amazing

25

00:01:09,830 --> 00:01:08,080

mission that will launch on december

26

00:01:13,030 --> 00:01:09,840

18th

27

00:01:15,749 --> 00:01:13,040

in january the topic will be galaxy

28

00:01:18,469 --> 00:01:15,759

clusters and the speaker will be maria

29

00:01:20,070 --> 00:01:18,479

montesquiles here of the space telescope

30

00:01:23,910 --> 00:01:20,080

science institute

31

00:01:26,390 --> 00:01:23,920

and in february we have a lecture on

32

00:01:31,270 --> 00:01:26,400

from the front lines of the exoplanet

33

00:01:33,270 --> 00:01:31,280

revolution by arpita roy also of sdsci

34

00:01:35,990 --> 00:01:33,280

so if you want to find out about those

35

00:01:37,910 --> 00:01:36,000

upcoming talks and find out who dr jw

36

00:01:43,030 --> 00:01:37,920

noetal turns out to be

37

00:01:47,990 --> 00:01:45,990

public hyphen lectures

38

00:01:50,069 --> 00:01:48,000

there you'll find on the left hand side

39

00:01:52,149 --> 00:01:50,079

the link to our webcast

40

00:01:55,190 --> 00:01:52,159

both on our space telescope webcasting

41

00:01:57,429 --> 00:01:55,200

site and the playlist on youtube

42

00:01:59,590 --> 00:01:57,439

and on the right we'll have the easy way

43

00:02:01,830 --> 00:01:59,600

to subscribe to our email just enter

44

00:02:03,270 --> 00:02:01,840

your email address and hit the subscribe

45

00:02:05,590 --> 00:02:03,280

button

46

00:02:07,830 --> 00:02:05,600

also we have the links to all of our

47

00:02:09,270 --> 00:02:07,840

upcoming lectures

48

00:02:10,949 --> 00:02:09,280

and if you click on one of those

49

00:02:13,030 --> 00:02:10,959

lectures you get all the details about

50

00:02:15,750 --> 00:02:13,040

it including the descriptions and after

51
00:02:18,550 --> 00:02:15,760
it's been recorded the link to the sdsci

52
00:02:20,949 --> 00:02:18,560
webcast as well as the link to it on

53
00:02:22,949 --> 00:02:20,959
youtube

54
00:02:24,790 --> 00:02:22,959
if you want to know keep up with things

55
00:02:26,470 --> 00:02:24,800
well just sign up for our email

56
00:02:28,869 --> 00:02:26,480
announcements the easiest way is of

57
00:02:30,869 --> 00:02:28,879
course to sign up at the website

58
00:02:31,830 --> 00:02:30,879
you can also subscribe to our youtube

59
00:02:33,350 --> 00:02:31,840
channel

60
00:02:35,430 --> 00:02:33,360
youtube.com

61
00:02:37,750 --> 00:02:35,440
hubble space telescope all one word

62
00:02:39,430 --> 00:02:37,760
hubble space telescope and if you

63
00:02:41,589 --> 00:02:39,440

subscribe you'll get the new video

64

00:02:43,670 --> 00:02:41,599

notices and you'll get reminders of

65

00:02:44,949 --> 00:02:43,680

these live events

66

00:02:46,869 --> 00:02:44,959

finally if you have comments or

67

00:02:51,910 --> 00:02:46,879

questions you can send them to the email

68

00:02:55,750 --> 00:02:53,190

for those of you who would like to

69

00:02:57,430 --> 00:02:55,760

follow us on social media

70

00:02:59,830 --> 00:02:57,440

for the hubble space telescope for the

71

00:03:01,350 --> 00:02:59,840

james webb space telescope and for our

72

00:03:03,750 --> 00:03:01,360

institute the space telescope science

73

00:03:06,630 --> 00:03:03,760

institute we're on facebook and twitter

74

00:03:09,110 --> 00:03:06,640

and youtube and instagram

75

00:03:11,589 --> 00:03:09,120

i myself do a tiny tiny bit of social

76

00:03:12,949 --> 00:03:11,599

media on facebook and twitter if you

77

00:03:15,110 --> 00:03:12,959

want to know what i'm thinking these

78

00:03:17,430 --> 00:03:15,120

days

79

00:03:20,390 --> 00:03:17,440

and now our news from the universe for

80

00:03:23,110 --> 00:03:20,400

november 2021

81

00:03:24,630 --> 00:03:23,120

the first story tonight a mirrored

82

00:03:26,470 --> 00:03:24,640

galaxy

83

00:03:29,350 --> 00:03:26,480

now this comes to us from the sloan

84

00:03:32,949 --> 00:03:29,360

digital sky survey

85

00:03:34,390 --> 00:03:32,959

in particular a galaxy cluster with the

86

00:03:35,910 --> 00:03:34,400

totally

87

00:03:43,430 --> 00:03:35,920

unmemorable name

88

00:03:48,229 --> 00:03:45,030

that's the designation for this galaxy

89

00:03:49,830 --> 00:03:48,239

cluster okay uh yeah not all things in

90

00:03:51,190 --> 00:03:49,840

in the night sky have

91

00:03:53,750 --> 00:03:51,200

pretty names

92

00:03:56,710 --> 00:03:53,760

but the interesting object

93

00:03:59,589 --> 00:03:56,720

in this galaxy cluster does have a a

94

00:04:00,710 --> 00:03:59,599

moniker it's actually called hamilton's

95

00:04:03,750 --> 00:04:00,720

object

96

00:04:05,509 --> 00:04:03,760

and so this is an image of this galaxy

97

00:04:07,030 --> 00:04:05,519

and we're calling this the single image

98

00:04:08,550 --> 00:04:07,040

because

99

00:04:12,550 --> 00:04:08,560

this cluster

100

00:04:13,509 --> 00:04:12,560

is so massive that it actually warps

101
00:04:16,789 --> 00:04:13,519
space

102
00:04:17,830 --> 00:04:16,799
now via general relativity the presence

103
00:04:19,990 --> 00:04:17,840
of mass

104
00:04:22,310 --> 00:04:20,000
warps the space around it and in this

105
00:04:25,590 --> 00:04:22,320
galaxy cluster there's so

106
00:04:29,189 --> 00:04:25,600
much mass that it warps the space enough

107
00:04:31,749 --> 00:04:29,199
to divert the path of light we call this

108
00:04:34,230 --> 00:04:31,759
gravitational lensing

109
00:04:35,189 --> 00:04:34,240
and this galaxy seen in this single

110
00:04:37,749 --> 00:04:35,199
image

111
00:04:39,430 --> 00:04:37,759
actually passes multiple ways through

112
00:04:40,830 --> 00:04:39,440
this galaxy cluster

113
00:04:44,390 --> 00:04:40,840

and shows up

114

00:04:46,550 --> 00:04:44,400

here in a mirrored image

115

00:04:47,830 --> 00:04:46,560

now we call this a mirrored image

116

00:04:49,510 --> 00:04:47,840

because it's got a really special

117

00:04:52,710 --> 00:04:49,520

property because it

118

00:04:55,749 --> 00:04:52,720

mirrors across a line of reflection

119

00:04:58,070 --> 00:04:55,759

that line of refraction reflection that

120

00:05:00,310 --> 00:04:58,080

is what we call in gravitational lensing

121

00:05:02,710 --> 00:05:00,320

things a caustic line it's a line of

122

00:05:05,189 --> 00:05:02,720

sort of infinite magnification and that

123

00:05:07,189 --> 00:05:05,199

galaxy lies close enough or its light

124

00:05:09,270 --> 00:05:07,199

passes close enough to that line of

125

00:05:11,510 --> 00:05:09,280

infinite magnification the caustic that

126

00:05:13,749 --> 00:05:11,520

it actually is reflected across it and

127

00:05:15,670 --> 00:05:13,759

this is a really cool event you don't

128

00:05:18,550 --> 00:05:15,680

see this very often okay

129

00:05:20,790 --> 00:05:18,560

to get to see it so we have both the

130

00:05:23,909 --> 00:05:20,800

single image of hamilton's object plus

131

00:05:26,950 --> 00:05:23,919

we have this double mirrored image of it

132

00:05:29,189 --> 00:05:26,960

so that means there are three

133

00:05:30,230 --> 00:05:29,199

images of this for example white dot

134

00:05:40,469 --> 00:05:30,240

here

135

00:05:42,230 --> 00:05:40,479

images of this blue little piece on the

136

00:05:45,510 --> 00:05:42,240

side of the galaxy

137

00:05:47,029 --> 00:05:45,520

so gravitational lensing allows us to

138

00:05:49,430 --> 00:05:47,039

see multiple

139

00:05:51,909 --> 00:05:49,440

views of the same object

140

00:05:54,950 --> 00:05:51,919

and it gives us this you know sort of

141

00:05:57,350 --> 00:05:54,960

determination of where um the the mass

142

00:05:58,629 --> 00:05:57,360

is in this galaxy cluster because what's

143

00:06:00,469 --> 00:05:58,639

really important for this when you're

144

00:06:02,950 --> 00:06:00,479

doing the gravitational lensing of this

145

00:06:04,710 --> 00:06:02,960

is that most of the mass of the cluster

146

00:06:06,710 --> 00:06:04,720

is in dark matter

147

00:06:08,870 --> 00:06:06,720

and by doing this gravitational lensing

148

00:06:11,110 --> 00:06:08,880

studying this gravitational lensing we

149

00:06:13,430 --> 00:06:11,120

can actually map the distribution of

150

00:06:15,510 --> 00:06:13,440

dark matter in these galaxies clusters

151

00:06:18,150 --> 00:06:15,520

and in this case we come up with a

152

00:06:20,390 --> 00:06:18,160

really cool object with three images a

153

00:06:24,070 --> 00:06:20,400

single one and a mirrored one of

154

00:06:28,390 --> 00:06:27,110

our second story tonight is a pumpkin

155

00:06:31,029 --> 00:06:28,400

star

156

00:06:34,550 --> 00:06:31,039

now we here at hubble but we have no

157

00:06:37,189 --> 00:06:34,560

shame okay we are very happy to make a

158

00:06:39,990 --> 00:06:37,199

press release related to a holiday and

159

00:06:42,790 --> 00:06:40,000

two days ago it was halloween

160

00:06:44,469 --> 00:06:42,800

so for a halloween release we released

161

00:06:48,230 --> 00:06:44,479

this image

162

00:06:50,469 --> 00:06:48,240

it's of the star cw leonis and what

163

00:06:52,950 --> 00:06:50,479

you're supposed to see in this is

164

00:06:55,189 --> 00:06:52,960

what i see in this is hey doesn't it

165

00:06:57,749 --> 00:06:55,199

look kind of like a pumpkin viewed top

166

00:06:59,990 --> 00:06:57,759

down you know you got the orange circle

167

00:07:02,909 --> 00:07:00,000

in here and then you got the little uh

168

00:07:07,110 --> 00:07:02,919

green of the stem sipping up there

169

00:07:10,390 --> 00:07:07,120

except um that uh the view here

170

00:07:11,270 --> 00:07:10,400

is mostly in infrared light

171

00:07:14,390 --> 00:07:11,280

so

172

00:07:17,350 --> 00:07:14,400

uh the orange here is actually near uh

173

00:07:18,710 --> 00:07:17,360

eight fourteen eight 814 nanometers

174

00:07:22,550 --> 00:07:18,720

which is beyond the red end of the

175

00:07:25,749 --> 00:07:22,560

spectrum and the green is out of uh even

176

00:07:27,830 --> 00:07:25,759

further out into the infrared um so what

177

00:07:29,990 --> 00:07:27,840

color are they really if it's infrared

178

00:07:31,990 --> 00:07:30,000

they sort of just translate it there so

179

00:07:33,830 --> 00:07:32,000

sort of get this pumpkin you can say

180

00:07:36,710 --> 00:07:33,840

it's kind of a cheat but it's still it's

181

00:07:37,670 --> 00:07:36,720

our cool image um and uh it looks

182

00:07:40,070 --> 00:07:37,680

something

183

00:07:41,909 --> 00:07:40,080

it kind of looks like a pumpkin but

184

00:07:45,189 --> 00:07:41,919

what's really cool about this image is

185

00:07:48,230 --> 00:07:45,199

what's actually going on in here so cw

186

00:07:50,629 --> 00:07:48,240

leonis is a red giant star this is a

187

00:07:53,350 --> 00:07:50,639

star at the end of its life

188

00:07:55,029 --> 00:07:53,360

and its nuclear fusion in the core is

189

00:07:57,589 --> 00:07:55,039

going a little unstable

190

00:07:58,710 --> 00:07:57,599

and it actually is blowing out its outer

191

00:08:01,589 --> 00:07:58,720

layers

192

00:08:04,629 --> 00:08:01,599

and this is called a carbon star because

193

00:08:06,950 --> 00:08:04,639

these rings that you see in this image

194

00:08:10,150 --> 00:08:06,960

are layers of mostly carbon that has

195

00:08:13,029 --> 00:08:10,160

been blown out from the star as it goes

196

00:08:15,110 --> 00:08:13,039

unstable at the end of its life it blows

197

00:08:17,350 --> 00:08:15,120

out this extra stuff

198

00:08:19,029 --> 00:08:17,360

the other cool thing is if you look deep

199

00:08:21,270 --> 00:08:19,039

in the center you can sort of see what

200

00:08:24,070 --> 00:08:21,280

look like diffraction spikes and i sort

201
00:08:26,309 --> 00:08:24,080
of you know drew um a pattern here to

202
00:08:27,749 --> 00:08:26,319
say now this is what you first look at

203
00:08:28,790 --> 00:08:27,759
it looks like diffraction spikes from

204
00:08:31,749 --> 00:08:28,800
the star

205
00:08:35,350 --> 00:08:31,759
but hubble's diffraction spikes are nice

206
00:08:38,630 --> 00:08:35,360
cross of four spikes so these can't be

207
00:08:42,070 --> 00:08:38,640
diffraction spikes and what they are

208
00:08:45,190 --> 00:08:42,080
are light beams spewing out from the

209
00:08:46,790 --> 00:08:45,200
star okay there is obviously material

210
00:08:49,430 --> 00:08:46,800
around it and that there are these

211
00:08:52,790 --> 00:08:49,440
preferred paths where the light gets out

212
00:08:54,550 --> 00:08:52,800
and it creates these really strong beams

213
00:08:56,389 --> 00:08:54,560

and this is really weird because i

214

00:08:58,550 --> 00:08:56,399

haven't personally seen this myself i'm

215

00:09:00,949 --> 00:08:58,560

not a stellar expert

216

00:09:03,590 --> 00:09:00,959

but in terms of a red giant star going

217

00:09:06,949 --> 00:09:03,600

through its final days i've not seen

218

00:09:10,790 --> 00:09:06,959

beams of light like this so cw alone is

219

00:09:13,430 --> 00:09:10,800

beyond being this pretty pumpkin star um

220

00:09:16,710 --> 00:09:13,440

is also a very interesting star in its

221

00:09:18,949 --> 00:09:16,720

own right and showing you the way that

222

00:09:21,430 --> 00:09:18,959

stars you know have these unstable

223

00:09:25,430 --> 00:09:21,440

episodes as they're going passing

224

00:09:30,389 --> 00:09:29,430

okay so our speaker tonight is seth ann

225

00:09:32,550 --> 00:09:30,399

howard

226

00:09:34,870 --> 00:09:32,560

and usually i give you an interesting

227

00:09:36,470 --> 00:09:34,880

tidbit just before i i introduce her

228

00:09:38,790 --> 00:09:36,480

well let me just start with that

229

00:09:41,110 --> 00:09:38,800

interesting tidbit because

230

00:09:43,509 --> 00:09:41,120

uh in the 1970s

231

00:09:45,990 --> 00:09:43,519

seth ann took one of the images of

232

00:09:49,190 --> 00:09:46,000

halley's comet from 1910

233

00:09:52,389 --> 00:09:49,200

and digitized it and colorized it

234

00:09:54,470 --> 00:09:52,399

and it is that image that is on this uh

235

00:09:57,269 --> 00:09:54,480

stamp from india

236

00:09:59,829 --> 00:09:57,279

that is worth one rupee and so she likes

237

00:10:03,110 --> 00:09:59,839

to tell her students that her her work

238

00:10:05,350 --> 00:10:03,120

is worth at least one rupee

239

00:10:07,509 --> 00:10:05,360

well actually seth ann

240

00:10:10,310 --> 00:10:07,519

stuff is worth an awful lot more than

241

00:10:12,150 --> 00:10:10,320

