<https://tr.wikipedia.org/wiki/Maslow_teorisi> “ Maslow proposed that motivation is **the result of a person's attempt at fulfilling five basic needs**: physiological, safety, social, esteem and self-actualization. According to Maslow, these needs can create internal pressures that can influence a person's behavior. “

<https://en.wikipedia.org/wiki/Printing_press> “It is thought that early presses existed in China as far back as the 8th century, but Johannes Gutenburg is credited with inventing the printing press which was used in Europe in around **1440**.”

before

35:09

printing revolution

35:14

only handwriting was possible and that

35:17

was actually

35:19

quite important

35:21

and

35:22

there were people who was named as

35:24

copiers

35:25

they were copying the original book for

35:27

example you write the book you hire 10

35:30

copier people

35:31

those 10 copier people copy your

35:34

writings so it makes 11.

35:37

then they copy again so it's like manual

35:40

printing

35:42

in the older days books about medicine

35:46

and other kinds of science

35:49

was distributed by handwriting

the bigger

36:33

part is the printing press

36:37

it's actually

36:46

with the printing press not only the

36:48

scientific knowledge

36:51

not only the scientific knowledge

36:52

expanded but also

36:54

social knowledge is expanded people

36:56

started to learn

37:00

reading and writing

37:02

by the time they arrive

37:07

17 1750

37:11

okay

37:12

literacy rate in germany was 70

37:17

so there were schools etc

in the previous times there were

37:22

localized

37:27

reading and writing

37:31

schools

37:32

for example it was very interesting

37:34

interesting that before

37:38

istanbul was taken in byzantium times

37:41

elementary

37:42

education was

37:45

obligatory

37:47

all children must go to school

37:52

until

37:57

until latin invasion

37:59

italians invaded istanbul in

38:02

1204

38:04

okay

38:06

in 1204 istanbul was demolished

38:09

everything was taken to italy

38:12

uh

38:14

probably you didn't know this did

38:16

you anybody know about

38:20

okay

38:23

so it is it is

38:25

placed by italians

38:27

latins

38:29

and they

38:33

prosperity of istanbul was

38:35

accepted from

38:37

100th it was from 100 to 10

38:41

to 1 4.

38:47

uh why am i saying that because

38:53

the good times of

38:55

byzantium empire was up to that part

38:58

later probably there were schools but

39:00

also

39:01

demolished them scholars were

39:04

moved to europe or

39:06

asia

0 first scientific journal

0 first turkish scientific journal mecmuai fünun

0 Writing makes things clear and permanent, they dont disappear.

unfortunately i have seen that in the

44:59

museum in france

45:01

we can only learn the shape of the

45:03

ottoman ships

45:04

from foreign paintings

45:08

because

45:09

they didn't have plans

45:15

they propagated the designs by

45:17

apprenticeship

45:20

and then

45:21

when the last booster died

45:24

all the designs disappeared there is no

45:26

written documentation so written

45:28

documentation is essential for

45:31

scientific advancement

45:33

and technology

45:40

so this is a brief

45:43

tool

0   
revolutions but

46:34

most people think about

46:36

renaissance

46:38

it has some

46:40

roots

46:42

going back to china going back to

46:44

islamic world going back to greece all

46:47

one another

46:49

but

46:52

the

46:55

the conditions in europe was

46:57

good enough

47:01

so that it

47:02

emerged not because they are europeans

47:05

or certain blood type

47:08

but because the conditions were good

0The scientific Revolution is a term commonly referring to the transformation of thought about nature through which the Aristotelian tradition was replaced by so-called “modern” science.

0George Washington dead due to bloodletting because people believed that there are such things as good blood and bad blood since the early Egyptians.

0Today’s science is tomorrow’s history of science. Science dynamics.

0Aristotelian natural philosophy

55:21

they also explain

55:23

upper atmosphere

55:29

there are worlds

55:30

on top of you

55:32

and

55:33

they

55:34

surround you

55:36

with similar elements so

55:38

it is geocentric worlds you are at the

55:41

center and everything is around

55:43

everything around you

55:47

are

55:48

made up of these four

55:50

basic elements

55:53

they don't know about

55:54

atomic

55:56

structure they don't know about other

55:58

elements

55:59

what they see is only four elements.

they were aware of the fact that

56:48

mars saturn

56:50

vanished etc mercury so they know that

56:52

they are

56:53

but they believe that

56:55

earth was at the center and they were

56:57

rotating around us

56:59

because they changed

57:06

he bought the telescope

57:07

with the front

57:11

adjust the telescope

57:14

and

57:15

the star stays about 10 seconds

57:18

it's very difficult because earth

57:20

rotates

57:21

but the beginning that they say since

57:24

they are moving

57:26

but they say they are moving so they

57:28

they think they

57:30

rotate around earth

the famous hypocrite

58:18

i forgot where he was in mila's

58:24

[Music]

58:30

was

58:30

[Music]

58:32

studying

58:34

human so we

58:37

call him as the

58:39

father of doctors because it was very

58:41

early

58:43

very very early

58:48

it

58:49

he studied the relationship between

58:51

health and lifestyle under the

58:59

under the control of the environment

59:03

so he said

59:06

hippocrates

59:10

the thing i said earlier

59:13

a few minutes ago

59:14

there is blood there is blood

59:18

there is yellow

59:20

blood

59:23

there is phlegm or something and there

59:25

is black blood

59:27

black blood is the sicknesses

59:31

yellow blood is something else i don't

59:33

know details so

59:37

he

59:40

he corresponded the aristotle elements

59:42

to the

59:44

human body

59:46

because it was so strong in those years

59:49

four things

59:51

so he transferred that theory to human

59:54

body and explained human body's workings

59:56

with these different things and whenever

59:58

one of them is greater than the other

60:00

human body balance is changed so they

60:03

try to reduce the other one

60:05

so the first medicine came out

0Nicholas Copernicus , he had some problems with the church since he studied to change things that had been known for a long time. They insist that it is written on the Bible.

-----------------------------------------------

so everything about rotating earth and

61:21

the

61:22

earth rotating around the sun was

61:24

against bible at that time

61:28

but copernicus was not

61:33

political so

0 Andreas Vesalius studied on the field of medicine.

0 Francis Bacon

for us bacon the great philosopher and

63:27

thinker and scientific knowledge a

63:28

scientific person

63:30

and

63:33

usually rich people

63:37

they have money so that they can think

63:39

just like old greece

0 William Gilbert

magnetism was studied explained not used

64:24

first used was by chinese of course

64:28

years before

64:29

but

64:30

explanation was done

64:33

around 1600

64:36

by william gilbert

64:38

and earth

64:41

is a magnet then magnet aligns itself

64:46

but the question of why

64:49

magnet

64:50

pulls

64:51

each other

64:54

is a different question

64:56

it is very difficult question

64:58

again

0 Galileo Galilei

actually he didn't invent the telescope

66:55

he improved it

66:57

he heard that

67:01

there was a device to make things

67:06

closer in netherlands

67:08

he was in italy and he went to

67:10

netherlands to

67:12

learn how to make that with the mirrors

67:14

etc the lens

67:17

he came back and made his own made his

67:19

own

67:22

thought about

67:24

a lot he had experiments with

67:26

the gravity too

67:29

and

67:32

he became

67:34

in conflict with the church a lot

67:37

because he was he was in italy as well

he was banned from doing

67:56

research he was banned from writing more

68:00

he was jailed and released then house

68:02

arrested

68:06

but again

68:12

his

68:13

students later

68:16

inevitably

68:19

propagated the knowledge

68:21

and also his

68:23

foundations

68:25

about

68:27

earth rotating etc around the sun

because of Galileo, series of revolutions started

68:37

in the church in vatican they changed

68:41

how they explained

68:43

the bible about the nature so

68:46

it also started certain reforms

68:50

in religious structure

68:53

along with

68:55

uh along with luther in social force

0Rene Descartes

--Descartes is often called the ‘father’ of modern philosophy

--Descartes argued that knowledge is genuinely possible, and that a mathematically-based scientific knowledge of the material world is possible.

--Mathematics and Natural philosophy, analytic geometry

--he rejected religious authority in the quest for scientific and philosophical knowledge ( but he was a devout catholic)

--he argued for a rational justification for a universal,mathematical/quantitative understanding of nature.

-- we still rely largely on the Cartesian view of the universe – a mechanistic view of nature.

-- he said “I think therefore I am”

-- Although Descartes and other philosophers established spaces for coexistence between science and religion, it would still be quite some time before Europe would be able to embrace evolution.

-- 100 more years

73:26

it's big

73:29

people only

73:30

can free themselves from

73:35

the relationship the tight relationship

73:37

between science and religion it is even

73:40

worse in

73:41

christianity than

73:43

islamic religion

at those times some of the

03:33

uh scientists were also

03:36

priests

03:37

religious people because they were the

03:39

one who are

03:41

able to read and write they were the

03:44

ones

03:45

who are able to

03:47

freely think without working without

03:50

obligatory work

03:52

in europe because

03:55

in

03:56

europe there was a

03:58

class of people who has to work for the

04:01

lords

04:02

what was the name of it

04:07

you guys listen upstairs

04:20

they were similar

04:21

set up in anatolia in ottomans too

04:24

villagers

04:25

has to work

04:28

for the lord

04:34

in anatolia

04:36

if they don't work they are punished

04:39

so it is not kind of slavery but

04:42

similar to slavery semi-slavery

04:45

position

04:46

so therefore

04:48

only

04:49

very rich upper class

04:52

land owners

04:53

given by the king

04:55

or

04:57

religious people were free kind of free

05:02

so

05:03

scientists were either rich

05:05

or rich people's

05:08

friends or supported

05:11

guys or people in the church

05:16

so there are a lot of uh

05:19

in ottoman and islamic world as well

05:22

religious people some of them

05:25

some of them

05:26

are interested in science

05:29

because they were free from work

-­----------------------------------------------------------

after french revolution people started

06:56

to think separately from the religious

07:00

ideas in in terms of science

0Up until Darwin, the predominant understanding of the world came from the Bible and Church doctrine. In this respect, truth had been revealed (via the Bible and Christ)…. There was no need to question God’s creation….