that because she has done an amazing

242

00:10:14,470 --> 00:10:12,160

number of things in her life

243

00:10:17,190 --> 00:10:14,480

starting with getting her bachelor's

244

00:10:19,030 --> 00:10:17,200

degree from uc davis where she was the

245

00:10:21,509 --> 00:10:19,040

first woman

246

00:10:23,670 --> 00:10:21,519

to get a bachelor's degree in physics

247

00:10:25,030 --> 00:10:23,680

from uc davis

248

00:10:27,750 --> 00:10:25,040

she went on to get her master's in

249

00:10:30,710 --> 00:10:27,760

nuclear physics from rensselaer and she

250

00:10:32,710 --> 00:10:30,720

got her phd in astrophysics

251
00:10:35,190 --> 00:10:32,720
from georgia state

252
00:10:37,269 --> 00:10:35,200
and uh then she's had quite the uh

253
00:10:40,069 --> 00:10:37,279
illustrious career she's been many many

254
00:10:41,670 --> 00:10:40,079
different places uh emory university los

255
00:10:44,550 --> 00:10:41,680
alamos

256
00:10:48,069 --> 00:10:44,560
nasa marshall space flight center nasa

257
00:10:50,069 --> 00:10:48,079
hq and she ended up at the united states

258
00:10:53,509 --> 00:10:50,079
naval observatory

259
00:10:56,150 --> 00:10:53,519
so uh ladies and gentlemen dr seth ann

260
00:11:02,870 --> 00:11:00,230
thank you frank a lot that's very nice

261
00:11:04,470 --> 00:11:02,880
uh should i share my screen yes you

262
00:11:06,550 --> 00:11:04,480
should okay

263
00:11:08,949 --> 00:11:06,560

and remember to include the audio and i

264

00:11:11,829 --> 00:11:08,959

did oh good

265

00:11:16,630 --> 00:11:11,839

i i gotta find what i'm gonna share

266

00:11:22,790 --> 00:11:21,190

okay and we're going to make it a full

267

00:11:34,949 --> 00:11:22,800

screen

268

00:11:39,110 --> 00:11:36,069

there we go

269

00:11:39,120 --> 00:11:42,230

okay

270

00:11:48,949 --> 00:11:45,030

we'll do it again

271

00:11:52,870 --> 00:11:50,470

laser pointer

272

00:11:55,190 --> 00:11:52,880

because that will keep it from advancing

273

00:11:57,829 --> 00:11:55,200

women hold up half the sky

274

00:12:01,350 --> 00:11:57,839

is a saying native to many cultures

275

00:12:02,550 --> 00:12:01,360

indians in the in indians from india

276

00:12:05,030 --> 00:12:02,560

africans

277

00:12:07,829 --> 00:12:05,040

uh even the europeans women hold up half

278

00:12:09,829 --> 00:12:07,839

the sky therefore

279

00:12:13,590 --> 00:12:09,839

i issue a challenge

280

00:12:17,030 --> 00:12:13,600

if women hold up half the sky

281

00:12:19,110 --> 00:12:17,040

where are they in science

282

00:12:22,470 --> 00:12:19,120

why aren't they listed

283

00:12:25,910 --> 00:12:22,480

so i i asked you to name one

284

00:12:28,310 --> 00:12:25,920

just to yourself before the 20th century

285

00:12:29,430 --> 00:12:28,320

and i do before the 20th century because

286

00:12:31,190 --> 00:12:29,440

after

287

00:12:33,829 --> 00:12:31,200

1910

288

00:12:35,829 --> 00:12:33,839

we get too many women and they swamp the

289

00:12:38,069 --> 00:12:35,839

wonderful women of the past

290

00:12:39,670 --> 00:12:38,079

so i don't want to swamp the women of

291

00:12:42,790 --> 00:12:39,680

the past i'm going to tell you about

292

00:12:44,470 --> 00:12:42,800

them and assume that the 20th century we

293

00:12:47,190 --> 00:12:44,480

just take off

294

00:12:48,310 --> 00:12:47,200

so when you name one it cannot be marie

295

00:12:50,550 --> 00:12:48,320

curie

296

00:12:54,069 --> 00:12:50,560

and this is a space telescope so we're

297

00:12:56,150 --> 00:12:54,079

not gonna name any astronomers either

298

00:13:00,949 --> 00:12:56,160

and that's your challenge see if you can

299

00:13:03,430 --> 00:13:00,959

come up with one before the 20th century

300

00:13:05,509 --> 00:13:03,440

and put it in the chat or whatever if

301
00:13:08,470 --> 00:13:05,519
you've got a good one put it in the chat

302
00:13:10,629 --> 00:13:08,480
or ask a question later

303
00:13:13,269 --> 00:13:10,639
so what i want to do

304
00:13:15,030 --> 00:13:13,279
is set the history stage and education

305
00:13:17,269 --> 00:13:15,040
stage to tell you

306
00:13:20,230 --> 00:13:17,279
what was going on four thousand years

307
00:13:23,350 --> 00:13:20,240
ago and three thousand years ago two

308
00:13:27,990 --> 00:13:25,350
riding began

309
00:13:30,470 --> 00:13:28,000
around thirty five hundred and after

310
00:13:31,509 --> 00:13:30,480
that in mesopotamia

311
00:13:33,670 --> 00:13:31,519
uh

312
00:13:36,069 --> 00:13:33,680
the land between the rivers the tigris

313
00:13:38,069 --> 00:13:36,079

and europe euphrates rivers

314

00:13:41,110 --> 00:13:38,079

and it began

315

00:13:43,750 --> 00:13:41,120

went to cuneiform and i'm i'm going to

316

00:13:46,150 --> 00:13:43,760

show you some of that

317

00:13:48,550 --> 00:13:46,160

egypt came in about the same time with

318

00:13:52,150 --> 00:13:48,560

hieroglyphs

319

00:13:54,790 --> 00:13:52,160

elam is proto-persian

320

00:13:57,990 --> 00:13:54,800

india was a little bit later and much

321

00:13:59,829 --> 00:13:58,000

later in minus 1200 china came in this

322

00:14:03,350 --> 00:13:59,839

is an oracle bone

323

00:14:07,750 --> 00:14:03,360

from china

324

00:14:13,829 --> 00:14:09,110

so

325

00:14:16,470 --> 00:14:14,790

now

326

00:14:17,750 --> 00:14:16,480

hieroglyphs everybody's seen a

327

00:14:20,150 --> 00:14:17,760

hieroglyph

328

00:14:23,030 --> 00:14:20,160

and we don't do anything like that today

329

00:14:25,590 --> 00:14:23,040

today we we you we went down this path

330

00:14:28,949 --> 00:14:25,600

and we got an alphabet

331

00:14:28,959 --> 00:14:32,870

at all right

332

00:14:35,829 --> 00:14:34,870

that's just a joke

333

00:14:40,790 --> 00:14:35,839

okay

334

00:14:44,710 --> 00:14:43,110

everything in the blue box is going to

335

00:14:47,189 --> 00:14:44,720

be possible

336

00:14:49,670 --> 00:14:47,199

maybe legendary maybe not

337

00:14:53,189 --> 00:14:49,680

first of all you get writing you need

338

00:14:57,590 --> 00:14:53,199

writing to have history

339

00:15:00,949 --> 00:14:57,600
and in 20 minus 2700 was merit

340

00:15:03,269 --> 00:15:00,959
she may be legendary maybe not

341

00:15:06,949 --> 00:15:03,279
she was found her image is found near

342

00:15:09,269 --> 00:15:06,959
sakara a step pyramid

343

00:15:13,189 --> 00:15:09,279
and that's her image and she was called

344

00:15:15,670 --> 00:15:13,199
by her son the chief physician

345

00:15:17,910 --> 00:15:15,680
she may be legendary i don't know

346

00:15:19,670 --> 00:15:17,920
there's not a lot of information about

347

00:15:20,949 --> 00:15:19,680
her other than the fact that her image

348

00:15:27,030 --> 00:15:20,959
exists

349

00:15:27,040 --> 00:15:30,790
then there's kudabao

350

00:15:35,430 --> 00:15:32,150
kudabao was

351

00:15:38,550 --> 00:15:35,440

king of kish she was the only woman

352

00:15:41,110 --> 00:15:38,560

in the sumerian king list who was a king

353

00:15:43,189 --> 00:15:41,120

not a queen they liked her so much they

354

00:15:45,269 --> 00:15:43,199

thought so highly of her that they said

355

00:15:47,430 --> 00:15:45,279

you can be called king

356

00:15:50,389 --> 00:15:47,440

and i think they liked her so much

357

00:15:52,870 --> 00:15:50,399

because she owned and distributed and

358

00:15:55,030 --> 00:15:52,880

made the beer

359

00:15:57,189 --> 00:15:55,040

and you got beer and ale

360

00:15:59,430 --> 00:15:57,199

drinks from her

361

00:16:01,910 --> 00:15:59,440

and that was why she was so popular and

362

00:16:05,269 --> 00:16:01,920

apparently like in legend says she ruled

363

00:16:12,310 --> 00:16:08,150

now where is kiss you might ask i want

364

00:16:14,870 --> 00:16:12,320

to do a little bit of geography here

365

00:16:16,230 --> 00:16:14,880

here's the tigris coming down into the

366

00:16:18,710 --> 00:16:16,240

persian gulf

367

00:16:21,350 --> 00:16:18,720

and here's the euphrates coming down

368

00:16:25,990 --> 00:16:21,360

into the persian gulf

369

00:16:30,150 --> 00:16:26,870

uh

370

00:16:33,910 --> 00:16:30,160

we're going to talk about er you are and

371

00:16:36,470 --> 00:16:33,920

it's there at this time 4 000 years ago

372

00:16:37,430 --> 00:16:36,480

it was a port city it was on the persian

373

00:16:40,230 --> 00:16:37,440

gulf

374

00:16:43,749 --> 00:16:40,240

today all this is filled in and here is

375

00:16:46,230 --> 00:16:43,759

where the persian gulf begins

376

00:16:47,749 --> 00:16:46,240

in the 21st century down here where the

377

00:16:48,550 --> 00:16:47,759

blue line is

378

00:16:51,749 --> 00:16:48,560

but

379

00:16:54,069 --> 00:16:51,759

at the time we were going to work

380

00:16:55,269 --> 00:16:54,079

er was a port city and it was a major

381

00:16:58,150 --> 00:16:55,279

port city

382

00:17:00,790 --> 00:16:58,160

it brought in stuff from all over the

383

00:17:02,870 --> 00:17:00,800

the middle east

384

00:17:04,870 --> 00:17:02,880

and just for curiosity's sake there's

385

00:17:06,630 --> 00:17:04,880

babylon

386

00:17:09,909 --> 00:17:06,640

case you're curious

387

00:17:12,630 --> 00:17:09,919

sumer is the name of the of the people

388

00:17:15,110 --> 00:17:12,640

the black-headed people who lived in

389

00:17:18,390 --> 00:17:15,120

southern mesopotamia

390

00:17:20,630 --> 00:17:18,400

and acadia is the name of the people who

391

00:17:23,350 --> 00:17:20,640

were semitic not not the black-headed

392

00:17:24,630 --> 00:17:23,360

people but semitic people who lived in

393

00:17:27,429 --> 00:17:24,640

northern

394

00:17:31,510 --> 00:17:27,439

mesopotamia

395

00:17:35,029 --> 00:17:31,520

so that just sets the the geography

396

00:17:38,150 --> 00:17:35,039

now jumping over to china

397

00:17:41,590 --> 00:17:38,160

we have the lady the first apparently

398

00:17:44,950 --> 00:17:41,600

maybe legend says was the first queen

399

00:17:48,070 --> 00:17:44,960

uh consort of china and sitting in her

400

00:17:50,390 --> 00:17:48,080

garden she finally figured out how

401
00:17:53,190 --> 00:17:50,400
silkworms made silk

402
00:17:56,470 --> 00:17:53,200
and she developed and crea she created

403
00:17:59,110 --> 00:17:56,480
and developed the silk industry in china

404
00:18:01,510 --> 00:17:59,120
uh it sounds like legendary to me but it

405
00:18:05,510 --> 00:18:01,520
i believe it could be

406
00:18:12,310 --> 00:18:07,430
semi-ramas

407
00:18:15,190 --> 00:18:12,320
is was queen of babylon

408
00:18:16,630 --> 00:18:15,200
now they think she'd built tunnels under

409
00:18:18,870 --> 00:18:16,640
the euphrates

410
00:18:20,870 --> 00:18:18,880
so that you could go from one side of

411
00:18:23,830 --> 00:18:20,880
the euphrates in babylon to the other

412
00:18:24,630 --> 00:18:23,840
side of the euphrates in babylon

413
00:18:28,710 --> 00:18:24,640

and

414

00:18:29,909 --> 00:18:28,720

they think she her legend is based on

415

00:18:33,590 --> 00:18:29,919

this

416

00:18:37,190 --> 00:18:33,600

lady here shamu rama met

417

00:18:40,390 --> 00:18:37,200

who lived in 824 minus 824

418

00:18:41,270 --> 00:18:40,400

but she saw she's probably legendary

419

00:18:43,669 --> 00:18:41,280

the

420

00:18:47,430 --> 00:18:43,679

2500 one

421

00:18:53,190 --> 00:18:50,070

now we come to hashep's who's real that

422

00:18:56,150 --> 00:18:53,200

she was a real pharaoh of egypt

423

00:18:59,029 --> 00:18:56,160

and just for curiosity's sake what else

424

00:19:01,909 --> 00:18:59,039

was going on mooses was around

425

00:19:03,990 --> 00:19:01,919

the trojan war happened

426

00:19:04,870 --> 00:19:04,000

my particular favorite

427

00:19:06,950 --> 00:19:04,880

was

428

00:19:10,710 --> 00:19:06,960

chocolate entered the world in minus

429

00:19:12,230 --> 00:19:10,720

1100 in the southern southern hemisphere

430

00:19:15,350 --> 00:19:12,240

and that's when that's when we got

431

00:19:17,430 --> 00:19:15,360

chocolate which is i think is important

432

00:19:18,789 --> 00:19:17,440

the first olympics were held a little

433

00:19:21,350 --> 00:19:18,799

bit later

434

00:19:23,590 --> 00:19:21,360

the f year of the city of the year of

435

00:19:26,390 --> 00:19:23,600

the founding of the city of rome was

436

00:19:28,549 --> 00:19:26,400

-648

437

00:19:31,350 --> 00:19:28,559

and then you have the dark ages what

438

00:19:34,710 --> 00:19:31,360

people call the dark ages uh

439

00:19:37,350 --> 00:19:34,720

going up to a thousand ce

440

00:19:40,789 --> 00:19:37,360

that's a misnomer they were not really

441

00:19:43,270 --> 00:19:40,799

dark at all and that's unfortunate

442

00:19:44,549 --> 00:19:43,280

i'm going to come in with my first

443

00:19:46,390 --> 00:19:44,559

scientist

444

00:19:49,510 --> 00:19:46,400

right about there

445

00:19:50,710 --> 00:19:49,520

right after legend quits and reality

446

00:19:52,470 --> 00:19:50,720

takes over

447

00:19:56,470 --> 00:19:52,480

so that's where i'm going to come in

448

00:19:56,480 --> 00:19:59,990

long before chocolate

449

00:20:05,270 --> 00:20:02,470

so how did they educate

450

00:20:07,590 --> 00:20:05,280

we do know a little bit about that

451
00:20:08,310 --> 00:20:07,600
we know that if you were literate you

452
00:20:09,830 --> 00:20:08,320
could

453
00:20:12,230 --> 00:20:09,840
you were numerate in other words if you

454
00:20:14,230 --> 00:20:12,240
could read you could write and cipher

455
00:20:15,590 --> 00:20:14,240
they came together they weren't

456
00:20:17,750 --> 00:20:15,600
separated

457
00:20:19,990 --> 00:20:17,760
but more importantly you were a member

458
00:20:23,190 --> 00:20:20,000
of the upper classes this was done only

459
00:20:25,029 --> 00:20:23,200
for the well-to-do not for the common

460
00:20:26,710 --> 00:20:25,039
people of the

461
00:20:27,750 --> 00:20:26,720
village or city

462
00:20:29,830 --> 00:20:27,760
so

463
00:20:32,549 --> 00:20:29,840

only the upper classes could read and

464

00:20:33,590 --> 00:20:32,559

write and cipher

465

00:20:35,510 --> 00:20:33,600

to learn

466

00:20:38,149 --> 00:20:35,520

those things

467

00:20:40,549 --> 00:20:38,159

the they were called philosophers they

468

00:20:42,390 --> 00:20:40,559

were not called scientists they were

469

00:20:44,149 --> 00:20:42,400

called philosophers

470

00:20:46,149 --> 00:20:44,159

they are generalists

471

00:20:49,029 --> 00:20:46,159

sumer did it with schools teaching

472

00:20:51,590 --> 00:20:49,039

cuneiform they had actual schools

473

00:20:54,070 --> 00:20:51,600

egypt did it with actual schools where

474

00:20:55,830 --> 00:20:54,080

they did it in hieroglyphs india did it

475

00:20:59,029 --> 00:20:55,840

with schools a little bit later where

476

00:21:01,190 --> 00:20:59,039

they did it in sanskrit and china taught

477

00:21:03,830 --> 00:21:01,200

the six arts of confucius

478

00:21:05,990 --> 00:21:03,840

a little bit later yet

479

00:21:07,669 --> 00:21:06,000

and the western world we did the seven

480

00:21:09,510 --> 00:21:07,679

liberal arts

481

00:21:13,190 --> 00:21:09,520

so what does that mean

482

00:21:18,230 --> 00:21:15,669

that adoba is the name of the school of

483

00:21:21,190 --> 00:21:18,240

learning a formal school of learning

484

00:21:22,390 --> 00:21:21,200

they were formal students signed up and

485

00:21:24,470 --> 00:21:22,400

and went through

486

00:21:26,070 --> 00:21:24,480

learning with it from a teacher

487

00:21:31,029 --> 00:21:26,080

they taught reading and math and

488

00:21:36,070 --> 00:21:33,430

now it in this era

489

00:21:38,549 --> 00:21:36,080

was the beginning of modern science

490

00:21:40,710 --> 00:21:38,559

modern science and modern history began

491

00:21:43,430 --> 00:21:40,720

in sumer

492

00:21:44,710 --> 00:21:43,440

not later but this is where it began

493

00:21:46,950 --> 00:21:44,720

when you had

494

00:21:50,950 --> 00:21:46,960

reading and writing and ciphering

495

00:21:57,350 --> 00:21:54,470

so india taught six different things

496

00:22:00,149 --> 00:21:57,360

phonetics meter grammar entomology

497

00:22:02,630 --> 00:22:00,159

astronomy and ritual practices

498

00:22:05,909 --> 00:22:02,640

the six arts of confucius

499

00:22:09,029 --> 00:22:05,919

writes music archery chivalry

500

00:22:11,350 --> 00:22:09,039

calligraphy and math and astronomy

501
00:22:12,870 --> 00:22:11,360
the seven liberal arts

502
00:22:16,390 --> 00:22:12,880
if you're curious

503
00:22:23,830 --> 00:22:20,070
the three are grammar rhetoric and logic

504
00:22:24,549 --> 00:22:23,840
the four are arithmetic geometry music

505
00:22:27,029 --> 00:22:24,559
and

506
00:22:30,870 --> 00:22:27,039
guess what astronomy

507
00:22:33,669 --> 00:22:30,880
so astronomy showed up everywhere

508
00:22:35,990 --> 00:22:33,679
and the word scientist

509
00:22:39,510 --> 00:22:36,000
representing these people was not used

510
00:22:44,390 --> 00:22:39,520
until the 1850s so they were all called

511
00:22:50,870 --> 00:22:46,950
here is my first lady

512
00:22:52,830 --> 00:22:50,880
4 400 years ago her name is in sumerian

513
00:22:55,909 --> 00:22:52,840

which i obviously speak

514

00:22:57,590 --> 00:22:55,919

fluently and hedawana

515

00:23:01,430 --> 00:22:57,600

meaning

516

00:23:03,190 --> 00:23:01,440

n is the name for chief lady lord queen

517

00:23:04,630 --> 00:23:03,200

boss head

518

00:23:06,310 --> 00:23:04,640

king

519

00:23:09,270 --> 00:23:06,320

ann is the title

520

00:23:10,390 --> 00:23:09,280

and she and hedonima means uh ornament

521

00:23:12,470 --> 00:23:10,400

of heaven

522

00:23:13,510 --> 00:23:12,480

so she was the first astronomer

523

00:23:16,149 --> 00:23:13,520

priestess

524

00:23:18,149 --> 00:23:16,159

in the city of er

525

00:23:20,870 --> 00:23:18,159

and she actually wrote that something

526
00:23:24,149 --> 00:23:20,880
has been created that no one has created

527
00:23:28,149 --> 00:23:24,159
before and she was the daughter of

528
00:23:31,909 --> 00:23:28,159
sargon of acadia and he was a warlord

529
00:23:35,750 --> 00:23:31,919
who captured sumeria and installed his

530
00:23:41,510 --> 00:23:36,870
in

531
00:23:43,510 --> 00:23:41,520
she was the first so that could be what

532
00:23:44,630 --> 00:23:43,520
she means here by something has been

533
00:23:46,470 --> 00:23:44,640
created

534
00:23:49,430 --> 00:23:46,480
uh she was the first one to become an

535
00:23:52,870 --> 00:23:49,440
astronomer priestess in ur

536
00:23:56,950 --> 00:23:54,470
this is from the university of

537
00:23:58,230 --> 00:23:56,960
pennsylvania museum it's a photo i took

538
00:24:00,310 --> 00:23:58,240

illegally

539

00:24:01,750 --> 00:24:00,320

while the guard was out of the room but

540

00:24:02,549 --> 00:24:01,760

i was with

541

00:24:03,430 --> 00:24:02,559

the

542

00:24:05,830 --> 00:24:03,440

uh

543

00:24:07,990 --> 00:24:05,840

curator of the tablets the chief curator

544

00:24:10,630 --> 00:24:08,000

of the tablets of the museum who said go

545

00:24:11,830 --> 00:24:10,640

ahead and take the picture so

546

00:24:14,549 --> 00:24:11,840

it's legal

547

00:24:15,590 --> 00:24:14,559

and there she is in procession

548

00:24:18,390 --> 00:24:15,600

uh

549

00:24:20,390 --> 00:24:18,400

we think the procession to establish her

550

00:24:22,870 --> 00:24:20,400

as the end priestess

551
00:24:26,149 --> 00:24:22,880
and it the uh

552
00:24:27,510 --> 00:24:26,159
side of the disc describes all this

553
00:24:30,870 --> 00:24:27,520
it's written on the side of the

554
00:24:33,110 --> 00:24:30,880
alabaster disc it's no longer on display

555
00:24:37,190 --> 00:24:33,120
it was on display when i was there but

556
00:24:40,789 --> 00:24:38,950
we know where she lived

557
00:24:43,430 --> 00:24:40,799
this is the aerial view of the

558
00:24:45,669 --> 00:24:43,440
archaeological dig at burr

559
00:24:48,789 --> 00:24:45,679
and she lived in quarters called the

560
00:24:52,149 --> 00:24:48,799
giphar which was the sacred place where

561
00:24:54,070 --> 00:24:52,159
the astronomer priestess has lived

562
00:24:57,430 --> 00:24:54,080
and

563
00:25:00,149 --> 00:24:57,440

er is famous for its ziggurat

564

00:25:01,110 --> 00:25:00,159

now the ziggurat was built after her

565

00:25:03,430 --> 00:25:01,120

time

566

00:25:05,669 --> 00:25:03,440

so it wasn't there when she was there

567

00:25:08,310 --> 00:25:05,679

but i put it here because it's what it's

568

00:25:11,990 --> 00:25:08,320

what ur is most famous for and to give

569

00:25:14,710 --> 00:25:12,000

you a side picture of the scale

570

00:25:17,269 --> 00:25:14,720

there is the partial reconstruction of

571

00:25:19,029 --> 00:25:17,279

the ziggurat with an army plane

572

00:25:22,070 --> 00:25:19,039

going over it

573

00:25:28,390 --> 00:25:22,080

and iraq and the u.s military were

574

00:25:31,430 --> 00:25:29,510

she

575

00:25:33,830 --> 00:25:31,440

created observatories

576

00:25:36,549 --> 00:25:33,840

across sumer with which to view the

577

00:25:39,750 --> 00:25:36,559

stars planets and moons and more

578

00:25:43,990 --> 00:25:39,760

importantly record their emotions they

579

00:25:49,269 --> 00:25:46,149

she was one of the primary advocates of

580

00:25:50,230 --> 00:25:49,279

astronomy and mathematics in base 60

581

00:25:52,549 --> 00:25:50,240

math

582

00:25:55,190 --> 00:25:52,559

sumer used base 60 which is why we have

583

00:25:58,549 --> 00:25:55,200

60 minutes to the hour and 60 seconds to

584

00:26:03,350 --> 00:25:58,559

the minute and 360 degrees in a circle

585

00:26:08,070 --> 00:26:06,149

about her time

586

00:26:10,549 --> 00:26:08,080

she helped maintain one of the first

587

00:26:12,950 --> 00:26:10,559

calendars which was a lunar calendar

588

00:26:15,590 --> 00:26:12,960

and that calendar is still used today

589

00:26:17,350 --> 00:26:15,600

today easter passover ramadan and other

590

00:26:19,350 --> 00:26:17,360

religious events

591

00:26:21,269 --> 00:26:19,360

it's a mess to calculate easter

592

00:26:23,909 --> 00:26:21,279

according to the rules

593

00:26:26,230 --> 00:26:23,919

uh using a lunar calendar

594

00:26:29,190 --> 00:26:26,240

using tables using the golden number

595

00:26:32,230 --> 00:26:29,200

using a whole bunch of oddball things it

596

00:26:35,350 --> 00:26:32,240

isn't as simple as the first uh full

597

00:26:37,110 --> 00:26:35,360

moon after first whatever we use it

598

00:26:39,510 --> 00:26:37,120

isn't that simple

599

00:26:41,909 --> 00:26:39,520

passover is just as complicated

600

00:26:43,830 --> 00:26:41,919

ramadan is easier to predict it's just

601
00:26:46,230 --> 00:26:43,840
somebody seeing the first of the new

602
00:26:51,590 --> 00:26:48,710
we have her writing she wrote things

603
00:26:54,390 --> 00:26:51,600
down on tablets and we have her writing

604
00:26:56,070 --> 00:26:54,400
this is her name in cuneiform and

605
00:26:58,710 --> 00:26:56,080
hedawana

606
00:27:02,390 --> 00:26:58,720
now if you're my generation

607
00:27:04,310 --> 00:27:02,400
and you think of writing tablets what do

608
00:27:06,470 --> 00:27:04,320
you think of as a tablet

609
00:27:08,230 --> 00:27:06,480
if you're my generation you think of

610
00:27:10,390 --> 00:27:08,240
this

611
00:27:12,950 --> 00:27:10,400
huge things that that are going to get

612
00:27:15,350 --> 00:27:12,960
thrown down and broken

613
00:27:17,909 --> 00:27:15,360

that's not what they were

614

00:27:21,430 --> 00:27:17,919

unfortunately

615

00:27:23,590 --> 00:27:21,440

cecil bill de mille got it wrong

616

00:27:26,070 --> 00:27:23,600

this is what a tablet looks like and

617

00:27:27,990 --> 00:27:26,080

after the lecture is over i will show

618

00:27:30,389 --> 00:27:28,000

you a tablet

619

00:27:34,870 --> 00:27:33,269

museum wouldn't give me her tablet i was

620

00:27:36,950 --> 00:27:34,880

very crushed but they wouldn't they

621

00:27:38,950 --> 00:27:36,960

wouldn't give me her tablet so i have

622

00:27:41,430 --> 00:27:38,960

another one to show you

623

00:27:44,789 --> 00:27:41,440

and in translation you can find on the

624

00:27:46,389 --> 00:27:44,799

web two of her long poems and 42 of her

625

00:27:49,029 --> 00:27:46,399

short poems

626
00:27:51,350 --> 00:27:49,039
and they wrote in poems

627
00:27:53,750 --> 00:27:51,360
couplets everybody did if you wrote

628
00:27:57,190 --> 00:27:53,760
literature you did it in poetry

629
00:28:00,470 --> 00:27:57,200
the bible was done that way

630
00:28:01,510 --> 00:28:00,480
and this particular uh

631
00:28:06,470 --> 00:28:01,520
tablet

632
00:28:09,269 --> 00:28:06,480
the moon goddess

633
00:28:10,630 --> 00:28:09,279
and she talks about house

634
00:28:12,630 --> 00:28:10,640
the inanna

635
00:28:15,350 --> 00:28:12,640
filled the land with venom and like

636
00:28:18,070 --> 00:28:15,360
thunder when you roar over the earth so

637
00:28:23,350 --> 00:28:18,080
she was writing about

638
00:28:28,230 --> 00:28:25,190

and to give you a

639

00:28:31,029 --> 00:28:28,240

a sample this is a tablet compared to a

640

00:28:32,950 --> 00:28:31,039

cell phone so they really are small

641

00:28:33,990 --> 00:28:32,960

they're not very big they can fit in a

642

00:28:35,830 --> 00:28:34,000

pocket

643

00:28:37,430 --> 00:28:35,840

so i put this up just to give you a

644

00:28:39,909 --> 00:28:37,440

sense of the scale

645

00:28:41,990 --> 00:28:39,919

they're not huge things and they're

646

00:28:43,909 --> 00:28:42,000

written

647

00:28:45,430 --> 00:28:43,919

if you see the line coming down the

648

00:28:47,350 --> 00:28:45,440

middle

649

00:28:51,110 --> 00:28:47,360

they're written in two sections and

650

00:28:51,120 --> 00:28:55,190

front and back

651

00:28:55,200 --> 00:29:01,029

this is a sample of her writing

652

00:29:08,549 --> 00:29:03,750

the true woman who possesses exceeding

653

00:29:13,909 --> 00:29:11,269

she can talk consults a tablet of lapis

654

00:29:15,750 --> 00:29:13,919

lazuli which was very rare it came from

655

00:29:20,950 --> 00:29:15,760

afghanistan and turkistan and was

656

00:29:26,549 --> 00:29:23,350

she gives advice to all lands that's a

657

00:29:32,389 --> 00:29:29,110

she measures off the heavens that's an

658

00:29:35,750 --> 00:29:34,710

she places the measuring chords on the

659

00:29:38,830 --> 00:29:35,760

earth

660

00:29:41,430 --> 00:29:38,840

that's mathematics

661

00:29:43,590 --> 00:29:41,440

surveying that's why i think you can

662

00:29:45,510 --> 00:29:43,600

it's fair to call her an astronomer

663

00:29:47,510 --> 00:29:45,520

priestess

664

00:29:49,990 --> 00:29:47,520

in the gipa which is

665

00:29:52,310 --> 00:29:50,000

where they lived the priests his rooms

666

00:29:55,430 --> 00:29:52,320

that that princely shrine of cosmic

667

00:29:57,510 --> 00:29:55,440

order they track the passage of the moon

668

00:29:59,750 --> 00:29:57,520

now we know that's that's how they did

669

00:30:02,070 --> 00:29:59,760

it they they uh built these

670

00:30:03,029 --> 00:30:02,080

observatories across

671

00:30:06,310 --> 00:30:03,039

sumer

672

00:30:11,510 --> 00:30:06,320

to track the passage of the moon

673

00:30:16,710 --> 00:30:14,230

the the british historian

674

00:30:17,830 --> 00:30:16,720

wrote that her compositions

675

00:30:21,190 --> 00:30:17,840

remained

676

00:30:22,950 --> 00:30:21,200

models of petitionary prayer and they

677

00:30:25,269 --> 00:30:22,960

you can find

678

00:30:28,470 --> 00:30:25,279

samples of them through the babylonians

679

00:30:30,630 --> 00:30:28,480

the hebrew bible and and homer

680

00:30:31,590 --> 00:30:30,640

and all the way into the early christian

681

00:30:35,269 --> 00:30:31,600

church

682

00:30:38,630 --> 00:30:35,279

her work was studied for over

683

00:30:40,710 --> 00:30:38,640

500 600 years after her death

684

00:30:43,110 --> 00:30:40,720

and as it said before she was called the

685

00:30:46,549 --> 00:30:43,120

shakespeare of the ancient world

686

00:30:48,870 --> 00:30:46,559

and the world's first poet

687

00:30:55,190 --> 00:30:51,590

those are good things

688

00:30:57,590 --> 00:30:55,200

so she could read and write we know that

689

00:30:59,509 --> 00:30:57,600

she standardized the political structure

690

00:31:00,710 --> 00:30:59,519

of the sumerian cities which were all

691

00:31:03,110 --> 00:31:00,720

scattered

692

00:31:05,350 --> 00:31:03,120

uh doing things different ways and we

693

00:31:07,990 --> 00:31:05,360

know that the first code of laws came

694

00:31:10,149 --> 00:31:08,000

from sumer not from her but from sumer

695

00:31:13,509 --> 00:31:10,159

about the same time

696

00:31:15,590 --> 00:31:13,519

uh long before hammurabi came up with

697

00:31:18,870 --> 00:31:15,600

the code of laws

698

00:31:21,029 --> 00:31:18,880