0This set of beliefs meant that people were highly resistant to evidence to the contrary and even went so far to create elaborate explanations to “fit” contradictions into religious belief.

people had prejudices pre-accepted

09:02

values

09:03

it was very difficult to change those

09:06

there was always

09:08

conflict

09:10

the conflict was more significant

09:13

in christianity

09:16

because

09:19

the church was

09:20

too strong

09:23

in in other religions including islam

09:27

there is no

09:28

solid organization called church

09:32

more like different people followers etc

09:36

but in

09:37

christianity there is a pope pope says

09:40

something it is accepted as a rule etc

09:42

so they want to govern the

09:46

entire europe they want to govern entire

09:48

world

09:50

so

09:51

in order to keep their power intact they

09:54

have to

09:55

they had to

10:00

make people believe in certain things

10:03

as they wish

10:05

so the conflict was very

10:08

significant

10:10

among

10:11

church and scientists

10:15

in those places

10:25

one

10:26

there were different things that

10:29

created conflict one of them was earth

10:32

is created in six days

10:35

so that prevented people searching for

10:38

age of the age of the earth and how evil

10:42

evolution is incrementally happened

uh earth was around

10:52

everything was around earth idea

10:56

uh was important and it was

10:59

it was said to be in the bible by the

11:01

church

11:03

so when galileo

11:06

coined

11:06

copenhagen as well

11:08

said the term earth is rotating around

11:11

thee

11:14

son

11:15

church

11:17

made a resistance

11:20

they said no

Bishop Ussher:

\*\* By working backwards from the Bible, he calculated the first day of creation to have been Sunday, October 23, 4004 BC!

\*\* Although many have ridiculed this attempt to date the age of the earth Ussher diligently correlated Middle Eastern and Mediterranean history and scripture to arrive at what was a “reasonable” calculation.

according to christians

13:46

earth is

13:48

earth is created in the result of two

13:50

factors one is the original creation and

13:52

then the

13:55

prophet

13:57

the great flood

\*\* According to christian thought, the appearance of earth is the result of two factors: 1)Original creation by God 2)The damage done by the great flood Otherwise, the earth had not changed over time, it was in state of statis.

Likewise, after God created plants & animals, these retained their true,original form, generation after generation .--- No species had been lost ---No species had changed Nevertheless, people did understand the process of selective(or artifical) breeding.

john ray said

16:09

uh

16:10

it was little later than deckard

16:16

god could be understood by only studying

16:18

his creation earth so

16:21

he promoted science

16:23

as a way of

16:26

as a way of

16:28

going into more deeper level

16:31

in the religion so in order to

16:33

understand god you have to understand

16:34

science etc

16:36

but same thing

16:38

is was

16:41

said in islamic world as well in order

16:43

to understand god more then you have to

16:45

understand nature more

most of the scientists in the in those

17:04

years tried to make taxonomies so they

17:07

tried to

17:08

taxonomy means classification and

17:10

organization

17:11

they tried to make organic organized

17:14

uh classification of objects organized

17:17

classification of sutons original

17:18

organized classification of

17:21

stones goes to elements

17:23

organized classification of species

17:25

living species organized classification

17:28

of

17:29

trees etc so that was this particular

17:32

way of doing science classification

17:35

actually it is

17:40

he'd spend a lot of time uh thinking

17:43

about the relationship of organismal

17:45

form to function

17:47

shape and function

17:50

four-legged animal

17:51

pokes two-legged animal walks

17:54

with different

17:59

birds fly etc

18:01

so living things as he

18:04

as he described living things showed

18:06

adaptations to environments which rey

18:08

were the signs of god's design and then

18:11

he said it has to be studied

18:14

so he kind of he kind of invented in

18:17

those years well before

18:22

darwin

18:24

he kind of

18:27

invented evolutionary

18:29

ideas

18:32

in order to study creation

18:37

he studied

18:39

because they were they were rich or they

18:43

don't want additional earnings

18:46

due to religious reasons

18:48

they just wanted to study things

18:50

for pleasure

18:55

they

18:56

do classification in physiology function

18:59

and behavior of animals and

19:02

plants

19:08

sixteen fifties are

19:12

good years

19:14

for science

\*\* John Ray: ---- Natural theology: the doctrine that the wisdom and power of God could be understood by studying his creation. ----- He was among the first to attempt a biological definition fort he concept of species.

---- Ray spent a great deal of time pondering the relationships of organismal form to function.

---- Living things showed adaptations to their environments, which for Ray were signs of God’s design and hence worthy of study.

----- Unlike Linnaeus, who focused almost exclusively on classification for its own sake, Ray began to use classification to address questions in physiology, function and behaviour.

Toricelli’s experiment (1644)

so tori charlie did that and

22:52

concluded that the weight of the air

22:55

pushes atmospheric pressure pushes this

22:58

back to

23:00

tube otherwise

23:02

doesn't rise

23:05

that was very interesting because that

23:08

gives you the ability to

23:10

do weather forecast

23:12

if the if the atmospheric pressure is

23:15

moving down

23:18

that means some

23:20

clouds are coming

23:23

it's going to rain

23:24

if it is increasing then it's not going

23:26

to rain

pascal

23:49

with the

23:50

water famous water no it is with double

23:53

air

23:54

area

23:59

they went up to mountain

24:01

and understood that

24:04

atmospheric pressure is lower

so that's what they found

24:12

in 1648

24:18

boil

24:21

in those years

24:22

chemistry

24:25

is one of the

24:26

things

24:27

that people liked like to play with

24:30

one

24:31

one type of people goes to chemistry and

24:34

some of them they try to

24:37

create medicines the mothers try to

24:39

create

24:40

gold

24:42

call them alchemists

24:44

and some other

24:46

people try to invent machines with

24:49

rotating things and

24:51

hammers etc

24:53

this is one chemical

24:55

guy

24:57

he invented air pump he invented boil

25:01

expansion and contraction

25:03

and

25:06

he was

25:07

into royal society of london in the in

25:11

england

25:14

kingdom

25:16

established a science

25:20

division let's say division and

25:23

they call them royal society

25:25

royal

25:26

society was

25:29

an organization that

25:33

that makes interaction between

25:35

scientists possible

25:37

they have newsletters

25:39

then later they

25:40

create a journal printed journal like

25:43

today's journals

25:45

in 16

25:46

1665 the first journal of the scientific

25:50

journal of the world that was royal

25:52

society the royal society of london was

25:55

very important in europe

25:58

as

25:58

an authority

26:02

they

26:06

introduced

26:07

the system of public ratification

26:11

meaning publication

26:13

publication of scientific work

26:16

by journals is invented by

26:19

royal society of london and Robert Boyle was one of the founders of those years.

Robert Boyle: Experimental Method, Natural Philosophy/ Air pump / Skeptical Chymist(1661)/Boyle’s Law/ Royal Society of London / Public verification of science/

when you are an educated person when you

26:54

are a scientist you know everything you

26:56

know medicine you know because there are

26:58

not much knowledge in the world

and you're also philosophers

27:09

people like to talk to you

27:16

that's why we see most of the scientists

27:18

in those years are also philosophers

27:20

they have

27:22

books of thought as well

Isaac Newton: Theory of Light / Theory of Motion / Theory of Gravity / Philosophiae Naturalis Principia Mathematica(1667)/Dynamics/Alchemy/Theology/Master of the Mint/Newtonian World System /

Methods of inquiry: 1)Method of authority 2)Method of logic (deductive reasoning from known facts) 3)Scientific Method (inductive reasoning)

how do we acquire knowledge

29:35

where do we get the nouns from

29:39

some of the things we are told

29:43

this is the thing that we are told

29:46

they say

29:49

world is created in six days

29:52

and we accept it

29:56

that is method of authority

29:59

in

30:00

in the previous hour one of you guys

30:03

said

30:03

why are we subtract why are we adding

30:06

one why are we switching digits and

30:08

adding one to find the negative number

30:11

of a positive number in binary in two's

30:13

complement form i said because the

30:15

professor said so

30:18

that is method of authority

30:20

you don't ask questions

30:22

it is not science

30:24

second

30:27

logic

30:30

if i kill you you cannot talk

30:34

so

30:35

logically if i want to talk i don't kill

30:37

you

30:39

pretty easy

30:41

so certain amount of knowledge

30:44

certain amount of knowledge

30:47

can

30:48

be found by

30:51

deduction by logic

30:55

third is the scientific

30:58

method

30:59

we call it inductive reasoning

31:02

we ask questions

31:04

we do experiments we solve problems we

31:07

develop things we validate things once

31:10

we validate things we can put additional

31:12

things on the previous things

31:14

and that is what science is validation

31:18

asking questions validation asking

31:20

questions and so on

31:29

therefore most research is empirical

31:34

there is a need to verify

31:37

the results of the research the famous

31:42

churning accelerator

31:48

what they do is

31:50

there are theories

31:52

they want to

31:53

prove the theories

31:55

by experiments

31:57

to understand nature

in

33:16

today's world

33:19

research when we are doing research

33:22

there are empirical studies

33:25

there is an empirical study going on

on the other hand

33:32

today

33:33

many decisions

33:35

by the government by the people

33:42

to select what you eat how many how many

33:44

of you

33:46

smoke

33:50

just three four

33:53

five six

33:55

okay

33:56

so it is not based on

33:59

scientific evidence

34:00

you just like it

34:03

and

34:04

you say my my uncle was

34:08

85 years old

34:10

he was smoking three packs of cigarette

34:13

and he lived until 85 years

34:15

so that i can smoke

34:18

it is an electoral evidence

34:21

it is not science

there is an example you have seen it

34:26

sometimes you didn't see it

34:28

you didn't see

34:30

it you just heard it

34:32

so many many decisions today are based

34:35

on anecdotal evidence

34:40

such as

34:42

things in programming languages etc

34:48

in general

34:49

scientific method

34:51

is of four steps it's made up of four

34:53

steps first

34:56

you see something

34:58

you see that

35:00

your dad was smoking and he died early

35:05

10 others

35:07

so what is going on

35:09

if you smoke you die earlier what's

35:11

going on

35:12

that is what noticing is

35:14

oops

35:18

noticing a funny man

The scientific method consists of four steps 1)noticing a phenomenon 2)formulating testable explanations(hypotheses) 3)observing and/or experimenting 4)refining and retesting explanations.