she codified the religious structure

699

00:31:24,549 --> 00:31:21,039

and brought the whole

700

00:31:25,909 --> 00:31:24,559

sumerian sumer into a common

701
00:31:28,789 --> 00:31:25,919
sense of

702
00:31:31,190 --> 00:31:28,799
how you treated the gods and goddesses

703
00:31:33,029 --> 00:31:31,200
in your religion

704
00:31:34,870 --> 00:31:33,039
she controlled the flow of food and

705
00:31:35,990 --> 00:31:34,880
supplies from the city temple to the

706
00:31:37,990 --> 00:31:36,000
populace

707
00:31:40,070 --> 00:31:38,000
that takes math

708
00:31:41,590 --> 00:31:40,080
she maintained the calendar as head of

709
00:31:43,750 --> 00:31:41,600
the synagogue

710
00:31:46,789 --> 00:31:43,760
a group of people who look for the new

711
00:31:48,470 --> 00:31:46,799
moon is called a synod that hence the

712
00:31:50,230 --> 00:31:48,480
synodic month

713
00:31:53,190 --> 00:31:50,240

in astronomy

714

00:31:54,950 --> 00:31:53,200

so she was head of the synod in er

715

00:31:57,190 --> 00:31:54,960

and she would be looking for the new

716

00:31:59,110 --> 00:31:57,200

moon to define the beginning of the

717

00:32:01,990 --> 00:31:59,120

month

718

00:32:06,630 --> 00:32:02,000

she managed the distribution of land

719

00:32:11,029 --> 00:32:09,029

so she did

720

00:32:14,710 --> 00:32:11,039

my question to you is

721

00:32:16,870 --> 00:32:14,720

was she a philosopher or early scientist

722

00:32:18,310 --> 00:32:16,880

and the i think she was i think the

723

00:32:21,590 --> 00:32:18,320

answer is yes

724

00:32:22,710 --> 00:32:21,600

but i post this because i posted her

725

00:32:25,590 --> 00:32:22,720

story

726

00:32:27,029 --> 00:32:25,600

on the aaas website the american

727

00:32:30,710 --> 00:32:27,039

association for the advancement of

728

00:32:32,630 --> 00:32:30,720

science and i got blowback from

729

00:32:34,630 --> 00:32:32,640

philosophers who said

730

00:32:36,950 --> 00:32:34,640

science did not start until the ancient

731

00:32:38,630 --> 00:32:36,960

greeks

732

00:32:40,549 --> 00:32:38,640

some said science didn't start until

733

00:32:42,710 --> 00:32:40,559

galileo

734

00:32:45,669 --> 00:32:42,720

and i think they're wrong i think we

735

00:32:46,549 --> 00:32:45,679

have an example of one right here

736

00:32:48,230 --> 00:32:46,559

so

737

00:32:49,590 --> 00:32:48,240

you can make up your own mind as to

738

00:32:52,310 --> 00:32:49,600

whether you think she was an early

739

00:32:56,149 --> 00:32:52,320

scientist or not based on what i've told

740

00:32:59,830 --> 00:32:58,149

now the earliest we've gone through on

741

00:33:03,430 --> 00:32:59,840

the top

742

00:33:06,630 --> 00:33:03,440

aganiche underneath at hedwana was the

743

00:33:08,950 --> 00:33:06,640

wife of cesarous affair of egypt and she

744

00:33:11,830 --> 00:33:08,960

used hieroglyphs to write down the

745

00:33:14,630 --> 00:33:11,840

planetary motions which is a neat trick

746

00:33:18,870 --> 00:33:14,640

in hieroglyphs i couldn't do it but she

747

00:33:21,430 --> 00:33:18,880

she was one who could track the planets

748

00:33:26,070 --> 00:33:23,110

taputi

749

00:33:27,110 --> 00:33:26,080

was is known as the world's first

750

00:33:29,269 --> 00:33:27,120

chemist

751
00:33:31,190 --> 00:33:29,279
she was head of the palace

752
00:33:32,149 --> 00:33:31,200
uh

753
00:33:34,789 --> 00:33:32,159
place

754
00:33:38,710 --> 00:33:34,799
that made the perfume which was not just

755
00:33:40,310 --> 00:33:38,720
to smell good but it was used in in

756
00:33:42,789 --> 00:33:40,320
religious events it was used in

757
00:33:45,029 --> 00:33:42,799
political events it was used in all

758
00:33:47,110 --> 00:33:45,039
kinds of events as well as just to smell

759
00:33:50,620 --> 00:33:47,120
good so she is known

760
00:33:53,990 --> 00:33:50,630
as the world's first chemist

761
00:33:58,549 --> 00:33:56,230
was the queen of the amazons

762
00:34:00,389 --> 00:33:58,559
and i've got her in here because she was

763
00:34:03,269 --> 00:34:00,399

killed in the in the trojan war by

764

00:34:04,630 --> 00:34:03,279

achilles but she is known for an

765

00:34:10,230 --> 00:34:04,640

invention

766

00:34:13,829 --> 00:34:10,240

excuse me while a cat enters the picture

767

00:34:13,839 --> 00:34:17,990

sorry about that

768

00:34:21,430 --> 00:34:20,629

but she's eager to find out what's going

769

00:34:23,349 --> 00:34:21,440

on

770

00:34:26,069 --> 00:34:23,359

there are three

771

00:34:27,190 --> 00:34:26,079

women mentioned in the ancient indian

772

00:34:29,990 --> 00:34:27,200

venice

773

00:34:32,869 --> 00:34:30,000

now as natural philosophers so they also

774

00:34:34,790 --> 00:34:32,879

had women as natural philosophers their

775

00:34:35,909 --> 00:34:34,800

names are there i can't really pronounce

776

00:34:38,710 --> 00:34:35,919

them but

777

00:34:39,909 --> 00:34:38,720

uh those are the names from india

778

00:34:42,470 --> 00:34:39,919

so we had

779

00:34:43,990 --> 00:34:42,480

a series of women all the way along

780

00:34:46,470 --> 00:34:44,000

along

781

00:34:47,589 --> 00:34:46,480

the years and one man

782

00:34:49,589 --> 00:34:47,599

imhotep

783

00:34:51,990 --> 00:34:49,599

the man in blue

784

00:34:54,710 --> 00:34:52,000

he was the one who was the architect of

785

00:34:56,550 --> 00:34:54,720

the pyramids and he may be legendary

786

00:34:58,470 --> 00:34:56,560

because he he turned out they made him

787

00:34:59,829 --> 00:34:58,480

into a god because he designed the

788

00:35:03,829 --> 00:34:59,839

pyramid

789

00:35:05,510 --> 00:35:03,839

he lived in the time when it could have

790

00:35:08,310 --> 00:35:05,520

been legendary

791

00:35:10,310 --> 00:35:08,320

so we don't really know

792

00:35:12,630 --> 00:35:10,320

now i could

793

00:35:14,150 --> 00:35:12,640

show you a list

794

00:35:16,390 --> 00:35:14,160

forget the list

795

00:35:18,950 --> 00:35:16,400

we're not going to do lists

796

00:35:22,150 --> 00:35:18,960

just know that if i mention a woman

797

00:35:26,310 --> 00:35:22,160

there are 20 30 40 50 100 lined up

798

00:35:27,910 --> 00:35:26,320

behind her that we could mention

799

00:35:30,310 --> 00:35:27,920

uh so

800

00:35:33,589 --> 00:35:30,320

if i mentioned theano know that there

801
00:35:36,150 --> 00:35:33,599
are 30 others lined up around her she

802
00:35:38,870 --> 00:35:36,160
was the wife of pythagoras and is the

803
00:35:42,390 --> 00:35:38,880
one who developed the golden ratio

804
00:35:45,910 --> 00:35:42,400
which says a is to be a plus b

805
00:35:48,150 --> 00:35:45,920
is to a as a is to be

806
00:35:50,310 --> 00:35:48,160
and the golden ratio is a infinite

807
00:35:54,950 --> 00:35:50,320
number but it's one point it starts off

808
00:35:59,270 --> 00:35:56,550
and

809
00:36:00,630 --> 00:35:59,280
it's supposedly the most pleasing

810
00:36:02,790 --> 00:36:00,640
of

811
00:36:05,589 --> 00:36:02,800
how things should look

812
00:36:06,950 --> 00:36:05,599
if you use the golden ratio

813
00:36:10,630 --> 00:36:06,960

so

814

00:36:13,109 --> 00:36:10,640

here's the golden mean spiral

815

00:36:16,069 --> 00:36:13,119

and it's based on identical golden

816

00:36:18,630 --> 00:36:16,079

rectangles each one with a golden ratio

817

00:36:21,190 --> 00:36:18,640

of 1.618

818

00:36:24,069 --> 00:36:21,200

of the long side to the short side so

819

00:36:25,190 --> 00:36:24,079

that's the golden mean spiral and we

820

00:36:26,950 --> 00:36:25,200

find it

821

00:36:30,230 --> 00:36:26,960

in reality

822

00:36:35,589 --> 00:36:32,950

things from the sea shells

823

00:36:41,270 --> 00:36:35,599

a staircase i wouldn't go up

824

00:36:45,829 --> 00:36:44,150

and if you can see the faint

825

00:36:54,069 --> 00:36:45,839

uh

826

00:36:57,750 --> 00:36:55,750

moving ahead

827

00:37:01,270 --> 00:36:57,760

cleopatra is not somebody you would

828

00:37:03,990 --> 00:37:01,280

think of as a scientist but this lady

829

00:37:06,870 --> 00:37:04,000

spoke eight languages

830

00:37:08,950 --> 00:37:06,880

she studied geography history astronomy

831

00:37:11,349 --> 00:37:08,960

international diplomacy mathematics

832

00:37:12,230 --> 00:37:11,359

alchemy medicine zoology economics and

833

00:37:14,950 --> 00:37:12,240

more

834

00:37:17,910 --> 00:37:14,960

and that makes her a natural philosopher

835

00:37:20,150 --> 00:37:17,920

and so she was able to

836

00:37:21,750 --> 00:37:20,160

do what anybody else would do who's a

837

00:37:24,069 --> 00:37:21,760

natural philosopher

838

00:37:26,550 --> 00:37:24,079

and who also spoke eight languages she

839

00:37:28,870 --> 00:37:26,560

was the first of the

840

00:37:31,990 --> 00:37:28,880

greek pharaohs who actually learned

841

00:37:34,710 --> 00:37:32,000

egyptian ancient egyptian

842

00:37:37,670 --> 00:37:34,720

that we don't think of cleopatra as a as

843

00:37:39,109 --> 00:37:37,680

a scientist but she's the one who gave

844

00:37:40,870 --> 00:37:39,119

julius caesar

845

00:37:43,990 --> 00:37:40,880

an astronomer to

846

00:37:48,550 --> 00:37:44,000

reconstruct the the roman calendar and

847

00:37:53,430 --> 00:37:51,829

mary hibrea was an alchemist of the

848

00:37:54,310 --> 00:37:53,440

first century

849

00:37:56,630 --> 00:37:54,320

she

850

00:37:57,750 --> 00:37:56,640

invented or came across

851
00:38:00,150 --> 00:37:57,760
invented

852
00:38:04,630 --> 00:38:02,550
hydrochloric acid she's the one who came

853
00:38:05,910 --> 00:38:04,640
up with hydrochloric acid

854
00:38:09,109 --> 00:38:05,920
and she

855
00:38:11,349 --> 00:38:09,119
invented tools to do her alchemy and one

856
00:38:13,510 --> 00:38:11,359
of them was a water bath

857
00:38:16,150 --> 00:38:13,520
that's a double boiler

858
00:38:18,390 --> 00:38:16,160
in france it's called the bameli

859
00:38:22,150 --> 00:38:18,400
they named it after her

860
00:38:24,470 --> 00:38:22,160
in germany it's called bahrain bad

861
00:38:25,990 --> 00:38:24,480
they named it after her it still is

862
00:38:28,069 --> 00:38:26,000
today

863
00:38:29,190 --> 00:38:28,079

so she invented

864

00:38:30,150 --> 00:38:29,200

a still

865

00:38:31,349 --> 00:38:30,160

uh

866

00:38:32,550 --> 00:38:31,359

ways to

867

00:38:34,710 --> 00:38:32,560

to

868

00:38:36,710 --> 00:38:34,720

handle hydrochloric acid which was i

869

00:38:40,150 --> 00:38:36,720

suppose very tricky

870

00:38:42,230 --> 00:38:40,160

and very talented lady in alexandria she

871

00:38:49,109 --> 00:38:42,240

lived in alexandria egypt in the first

872

00:38:54,710 --> 00:38:51,670

is one you probably have heard of and

873

00:38:55,750 --> 00:38:54,720

it's pronounced hippatia because she was

874

00:38:58,230 --> 00:38:55,760

greek

875

00:39:02,630 --> 00:38:58,240

the americans mispronounce it and but

876

00:39:05,670 --> 00:39:02,640

it's properly pronounced he patia

877

00:39:07,990 --> 00:39:05,680

people say she invented an astrolabe

878

00:39:10,950 --> 00:39:08,000

i don't think she invented an astrolabe

879

00:39:13,349 --> 00:39:10,960

i think she did she built her own but

880

00:39:15,349 --> 00:39:13,359

she didn't invent the concept but she

881

00:39:17,750 --> 00:39:15,359

did invent the concept of measuring the

882

00:39:19,349 --> 00:39:17,760

specific gravity of water

883

00:39:21,750 --> 00:39:19,359

and we know this

884

00:39:22,630 --> 00:39:21,760

because of letters her students wrote to

885

00:39:24,390 --> 00:39:22,640

her

886

00:39:27,109 --> 00:39:24,400

the philosophy she was called the

887

00:39:29,589 --> 00:39:27,119

philosopher at the great library in

888

00:39:32,950 --> 00:39:29,599

alexandria and letters addressed to the

889

00:39:35,349 --> 00:39:32,960

philosopher were delivered to her

890

00:39:36,630 --> 00:39:35,359

she was a teacher an inventor a writer a

891

00:39:40,069 --> 00:39:36,640

mathematician

892

00:39:42,710 --> 00:39:40,079

and i recommend to you a dvd

893

00:39:45,510 --> 00:39:42,720

that is a film of her life a short film

894

00:39:47,030 --> 00:39:45,520

of her life called agora

895

00:39:48,230 --> 00:39:47,040

and it is

896

00:39:50,390 --> 00:39:48,240

which is

897

00:39:51,670 --> 00:39:50,400

greek for marketplace

898

00:39:54,390 --> 00:39:51,680

and

899

00:39:57,270 --> 00:39:54,400

it's a wonderful film that tries to show

900

00:40:00,230 --> 00:39:57,280

a balanced view of what life was like in

901
00:40:02,710 --> 00:40:00,240
alexandria during her time

902
00:40:06,230 --> 00:40:02,720
and how she played into the

903
00:40:08,790 --> 00:40:06,240
into the society she was a pagan

904
00:40:10,550 --> 00:40:08,800
there were christians there were jews

905
00:40:12,150 --> 00:40:10,560
and there were

906
00:40:14,150 --> 00:40:12,160
the romans

907
00:40:17,349 --> 00:40:14,160
and the pagans

908
00:40:22,829 --> 00:40:18,710
now she

909
00:40:25,030 --> 00:40:22,839
was known for she wrote several books

910
00:40:27,990 --> 00:40:25,040
unfortunately when the library was

911
00:40:30,390 --> 00:40:28,000
finally destroyed we lost all her books

912
00:40:33,109 --> 00:40:30,400
we only know she wrote them from letters

913
00:40:34,309 --> 00:40:33,119

her students had written her

914

00:40:35,109 --> 00:40:34,319

uh

915

00:40:38,630 --> 00:40:35,119

so

916

00:40:40,470 --> 00:40:38,640

she did write commentary on lots of

917

00:40:42,710 --> 00:40:40,480

stuff and wrote the text the

918

00:40:48,550 --> 00:40:42,720

astronomical canon but we don't know

919

00:40:54,230 --> 00:40:52,790

fables should be taught as fables myths

920

00:40:57,430 --> 00:40:54,240

as myths

921

00:41:00,150 --> 00:40:57,440

and miracles as poetic fantasies

922

00:41:02,550 --> 00:41:00,160

to teach superstitions as truth is a

923

00:41:06,630 --> 00:41:02,560

most terrible thing

924

00:41:09,430 --> 00:41:06,640

the child mind accepts and believes them

925

00:41:12,470 --> 00:41:09,440

and only through great

926
00:41:15,990 --> 00:41:12,480
pain and perhaps tragedy can he be in

927
00:41:19,030 --> 00:41:16,000
after years relieved of them

928
00:41:22,390 --> 00:41:19,040
in fact men will fight for a

929
00:41:24,230 --> 00:41:22,400
superstition quite as quickly as for

930
00:41:26,150 --> 00:41:24,240
a living truth

931
00:41:29,349 --> 00:41:26,160
often more so

932
00:41:31,829 --> 00:41:29,359
since a superstition is so intangible

933
00:41:33,750 --> 00:41:31,839
that you cannot get at it

934
00:41:37,349 --> 00:41:33,760
to refute it

935
00:41:38,790 --> 00:41:37,359
but truth is a point of view

936
00:41:41,030 --> 00:41:38,800
and so

937
00:41:43,990 --> 00:41:41,040
is changeable

938
00:41:46,950 --> 00:41:44,000

that's a quote from hepatica

939

00:41:50,069 --> 00:41:46,960

an interesting quote i think it

940

00:41:52,950 --> 00:41:50,079

lasts through the centuries

941

00:41:53,910 --> 00:41:52,960

she was known for speaking her mind

942

00:41:54,950 --> 00:41:53,920

and

943

00:41:57,270 --> 00:41:54,960

if you

944

00:41:58,870 --> 00:41:57,280

remember one thing from the talk

945

00:42:02,550 --> 00:41:58,880

remember this

946

00:42:05,910 --> 00:42:02,560

reserve your right to think

947

00:42:08,470 --> 00:42:05,920

for even to think wrongly is better than

948

00:42:10,630 --> 00:42:08,480

not to think at all

949

00:42:11,990 --> 00:42:10,640

that's a wonderful quote

950

00:42:14,550 --> 00:42:12,000

from her

951
00:42:17,470 --> 00:42:14,560
now she was

952
00:42:19,430 --> 00:42:17,480
in her chariot riding through

953
00:42:22,950 --> 00:42:19,440
alexandria and

954
00:42:24,630 --> 00:42:22,960
the bishop cyril of of alexandria hated

955
00:42:25,910 --> 00:42:24,640
her because she was a pagan he was a

956
00:42:31,349 --> 00:42:25,920
christian

957
00:42:34,470 --> 00:42:31,359
monks and they pulled her from her

958
00:42:36,309 --> 00:42:34,480
chariot and peeled her to death with

959
00:42:38,710 --> 00:42:36,319
oyster shells

960
00:42:42,150 --> 00:42:38,720
and that was the method of her death

961
00:42:44,710 --> 00:42:42,160
and she she's therefore sacrificed for

962
00:42:45,829 --> 00:42:44,720
her science

963
00:42:48,309 --> 00:42:45,839

something

964

00:42:49,190 --> 00:42:48,319

we wouldn't know about today would we

965

00:42:51,829 --> 00:42:49,200

well

966

00:42:54,390 --> 00:42:51,839

doctor jean wong mamudi was an iranian

967

00:42:55,589 --> 00:42:54,400

meteorologist a woman who dared to be a

968

00:42:58,550 --> 00:42:55,599

scientist

969

00:43:04,069 --> 00:42:58,560

and was executed for this by the iranian

970

00:43:06,309 --> 00:43:04,079

revolutionary guard on december 27 1981

971

00:43:08,069 --> 00:43:06,319

that was 1500 years later

972

00:43:10,309 --> 00:43:08,079

and of course that we could say that's

973

00:43:13,589 --> 00:43:10,319

it too but now we have malala thank

974

00:43:16,630 --> 00:43:13,599

goodness she's still with us malala

975

00:43:20,950 --> 00:43:16,640

in 2012 is when she was attacked

976

00:43:26,790 --> 00:43:23,670

so i like to dedicate these talks to dr

977

00:43:28,950 --> 00:43:26,800

mama d

978

00:43:30,069 --> 00:43:28,960

now let's do a brief update of where we

979

00:43:32,550 --> 00:43:30,079

are

980

00:43:34,230 --> 00:43:32,560

we're moving into the dark ages coming

981

00:43:36,230 --> 00:43:34,240

forward in time

982

00:43:38,230 --> 00:43:36,240

the dark ages were a time where there

983

00:43:40,710 --> 00:43:38,240

were lots of schools

984

00:43:42,950 --> 00:43:40,720

in india there was a buddhist

985

00:43:45,190 --> 00:43:42,960

monastery that

986

00:43:50,150 --> 00:43:45,200

taught a university

987

00:43:51,990 --> 00:43:50,160

and then in morocco in 859 fatima

988

00:43:53,589 --> 00:43:52,000

founded this university i can't

989

00:43:54,390 --> 00:43:53,599

pronounce its name

990

00:43:57,109 --> 00:43:54,400

but

991

00:43:59,430 --> 00:43:57,119

it was founded in 859

992

00:44:01,030 --> 00:43:59,440

and it exists today

993

00:44:04,150 --> 00:44:01,040

it is

994

00:44:05,430 --> 00:44:04,160

calls itself the longest existing

995

00:44:06,710 --> 00:44:05,440

university

996

00:44:09,349 --> 00:44:06,720

in the world

997

00:44:12,069 --> 00:44:09,359

because it was built in 1859 and is

998

00:44:17,109 --> 00:44:12,079

still going strong today

999

00:44:19,990 --> 00:44:17,119

italy the salerno medical school in 1875

1000

00:44:22,550 --> 00:44:20,000

and then convents and monasteries ran

1001

00:44:25,270 --> 00:44:22,560

schools throughout europe

1002

00:44:26,550 --> 00:44:25,280

if you if a woman wanted to learn

1003

00:44:29,670 --> 00:44:26,560

anything

1004

00:44:31,270 --> 00:44:29,680

a high-ranking woman she would go to a

1005

00:44:35,349 --> 00:44:31,280

convent school where they would teach

1006

00:44:40,630 --> 00:44:37,430

in the early middle ages the university

1007

00:44:44,069 --> 00:44:40,640

of bologna was founded in 1088

1008

00:44:46,069 --> 00:44:44,079

and the university of paris in 1100

1009

00:44:48,390 --> 00:44:46,079

now they both are called universities

1010

00:44:51,109 --> 00:44:48,400

but they are very very distinct from

1011

00:44:54,950 --> 00:44:51,119

each other one in italy one in france

1012

00:44:57,750 --> 00:44:54,960

the one in italy was founded in 1088 and

1013

00:45:00,150 --> 00:44:57,760

from that time to this women have been

1014

00:45:02,870 --> 00:45:00,160

welcomed at the doors of universities in

1015

00:45:09,990 --> 00:45:04,790

university of paris

1016

00:45:12,550 --> 00:45:10,000

the first ranking

1017

00:45:15,109 --> 00:45:12,560

people in the priesthood were eligible

1018

00:45:17,030 --> 00:45:15,119

to go to the university of paris

1019

00:45:19,349 --> 00:45:17,040

and that's

1020

00:45:21,589 --> 00:45:19,359

a big difference between the university

1021

00:45:30,390 --> 00:45:21,599

of bologna and the university of paris

1022

00:45:36,470 --> 00:45:33,910

son duke was a queen of korea

1023

00:45:39,430 --> 00:45:36,480

and in the sixth century she had she

1024

00:45:43,190 --> 00:45:39,440

liked astronomy and pad built

1025

00:45:49,589 --> 00:45:45,190

and my cat just is going to try to

1026

00:45:52,390 --> 00:45:50,710

yes

1027

00:45:53,190 --> 00:45:52,400

sorry about that

1028

00:45:56,069 --> 00:45:53,200

uh

1029

00:45:58,069 --> 00:45:56,079

and this is what remains of the temple

1030

00:46:01,910 --> 00:45:58,079

of the sun and moon today

1031

00:46:05,030 --> 00:46:01,920

but she was the queen of korea who liked

1032

00:46:10,790 --> 00:46:08,390

hildegard is one of my favorites

1033

00:46:11,750 --> 00:46:10,800

she lit she was an abbess a benedictine

1034

00:46:15,270 --> 00:46:11,760

abbess

1035

00:46:16,470 --> 00:46:15,280

in the 11th century in bingham omrin in

1036

00:46:20,950 --> 00:46:16,480

germany

1037

00:46:22,950 --> 00:46:20,960

was a scholar leader musician writer

1038

00:46:25,430 --> 00:46:22,960

mystic healer artist

1039

00:46:27,349 --> 00:46:25,440

she that's one of her illuminations on

1040

00:46:31,190 --> 00:46:27,359

the left and it's one of my favorites

1041

00:46:32,150 --> 00:46:31,200

because it reminds me of falling stars

1042

00:46:32,950 --> 00:46:32,160

uh

1043

00:46:41,030 --> 00:46:32,960

she

1044

00:46:44,230 --> 00:46:41,040

one one of the books was on natural

1045

00:46:46,390 --> 00:46:44,240

healing and she is honored by many

1046

00:46:47,510 --> 00:46:46,400

people as the founder of holistic

1047

00:46:49,270 --> 00:46:47,520

medicine

1048

00:46:51,670 --> 00:46:49,280

and the book has

1049

00:46:54,470 --> 00:46:51,680

a recipe for spice cookies because

1050

00:46:57,829 --> 00:46:54,480

cinnamon was an important thing to calm

1051

00:47:00,230 --> 00:46:57,839

your bitterness of heart and mind

1052

00:47:04,069 --> 00:47:00,240

and you can find this recipe on the web

1053

00:47:06,150 --> 00:47:04,079

it's called hildegard's cookies of joy

1054

00:47:08,550 --> 00:47:06,160

so you don't need to copy it down it's

1055

00:47:09,589 --> 00:47:08,560

it's out there hildegard's cookies of

1056

00:47:11,990 --> 00:47:09,599

joy

1057

00:47:14,150 --> 00:47:12,000

if you if i couldn't figure a way to get

1058

00:47:16,470 --> 00:47:14,160

spice cookies to the internet to you i'm

1059

00:47:18,790 --> 00:47:16,480

very sorry because i usually hand them

1060

00:47:20,710 --> 00:47:18,800

out of these talks but you can see

1061

00:47:23,109 --> 00:47:20,720

they're made of of

1062

00:47:26,150 --> 00:47:23,119

cinnamon nutmeg and cloves

1063

00:47:28,790 --> 00:47:26,160

and then the regular cookie

1064

00:47:32,069 --> 00:47:28,800

concoction and they're they're about

1065

00:47:34,069 --> 00:47:32,079

this big this big around small

1066

00:47:36,470 --> 00:47:34,079

and they taste delicious

1067

00:47:38,870 --> 00:47:36,480

so your mind will be joyous your sense

1068

00:47:41,430 --> 00:47:38,880

is purified and harmful humors will

1069

00:47:43,910 --> 00:47:41,440

diminish

1070

00:47:46,069 --> 00:47:43,920

this is she wrote music

1071

00:47:49,030 --> 00:47:46,079

she wrote the gorian chants

1072

00:47:50,950 --> 00:47:49,040

and this is a page of her music and let

1073

00:47:53,829 --> 00:47:50,960

me see if it will play

1074

00:47:56,470 --> 00:47:53,839

a little bit

1075

00:48:02,150 --> 00:47:56,480

uh it won't play this way i have to

1076
00:48:02,160 --> 00:48:13,220
there we go

1077
00:48:19,440 --> 00:48:15,630
[Music]

1078
00:48:21,410 --> 00:48:19,450
pretty much

1079
00:48:26,069 --> 00:48:21,420
[Applause]

1080
00:48:39,750 --> 00:48:26,079
[Music]

1081
00:48:45,750 --> 00:48:43,030
there will will not go on too long

1082
00:48:47,270 --> 00:48:45,760
because it runs into copyright issues

1083
00:48:49,510 --> 00:48:47,280
but

1084
00:48:51,510 --> 00:48:49,520
it is said that her music was so

1085
00:48:52,549 --> 00:48:51,520
beautiful that people would faint upon

1086
00:48:55,510 --> 00:48:52,559
hearing it

1087
00:48:59,109 --> 00:48:55,520
and a thousand years after her time

1088
00:49:00,829 --> 00:48:59,119

in 2000 the national cathedral did a

1089

00:49:05,270 --> 00:49:00,839

whole day of

1090

00:49:07,510 --> 00:49:05,280

her gregorian chants i have eight cds of

1091

00:49:09,670 --> 00:49:07,520

her of her gregorian chants

1092

00:49:13,829 --> 00:49:09,680

if you're interested in her music make

1093

00:49:15,109 --> 00:49:13,839

sure that the cd you or dvd you buy

1094

00:49:17,750 --> 00:49:15,119

is not

1095

00:49:20,069 --> 00:49:17,760

one with orchestral accompaniment

1096

00:49:21,430 --> 00:49:20,079

gregorian chants are meant to be

1097

00:49:24,150 --> 00:49:21,440

acapella

1098

00:49:26,309 --> 00:49:24,160

so don't get one with an orchestra and

1099

00:49:28,950 --> 00:49:26,319

they've done that some other people have

1100

00:49:31,910 --> 00:49:28,960

put or orchestral music to it and that's

1101

00:49:36,870 --> 00:49:34,549

she painted

1102

00:49:39,990 --> 00:49:36,880

these are three of her illuminations the

1103

00:49:43,190 --> 00:49:40,000

stars on the right the one in the middle

1104

00:49:44,790 --> 00:49:43,200

is called the cosmic egg

1105

00:49:47,430 --> 00:49:44,800

and

1106

00:49:48,710 --> 00:49:47,440

so she was very talented as a as an

1107

00:49:50,710 --> 00:49:48,720

artist

1108

00:49:52,549 --> 00:49:50,720

most of the nuns were that's what one of

1109

00:49:55,510 --> 00:49:52,559

the things they did was

1110

00:49:57,589 --> 00:49:55,520

uh illumine or paint prayer books in the

1111

00:49:59,829 --> 00:49:57,599

bible

1112

00:50:00,950 --> 00:49:59,839

now she wrote a book called the physical

1113

00:50:03,109 --> 00:50:00,960

world

1114

00:50:05,190 --> 00:50:03,119

and in that book she said the stars

1115

00:50:06,790 --> 00:50:05,200

gravitate around the sun just as the

1116

00:50:10,230 --> 00:50:06,800

earth attracts the creatures which

1117

00:50:12,549 --> 00:50:10,240

inhabit it this is universal gravitation

1118

00:50:14,630 --> 00:50:12,559

long before uh newton

1119

00:50:16,549 --> 00:50:14,640

and now she was wrong about gravitating

1120

00:50:18,549 --> 00:50:16,559

about the sun but that's okay because

1121

00:50:20,870 --> 00:50:18,559

everybody thought the sun was the center

1122

00:50:24,549 --> 00:50:20,880

of the universe in those days

1123

00:50:27,430 --> 00:50:24,559

um but it was the fact that the earth's

1124

00:50:29,349 --> 00:50:27,440

gravitation and the stars gravitation

1125

00:50:32,870 --> 00:50:29,359

was the same

1126

00:50:36,790 --> 00:50:34,630

her analogies

1127

00:50:38,950 --> 00:50:36,800

stars are not immovable

1128

00:50:41,670 --> 00:50:38,960

they transverse the universe

1129

00:50:43,030 --> 00:50:41,680

just like blood moving through the body

1130

00:50:45,750 --> 00:50:43,040

that's good

1131

00:50:47,829 --> 00:50:45,760

but she wasn't perfect

1132

00:50:48,790 --> 00:50:47,839

i like to pretend she's perfect but she

1133

00:50:51,510 --> 00:50:48,800

wasn't

1134

00:50:52,870 --> 00:50:51,520

a precious gem will heal the body if

1135

00:50:55,910 --> 00:50:52,880

taken to bed

1136

00:50:59,030 --> 00:50:55,920

at a diamond held in the mouth of a wire

1137

00:51:00,549 --> 00:50:59,040

will cure any spiritual defects i'd love

1138

00:51:02,309 --> 00:51:00,559

to test this out

1139

00:51:06,549 --> 00:51:02,319

so if you send me your diamonds i'll

1140

00:51:10,630 --> 00:51:07,349

then

1141

00:51:11,670 --> 00:51:10,640

herod of lonzberg a little bit later

1142

00:51:13,670 --> 00:51:11,680

wrote

1143

00:51:15,670 --> 00:51:13,680

what we consider to be the first

1144

00:51:18,069 --> 00:51:15,680

encyclopedia called the garden of

1145

00:51:21,190 --> 00:51:18,079

delights and in it

1146

00:51:26,710 --> 00:51:21,200

let me turn back to the

1147

00:51:26,720 --> 00:51:30,150

back

1148

00:51:30,160 --> 00:51:35,349

laser pointer

1149

00:51:39,109 --> 00:51:37,990

these are the seven liberal arts around

1150

00:51:41,589 --> 00:51:39,119

here

1151
00:51:44,390 --> 00:51:41,599
each one is a lady representing a

1152
00:51:46,870 --> 00:51:44,400
liberal one of the seven

1153
00:51:48,710 --> 00:51:46,880
so she wrote one of the world's first

1154
00:51:51,349 --> 00:51:48,720
encyclopedias

1155
00:51:54,150 --> 00:51:51,359
on the seven liberal arts and she taught

1156
00:51:56,870 --> 00:51:54,160
in her school in her convent

1157
00:51:59,910 --> 00:51:56,880
the seven liberal arts

1158
00:52:02,390 --> 00:51:59,920
this is a frontispiece to euclid's

1159
00:52:03,589 --> 00:52:02,400
elements and it shows a woman teaching

1160
00:52:05,349 --> 00:52:03,599
the monks

1161
00:52:08,069 --> 00:52:05,359
geometry

1162
00:52:11,109 --> 00:52:08,079
that was 13 uh 10.