!!! = The scientific method can be tedious and time consuming /\ But it is the most widely accepted methodology for acquiring knowledge about the World.

if the explanation is

38:56

aligned with the

38:58

experimental results then your

39:00

explanation is true until

39:04

a further theory is

39:08

until further theory is

39:10

coined is

39:13

found and

39:15

explained by experiments

39:19

that doesn't make your

39:21

data incorrect

39:24

usually further theory explains

39:29

unknown details of existing experiments

39:32

for example

39:35

people died earlier

39:37

but how much

39:39

if there's a further theory and further

39:41

experiment is done on top of that

39:44

that can maybe that may predict

39:47

how long your life is going to shorten

39:50

if you drink vodka or

39:52

raku for example which one

39:54

shortens how much or if you smoke in

39:57

addition to

39:59

three

40:00

and this is what will be your life

40:02

expectancy so

so new theories and

40:42

new experiments

40:44

usually does not contradict with the old

40:47

ones they just explain further

40:50

unless the previous one is

40:54

previous one a previous experiment is

40:56

incorrectly done if it is incorrectly

40:59

done

41:00

then

41:01

sometimes on purpose

41:04

then you can obviously

41:07

correct it

Noticing a phenomenon

\*\*\* After noticing a phenomenon, you identify variaBles or theMes that appear important in explaining what happens

Formulating Tentative Explanations

\*\*\* Initial observations allow you to develop a hyPothesis,or tentative statement, about the relationships among the variables identified

Observing and Experimenting

\*\*\* You deSign and carry out systematic observations of the behaviour of interest

\*\*\* These obserVations are directed at testing your hypothesis.

Refining and Retesting Explanations

\*\*\* Supported hypotheses are often reFined and subjected to further exploration

\*\*\* Disconfirmed hypotheses may be reworked reTested

some people are

56:21

against capital punishment some people

56:24

are pro-capital punishment it is even

56:26

undecided in the united states some

56:30

states are

56:32

allowing capital punishment some other

56:34

states does not allow

56:38

so the question is how do we decide if

56:41

we go

56:43

dogmatic way

56:44

based on

56:45

religion and all the beliefs etc

56:48

accepted values

56:50

then you can say it has to do

56:53

it has to be done this way this is

56:55

correct

56:56

but if you are going to do

56:57

scientifically

56:59

you have to make a study and that study

57:02

should have a longer

57:05

japan

57:07

saying that

57:08

in the capital punishment states

57:11

seeing decrees

57:13

in murders

57:15

you make a statistics

57:17

if you see decrees in murders

57:20

if you

57:21

cut the

57:23

hands of the tips for example if it is

57:25

decreasing

57:26

you can say

57:28

yes it is effective

57:30

or

57:32

it is not effective

57:35

so you can

57:37

explain it

57:42

with signs

57:44

obviously there are other reasons

57:46

whether whether killing a person is

57:48

correct or not made they're cutting

57:50

cutting the head is cutting the hand is

57:53

correct or not there are other issues

57:55

related with that but in terms of

57:57

effectiveness

57:58

you have to make a scientific study

58:01

yeah

58:02

yeah

58:03

there is a human rights issue etc

58:10

one of the famous example uh i was

58:13

giving was whether heroin is better

58:16

cocaine is better which one is better in

58:18

order to test that

58:20

you have to

58:21

make an experiment and if you give two

58:24

of them to the same person the same

58:26

person will die

58:27

because you cannot give

58:29

two at the same time so how are you

58:31

going to study

58:33

so you will find half of the class given

58:36

to okay another half of the class given

58:38

to heroin and you will compare

58:40

so that is what experiment

58:42

is in between subjects

58:45

escort between subjects experiments

recently they discovered

58:54

did not discover they invented

59:00

pills for covet 19

59:02

it reduces the effect of the it is

59:05

antiviral drug

59:07

they give placebo to half of the

59:09

patients

59:10

an actual drug to the

59:12

other patients plus a principal

59:14

patient's diet

59:18

in the study

59:20

they let people die

59:22

but otherwise

59:25

they cannot understand the difference

59:37

that's

59:38

what i was going to say observation

59:41

we design and carry out systematic

59:43

observations just the examples i have

59:45

given to you

59:48

those observations are

59:51

actually observations for testing the

59:53

hypothesis or disproving the hypothesis

59:58

either hypotheses are refined and

60:01

explained subjected to further

60:03

explanation or disconfirmed disproved

60:07

so that

60:08

other theories

60:10

must be found to explain situation

The importance of skepticism

\*\*\* Ask whether the observed data can be explained another way?

\*\*\* Seek data that disconfirms a theory

\*\*\* View all theories as tentative (accepted until disproved)

How do I know whether this is true?? How could it be proved false??

Overview of the research methods

\*\*\*Quantitative

\*\*\*correlational studies

\*\*\*surveys

\*\*\*experiments

\*\*\*quasi-experiments

\*\*\*Qualitative

\*\*\*ethnography

\*\*\*case studies

\*\*\*grounded theory

\*\*\*Mixed

What is a research method?

\*\*\*A strategy of inquiry, which moves from underlying philosophical assumptions to a research design

Philosophical 🡪 Research strategy/method 🡪 Research design

assumptions

\*\*\*Philosophical schools regarding research (“epistemology”): |

\*\*\*positivist – research should seek objective truth | Not that

\*\*\*interpretive – research should take human experience into account,truth can be subjective | important

\*\*\*critical – research should be aimed at making the World better |

there is a misconception

66:19

misunderstanding that anything

66:22

quantitative is research anything

66:24

qualitative is not research this is

66:27

wrong

66:28

research can be qualitative as well you

66:30

can describe you can classify etc it

66:33

doesn't have to be

66:35

measured precisely you can study

66:37

something scientifically

66:39

you know in discussing about in

66:42

measuring the qualities

66:45

okay doesn't have to be metric

66:48

or doesn't have to be

66:49

a statistical

66:53

or you can have

66:55

both of them

66:56

together

66:57

usually it's better

66:59

if you may if you ask people about their

67:02

preference of

67:04

political parties right

67:06

you can make

67:07

quantitative research

67:10

this person gives this party this person

67:13

gives this party this person gives this

67:15

party and further

67:17

you can have

67:18

qualitative research why do you

67:21

why do they give to this party why do

67:23

they give this party their common

67:26

characteristics etc

67:28

so

67:29

you can study in more deep detail

67:32

and together

67:33

it makes more sense

Douglas Engelbart [the inventor of the Mouse and PC]

The key thing about all the world’s big problems is that they have to be dealt with collectively.

If we don’t get collectively smarter, we’re doomed.

the big problems

68:27

engelbart says they have to be dealt

68:30

with collectively as a team

the first

68:34

person

68:36

who started

68:39

collective research

68:41

is actually

68:43

aside from universities in terms of

68:45

research laboratories and so on

68:51

edison made a research laboratory in

68:53

united states new jersey at that time in

68:56

the early

68:59

years of the century 20th century

69:03

they did collective research

69:05

with multiple people working on the same

69:07

topic etc

69:14

and he says douglas engelbart says

69:17

if we don't get collectively smarter we

69:20

are doomed our future is dark

The technological way of problem solving

1)describe the problem

2)describe the results you want

3)gather information

4)think of solutions

5)choose the best solution

6)implement the solution

7)evaluate results and make necessary changes

8)reenter this list at any step to revişe as necessary

this is

71:39

also

71:41

followed in

71:43

technological

71:48

development

71:51

of items technological development of

71:53

software and hardware

71:55

all the machines or buildings

71:59

you iterate and it is usually said

72:03

in order to get something done

72:05

correctly uh

72:08

in order to get something done correctly

72:11

it has to be

72:14

done five times that's on the average so

72:18

if you have a chance to manufacture

72:22

first prototype second prototype track

72:24

prototype fourth prototype in the fifth

72:26

prototype it becomes a good product

72:30

in the iteration

72:36

and

72:38

that's important in the science

72:44

leadership is important

72:47

in order to

72:49

in order to

72:52

in order for a nation in order for a

72:54

company in order for a school university

72:57

to increase

73:00

success

73:01

and increase the success in science

73:04

depends on lead leadership

73:07

that was the same in europe

73:09

that was the same in

73:11

islamic time

73:13

in asia

73:15

that was the same in spanish arabic

73:17

spanish

73:19

times in cordoba

73:23

today's europe in the united states

73:26

in russia so the leadership

73:29

and government is very important for

73:33

science to improve

first university

73:57

of the

73:58

world is considered to be

74:01

university of constantinople

74:05

founded in

74:07

as an institution of higher learning

74:09

after secondary schools

74:11

in years what

74:20

is this disconnected

74:27

in year

74:29

14 25.

74:34

when was

74:36

i a sofia built

“The university of Constantinople, founded as an instiitution of higher learning in 425 and reorganized as a Corporation of students in 849 by the regent Bardas of Emperor Michael III, is considered by some to be the characteristics we associate today with a university (research and teaching, auto-administration, academic independence)

the location of that university is

75:30

today

75:31

behind sultan mosque

75:36

when you go to sultana i meant it is

75:38

behind sultan mosque

75:40

and there was an old palace some of most

75:42

of them are

75:44

ruined but some of them are intact and

75:46

that part contains

75:48

a carpet store now

70 or 80 scholars at that time teachers

76:07

for universities studying and

76:09

the problem the

76:12

not the problem

76:13

the property of

76:16

university was

76:18

at that time

76:20

research an institution doing research

76:23

teaching

76:25

self-administration

76:27

and academic independence

76:29

so that is the four

76:31

important thing

76:33

that makes the university

76:35

a university

76:37

in order to

76:39

be

76:40

counted as a university

76:44

in terms of definition

76:45

you have to have research doing

76:49

teaching

76:50

so creating new scholars

76:54

self-administration so you have to have

76:58

you have to be able to select your

76:59

president

77:01

and academic independence

77:05

you have to be able to

77:07

study whatever you like

77:10

separated from the government

77:13

that is what

77:15

is accepted as a

77:18

university

77:21

by the authorities

What is University?

1)Knowledge Creation, research

2)Self improvement, social development

3)Empowering students with knowledge

4)Interaction with public

\*Giving profession to students? No..

diversity creates

78:15

knowledge

78:16

do research

78:18

second

78:19

it allows you to improve yourself

78:22

third

78:24

empowers students with knowledge support

78:28

interacts with the public so

78:30

there will be seminars courses

78:33

public also can you use the library

78:37

and so on

78:39

giving profession to students

78:41

let's take

78:42

no

78:44

it depends on students

78:46

so

78:47

we are not going to find you jobs here

78:49

so there is a misconception about in the

78:51

public saying that

78:54

finding job after

78:56

jordan

78:57

department

78:59

is correlated finding job and the

79:02

university education is correlated no it

79:04

is not

it is not a job course it is a

79:08

university the name

79:12

the position is different today

79:15

it is kind of shifting to

79:17

vocational schools

79:19

trying to find trying to find jobs for

79:22

people but actually in the universal

79:24

sense university means a place to do

79:27

four things

79:28

not to find a job not to put your

79:30

something

79:31

after you graduate

Ancient Middle East

\*\*\*Ancient Mesomotamians had no distinction between “rational science” and alchemy.