1163
00:52:14,069 --> 00:52:11,119

so women were

1164

00:52:16,870 --> 00:52:14,079

still involved

1165

00:52:19,910 --> 00:52:16,880

i don't know her name but she

1166

00:52:23,750 --> 00:52:19,920

was somebody who taught geometry

1167

00:52:26,309 --> 00:52:23,760

then moving ahead a little bit

1168

00:52:27,910 --> 00:52:26,319

i i tried to avoid sticking in a whole

1169

00:52:30,309 --> 00:52:27,920

bunch of astronomers because i'm

1170

00:52:31,349 --> 00:52:30,319

prejudiced for astronomy and i didn't

1171

00:52:34,069 --> 00:52:31,359

want to

1172

00:52:37,430 --> 00:52:34,079

inundate you with astronomers but tico

1173

00:52:39,670 --> 00:52:37,440

bright was one of the last great

1174

00:52:44,230 --> 00:52:39,680

pre-telescope observers

1175

00:52:49,829 --> 00:52:47,109

is sophia

1176

00:52:52,950 --> 00:52:49,839

helped him in his work and she also did

1177

00:52:55,030 --> 00:52:52,960

observations for him and with him

1178

00:53:03,349 --> 00:52:55,040

and

1179

00:53:06,390 --> 00:53:03,359

were sick she she would heal them

1180

00:53:09,109 --> 00:53:06,400

so the danish government has said when

1181

00:53:11,349 --> 00:53:09,119

denmark remembers hertiko she should not

1182

00:53:14,069 --> 00:53:11,359

forget the noblewoman his sister who in

1183

00:53:16,470 --> 00:53:14,079

spirit was more than blood that shining

1184

00:53:18,150 --> 00:53:16,480

star in the danish sky is indeed a

1185

00:53:19,510 --> 00:53:18,160

double star

1186

00:53:22,950 --> 00:53:19,520

raje was

1187

00:53:30,309 --> 00:53:25,990

so she she counts

1188

00:53:32,069 --> 00:53:30,319

so does this lady maria marion she drew

1189

00:53:33,829 --> 00:53:32,079

pictures of

1190

00:53:34,630 --> 00:53:33,839

insects

1191

00:53:36,950 --> 00:53:34,640

and

1192

00:53:38,069 --> 00:53:36,960

traveled the world she went to south

1193

00:53:40,470 --> 00:53:38,079

america

1194

00:53:42,150 --> 00:53:40,480

to study insects there she was from

1195

00:53:43,589 --> 00:53:42,160

germany

1196

00:53:45,109 --> 00:53:43,599

and

1197

00:53:46,390 --> 00:53:45,119

she said that

1198

00:53:48,790 --> 00:53:46,400

note that

1199

00:53:51,510 --> 00:53:48,800

nature shall always be wrestling art and

1200

00:53:53,910 --> 00:53:51,520

nature until they eventually conquer one

1201
00:53:56,630 --> 00:53:53,920
another so that the victory is the same

1202
00:53:59,510 --> 00:53:56,640
stroke and line that which is conquered

1203
00:54:00,710 --> 00:53:59,520
conquers at the same time

1204
00:54:04,950 --> 00:54:00,720
she

1205
00:54:09,030 --> 00:54:04,960
the united states issued 32 cent stamp

1206
00:54:11,190 --> 00:54:09,040
in her honor with two of her drawings

1207
00:54:14,710 --> 00:54:11,200
and she was the first to show the

1208
00:54:16,870 --> 00:54:14,720
complete life cycle of an insect

1209
00:54:19,510 --> 00:54:16,880
they didn't know that insects actually

1210
00:54:23,589 --> 00:54:19,520
went through a life cycle to become

1211
00:54:26,069 --> 00:54:23,599
what you see as the grown-up insect

1212
00:54:27,349 --> 00:54:26,079
if you find her drawings today they're

1213
00:54:29,829 --> 00:54:27,359

available

1214

00:54:32,069 --> 00:54:29,839

but they cost many thousands of dollars

1215

00:54:36,789 --> 00:54:32,079

her drawings are so exquisitely

1216

00:54:41,190 --> 00:54:39,190

it seems to me debilitating for a

1217

00:54:43,670 --> 00:54:41,200

catholic not to know everything in this

1218

00:54:46,150 --> 00:54:43,680

life of divine mysteries that can be

1219

00:54:49,349 --> 00:54:46,160

learned through natural means this was

1220

00:54:50,390 --> 00:54:49,359

sister de la cruz in mexico city

1221

00:54:54,470 --> 00:54:50,400

she

1222

00:54:57,510 --> 00:54:54,480

was also a poet and is honored by mexico

1223

00:54:59,030 --> 00:54:57,520

by putting her image on the

1224

00:55:01,750 --> 00:54:59,040

1000

1225

00:55:03,670 --> 00:55:01,760

peso bill

1226

00:55:06,470 --> 00:55:03,680

science and knowledge will strengthen

1227

00:55:08,710 --> 00:55:06,480

faith in god not weaken it and i think

1228

00:55:12,549 --> 00:55:08,720

it's interesting that she finds no

1229

00:55:15,349 --> 00:55:12,559

conflict between religion and science

1230

00:55:17,190 --> 00:55:15,359

uh and if it would be good

1231

00:55:21,109 --> 00:55:17,200

to carry that forward

1232

00:55:27,109 --> 00:55:24,789

she had a great library in mexico city

1233

00:55:29,750 --> 00:55:27,119

she had a telescope she observed the

1234

00:55:31,190 --> 00:55:29,760

stars we know that much and she had a

1235

00:55:33,109 --> 00:55:31,200

lot of books

1236

00:55:35,270 --> 00:55:33,119

she was not popular with the bishop but

1237

00:55:37,270 --> 00:55:35,280

i can understand that

1238

00:55:40,950 --> 00:55:37,280

the bishop didn't like her doing all

1239

00:55:44,789 --> 00:55:43,670

the taj mahal is famous throughout the

1240

00:55:46,069 --> 00:55:44,799

world

1241

00:55:49,670 --> 00:55:46,079

and the

1242

00:55:51,270 --> 00:55:49,680

maternal aunt of the woman buried in the

1243

00:55:55,990 --> 00:55:51,280

taj mahal

1244

00:55:57,270 --> 00:55:56,000

the maternal aunt her name is noor mahal

1245

00:56:01,349 --> 00:55:57,280

and she

1246

00:56:05,349 --> 00:56:04,390

a tar of roses she was a alchemist a

1247

00:56:08,630 --> 00:56:05,359

chemist

1248

00:56:16,789 --> 00:56:08,640

and she made perfume and we still use a

1249

00:56:20,870 --> 00:56:18,950

i added in another astronomer but not

1250

00:56:23,910 --> 00:56:20,880

for the reason you think

1251

00:56:26,630 --> 00:56:23,920

she she wrote in one of her books

1252

00:56:29,990 --> 00:56:26,640

a hint that if uranus

1253

00:56:32,069 --> 00:56:30,000

the motion of uranus isn't quite right

1254

00:56:33,910 --> 00:56:32,079

there could be another planet out there

1255

00:56:35,510 --> 00:56:33,920

causing the problem

1256

00:56:37,430 --> 00:56:35,520

and it was a hint that there might be

1257

00:56:38,870 --> 00:56:37,440

another planet and it is because of the

1258

00:56:40,950 --> 00:56:38,880

hint in her book

1259

00:56:42,789 --> 00:56:40,960

that astronomers went out and found the

1260

00:56:45,510 --> 00:56:42,799

planet neptune

1261

00:56:49,430 --> 00:56:45,520

so she wrote several things that are

1262

00:56:52,470 --> 00:56:49,440

uh she translated laplace into english

1263

00:56:54,710 --> 00:56:52,480

it's still used as a textbook

1264

00:56:56,789 --> 00:56:54,720

uh she wrote a paper on the magnetic

1265

00:56:58,789 --> 00:56:56,799

properties of the violent rays of the

1266

00:57:00,549 --> 00:56:58,799

solar spectrum i'd love to see that

1267

00:57:02,549 --> 00:57:00,559

paper

1268

00:57:04,549 --> 00:57:02,559

the connection of the physical sciences

1269

00:57:05,829 --> 00:57:04,559

is a textbook in which this quote

1270

00:57:08,549 --> 00:57:05,839

appears

1271

00:57:10,150 --> 00:57:08,559

about uranus and the possibility of

1272

00:57:13,670 --> 00:57:10,160

another planet

1273

00:57:16,309 --> 00:57:13,680

and physical geography

1274

00:57:18,630 --> 00:57:16,319

and molecular and microscopic science

1275

00:57:20,630 --> 00:57:18,640

now i put her in here not because she

1276

00:57:24,150 --> 00:57:20,640

did all these wonderful things

1277

00:57:25,670 --> 00:57:24,160

but because she was scottish

1278

00:57:26,390 --> 00:57:25,680

and scotland

1279

00:57:32,390 --> 00:57:26,400

in

1280

00:57:34,630 --> 00:57:32,400

telford two other scots

1281

00:57:37,030 --> 00:57:34,640

in a public competition run by the royal

1282

00:57:39,589 --> 00:57:37,040

bank of scotland to decide whose face

1283

00:57:41,910 --> 00:57:39,599

should appear on the new ten pound notes

1284

00:57:44,710 --> 00:57:41,920

and they did it on facebook

1285

00:57:47,829 --> 00:57:44,720

and she actually won she beat out

1286

00:57:52,230 --> 00:57:47,839

maxwell and telford and the 10 pound

1287

00:57:56,309 --> 00:57:54,789

so i think that's wonderful that's a

1288

00:57:57,589 --> 00:57:56,319

country

1289

00:57:58,549 --> 00:57:57,599

dedicating

1290

00:58:00,950 --> 00:57:58,559

uh

1291

00:58:05,589 --> 00:58:00,960

its money pictures that they use to

1292

00:58:09,910 --> 00:58:06,470

now

1293

00:58:12,150 --> 00:58:09,920

british patent number 401 was possibly

1294

00:58:13,349 --> 00:58:12,160

one of the first patents granted to the

1295

00:58:14,710 --> 00:58:13,359

colonies

1296

00:58:18,789 --> 00:58:14,720

by england

1297

00:58:20,710 --> 00:58:18,799

and it was granted to sir thomas masters

1298

00:58:23,270 --> 00:58:20,720

for an invention

1299

00:58:25,349 --> 00:58:23,280

by his wife sibila

1300

00:58:27,589 --> 00:58:25,359

his wife did the work

1301
00:58:29,510 --> 00:58:27,599
and he got her name on the patent but

1302
00:58:31,990 --> 00:58:29,520
women couldn't get patents in their own

1303
00:58:34,390 --> 00:58:32,000
name in england at that time but he did

1304
00:58:36,950 --> 00:58:34,400
get her name on the patent

1305
00:58:37,829 --> 00:58:36,960
it was a device to clean and cure indian

1306
00:58:40,230 --> 00:58:37,839
corn

1307
00:58:42,789 --> 00:58:40,240
they built the device

1308
00:58:46,549 --> 00:58:42,799
ran it and made a lot of money and he

1309
00:58:51,109 --> 00:58:48,789
but it's the first patent

1310
00:58:52,710 --> 00:58:51,119
issued to the colonies was issued for an

1311
00:58:55,349 --> 00:58:52,720
invention by a woman

1312
00:59:06,470 --> 00:58:56,309
now

1313
00:59:08,870 --> 00:59:06,480

lived a wild life

1314

00:59:11,349 --> 00:59:08,880

her translation of newton is still the

1315

00:59:12,309 --> 00:59:11,359

only french translation she transfused

1316

00:59:18,549 --> 00:59:12,319

french

1317

00:59:21,589 --> 00:59:18,559

she and both she lived with voltaire and

1318

00:59:22,789 --> 00:59:21,599

they formed a a competition

1319

00:59:25,910 --> 00:59:22,799

in in

1320

00:59:28,630 --> 00:59:25,920

science they wrote they disagreed on the

1321

00:59:30,789 --> 00:59:28,640

concept of what fire was and they wrote

1322

00:59:32,630 --> 00:59:30,799

essays and submitted them to the french

1323

00:59:35,270 --> 00:59:32,640

academy of sciences

1324

00:59:38,309 --> 00:59:35,280

the essays did not win first prize but

1325

00:59:40,710 --> 00:59:38,319

they ran one honorable mention so she is

1326
00:59:43,589 --> 00:59:40,720
the first woman to be published in the

1327
00:59:45,829 --> 00:59:43,599
french academy of sciences

1328
00:59:46,789 --> 00:59:45,839
but i have her here because of what

1329
00:59:50,870 --> 00:59:46,799
she's

1330
00:59:54,549 --> 00:59:52,470
judge me

1331
00:59:56,789 --> 00:59:54,559
for my own merits

1332
01:00:00,950 --> 00:59:56,799
or lack of them

1333
01:00:05,430 --> 01:00:00,960
but do not look upon me as a mere

1334
01:00:09,670 --> 01:00:05,440
appendage to this great general or that

1335
01:00:11,349 --> 01:00:09,680
great scholar i am in my own right a

1336
01:00:14,870 --> 01:00:11,359
whole person

1337
01:00:16,710 --> 01:00:14,880
responsible to myself alone for

1338
01:00:21,589 --> 01:00:16,720

all that i am

1339

01:00:25,430 --> 01:00:23,589

it may be

1340

01:00:27,430 --> 01:00:25,440

that there are metaphysicians and

1341

01:00:29,510 --> 01:00:27,440

philosophers whose learning is greater

1342

01:00:32,789 --> 01:00:29,520

than mine

1343

01:00:33,990 --> 01:00:32,799

although i have not met them

1344

01:00:37,670 --> 01:00:34,000

yet

1345

01:00:40,390 --> 01:00:37,680

they are but frail humans too

1346

01:00:41,589 --> 01:00:40,400

and have their faults

1347

01:00:44,950 --> 01:00:41,599

so

1348

01:00:46,630 --> 01:00:44,960

when i add the sum total of

1349

01:00:48,950 --> 01:00:46,640

my graces

1350

01:00:52,309 --> 01:00:48,960

i confess i am in

1351

01:00:55,190 --> 01:00:52,319

i am inferior to no one i think that's

1352

01:00:59,510 --> 01:00:55,200

another wonderful quote and it's just as

1353

01:01:04,630 --> 01:01:02,549

maria agnesi was italian she was called

1354

01:01:07,190 --> 01:01:04,640

the oracle of the seven tongues because

1355

01:01:10,470 --> 01:01:07,200

by the time she was seven she could read

1356

01:01:12,470 --> 01:01:10,480

write and speak seven languages

1357

01:01:15,030 --> 01:01:12,480

those are the seven languages around her

1358

01:01:16,630 --> 01:01:15,040

she was a mathematician

1359

01:01:18,230 --> 01:01:16,640

and she

1360

01:01:20,069 --> 01:01:18,240

wrote a book

1361

01:01:22,470 --> 01:01:20,079

in mathematics

1362

01:01:24,549 --> 01:01:22,480

that was going to be used as a textbook

1363

01:01:25,589 --> 01:01:24,559

and in that textbook

1364

01:01:28,390 --> 01:01:25,599

she

1365

01:01:29,990 --> 01:01:28,400

solved a curve

1366

01:01:32,950 --> 01:01:30,000

it's called the curve of the which of

1367

01:01:36,549 --> 01:01:32,960

agnesi and those of you who have taken

1368

01:01:37,750 --> 01:01:36,559

algebra and geometry uh

1369

01:01:39,990 --> 01:01:37,760

calculus

1370

01:01:41,750 --> 01:01:40,000

you may have come across i did in school

1371

01:01:43,109 --> 01:01:41,760

i came across the curve of the witch of

1372

01:01:46,150 --> 01:01:43,119

magnesi

1373

01:01:48,230 --> 01:01:46,160

now they did not think she was a witch

1374

01:01:51,430 --> 01:01:48,240

that wasn't the problem

1375

01:01:54,510 --> 01:01:51,440

the problem is that the curve

1376

01:02:00,309 --> 01:01:54,520

the word for curve in middle italian is

1377

01:02:04,150 --> 01:02:02,630

the person who translated it into

1378

01:02:09,270 --> 01:02:04,160

english

1379

01:02:12,069 --> 01:02:09,280

made a typo he misread that a apostrophe

1380

01:02:14,069 --> 01:02:12,079

as belonging to the rest of the word and

1381

01:02:16,230 --> 01:02:14,079

stuck an l in front of it

1382

01:02:17,829 --> 01:02:16,240

and that's

1383

01:02:20,870 --> 01:02:17,839

which or

1384

01:02:24,150 --> 01:02:20,880

cognate with adversary in english

1385

01:02:26,710 --> 01:02:24,160

so they think the curve is a witch not

1386

01:02:28,870 --> 01:02:26,720

maria agnesi

1387

01:02:30,789 --> 01:02:28,880

and the curve is this is the curve in

1388

01:02:31,910 --> 01:02:30,799

red just to show you the curve she

1389

01:02:34,150 --> 01:02:31,920

solved

1390

01:02:35,670 --> 01:02:34,160

we we can do that today with computers

1391

01:02:36,950 --> 01:02:35,680

very simply but she didn't have

1392

01:02:38,309 --> 01:02:36,960

computers

1393

01:02:41,990 --> 01:02:38,319

when she did it

1394

01:02:42,950 --> 01:02:42,000

the red shows the curve she solved as

1395

01:02:50,150 --> 01:02:42,960

and the

1396

01:02:54,069 --> 01:02:52,230

dr mary walker

1397

01:02:57,589 --> 01:02:54,079

you may have heard of

1398

01:02:58,870 --> 01:02:57,599

was a surgeon in the civil war

1399

01:03:00,309 --> 01:02:58,880

and she

1400

01:03:02,470 --> 01:03:00,319

was honored

1401

01:03:03,510 --> 01:03:02,480

by the government for her work as a

1402

01:03:05,910 --> 01:03:03,520

surgeon

1403

01:03:08,710 --> 01:03:05,920

by the congressional medal of honor

1404

01:03:09,670 --> 01:03:08,720

the only one given to a woman

1405

01:03:12,150 --> 01:03:09,680

and

1406

01:03:15,190 --> 01:03:12,160

that's fine she accepted it that was

1407

01:03:18,390 --> 01:03:15,200

great but afterwards after the civil war

1408

01:03:20,630 --> 01:03:18,400

was over she joined the group of women

1409

01:03:23,349 --> 01:03:20,640

who wore bloomers

1410

01:03:27,349 --> 01:03:23,359