\*\*\* When a person became ill dostors prescribed magical formulas to be recited as well as medicinal treatments

\*\*\* The earliest medical prescriptions appear in Sumerian during the Third Dynasty of Ur.

mesopotamia is

02:44

due to

02:51

due to the property of the land and

02:53

irrigation

02:55

uh

02:56

considered as a

02:58

beginning of the civilization in most

03:01

in most books

Babylonian medicine – Each Semitic cultures

\*\*\* Main medicinal theory was a kind of exorcist-healer known as an asipu

\*\*\* The profession was generally passed down from father to son and was held in extremely high regard

\*\*\* Of less frequent recourse was another kind of healer known as an asu, who corresponds more closely to a modern physician and treated physical symptoms using primarily folk remedies composed of various herbs animal products and minerals as well as potions, enemas , and ointments of poultices.

the scientific scientist like person was

03:13

the healer guy

03:14

uh asipo

03:18

that was taken from the book

03:22

that

03:24

healer

03:25

person that kind of job was passed down

03:28

from father to son so if your father is

03:31

scientist you will be scientist if your

03:34

father is medical person doctor

03:37

not doctor but medical person healer

03:39

you will be a healer it is because the

03:42

abilities are

03:44

transferred from generation to

03:46

generation by learning at home so

03:49

most

03:51

unless there is an exception

03:53

most

03:55

jobs were transferred from father to son

03:58

including science including scientists

less frequent recourse was another kind

04:07

of healer asu

04:09

that corresponds more closely to a

04:10

modern physician

04:12

that created physical symptoms using

04:14

primarily folk remedies comprised of

04:16

comprised of

04:17

various herbs animal products minerals

04:21

uh oils etc so they want

04:24

people to drink something

since

04:41

they are very into tablet

04:43

writing

04:45

a lot of

04:47

a lot of things

04:52

a lot of things were done related to

04:55

clays

04:56

kill tablets

04:58

sand metal

05:00

metals

05:02

bitumen the

05:04

early form of

05:06

petroleum

05:08

stones and other natural materials so

05:10

material handling material processing

05:14

was

05:18

available

05:20

therefore

05:22

use of those knowledge in pottery

05:25

class

05:34

offend them

\*\*\*Extensive knowledge about the chemical properties of clasy,sand,metal ore,bitumen,stone and other natural materials, and applied this knowledge to practical use in manufacturing pottery,faience,glass,soap,metals,lime plaster and waterproofing.

\*\*\* Metallurgy required scientific knowledge about the properties of metals.

\*\*\* Nonetheless, the Mesopotamians seem to have had little interest in gathering information about the natural World for the mere sake of gathering information and WERE FAR MORE INTERESTED in studying the manner in which the gods had ordered the universe.

they didn't have

07:07

much interest about

07:09

natural world

07:11

they didn't have much interest about

07:12

understanding natural world

07:18

they were

07:21

interested in

07:22

how

07:24

gods has

07:27

created

07:34

the universe they had uh

07:38

they had certain stories about how world

07:41

is how world is formed etc so those

07:43

stories were

07:46

important

07:47

part of their life

07:49

later it became their religion

so sumerian's

08:29

babylonian tablet contained that kind of

08:32

information they pre-calculated the

08:35

numbers

08:36

and stored on the tablet so when they

08:38

need it they just look at it

08:40

there were a tablet like that it was dated about 1800 BC

also they were interested in astronomy

08:57

uh they recorded the motions of the

08:59

stars planets and the moon etc

Astronomy

\*\*\* In Babylonian astronomy, records of the motions of the starts, planets, and the moon are left on thousands of clay tablets created by scribes.

\*\*\* Even today, astronomical periods identified by Mesopotamian proto-scientists are still widely used in Western calendars such as the solar year and the lunar month.

later

10:48

in

10:50

greece

10:51

india and islamic world

10:55

all

10:56

babylonian science

10:58

is inherited

11:00

so it depends it depended on

11:03

babylonian science

11:05

first

11:07

arabs also took a lot of things from

11:10

them

11:12

greeks

11:13

took a lot of things from them also

11:15

indians took other things from

11:18

babylonians and sumerians

Effects

\*\*\* Babylonian astronomy was “the first and highly successful attempt at giving a refined mathematical description of astronomical phenomena.”

\*\*\* According to the historian A.Aaboe, “ALL SUBSEQUENT VARIETIES OF SCIENTIFIC ASTRONOMY, in the Hellenistic World, In India, in Islam, and in the West --- if not indeed all subsequent endeavour in the exact sciences--- depend upon Babylonian astronomy in decisive and fundamental ways.

egypt was interesting

11:29

[Music]

11:33

again just like mesopotamia a very

11:38

good for irrigation and very

11:42

nice place to live

11:43

therefore they developed skills for

11:47

farming

11:49

and farming resulted in

11:52

being ability to stay in

11:55

villages for feeding them

11:57

therefore society

11:59

formed and

12:01

population growth is more sustainable

12:04

because they were not hunting they were

12:06

farming when you do farming you can

12:09

store

12:10

food for next year etc

12:13

so

12:14

society is more

12:16

stable

what they did initially was

12:22

right triangles

12:23

they make pyramids etc so

12:28

a lot of things were dependent on the

12:30

nile the tides of the nile yearly tides

12:34

one

12:46

was very significant in their life

12:52

one of the reasons

12:54

they even invented certain mathematical

12:57

issues where

12:59

farms were lost

13:00

during flood

13:02

when the flood goes away they want to

13:04

redistribute

13:07

farms to farmers

13:09

so each

13:11

farmer has a record of the land what

13:13

they have

13:14

so a measurement guy comes and from here

13:17

to here this is yours from here to here

13:19

this is yours etc every year after the

13:22

flood

13:23

therefore they developed geometrical

13:27

skills

Egypt

\*\*\* Their development of geometry was a necessary outgrowth of surveying to preserve the layout and ownership of farmland, which was flooded annually by the Nil eriver.

\*\*\* The 3-4-5 right triangle and other rules of geometry were used to build rectilinear structures, and the post and lintel architecture of Egypt.

Egypt

\*\*\* Egypt was also a center of alchemy research for much of the Mediterranean.

\*\*\* The Edmin Smith papyrus is one of the first medical documents still extant, and perhaps the earliest document that attempts to describe and analyse the brain.

\*\*\* it might be seen as the very beginnings of modern neuroscience.

one advantage over others egyptians

14:48

found papers

14:52

at the same time with

14:55

people in paraguay in pergamon in in

14:59

turkey

15:01

one was made from populist other one was

15:03

made from parchment

15:06

instead of writing clay tablets they

15:08

started writing on

15:10

paper-like

15:11

substances which can be stored

15:14

for

15:16

thousands of years

saying here many historians believe that

16:04

ancient egyptian pharmacology medicine

16:07

was largely ineffective

16:11

so

16:16

however

16:17

they

16:18

examine they diagnose they treat and

16:20

they follow what happened after that

16:23

which is prognosis in today's science

16:26

they did all of that

16:27

so

16:29

we can compare it with today's empirical

16:32

science

16:34

they look at the disease they think

16:36

about solutions they implement the

16:38

solutions and they write

16:40

they write down the results they follow

16:42

the results that's

16:45

scientific method

Egypt played a significant role in developing of the methodology called “empirical method of science”

so in most cases in most documents

17:33

greece is

17:34

considered as a

17:36

origin of

17:38

science

17:39

like Pisagor or etc

The history of science in classical antiquity encompasses both those inquiries into the workings of the universe aimed at such practical goals as establishing a reliable calendar or determining how to cure a variety of illnesses and those abstract investigations known as natural philosophy.

starting from

18:32

egypt and

18:36

mesopotamia

18:39

then improved

18:41

many mathematicians

18:42

came out

18:45

they talked they taught about

18:48

the purpose of the universe

18:50

they did a lot of philosophy

18:52

purpose of the universe understanding

18:54

the nature etc

18:56

some nations

18:59

did

19:00

go more into

19:02

engineering

19:03

egyptians for example more

19:07

they have

19:11

they have created solutions for existing

19:13

problems

19:16

but greeks mostly think

19:20

they try to understand

19:23

causes and they tried to understand the

19:25

nature that was the fashion probably

19:28

in the greek

19:29

uh

19:30

land

19:31

in the in the turkish part or in the

19:33

greek part today

19:36

therefore the

19:41

term natural philosophy

19:43

came out

19:44

natural philosophy

19:49

that

19:53

contains

19:54

inquiries of the working of the universe

19:57

that includes human body

19:59

but for

20:01

quite amount of time human body was

20:06

sacred

20:08

so it cannot be studied

20:13

except some

20:16

outgoing

20:17

scientists

plato's academy so they

20:29

they discuss issues

20:31

this discussed natural philosophy

20:35

in pompey pompein in italy you know and

20:38

volcano destroyed city in when

20:42

Seventy (In Pompei, Italy)

so that mosaic is from that time

21:00

in the old days in the greek time

21:04

scientists are philosophers

21:07

so philosophy and science were

21:12

mixed

21:13

also

21:14

they were doctors they were religious

21:16

people they were they were everything

21:19

because

21:20

there were not many books

21:22

and schools in the world so once you go

21:25

to the school once you go to an academy

21:27

of plato for example

21:29

you learn almost everything that are

21:32

accumulated so far

21:34

you are engineer you are doctor you are

21:36

philosopher you are thinker

21:42

everybody some of them are

21:47

followers of religious tradition

21:51

therefore a lot of scientists are

21:54

also

21:56

religious priests

21:58

in those years

Era of classical antiquity

\*\*\* The encyclopedic works of Aristotle, Archimedes, Hippocrates, Galen, Ptolemy, Euclid,[They are all greek anotolian people] and others spread throughout the World. These works and the important commentaries on them were the wellspring(kaynak) of science.

\*\*\* One of the oldest surviving fragments of Euclid’s Elements.

that is the

22:43

that's a mathematical book [ Euclid’s Elements ]

22:45

which was taught

22:48

for the longest time in history

22:53

if i'm correct

22:55

it was taught in schools for

22:58

one thousand six hundred years

23:00

same book

23:05

so early elements this book was

23:11

obligatory in classical mathematics

23:14

classes in certain universities in

23:16

europe until i think 1950s or 1960s

23:22

in mathematics departments so it's like

23:26

studying classical mathematics etc not

23:29

to teach regular mathematics but

23:31

as a different course

that book was

23:55

the the main mathematics book

23:59

you can

24:01

purchase the book

24:24

updates elements

**Öklid'in *Elementler'i*** (bazen: *Elementler*, [Yunanca](https://tr.wikipedia.org/wiki/Yunanca): *Stoicheia)* [geometri](https://tr.wikipedia.org/wiki/Geometri) hakkında pek çok kitabın bir kümesidir ve [Öklid](https://tr.wikipedia.org/wiki/%C3%96klid) (M.Ö. 325-M.Ö. 265) olarak bilinen [antik Yunan](https://tr.wikipedia.org/wiki/Grek%C3%A7e) [matematikçi](https://tr.wikipedia.org/wiki/Matematik%C3%A7i) tarafından [İskenderiye](https://tr.wikipedia.org/wiki/%C4%B0skenderiye)'de ([Antik Mısır](https://tr.wikipedia.org/wiki/Antik_M%C4%B1s%C4%B1r)) yaklaşık M.Ö. 300 'de yazılmıştır. Küme 13 ciltten, veya bölümden, oluşur ve genelde tek bir büyük kitap yerine 13 küçük kitap (I-XIII numaralı) olarak basılır. Antik zamanların en ünlü matematiksel metni olan Elementler, [Latince](https://tr.wikipedia.org/wiki/Latince" \o "Latince)'ye *"Euclidis Elementorum"* adıyla çevrilmiştir.[Pek çok farklı dile çevrildi.]

Öklid, kendi zamanının [geometriyle ilgili](https://tr.wikipedia.org/wiki/Geometri) bilinen her şeyini *Elementler ile* bir araya getirdi. *Elementler* antik geometrinin ana kaynağıdır. Öklid temelli [ders kitapları](https://tr.wikipedia.org/wiki/Ders_kitab%C4%B1) günümüze kadar kullanılmıştır. Kitap, küçük bir [aksiyom](https://tr.wikipedia.org/wiki/Aksiyom) [setiyle](https://tr.wikipedia.org/wiki/K%C3%BCme) (yani, doğru olduğu düşünülen ama kanıtlanamayan önermeler setiyle) başlar. Öklid daha sonra bu aksiyomlara dayanarak geometrik nesnelerin ve [tam sayıların](https://tr.wikipedia.org/wiki/Tam_say%C4%B1) [özelliklerini](https://tr.wikipedia.org/wiki/M%C3%BClkiyet_hakk%C4%B1) gösterir.

*Elementler* ayrıca perspektif, konik kesitler, küresel geometri ve muhtemelen kuadrik yüzeyler üzerinde çalışmalar içerir. Geometri dışında çalışma [sayı teorisini](https://tr.wikipedia.org/wiki/Say%C4%B1lar_teorisi) de içerir. Öklid [*en büyük ortak bölenler*](https://tr.wikipedia.org/wiki/EBOB)*(EBOB)* fikrini ortaya attı ve *Elementler*'inde bu fikre yer verdi. İki sayının en büyük ortak [böleni](https://tr.wikipedia.org/wiki/B%C3%B6len), iki sayının ikisine de [bölünebilen](https://tr.wikipedia.org/wiki/B%C3%B6lme) en büyük sayıdır.

Classical Antiquity: Practical knowledge

\*\*\* Practical concerns of the ancient Greeks to establish a calendar is first exemplified by the Works and Days of the Greek poet Hesiod, who lived around 700 BC

\*\*\* The Works and Days incorporated a calendar, in which the farmer was to regulate seasonal activies by the seasonal appearances and disappearances of the stars, as well as by the phases of the Moon which were held to be propitious or ominous.

first kelvin first calendar

29:20

in greece

29:22

uh

29:23

mentioned about 700 bc

29:28

that was way later than babylonians

29:31

so the origin was babylonians but greeks

29:34

accumulated those kind of things

29:37

around the first mention is about 700 bc

29:41

works and days

29:44

incorporated a calendar in which the

29:46

farmer was to regulate seasonal

29:48

activities so farming is very related

29:51

with the calendar

29:52

operations when to irrigate when to stop

29:55

when to

29:57

get the crops etc

30:00

the phases of the moon etc

30:14

around 450 bc

30:16

seasonal

30:18

seasonal appearances and disappearances

30:20

of the stars like jupiter

30:25

and saturn the most visible ones all for

30:28

the venus

30:33

they were

30:34

discussed in certain texts

30:37

they wrote for

30:39

texts

30:40

they used to regulate the civil

30:42

calendars

30:43

of greek city-states

30:45

based on astronomical observations so

30:48

they defined holidays for example

Classical Antiquity: Astronomy..

\*\*\* Around 450 BC we begin to see compilations of the seasonal appearances and disappearances of the stars in texts known as **parapegmata,** which were used to regulate the civil calendars of the Greek-city states on the basis of astronomical observations.

Classical Antiquity: Medicine…

\*\*\*Greek medicine was not the province of a single trained profession and there was no accepted method of qualification of licensing.

\*\*\*Physicians(doktor,hekim) in the **Hippocratic** tradition, temple healers associated with the cult of Asclepius, herb collectors drug sellers, midwives, and gymnastic trainers all claimed to be qualified as healers in specific contexts and competed actively for patients.

Hippocrates of Kos

\*\*\* In the Hippocratic text, On the sacred disease, which deals with the nature of epilepsy **the** **author** **attacks his rivals (temple healers) for their ignorance** and for their **love of gain.**

**\*\*\*** The author of this text seems modern and progressive when he insists that **the epilepsy has a natural cause**

, yet when he comes to explain what that cause is and what the proper treatment would be, his explanation is as short on specific evidence and his treatment as vague as that of his rivals.

he was one of the first people who was

33:15

in conflict with temple healers in this

33:18

sense

33:21

so he insisted that

33:23

epilepsy has a natural cause he didn't

33:26

find the solution but he insisted that

33:29

it was not because of the sin

33:32

because temple killers were believing

33:33

that you were acting differently because

33:36

the

33:38

certain things happen to you in terms of [it is happening to you because you have sin,according to temple healers]

Pre-Socratic philosophers

\*\*\* Earliest greek philosophers, known as the pre-socratics, were materialists who provided alternative answers to the same question found in the myths of their neighbors: “**How did the ordered cosmos in which we live come to be?**”

\*\*\* But although the question is much the same, their answers and their attitude towards the answers is markedly different.

\*\*\* As reported by such later writers as Aristotle, **their explanations tended to center on the material source of things.**

they didn't explain things with gods

36:27

they explained things with

36:30

a material source of things

36:32

so they talked about fire they thought

36:35

about

36:40

earth

36:41

stones etc so they try to explain

36:45

how the earth is formed

36:47

how the earth is created

36:49

with materialist

36:51

approaches

Thales, Anaximander.. (at Miletus)

\*\*\* Thales of Miletus (624 – 546 BC) considered that all things came to be from and find their sustenance in water.

\*\*\* Anaximander (610-546 BC ) then suggested that things could not come from a specific substance like water, but rather from something he called the “boundless”

it said

37:18

all things

37:24

are related to water

37:27

so it's it's a kind of

37:29

true because hydrogen is

37:32

the smallest atom so if you think that

37:35

hydrogen contains the basic

37:38

and the center so everything is made up

37:40

of water and

37:48

one idea of the tallest these guys are

37:50

also mathematicians they think about the

37:53

reason of the universe

37:55

they also study mathematics geometry

37:57

etcetera there is a tallest

38:03

alexander is interesting

38:09

also he

38:11

studied

38:13

cause of the universe

38:16

things could not come from a specific

38:18

substance like water like tyler said

38:21

but rather from something he called the

38:23

boundless

38:25

something intangible

38:30

kind of atom but not quite so

38:33

they can do experiments

38:35

they are trying to figure out by

38:37

thinking

38:43

it returns to a concrete material

38:45

substance air that could be altered by

38:48

refraction and condensation so

38:50

from the vacuum by squeezing the vacuum

38:54

you can generate materials if you

38:56

squeeze a lot you get if you squeeze a

38:59

little bit you get wound for example

39:01

less squeeze

39:10

he also

39:12

demonstrated that air was a substance

39:15

and simple experiment

39:17

by pulling pulling with the pipe

39:20

right

39:21

and show that it could be else by

39:23

refraction and condensation so

39:26

a

39:27

matter

39:30

and replace each other

39:34

at least he studied and he

39:37

tried to explain how matter is formed

Heraclitus of Ephesus

\*\*\* Change, rather than any substance was fundamental,although the element fire seemed to play central role in this process.

change

40:18

is fundamental rather than substance so

40:21

it's not the substance we can

40:23

we should concentrate

40:24

he said change is more important

40:29

so the change is caused by fire so fire

40:32

changes things from one form to another

40:34

from wood to ash from ash to suton etc

40:39

also metals

40:40

so

40:41

harakutu said

40:44

it is the change that creates

40:47

different forms of objects different

40:49

forms of

40:50

substances

40:57

another guy

Empedocles of Acragas (490 -430 BC)

\*\*\* Combined the views of his predecessors(ondan önce gelenler), asserting(öne sürmek) that there are four elements (Earth,Water,Air and Fire) which produce change by mixing and separating under the influence of two opposing “forces” that he called Love and Strife.(çatışma)

\*\*\* Influenced by Pythagoras (died c. 495 BC) and the Pythagoreans, Empedocles challanged the practice of animal sacrifice and killing animals for food.

\*\*\*\* He developed a distinctive doctrine of reincarnation.

empedoco

41:06

uh it is important

41:08

he coined the term earth

41:11

earth the earth for toprak

41:14

earth water air and fire

41:16

which which will be

41:19

the main understanding of the universe

41:22

for long periods

41:26

and

41:28

they produce everything by mixing and

41:30

separating in certain quantities some

41:32

fire and some earth create some other

41:35

thing some less fire and more earth

41:37

creates a different thing

41:40

some water is added and the another

41:42

object is formed

41:44

so

41:46

under the influence of two opposing

41:47

forces

41:49

that called love and strife

41:51

pulling and pushing

41:53

so just like atomic

41:55

forces

he is he was influenced by

42:02

pisagor

42:03

and

42:06

his

42:07

people

42:11

he was influenced by sagor he challenged

42:14

the practice of animal sacrifice and

42:16

killing animals for food so he was kind

42:18

of vegetarian

42:24

also he developed distinctive doctrine

42:26

of reincarnation

42:28

religiously and probably it is the

42:31

animal sacrifice prohibition is related

42:34

with the reincarnation because

42:36

you may reborn again as an animal

42:40

for that

42:41

theory

42:46

so it they are going back to they are

42:49

going slowly towards atoms

Atoms!!!