and bloomers were a bad thing they were

1411

01:03:29,029 --> 01:03:27,359

worn by women of low moral

1412

01:03:31,430 --> 01:03:29,039

standards

1413

01:03:33,109 --> 01:03:31,440

and so the government said

1414

01:03:35,190 --> 01:03:33,119

we've given the congressional medal of

1415

01:03:37,670 --> 01:03:35,200

honor to a woman who has

1416

01:03:40,309 --> 01:03:37,680

not high standards they asked for the

1417

01:03:42,549 --> 01:03:40,319

medal back

1418

01:03:44,630 --> 01:03:42,559

i think her family by that time she had

1419

01:03:47,109 --> 01:03:44,640

died i think her family refused to give

1420

01:03:49,430 --> 01:03:47,119

it back but nonetheless they retracted

1421

01:03:51,270 --> 01:03:49,440

the congressional medal of honor and it

1422

01:03:52,230 --> 01:03:51,280

wasn't until jimmy president jimmy

1423

01:03:54,390 --> 01:03:52,240

carter

1424

01:03:57,349 --> 01:03:54,400

that he restored the medal of honor to

1425

01:04:02,710 --> 01:03:57,359

her family legally so they can now

1426

01:04:08,470 --> 01:04:04,950

florence nightingale

1427

01:04:10,630 --> 01:04:08,480

for her contributions to army statistics

1428

01:04:12,630 --> 01:04:10,640

she was a statistician

1429

01:04:14,789 --> 01:04:12,640

and she became the first woman to be

1430

01:04:17,670 --> 01:04:14,799

elected a fellow of the statistical

1431

01:04:19,829 --> 01:04:17,680

society and it was her writings on

1432

01:04:22,309 --> 01:04:19,839

massive hospital planning in others how

1433

01:04:24,950 --> 01:04:22,319

do you plan a hospital that's going to

1434

01:04:30,390 --> 01:04:24,960

treat people coming in fast and

1435

01:04:36,309 --> 01:04:33,430

that technique she set up

1436

01:04:38,710 --> 01:04:36,319

established the techniques we use today

1437

01:04:41,670 --> 01:04:38,720

in setting up hospitals

1438

01:04:44,150 --> 01:04:41,680

hospital planning

1439

01:04:47,029 --> 01:04:44,160

so she was quite a an important

1440

01:04:50,470 --> 01:04:48,870

washing machines i'm almost at the end

1441

01:04:52,829 --> 01:04:50,480

washing machines

1442

01:04:55,349 --> 01:04:52,839

you must know that before washing

1443

01:04:56,630 --> 01:04:55,359

machines nobody washed clothes it was

1444

01:04:59,750 --> 01:04:56,640

too much work

1445

01:05:01,990 --> 01:04:59,760

you wore your clothes all season long

1446

01:05:04,069 --> 01:05:02,000

and because they got dirty and full of

1447

01:05:05,270 --> 01:05:04,079

fleas and everything you could get all

1448

01:05:07,190 --> 01:05:05,280

kinds of

1449

01:05:10,150 --> 01:05:07,200

fleaborn diseases

1450

01:05:13,750 --> 01:05:10,160

so people were constantly sick or

1451

01:05:20,069 --> 01:05:16,630

in 1691 the first patent for a washing

1452

01:05:22,870 --> 01:05:20,079

machine was issued and then in 1782 the

1453

01:05:25,829 --> 01:05:22,880

hand operating rotating drone and that's

1454

01:05:29,109 --> 01:05:25,839

the picture that looks very difficult to

1455

01:05:31,750 --> 01:05:29,119

use i wouldn't want to use it in 1782 so

1456

01:05:34,630 --> 01:05:31,760

even then it was too difficult to wash

1457

01:05:37,510 --> 01:05:34,640

clothes on a routine basis

1458

01:05:40,390 --> 01:05:37,520

you do them very rarely

1459

01:05:42,870 --> 01:05:40,400

but in 1888

1460

01:05:44,470 --> 01:05:42,880

came the patent for the rotary press

1461

01:05:51,990 --> 01:05:44,480

attachment

1462

01:05:54,710 --> 01:05:52,000

i've used a washing machine like that

1463

01:05:57,430 --> 01:05:54,720

and all of a sudden it became feasible

1464

01:05:59,990 --> 01:05:57,440

to wash clothes regularly

1465

01:06:02,309 --> 01:06:00,000

and all of it all of a sudden

1466

01:06:04,789 --> 01:06:02,319

the disease rate dropped

1467

01:06:07,510 --> 01:06:04,799

right around the turn of the the

1468

01:06:10,870 --> 01:06:07,520

uh 2 19 1900s

1469

01:06:15,349 --> 01:06:12,870

they people weren't as sick they they

1470

01:06:18,710 --> 01:06:15,359

were wearing clean clothes and that made

1471

01:06:19,990 --> 01:06:18,720

a huge difference in their health

1472

01:06:21,349 --> 01:06:20,000

the patent

1473

01:06:24,549 --> 01:06:21,359

for the

1474

01:06:27,510 --> 01:06:24,559

that rotary press attachment was sold

1475

01:06:32,789 --> 01:06:28,549

and

1476
01:06:33,910 --> 01:06:32,799
known that a negro woman patented the

1477
01:06:36,549 --> 01:06:33,920
invention

1478
01:06:38,549 --> 01:06:36,559
white ladies would not buy the ringer

1479
01:06:40,950 --> 01:06:38,559
i was afraid to be known because of my

1480
01:06:43,589 --> 01:06:40,960
color in having it introduced into the

1481
01:06:47,349 --> 01:06:43,599
market and that is the only reason

1482
01:06:49,670 --> 01:06:47,359
so in 1888 she sold the patent for 18

1483
01:06:53,270 --> 01:06:49,680
which i think is very sad that she had

1484
01:06:57,109 --> 01:06:53,280
to do that ellen egg louis and she's a

1485
01:07:01,910 --> 01:07:00,069
beatrix potter was a mycologist she

1486
01:07:04,069 --> 01:07:01,920
studied the fungus

1487
01:07:06,150 --> 01:07:04,079
and she did a lot of

1488
01:07:08,390 --> 01:07:06,160

groundbreaking work but nobody would pay

1489

01:07:09,589 --> 01:07:08,400

attention because she was a female so

1490

01:07:12,470 --> 01:07:09,599

she got

1491

01:07:15,510 --> 01:07:12,480

depressed and retreated to her

1492

01:07:17,990 --> 01:07:15,520

home and wrote the books on peter rabbit

1493

01:07:20,470 --> 01:07:18,000

so we we get peter rabbit from her but

1494

01:07:21,510 --> 01:07:20,480

we lost her science on on the humble

1495

01:07:23,910 --> 01:07:21,520

fungus

1496

01:07:26,549 --> 01:07:23,920

today they are digging up her her

1497

01:07:31,349 --> 01:07:26,559

original works and trying to restore her

1498

01:07:38,390 --> 01:07:34,150

now hedy lamarr was a femme fatale of

1499

01:07:40,630 --> 01:07:38,400

the 1940s movies industry in hollywood

1500

01:07:43,589 --> 01:07:40,640

and she said anybody can be glamorous

1501

01:07:45,829 --> 01:07:43,599

just stand still and look stupid

1502

01:07:47,829 --> 01:07:45,839

well that would mean if you're smart you

1503

01:07:49,910 --> 01:07:47,839

look like mrs pifflesnick there on the

1504

01:07:51,430 --> 01:07:49,920

right well we don't look like that

1505

01:07:53,750 --> 01:07:51,440

either

1506

01:07:56,710 --> 01:07:53,760

we are allowed to be as

1507

01:07:58,789 --> 01:07:56,720

any dress any way we like and look any

1508

01:08:02,150 --> 01:07:58,799

way we like we can be glamorous we can

1509

01:08:04,549 --> 01:08:02,160

be ugly we can be anything we like

1510

01:08:07,349 --> 01:08:04,559

now why did i pick hedy lamarr i picked

1511

01:08:09,829 --> 01:08:07,359

one person from the 20th century and i

1512

01:08:12,309 --> 01:08:09,839

picked hedy lamarr

1513

01:08:14,069 --> 01:08:12,319

she and george antheal invented

1514

01:08:16,309 --> 01:08:14,079

frequency hopping

1515

01:08:18,789 --> 01:08:16,319

for world war ii to prevent jamming

1516

01:08:20,950 --> 01:08:18,799

signals sent to torpedoes

1517

01:08:22,870 --> 01:08:20,960

she was granted the patent

1518

01:08:25,269 --> 01:08:22,880

and it's renamed

1519

01:08:28,550 --> 01:08:25,279

spread spectrum technology

1520

01:08:31,110 --> 01:08:28,560

and the reason your cell phone can pick

1521

01:08:33,990 --> 01:08:31,120

the your recipient out of all the

1522

01:08:36,390 --> 01:08:34,000

billions of cell phone calls going on

1523

01:08:39,269 --> 01:08:36,400

is because of what she invented

1524

01:08:41,829 --> 01:08:39,279

frequency hopping

1525

01:08:43,430 --> 01:08:41,839

so she is the one 20th century person i

1526

01:08:46,550 --> 01:08:43,440

put in because people wouldn't think of

1527

01:08:50,309 --> 01:08:46,560

an actress as being a scientist but she

1528

01:08:55,189 --> 01:08:52,870

this is my definition of a scientist

1529

01:08:57,829 --> 01:08:55,199

i've stitched my dress with continents

1530

01:09:00,229 --> 01:08:57,839

bound the equator around my waist

1531

01:09:01,590 --> 01:09:00,239

i waltz to a steady rhythm bending

1532

01:09:04,229 --> 01:09:01,600

slightly

1533

01:09:07,669 --> 01:09:04,239

i can't stop my arms plunging into

1534

01:09:10,950 --> 01:09:07,679

galaxies gloved elbows in adhesive gold

1535

01:09:13,189 --> 01:09:10,960

i carry on my arms a star's vaccine

1536

01:09:15,669 --> 01:09:13,199

with such greedy sight my eyelids

1537

01:09:17,910 --> 01:09:15,679

flutter in the breeze like a strange

1538

01:09:20,950 --> 01:09:17,920

enthusiastic plant

1539

01:09:23,430 --> 01:09:20,960

no one fears me except error

1540

01:09:27,189 --> 01:09:23,440

who is everywhere

1541

01:09:29,510 --> 01:09:27,199

and when i act nina cassian was a

1542

01:09:31,590 --> 01:09:29,520

national poet of romania

1543

01:09:34,870 --> 01:09:31,600

and when i asked her if i had permission

1544

01:09:36,789 --> 01:09:34,880

to use her poem she asked me said sure

1545

01:09:38,070 --> 01:09:36,799

you can use my poem what did what do you

1546

01:09:39,990 --> 01:09:38,080

think it meant

1547

01:09:42,229 --> 01:09:40,000

and i told her it meant to me what a

1548

01:09:44,149 --> 01:09:42,239

scientist was and she said oh that's

1549

01:09:46,630 --> 01:09:44,159

interesting i didn't i wasn't thinking

1550

01:09:49,829 --> 01:09:46,640

of science when i wrote it

1551

01:09:52,950 --> 01:09:49,839

don't know what she was thinking of

1552

01:09:55,590 --> 01:09:52,960

any rate where at the end no pessimist

1553

01:09:58,229 --> 01:09:55,600

ever discovered the secrets of the stars

1554

01:10:00,709 --> 01:09:58,239

or sailed to an uncharted land

1555

01:10:02,790 --> 01:10:00,719

or opened a new heaven to the human

1556

01:10:04,950 --> 01:10:02,800

spirit if you don't know who helen

1557

01:10:07,830 --> 01:10:04,960

keller is google her she was a wonderful

1558

01:10:10,950 --> 01:10:07,840

lady of the 20th century not a scientist

1559

01:10:12,790 --> 01:10:10,960

but nonetheless a wonderful lady

1560

01:10:16,390 --> 01:10:12,800

and

1561

01:10:19,830 --> 01:10:16,400

the url for the

1562

01:10:22,070 --> 01:10:19,840

webpage for students is given there

1563

01:10:24,229 --> 01:10:22,080

and the book that contains all the

1564

01:10:25,910 --> 01:10:24,239

stories that i know about all the women

1565

01:10:27,990 --> 01:10:25,920

i have so far

1566

01:10:30,550 --> 01:10:28,000

uh about 400

1567

01:10:34,950 --> 01:10:30,560

uh is called the hidden giants third

1568

01:10:39,270 --> 01:10:37,910

and we i at this point i will

1569

01:10:41,350 --> 01:10:39,280

stop

1570

01:10:44,709 --> 01:10:41,360

sharing the screen

1571

01:10:47,189 --> 01:10:44,719

if that's okay

1572

01:10:49,990 --> 01:10:47,199

that's great no that's wonderful

1573

01:10:52,550 --> 01:10:50,000

thank you very much seth ann that was a

1574

01:10:54,870 --> 01:10:52,560

tremendous amount of information that

1575

01:10:57,189 --> 01:10:54,880

i as a professional scientist knew very

1576

01:10:58,630 --> 01:10:57,199

little of i mean and there were a number

1577

01:11:00,870 --> 01:10:58,640

of names that you gave out there that i

1578

01:11:03,990 --> 01:11:00,880

said oh yeah i know but if you'd asked

1579

01:11:05,750 --> 01:11:04,000

me what exactly they did uh i would have

1580

01:11:08,070 --> 01:11:05,760

been hard-pressed to come through so i

1581

01:11:08,790 --> 01:11:08,080

really really enjoyed this talk oh thank

1582

01:11:14,630 --> 01:11:08,800

you

1583

01:11:15,430 --> 01:11:14,640

have an actual tablet okay yeah there it

1584

01:11:21,669 --> 01:11:15,440

is

1585

01:11:23,110 --> 01:11:21,679

it's a it's a dr lulu's prescription

1586

01:11:25,510 --> 01:11:23,120

tablet

1587

01:11:27,430 --> 01:11:25,520

okay yet uh uh

1588

01:11:29,430 --> 01:11:27,440

apparently they had a lot of trouble

1589

01:11:31,350 --> 01:11:29,440

with boils

1590

01:11:34,310 --> 01:11:31,360

and they had a lot of recipes for

1591

01:11:37,990 --> 01:11:34,320

treating boils you see how small it is i

1592

01:11:40,390 --> 01:11:38,000

mean it's just not that weird you can

1593

01:11:42,870 --> 01:11:40,400

a very hard time thinking how you would

1594

01:11:45,430 --> 01:11:42,880

do that on a tablet so tiny

1595

01:11:47,110 --> 01:11:45,440

well really kind of amazing very gifted

1596

01:11:49,750 --> 01:11:47,120

now if you look

1597

01:11:52,310 --> 01:11:49,760

i don't want to destroy it you see the

1598

01:11:54,950 --> 01:11:52,320

blank rectangle yeah

1599

01:11:57,350 --> 01:11:54,960

well the blank rectangle is used as

1600

01:12:01,030 --> 01:11:57,360

their database

1601
01:12:03,510 --> 01:12:01,040
line one to a thousand of tablet one

1602
01:12:06,310 --> 01:12:03,520
lines one thousand one to two thousand

1603
01:12:07,910 --> 01:12:06,320
of tablet two so this was their card

1604
01:12:09,910 --> 01:12:07,920
catalog

1605
01:12:11,030 --> 01:12:09,920
now he only had one so there's nothing

1606
01:12:13,270 --> 01:12:11,040
on it

1607
01:12:15,189 --> 01:12:13,280
and it would fit in his pocket

1608
01:12:17,830 --> 01:12:15,199
or her pocket i don't know whether dr

1609
01:12:19,270 --> 01:12:17,840
lulu was a him or her i just know it was

1610
01:12:20,830 --> 01:12:19,280
dr lulu

1611
01:12:24,149 --> 01:12:20,840
and it's on both

1612
01:12:27,669 --> 01:12:24,159
sides the back side isn't as is well

1613
01:12:30,709 --> 01:12:27,679

preserved as the front side this side

1614

01:12:32,310 --> 01:12:30,719

but i think that's a real tablet from

1615

01:12:34,870 --> 01:12:32,320

they can they let me have this one they

1616

01:12:36,630 --> 01:12:34,880

wouldn't let me have hers and hedawanas

1617

01:12:39,030 --> 01:12:36,640

but they let me have this one well

1618

01:12:41,590 --> 01:12:39,040

that's quite a treat to have and i'm

1619

01:12:42,790 --> 01:12:41,600

glad we don't have to write so small

1620

01:12:45,030 --> 01:12:42,800

these days

1621

01:12:46,310 --> 01:12:45,040

and i'm also glad that you know the cue

1622

01:12:48,950 --> 01:12:46,320

the uh

1623

01:12:51,030 --> 01:12:48,960

the use of of uh the

1624

01:12:53,030 --> 01:12:51,040

how you treat boils is not quite as

1625

01:12:55,990 --> 01:12:53,040

necessary today as well

1626

01:12:57,510 --> 01:12:56,000

yes it wasn't it was very ugly but the

1627

01:12:59,110 --> 01:12:57,520

solution

1628

01:13:01,030 --> 01:12:59,120

you mix things together that you

1629

01:13:04,070 --> 01:13:01,040

wouldn't want to mix

1630

01:13:06,470 --> 01:13:04,080

all right so uh grant justice has been

1631

01:13:08,630 --> 01:13:06,480

monitoring the chat on youtube uh so

1632

01:13:11,510 --> 01:13:08,640

grant why don't you turn on your video

1633

01:13:13,270 --> 01:13:11,520

um and let us know if you found any uh

1634

01:13:14,630 --> 01:13:13,280

interesting questions in the youtube

1635

01:13:18,470 --> 01:13:14,640

chat

1636

01:13:21,030 --> 01:13:18,480

audience tonight

1637

01:13:22,550 --> 01:13:21,040

um so first off and this is one that i

1638

01:13:24,870 --> 01:13:22,560

wanted you to give a little more

1639

01:13:27,350 --> 01:13:24,880

clarification on as well

1640

01:13:29,510 --> 01:13:27,360

the uh the chats caught this

1641

01:13:30,950 --> 01:13:29,520

when you said that the dark ages weren't

1642

01:13:33,430 --> 01:13:30,960

really dark

1643

01:13:37,669 --> 01:13:33,440

you did talk about it a little bit about

1644

01:13:40,550 --> 01:13:37,679

some like modest monostatic uh learning