\*\*\* All previous theories imply that matter is a continious substance.

\*\*\* Two Greek philosophers, **Leucippus** ( first half of the 5th century BC) and **Democritus** of Abdera (lived about 410 BC ) came up with the Notion that there were two real entities: **atoms**, which were small indivisible particles of matter, and the **void**, which was the empty spae in which matter was located.

up to that time the matter was

42:58

continuous

42:59

but to greek philosophers

43:01

it is later forgotten

43:04

how do we

43:05

read it lucid lucipus and democritus

43:10

came up the idea that atoms actually

43:13

they were the owner of the word atoms

43:15

which were small indivisible particles

43:17

of matter and the void

43:20

empty which was the empty space which

43:22

matters was located so small

43:24

indivisible structures were atoms

43:30

again

43:31

they made it by observation and thinking

43:33

no experiment no nuclear experiments of

43:35

course

43:46

pythagoreans was materialists so they ex

43:49

they tried to explain

43:52

[Music]

43:58

they tried to explain

44:01

the cause of the earth the cause of the

44:04

materials

44:06

classical explanations were not

44:09

sufficient for them

44:10

so what they did is

44:13

try to focus on how random assemblage of

44:16

water produce and ordered universe

44:18

without existence of some ordering

44:19

principle so

44:21

that is a

44:24

very famous

44:28

that's a very famous question actually

44:30

even today how

44:32

a random

44:33

operation can

44:37

bring up

44:38

an ordered universe like this

44:43

without a principle how can it be

44:48

before it is it is uh 2 600 years before

44:53

now

44:54

so

44:55

they tried to make a model

44:57

and for the model

45:01

they said matter was made up of

45:05

ordered arrangements of atoms

45:08

arranged according to geometrical

45:10

principles into triangles squares

45:12

rectangles and so on

Pythagoreans

\*\*\* The first step in this emphasis upon a model was that of the followers of Phythagoras (approximately 582 – 507 BC), who was number as the fundamental unchanging entity underliying all the structure of the universe.

\*\*\* For Pytagoras and his followers matter was made up of ordered arrangements of point/atoms, arranged according to geometrical principles into triangles,squares, rectangles, and so on…

\*\*\* Even on a larger scale, the parts of the universe were arranged on the principles of a musicial scale and a number.

that that's correct i think that's

45:29

correct interpretation geometry is god

45:31

that's that's what they thought so

45:33

everything is based on on principle

45:36

geometry determines geometry is the

45:38

determination of

45:40

everything mathematics is determination

45:42

of everything so if there is a

45:43

mathematics there is an intelligence

45:45

since mathematics is already there for

45:47

example

45:49

a right triangle

45:51

three four five right

45:53

right triangle is right triangle

45:56

so even if you don't draw the right

45:58

triangle right triangle is there the

46:00

information is there so what they say is

46:03

the order in the universe is there even

46:05

if you don't discover it it's still

46:07

ordered because mathematics is still

46:11

mathematics is still present even if you

46:13

don't know it

46:16

it is

46:17

kind of

46:19

consistent in itself but

46:22

with today's knowledge

46:25

i think it is not sufficient

so

46:35

pilato

46:37

in turkish if latin and aristotle

46:40

plato found the ordering principle of

46:42

universe in mathematics specifically in

46:45

geometry like

46:50

geometry is itself

46:52

is the order and the cause of the order

46:58

later account has it that plato had

47:00

inscribed

47:02

at the entrance of his school in the

47:05

book

47:06

we have seen the mosaic in

47:12

let no man ignorant of geometry enters

47:17

so if you ignore geometry

47:19

don't enter from this door

47:22

he

47:22

wrote at the entrance of the academy

47:27

because there were no

47:29

regular schools

47:30

there were academies by

47:32

certain philosophers like tekken

47:40

their rules were determined by

47:42

themselves

47:44

not by the government

47:54

plato said story is a myth

47:57

but it has a grain of truth

47:59

some truth for in his writings plato

48:04

he said tells us the importance of

48:07

geometry

48:12

it says geometry geometric geometric

48:14

geometry so order actually

48:25

he is known for

48:27

more

48:28

for philosophical basis

48:31

rather than scientific method but

48:32

actually in those years they were

48:34

philosophers and scientists together so

48:37

they are mathematicians and thinkers

Plato and Aristotle

\*\*\*Plato is known mor efor his contributions to the philosophical basis of scientific method than to particular scientific concepts.

\*\*\* He maintained that all things in the material World are imperfect reflections of eternal unchanging ideas, just as all mathematical diagrams are reflections of eternal unchanging mathematical truths.

\*\*\* Since Plato believed that material things had an inferior kind of reality, he considered that we don’t achieve demonstrative knowledge – that kind of knowledge we call science – by looking at the imperfect material World.

stop quickly he said all things in the

48:48

material world are imperfect

48:51

reflections of eternal unchanging ideas

48:53

just as all mathematical diagrams are

48:56

reflections of eternal unchanging

48:57

mathematical tools so i just said it

49:00

in my previous sentences mathematics is

49:03

there mathematics is the universe

49:07

what we see is

49:10

this is very hard to explain what we see

49:12

is the reflection of the mathematics

49:15

as

49:17

as a matter

49:18

that's what they said

49:20

since he believed that material things

49:22

had an inferior kind of reality

49:24

materials are inferior so this is

49:26

inferior than the mathematics itself

49:29

mathematics itself

49:31

is

49:32

has become visible

49:34

in the wood

49:36

or in the matter

49:39

so

49:41

we don't achieve demonstrative(kesin olarak ispatlayan) knowledge

49:44

by

49:46

looking at the material world

49:50

so

49:52

without

49:54

studying abstracts

49:55

without studying abstract mathematics

49:58

he said we cannot

50:01

understand

50:02

things

50:03

by examining and studying

50:06

elements we have to study mathematics to

50:09

understand

50:11

actual objects

Plato and Aristotle

\*\*\*Truth is to be found through rational demonstrations, analogous to the demonstrations of geometry.

\*\*\* Applying this concept, Plato recommended that astronomy be studied in terms of geometrical models and proposed that the elements were particles constructed on a geometrical basis.

truth

51:03

is to be found through rational

51:05

demonstrations

51:10

similar to demonstrations of geometry

51:12

for example

51:14

this

51:16

is

51:17

cutting the line is cutting the circle

51:19

so you can prove it you can show it you

51:22

can measure it

51:25

and that can be realized in real life

51:27

like an apple

51:30

cutting

51:31

with a knife so

51:33

in that case part of the apple is gone

51:36

so it is realized

51:41

so it is analogous to demonstrations of

51:43

the geometry

51:45

using this concept he said astronomy

51:48

should be studied in terms of

51:50

geometrical models

51:52

and proposed that elements were

51:53

particles constructed on geometrical

51:55

basis so all elements and space

51:59

are geometrical

52:01

geometrical counterparts

Plato and Aristotle

\*\*\* Aristotle (384-322 BC) disagreed with his teacher

\*\*\* While Aristotle agreed that truth must be eternal and unchanging, he maintained that we come to know the truth through the external World which we perceive with our senses.

\*\*\*For aristotle, directly observable things are real; ideas (or as he called them, forms) only exist as they Express themselves in matter, such as in living things,or in the mind of an observer or artisan.

they disagreed with his teacher

52:28

aristotle disagreed with teacher

52:31

he agreed that truth must be eternal

52:34

and unchanging

52:36

said that

52:38

plato was thinking

52:39

differently

52:42

aristotle said truth must be eternal

52:44

unchanged and

52:49

truth we know truth through external

52:51

world which we perceive with our senses

52:54

so we have to see we have to hear it

52:57

to understand the truth

53:00

he said direct observable things are

53:02

real

53:03

if we cannot observe it

53:05

it is a myth

53:07

it's not true so we have to observe but

53:10

plato said with mathematics we can do

53:13

induction

53:14

so

53:15

for example derivative there is a

53:18

realistic part but you can also

53:22

hypothetically study the the problem of

53:25

derivatives

53:28

so for living things uh

53:32

it was real only if

53:34

things only exist

53:37

if they are visible aristo said

53:45

it exists if i cannot see it it doesn't

53:47

exist but pilot said in mathematics you

53:50

have to study mathematics and

53:51

mathematics

53:53

reveals itself with the nature so there

53:55

must be something that may not be

53:57

revealed but it is still there

53:59

so it's more

54:00

plato is more

54:02

abstract

54:05

compared to aristotle

Aristotle

\*\*\* Aristotle was one of the most prolific(üretken) natural philsoophers of Antiquity. He made countless observations of the structure and habits of animals, especially those in the sea at Lesbos.

\*\*\* He also made many observations about the large-scale workings of the universe, which led to his development of a comprehensive theory of physics.

he made observations observation because

54:13

he said so he observed observations

54:16

observations observations animals and

54:19

in the at the sea of lesbos

54:22

that's the island

54:25

he did taxonomy and categorizations

there are original writings some of them

54:53

are original writings some of them are

54:55

stone writings so

54:57

but i believe it

55:00

today people who study them are also

55:02

scientific people

55:04

and those scientific people i don't

55:06

think they were they will act like

55:08

politicians so

55:10

if they say it is less

55:13

if they believe that it is less probable

55:15

they don't say so why should

55:23

he made observations and

55:25

probably there are listings there are

55:29

properties of those observations

55:31

somewhere found or some writings some of

55:33

them are not found most of them are not

55:34

found

55:37

they

55:38

interpolate(arasına sözcük eklemek,çıkarmak) what they found

55:42

they make assumptions based on the

55:44

findings

55:46

he made observations about the

55:48

large-scale workings of the universe

55:50

which led to his development and

55:52

comprehensive theory of physics

Aristotle

\*\*\* Developed a version of the classical theory of the elements ( earth,water,fire,air and aether).

\*\*\* In his theory, the light elements(fire and air) have a natural tendency to move away from the center of the universe while the heavy elements (earth and water) have a natural tendency to move toward the center of the universe,thereby forming a spherical earth.

\*\*\*Since the celestial bodies – that is, the planets and stars – were seen to move in circles, he concluded that they must be made of a fifth element, which he called Aether

is

57:10

improved with the addition of ether

57:13

ether was also

57:20

the first

57:21

greek god

57:23

who

57:24

was there before anything

people didn't believe that there was

57:57

something like vacuum(uzay boşluğu)

57:58

there was a

58:00

there was a material that fills

58:03

those gaps

58:05

and the name of the

58:06

material was aether

repels each other others attract each

58:34

other so he tried to develop certain

58:36

rules based on observation

58:38

obviously these are not correct but

58:40

started trying to explain the nature

since

58:51

bodies

58:53

in space move around circles the jupiter

58:56

and saturn etc and

58:58

sun and moon rotates in circles

59:03

he concluded that they must be made from

59:04

the fifth element which we called which

59:06

they called aether

59:09

at that time

Hellenistic period

\*\*\* The military campaigns of Alexander the Great spread Greek thought to Egypt, Asia Minor, Persia, up to the Indus River.

\*\*\* The resulting Hellenistic civilization produced seats of learning in Alexandria in Egypt and Antioch in Syria along with Greek speaking populations across several monarchies.

**\*\*\* Hellenistic science differed from Greek science in at least two ways: first,it benefited from the cross-fertilization of Greek ideas with those that had developed in the larger Hellenistic World; secondly, to some extent, it was supported by royal patrons in the kingdoms founded by Alexander’s successors(kendinden sonra gelenler)**

\*\*\* Especially important to Hellenistic science was the city of Alexandria in Egypt, which became a major center of scientific research in the 3rd century BC

the hellenistic period is very long

59:55

it

59:56

it goes back to

59:59

it goes back until romance

60:04

so

60:07

it ex

60:08

expanded to egypt

60:10

middle east persia

60:13

and up to

60:15

india

60:17

and all the a

60:20

hellenistic period

60:22

a combined information that was created

60:26

in those areas before Greeks

so since helens expanded

60:34

they

60:39

they gathered all the information

60:42

created especially in

60:45

egypt and

60:47

middle east

60:53

alexandria in egypt was center

60:58

and antioch antakia

61:01

in syria

61:02

and york is a

61:04

city in old syria

61:08

there were cities of science

61:12

cities of libraries etcetera

hellenistic science and greek science

61:19

were different

61:21

but they say

61:27

realistic science

61:29

benefited from

61:30

greek

61:32

ideas

61:34

[Music]

61:38

and hellenistic science is more like

61:40

united united states versus british the

61:44

united states is

61:46

kind of british but united states is

61:48

more wider and

61:50

touches more uh different parts of the

61:53

world

61:55

uh second

61:57

it was supported by

61:59

royal patrons of the in the kingdoms

62:01

founded by alexander's successors so

62:04

heroistic science was funded by

62:07

kings

62:09

in the greek time

62:11

there were people

62:14

three people

62:17

getting together and opening an academy

62:20

and philosophers start

62:23

thinking and writing things so it's it's

62:25

it was like free universities

62:27

in certain regions and people

62:30

but in hellenistic period kings were

62:32

also interested

62:36

especially in the holistic

62:38

time

62:39

alexandria in egypt

62:41

became major center of scientific

62:43

research in third century bc(200-300 yıllarını kapsar.)(Just before phytagoras)

egypt was

63:00

gaining a lot of

63:02

popularity just before not just 200

63:05

years 300 years

63:07

before uh

63:09

christians

63:12

jesus was

63:13

born

63:15

in israel

antique antique terra mechanism 150 bc [The Antikythera Mechanism]

63:33

37 gear mechanical computers

63:37

which computed the motions of the sun

63:39

moon including lunar and solar eclipses

they were able to

67:54

connect the information that they gather

67:58

from observing sun and solar

68:01

moon operations the

68:04

moments

68:05

to the gears they apply the same

68:07

information to gears so that they can

68:10

simulate

68:13

time for 19 years further

68:16

from the existing time

68:18

so that they can predict from

68:22

three three years from now

68:25

there will be the moon

68:28

and the

68:29

space

68:30

so they were able to

68:32

tell that

68:36

almost yeah almost 2000 years ago i think

68:42

Post Classical Science

\*\*\* In the Middle Ages the classical learning continued in three major linguistic cultures and civilizations;

\*\*\* Greek (the Byzantine Empire)

\*\*\*Arabic (the Islamic World)

\*\*\*Latin (Western Europe)

we will start

00:38

going into

00:42

early early early to middle ages

00:50

that is called as post classical science

00:52

and middle ages in the

00:55

theory

00:56

in

00:58

in those years post classical science

01:00

after hellenistic time after egyptian

01:02

time

01:04

uh greek's

01:06

names byzan's empire

01:09

arabs and latin

01:12

civilizations

01:17

have seen developments in addition to

01:20

this

Byzantine Empire

\*\*\* A form of Classical Science

\*\*\* Closely connected with **ancient-pagon philosophy**, **and** **metaphysics**

\*\*\* University of Constantinople

\*\* University of the Palace Hall of **Magnaura** was an Eastern Roman educational institution that could trace its corporate origins to 425 AD, when the emperor Theodosius II founded the Pandidakterion

\*\* At the time various economic schools, colleges, polytechnics, libraries and fine arts academies also operated in the city of Constantinopole

starting from anatolia

01:33

[Music]

01:35

and the

01:36

remnants of the

01:38

remaining of the hellenistic

01:41

work

01:42

uh it is

01:46

it was a form of classical science in

01:48

hellenistic times

01:50

it was

01:51

connected with

01:52

the early pagan philosophy and

01:55

metaphysics so it was science

01:59

plus religion together

02:03

in those years it was

02:05

just after

02:08

just after

02:13

it wasn't just after 400 years

02:18

jesus was

02:19

born so it was after christianity

02:23

but considering that christianity and

02:27

bible

02:28

have been written

02:30

several

02:32

hundred years later than

02:34

jesus times so it was about

02:41

enlargement enlargement days of the

02:43

christianity like 300 400 years of a.d

02:49

was good years of christianity

University of Constantinople 425 AD

\*\*\* Byzantine society on the whole was an educated one. Primary education was widely available, sometimes even at village level and uniquely in that era for both sexes.

\*\*\* Female participation in culture was high.

\*\*\* Scholarship was fostered not only in Constantinople but also in instutions operated in such major cities as Antioch(antakya) and Alexandria(İskenderiye)

\*\*\* The original school was by Emperor Theodosius II with 31 chairs for law, philosophy, medicine, arithmetic,geometry, astronomy, music, rhetoric and other subjects, 15 to Latin and 16 to Greek.

The university existed until the 15th century.

in the world university of

02:57

constantinople meaning university of

02:59

istanbul was considered as a first

03:01

university

03:03

in the world

03:06

university was in the palace university

03:09

palace uh named as magnara palace

03:13

it was an educational institution

03:16

going back to 425

at that time 480

04:26

different

04:26

schools were also president present

04:30

economic schools colleges polytechnic

04:32

schools libraries and fine art academies

04:35

were operated

04:37

in the city

04:45

the society was

04:47

interestingly developed

04:50

primary education was widely available

04:52

and it was

04:55

even available at the village level

04:57

primary education

05:00

both

05:01

boys and girls

05:04

female participation in the culture was

05:06

very high

05:09

scholarship

05:12

uh

05:14

meaning

05:17

not money scholarship but

05:19

[Music]

05:23

studying

05:25

studying for studying this

05:28

scholarship

05:30

being scholar

05:32

was fostered not only in

05:34

istanbul but also in institutions

05:36

operated in major cities in bazantium

05:39

empire such as antioch and

05:44

alexandria was in egypt

05:46

antioch is in where is it

05:51

so there were institutions

05:55

promoting studying and scholarship

06:00

at university level

06:03

original school

06:04

was

06:06

built by

06:07

emperor emperor taylor's use

that university existed until the 15th

06:47

century until the

06:49

fall of

06:51

constantinople

06:53

fall of istanbul and

06:57

until fatih

07:00

conquered istanbul however

07:04

all of istanbul

07:06

the

07:06

decline in istanbul

07:09

[Music]

07:12

started

07:14

by uh

07:18

12 04

07:20

when italians latins invaded

07:23

the city

07:24

and destroyed so after that destruction

07:28

many things were demolished and taken

07:30

back to europe

07:31

uh people left this most of the scholars

07:34

left europe left istanbul to europe and

07:37

the

07:39

egypt

07:40

etc so city was

07:44

turned into a poorer stage

University of Constantinople..

\*\*\* The main content of higher education for most students was rhetoric(söz bilim), philosophy and law with the aim of producing competent, lerned personnel to staff the bureaucratic postings of state and church.

\*\*\* In this sense the university was the secular equivalent of the Theological Schools.

\*\*\* The university maintained an active philosophical tradition of Platonism and Aristotelianism, with the former being the longest unbroken Platonic school, running for close to two millennia until the 15th century.