1645

01:13:41,990 --> 01:13:40,560

and yeah some more like theology based

1646

01:13:43,430 --> 01:13:42,000

but would you elaborate a little more on

1647

01:13:44,550 --> 01:13:43,440

what you mean it's because of the

1648

01:13:46,630 --> 01:13:44,560

schooling

1649

01:13:48,470 --> 01:13:46,640

the convents and monasteries the

1650

01:13:50,229 --> 01:13:48,480

convents trained the girls the

1651

01:13:53,110 --> 01:13:50,239

monasteries trained the boys in the

1652

01:13:54,149 --> 01:13:53,120

seven liberal arts so they weren't they

1653

01:13:56,630 --> 01:13:54,159

weren't

1654

01:13:58,870 --> 01:13:56,640

indoctrinated into a religion they were

1655

01:14:01,110 --> 01:13:58,880

they were they went to school and these

1656

01:14:04,310 --> 01:14:01,120

were actual schools run by the convents

1657

01:14:05,990 --> 01:14:04,320

and and monasteries so to me that's not

1658

01:14:08,870 --> 01:14:06,000

a dark age

1659

01:14:10,709 --> 01:14:08,880

and the monks and the con the nuns were

1660

01:14:11,990 --> 01:14:10,719

learning people who could read and write

1661

01:14:13,510 --> 01:14:12,000

and cipher

1662

01:14:15,830 --> 01:14:13,520

and

1663

01:14:17,430 --> 01:14:15,840

i don't find that dark

1664

01:14:19,750 --> 01:14:17,440

now the roman

1665

01:14:20,630 --> 01:14:19,760

empire had fallen

1666

01:14:23,990 --> 01:14:20,640

and

1667

01:14:26,870 --> 01:14:24,000

maybe road travel was not easy but each

1668

01:14:29,750 --> 01:14:26,880

little place built its convent and its

1669

01:14:34,149 --> 01:14:29,760

monastery all over the place

1670

01:14:35,350 --> 01:14:34,159

and i have several uh names of famous

1671

01:14:37,750 --> 01:14:35,360

abbesses

1672

01:14:39,750 --> 01:14:37,760

who ran schools

1673

01:14:41,430 --> 01:14:39,760

several in england several in germany

1674

01:14:43,510 --> 01:14:41,440

several in france

1675

01:14:46,070 --> 01:14:43,520

and italy of course was always ahead

1676

01:14:47,430 --> 01:14:46,080

with the women

1677

01:14:50,310 --> 01:14:47,440

so i'd like to follow up with that

1678

01:14:52,630 --> 01:14:50,320

because um you mentioned that astronomy

1679

01:14:54,630 --> 01:14:52,640

is one of the seven liberal arts and

1680

01:14:57,110 --> 01:14:54,640

that you know the first scientist was

1681

01:15:00,149 --> 01:14:57,120

part astronomer right that you you look

1682

01:15:03,669 --> 01:15:00,159

at that and when you look at today's

1683

01:15:06,310 --> 01:15:03,679

lang today's education uh it's rare to

1684

01:15:07,990 --> 01:15:06,320

find a high school that has as astronomy

1685

01:15:10,390 --> 01:15:08,000

classes in it and such

1686

01:15:12,709 --> 01:15:10,400

and so it's interesting how our

1687

01:15:14,550 --> 01:15:12,719

technological behavior our our

1688

01:15:16,310 --> 01:15:14,560

technological understanding and our

1689

01:15:17,990 --> 01:15:16,320

ability to keep track of time because

1690

01:15:20,470 --> 01:15:18,000

astronomers were really important early

1691

01:15:22,790 --> 01:15:20,480

on because the calendar and such

1692

01:15:23,830 --> 01:15:22,800

made astronomy less important on a daily

1693

01:15:26,149 --> 01:15:23,840

basis

1694

01:15:28,470 --> 01:15:26,159

yes and unfortunately i think it's very

1695

01:15:30,630 --> 01:15:28,480

unfortunate but they no longer teach the

1696

01:15:33,990 --> 01:15:30,640

seven liberal arts

1697

01:15:37,350 --> 01:15:35,030

writing

1698

01:15:39,990 --> 01:15:37,360

not script but printing

1699

01:15:42,070 --> 01:15:40,000

and uh that's about it they don't teach

1700

01:15:44,870 --> 01:15:42,080

much math

1701

01:15:46,070 --> 01:15:44,880

the students don't get a good grounding

1702

01:15:49,110 --> 01:15:46,080

in math

1703

01:15:50,550 --> 01:15:49,120

the way they did 100 years ago

1704

01:15:53,990 --> 01:15:50,560

okay

1705

01:15:55,830 --> 01:15:54,000

well um you know i it's as an astronomer

1706

01:15:57,750 --> 01:15:55,840

you know it's interesting to sort of uh

1707

01:15:59,189 --> 01:15:57,760

look back and and say oh yeah astronomy

1708

01:16:01,350 --> 01:15:59,199

was much more important important

1709

01:16:03,110 --> 01:16:01,360

earlier on um

1710

01:16:04,550 --> 01:16:03,120

because it really affected your daily

1711

01:16:06,630 --> 01:16:04,560

life and the planting of crops and

1712

01:16:08,470 --> 01:16:06,640

everything and you know i always like to

1713

01:16:10,550 --> 01:16:08,480

point out that you know you're down at

1714

01:16:13,830 --> 01:16:10,560

usno you guys are the official time

1715

01:16:15,510 --> 01:16:13,840

keepers of the world yes

1716

01:16:16,630 --> 01:16:15,520

astronomers are responsible for the

1717

01:16:18,870 --> 01:16:16,640

calendar

1718

01:16:23,669 --> 01:16:18,880

yes i was chief of the nautical almanac

1719

01:16:24,950 --> 01:16:23,679

office i did the astronomical almanac

1720

01:16:27,430 --> 01:16:24,960

all right grant what else we got from

1721

01:16:29,189 --> 01:16:27,440

the chat absolutely i'm just enjoying

1722

01:16:31,510 --> 01:16:29,199

everywhere that you have been in your

1723

01:16:34,070 --> 01:16:31,520

life thus far

1724

01:16:36,070 --> 01:16:34,080

you've like a rolodex of jobs that you

1725

01:16:39,430 --> 01:16:36,080

just pull out like oh yeah i did that i

1726

01:16:42,470 --> 01:16:39,440

was the head of that for five years

1727

01:16:44,470 --> 01:16:42,480

um this is one that i actually it's not

1728

01:16:46,149 --> 01:16:44,480

necessarily as topic related but

1729

01:16:47,510 --> 01:16:46,159

hildegard you were talking a little bit

1730

01:16:48,630 --> 01:16:47,520

about that it was some of the music that

1731

01:16:50,950 --> 01:16:48,640

you shared

1732

01:16:53,350 --> 01:16:50,960

um the chat mentioned this as well was

1733

01:16:55,350 --> 01:16:53,360

that not the first usage of polyphonic

1734

01:16:58,070 --> 01:16:55,360

music as well

1735

01:17:00,149 --> 01:16:58,080

uh i don't know it may have been i

1736

01:17:01,030 --> 01:17:00,159

really that one i don't know the answer

1737

01:17:04,390 --> 01:17:01,040

to

1738

01:17:06,229 --> 01:17:04,400

um because it was early gregorian chant

1739

01:17:08,149 --> 01:17:06,239

this was still early for gregorian

1740

01:17:09,590 --> 01:17:08,159

chance so it could could well have been

1741

01:17:11,510 --> 01:17:09,600

the first

1742

01:17:13,270 --> 01:17:11,520

two

1743

01:17:15,030 --> 01:17:13,280

i don't know

1744

01:17:17,830 --> 01:17:15,040

all i know is people tell me they

1745

01:17:19,990 --> 01:17:17,840

fainted when they hear her music

1746

01:17:22,070 --> 01:17:20,000

because it was so beautiful yeah at the

1747

01:17:24,870 --> 01:17:22,080

time especially given the resonance in

1748

01:17:27,189 --> 01:17:24,880

the cathedrals

1749

01:17:29,189 --> 01:17:27,199

yeah that is just so much fun when you

1750

01:17:32,550 --> 01:17:29,199

walk into these giant cathedrals and you

1751

01:17:35,990 --> 01:17:32,560

really hear it resonating through

1752

01:17:37,590 --> 01:17:36,000

la sagrada familia in barcelona

1753

01:17:39,270 --> 01:17:37,600

we entered in that and they played some

1754

01:17:40,870 --> 01:17:39,280

beautiful music that resonated

1755

01:17:43,990 --> 01:17:40,880

throughout and i was just

1756

01:17:46,070 --> 01:17:44,000

wow what an experience

1757

01:17:48,709 --> 01:17:46,080

um videographer experience in the

1758

01:17:50,550 --> 01:17:48,719

commons stsci is space telescope science

1759

01:17:53,669 --> 01:17:50,560

institute that's where we're located and

1760

01:17:57,430 --> 01:17:55,189

all right so

1761

01:17:59,270 --> 01:17:57,440

um another one that i don't think i saw

1762

01:18:02,550 --> 01:17:59,280

in the talk that the the chat was

1763

01:18:06,070 --> 01:18:02,560

talking about is ada lovelace oh yes i i

1764

01:18:07,350 --> 01:18:06,080

left out as i said everyone i put had 29

1765

01:18:09,030 --> 01:18:07,360

behind her

1766

01:18:09,990 --> 01:18:09,040

and and

1767

01:18:13,430 --> 01:18:10,000

ada

1768

01:18:15,189 --> 01:18:13,440

the countess of lovelace was

1769

01:18:16,790 --> 01:18:15,199

the daughter of

1770

01:18:21,350 --> 01:18:16,800

of um

1771

01:18:28,470 --> 01:18:24,870

oh well it doesn't matter she became a a

1772

01:18:32,709 --> 01:18:31,189

somebody who who monitored babbage sir

1773

01:18:34,550 --> 01:18:32,719

charles babbage

1774

01:18:37,270 --> 01:18:34,560

and babbage wrote the fir

1775

01:18:39,510 --> 01:18:37,280

built design didn't build designed the

1776

01:18:42,310 --> 01:18:39,520

first difference engine which is

1777

01:18:43,110 --> 01:18:42,320

essentially a pre-computer

1778

01:18:45,750 --> 01:18:43,120

and

1779

01:18:46,790 --> 01:18:45,760

she wrote the subroutine that would make

1780

01:18:49,350 --> 01:18:46,800

it run

1781

01:18:53,350 --> 01:18:49,360

so when they actually

1782

01:18:57,189 --> 01:18:53,360

built the device in the mid 20th century

1783

01:18:59,189 --> 01:18:57,199

they ran her subroutine and it worked

1784

01:19:00,870 --> 01:18:59,199

so she is known as the world's first

1785

01:19:02,470 --> 01:19:00,880

computer programmer

1786

01:19:03,350 --> 01:19:02,480

and

1787

01:19:05,910 --> 01:19:03,360

the

1788

01:19:10,390 --> 01:19:05,920

dod language ada

1789

01:19:15,830 --> 01:19:12,950

and wikipedia uh says that she's the

1790

01:19:17,270 --> 01:19:15,840

only child of lord byron not lord byron

1791

01:19:18,709 --> 01:19:17,280

that's why i couldn't think of his name

1792

01:19:20,390 --> 01:19:18,719

my offhand

1793

01:19:22,070 --> 01:19:20,400

yes

1794

01:19:24,229 --> 01:19:22,080

and that

1795

01:19:26,630 --> 01:19:24,239

he didn't grow up under his tutelage

1796

01:19:28,709 --> 01:19:26,640

however his mother her mother

1797

01:19:31,990 --> 01:19:28,719

withdrew her from his

1798

01:19:34,950 --> 01:19:32,000

tutelage and raised her on her own

1799

01:19:37,750 --> 01:19:34,960

and she read math books on her own and

1800

01:19:39,270 --> 01:19:37,760

then corresponded with babbage about

1801

01:19:40,229 --> 01:19:39,280

designing the

1802

01:19:45,830 --> 01:19:40,239

uh

1803

01:19:48,630 --> 01:19:46,870

wonderful

1804

01:19:50,310 --> 01:19:48,640

yeah i was going to say i have a i had

1805

01:19:51,910 --> 01:19:50,320

three more questions written down but

1806

01:19:55,350 --> 01:19:51,920

you actually answered them throughout

1807

01:19:56,790 --> 01:19:55,360

your talk and most if not all of the the

1808

01:19:58,870 --> 01:19:56,800

names that were thrown out in the

1809

01:20:02,070 --> 01:19:58,880

beginning were part of your presentation

1810

01:20:04,310 --> 01:20:02,080

as well so you've done a good job of

1811

01:20:05,750 --> 01:20:04,320

quelling them before they came up oh

1812

01:20:07,830 --> 01:20:05,760

good

1813

01:20:10,629 --> 01:20:07,840

the very first very first thing i had

1814

01:20:15,270 --> 01:20:10,639

written down was uh hapatia and that was

1815

01:20:17,910 --> 01:20:16,229

thank you

1816

01:20:20,229 --> 01:20:17,920

yes we're

1817

01:20:22,629 --> 01:20:20,239

i used to do it the way the americans do

1818

01:20:25,270 --> 01:20:22,639

and i had a greek person in my audience

1819

01:20:27,430 --> 01:20:25,280

who yells at me

1820

01:20:30,390 --> 01:20:27,440

do not say it that way you say it

1821

01:20:31,990 --> 01:20:30,400

hipatia because she's greek

1822

01:20:34,070 --> 01:20:32,000

and that and that's kind of very it's

1823

01:20:35,590 --> 01:20:34,080

always useful to find it you know

1824

01:20:37,590 --> 01:20:35,600

because um

1825

01:20:39,110 --> 01:20:37,600

uh like tycho brahi all right i

1826

01:20:41,750 --> 01:20:39,120

pronounced it as tico bright other

1827

01:20:42,870 --> 01:20:41,760

people will call it tycho um and i'm not

1828

01:20:43,750 --> 01:20:42,880

like

1829

01:20:47,510 --> 01:20:43,760

i

1830

01:20:49,110 --> 01:20:47,520

speaker you know you always won't wonder

1831

01:20:51,030 --> 01:20:49,120

all right can i get the pronunciation

1832

01:20:51,910 --> 01:20:51,040

absolutely right i prefer to get it

1833

01:20:54,149 --> 01:20:51,920

right

1834

01:20:56,629 --> 01:20:54,159

and so we want to talk about sofia

1835

01:20:58,950 --> 01:20:56,639

instead of chico oh wow certainly sophia

1836

01:21:01,270 --> 01:20:58,960

yeah and you left out carolyn herschel

1837

01:21:04,629 --> 01:21:01,280

and you know i left out carolyn herschel

1838

01:21:05,669 --> 01:21:04,639

yes i didn't i left out mariah mitchell

1839

01:21:13,350 --> 01:21:05,679

i

1840

01:21:14,550 --> 01:21:13,360

good number of female astronomers

1841

01:21:16,550 --> 01:21:14,560

in our history

1842

01:21:18,550 --> 01:21:16,560

um and is there do you think there's any

1843

01:21:20,550 --> 01:21:18,560

particular reason for that i

1844

01:21:23,270 --> 01:21:20,560

can't well astronomy was one of the

1845

01:21:25,669 --> 01:21:23,280

seven liberal arts right so astronomers

1846

01:21:26,870 --> 01:21:25,679

were always part of the history of

1847

01:21:29,110 --> 01:21:26,880

science

1848

01:21:32,070 --> 01:21:29,120

mathis math astronomers went together

1849

01:21:33,750 --> 01:21:32,080

that uh if you hired a uh

1850

01:21:35,990 --> 01:21:33,760

the king would hire

1851
01:21:38,629 --> 01:21:36,000
a math astronomer

1852
01:21:40,830 --> 01:21:38,639
one person to do the calendar and the

1853
01:21:43,510 --> 01:21:40,840
math and everything

1854
01:21:45,990 --> 01:21:43,520
uh that went together

1855
01:21:47,669 --> 01:21:46,000
throughout history so you'd find women

1856
01:21:49,910 --> 01:21:47,679
there were lots of women hired by the

1857
01:21:53,430 --> 01:21:49,920
paris observatory

1858
01:21:55,669 --> 01:21:53,440
uh who did uh calculated almanacs

1859
01:21:57,189 --> 01:21:55,679
there's one in ancient spain

1860
01:21:59,270 --> 01:21:57,199
who

1861
01:22:02,390 --> 01:21:59,280
wrote almanacs

1862
01:22:04,310 --> 01:22:02,400
calculated almanacs for toledo

1863
01:22:07,030 --> 01:22:04,320

and uh

1864

01:22:09,590 --> 01:22:07,040

of course the nautical almanac office at

1865

01:22:12,149 --> 01:22:09,600

the u.s naval observatory was founded in

1866

01:22:15,430 --> 01:22:12,159

1848 and they hired a lot of women

1867

01:22:17,350 --> 01:22:15,440

mathematicians to calculate the books

1868

01:22:19,510 --> 01:22:17,360

because it takes a lot of calculation to

1869

01:22:20,790 --> 01:22:19,520

produce one book

1870

01:22:23,350 --> 01:22:20,800

yes

1871

01:22:25,910 --> 01:22:23,360

all right well um thomas has to go to

1872

01:22:28,550 --> 01:22:25,920

another event in a few minutes so

1873

01:22:30,310 --> 01:22:28,560

we're gonna have to wrap this up uh and

1874

01:22:31,990 --> 01:22:30,320

i just want to thank you so much for the

1875

01:22:34,149 --> 01:22:32,000

enlightenment you've brought to all of

1876

01:22:38,149 --> 01:22:34,159

us here and i want to remind our

1877

01:22:40,070 --> 01:22:38,159

audience that next month on december 7th

1878

01:22:42,790 --> 01:22:40,080

we will have the james webb space

1879

01:22:45,030 --> 01:22:42,800

telescope countdown to launch launch is

1880

01:22:47,750 --> 01:22:45,040

scheduled for december 18th everybody

1881

01:22:49,830 --> 01:22:47,760

cross your fingers cross your fingers

1882

01:22:51,590 --> 01:22:49,840

this is going to be fantastic

1883

01:22:52,950 --> 01:22:51,600

thank you all for coming and we'll see