\*\*\* The period of decline began with the Latin conquest of 1024 although the university survived as a non-secular institution under Church management until the Fall of Constantinople in 1453, and was re-established by Mehmet II as a Madrasa (an Islamic theological school) following the conquest of the city

the main content main topic of higher

09:17

education for most students was rhetoric

09:20

discussion

09:23

learning to talk learning to write

09:24

learning to read very well

09:28

and and love

09:30

with the aim of producing competent

09:32

learned personal

09:34

to staff the bureaucratic postings of

09:36

state and church so

09:38

to educate people for

09:40

higher

09:42

level of jobs

09:45

in that sense universe to university was

09:48

secular equivalent of the theological

09:50

schools so

09:51

they were not

09:57

they were not

09:58

teaching for

10:01

church

10:02

rather

10:03

because church was not

10:05

established

10:07

as if it was in

10:09

medieval times in the early days of

10:12

christianity

10:15

probably similar to early days of islam

10:19

it was not

10:20

that strong

10:26

on the science so scientific

10:29

work

10:31

proceeded

10:33

particularly

10:35

at the beginning

10:39

in all religions

10:41

so it was a secular equivalent of the

10:44

theological

10:45

because the theological schools tries to

10:48

promote

10:49

and study

10:57

why god is created and how to obey etc

11:01

so standard procedure of praying and

11:03

practicing

11:06

and they

11:07

educate their people for that purpose

11:11

in this case

11:12

the purpose of the university of

11:14

constantinople was

11:16

educate people for bureaucratic jobs

11:18

rather than for peace

11:26

university maintained active

11:27

philosophical tradition of platonism and

11:29

aristotle aristotelianism

11:32

with the former platonism being the

11:34

longest unbroken platonic school running

11:37

for close to 2 000 years until 15th

11:40

century

so effect of hellenistic work was

11:45

still there

11:47

although

11:49

christianity is there in terms of

11:51

science and

11:52

scientific thinking Platonism and Aristotelianism were followed.

the decline was

12:06

decline began with the latin conquest of

12:09

1204

12:11

so most people left

12:13

although the university as a university

12:16

survived as a non-secular institution

12:20

because church improved over the years

12:23

in the medieval times

12:24

so university survived as a non-secular

12:26

institution

12:28

under church management entered until

12:30

the fall of constantinople in 1453

12:34

and

12:37

re-established by

12:39

fatih sultan met as a madrasa

12:42

as an islamic theological circle

12:47

didn't forget that and they converted

12:50

the school to islamic theological

12:52

schools rather than

12:54

christian theological schools so it was

12:55

still school

Byzantine Empire

\*\*\* Mathematics

\*\*\* Physics

\*\*\* Medicine

\*\*\* Incendiary weapons: Greek Fire

\*\*\* Humanism and Renaissance

in byzantium empire

17:16

people were good in mathematics physics

17:19

medicine

17:20

weapons like

17:22

we know greek fire were present

17:25

and some humanism and

17:30

thinking

17:32

um

17:33

don't get me wrong i am not

17:38

i am not

17:41

trying to

17:43

say that the mathematics physics and

17:45

medicine were

17:47

highly sophisticated

17:49

in most cases

17:51

it is connected to pagan culture

17:55

roman culture

17:57

before christianity right and

18:03

related to christianity

18:06

more than half of the ideas were

18:09

incorrect

18:11

but they were correct for those years

but still there were people

18:17

thinking about mathematics physics and

18:19

medicine and writing

18:23

on those topics and there was a

18:25

university

18:27

that's why uh until 1204

18:34

until 1204 latin conquest

18:37

istanbul was a very

18:40

great place for science and

18:43

furthermore

18:44

it was probably the

18:47

yeah it was probably the biggest city

18:50

in the world

18:52

in those years

19:01

islamic science and business

19:05

were highly related

19:10

there are reasons for it

19:12

they were not always fighting

19:14

because on anatolia there were islamic

19:17

people in the in the middle middle east

19:20

there were islamic people arabs

19:22

and later turks

19:26

turks were

19:28

working for

19:30

some of them were christian

19:32

turks were working for

19:34

uh

19:36

byzantium empire as well

there were turks

19:54

in anatolia

19:56

speaking greek and speaking arabic

20:00

so they helped to exchange ideas

20:05

in between

20:07

they don't

20:08

fight all the time okay they fight from

20:11

time to time

20:16

when i

20:17

think about

20:18

byzantium empire and islamic people

20:22

to my age we always remember

20:25

turkish films by

20:27

talking and card altivet etc

20:31

so the image of

20:33

byzantium empire is always connected

20:36

with those films

20:39

so they were always fight etc but there

20:41

were also good connections i mean

20:44

technically there were technical people

20:46

there were trade okay

early greek text

20:59

from hellenistic times

21:01

were preserved by the greeks and they

21:04

moved back to greece

21:06

moved back to byzantium

21:08

and

21:15

islamic world islamic world first

21:18

obtained those

21:20

resources

21:21

such as

21:23

uh

21:26

earthlings elements

21:28

old books

21:29

coming from egypt etc

21:31

from byzantium empire so there were

21:34

cultural exchange between byzantium

21:37

and islamic

21:39

people the islamic people were also

21:42

exchanging information with china and

21:45

india so information taken from china

21:48

and india for example numbering system

21:54

were

21:55

transferred back to

21:58

byzantium empire so byzantine memphis

22:00

was kind of

22:02

a

22:03

buffer

22:04

in between

later european

22:09

development and islamic World

Byzantine and Islamic science

\*\*\* During the Middle Ages, there was frequently an exhange of works between and Islamic science

\*\*\* The Byzantine Empire initially provided the medieval Islamic World with Ancient and early Medieval Greek texts on astronomy,mathematics and philosophy for translation into Arabic as the Byzantine Empire was the leading center of scientific scholarship in the region at the beginning of the Middle Ages

\*\*\* Later as the Caliphate and other medieval Islamic cultures became the leading centers of scientific knowledge, Byzantine scientists such as Gregory Choniadres, who had visited the famous Maragheh observatory, translated books on Islamic astronomy, mathematics and science into Medieval Greek

some

22:37

[Music]

22:38

scholars like george colinades

22:41

visited

22:43

islamic observatories

22:45

translated books on islamic astronomy

22:48

to greek

22:51

some islamic books were translated into

22:53

greek some greek books were translated

22:56

into

22:57

arabic so arabic greek interaction

23:00

was very

23:02

significant

23:05

when

23:07

let's say

23:08

between years

23:10

eight hundred

23:13

eight hundred nine

23:15

eight hundred one thousand

23:17

and

23:18

until yeah until uh

Byzantine and Islamic science

\*\*\* Byzantine science thus played an important role in not only transmitting ancient Greek knowledge to Western Europe and the Islamic World, but in also transmitting Arabic knowledge to Western Europe

\*\*\* Some historians suspect that Copernicus or another European author had Access to an Arabic astronomical text, resulting in the transmission of the Tusi-couple, an astronomical model developed by Nasir al-Din al-Tusi that later appeared in the work of Nicolaus Copernicus.

\*\*\* Scientists also became acquainted with Sassanid and Indian astronomy through citations in some Arabic works

but

23:28

as time

23:29

progresses like after

23:32

1400

23:35

the church in

23:37

prisons

23:38

and europe was so

23:40

strong

23:41

so they eliminated

23:44

the

23:45

progress of science so most of the

23:47

achievements were happened

23:51

until latin

23:53

maybe until

23:57

1300

23:59

1300

24:01

years

24:02

from christ

24:10

business science

24:13

played an important role

24:15

not only transmitting ancient greek

24:17

knowledge to west

24:19

eastern europe and islamic work but also

24:21

transmitting arabic knowledge

24:23

to western europe so it was a gate from

24:26

arabic knowledge to

24:28

european knowledge

some historians believe that

24:34

copanic or other european order had

24:36

access to arabic astronomical text

24:38

there was an i there is an idea so

24:40

copanic was following arabic text some

24:42

people say that

24:44

a resulting transmission of the

24:46

two c coupled

24:48

an asteroid astronomical model developed

24:50

by

24:53

nester aldine autoc l2c

24:56

that later appeared on

24:58

the work on copernicus work of copanic

25:02

so

25:03

some people say that copenhagen

25:05

translated certain arabic texts and

25:10

heliocentric ideas rather than

25:12

geocentric ideas

25:14

were the result of islamic studies

25:17

happened before

scientists also became

25:22

familiar with sasani and indian

25:24

astronomy to produce citations in some

25:27

arabic works so since arabic people were

25:29

also affected from iranian

25:32

chinese and indian

25:34

texts

25:37

since they are translated

25:38

so

25:41

scientists and byzantine byzantium

25:43

empire were also affected from

25:45

eastern

25:48

Studies

After 1453

\*\*\* During the Fall of Constantinople in 1453, a number of Greek scholars fled to North Italy in which they fueled the era later commonly known as the “Renaissance” as they brought with them a great deal of classical learning including an understanding of botany, medicine, and zoology

it is two-sided issue they lost we won

26:16

but actually it said

26:19

it's a big change

26:22

a

26:25

number of greek scholars

26:27

went to italy from istanbul

26:31

they escaped

26:32

some of them were escaped in latin con

26:35

latin inquisition

26:38

the remaining ones

26:40

left the city

26:41

after

26:43

partisan

26:46

occupied

26:48

and they were

26:51

considered as a

26:53

starting field of

26:56

renaissance in italy

26:59

because europe was in very bad shape

27:03

italy has some trade

27:08

ability

27:10

for the world so they were good in

27:13

shipbuilding and trading italians

27:17

but in terms of culture they were highly

27:20

effected from

27:22

people came from istanbul

27:26

in renaissance

in terms of understanding

27:33

medicine zoology and

27:35

plants and knowledge botany

Islamic World – 8th century

\*\*\* **721 – 815: Jabir ibn Hayyan** (Latinized name, Geber,). First chemist known to produce sulfuric acid, as well as many other chemicals and instruments.

\*\*\* Wrote on adding color to glass by adding small quantities of metallic oxides to the glass, such as manganese dioxide.

\*\*\* This was a new advance in glass industry unknown in antiquity.

\*\*\* His works include The Elaboration of the Grand Elixir; The Chest of Wisdom in which he writes on nitric acid; Kitab al-istitmam (translated to Latin later as Summa Perfectionis); and others.

Islamic World – 8th century

\*\*\* 780-850: al-Khwarizmi

\*\*\* Developed the “calculus of resolution and juxtaposition”(hisabal-jabr w’al – muqabala), more briefly referred to as al-jabr, or algebra.

Islamic World – 9th century

\*\*\* **801-873: Al-Kindi writes** onthe distillation of wine as that of rose water and gives 107 recipes for perfumes, in his book Kibab Kimia al-‘otoor wa altas ‘eedat(book of the chemistry of perfumes and distillations.)

\*\*\* Al-Kindi was the first major writer on optics since antiquity. Roger Bacon placed him in the first rank after Ptolemy as a writer on the topic

Al Kindi

\*\*\* al-Kindi wrote at least **two hundred and sixty** books, contributing heavily to geometry (thirty-two books), medicine and philosophy (twenty-two books each), logic(nine books), and physics (twelve books).

\*\*\* Although most of his books have been lost over the centuries, a few have survived in the form of Lating translations by Gerard of Cremona, and others have been rediscovered in Arabic manuscripts; most importantly, twently four of his lost works were located in the mid-twentieth century in a turkish library.

9th Century Islamic Science

\*\*\* **854 – 930: Al-Razi** wrote on Naft (naphta or petroleum) and its distillates in his book “Kitab sirr al-asrar” (book of the secret of secrets.)

\*\*\* When choosing a site to build Baghdad’s hospital, he hung pieces of fresh meat took the longest to rot was the one he chose for building the hospital.

\*\*\* Advocated that patients not be told their real condition so that fear or despair do not affect the healing process. Wrote on alkali,caustic soda, soap and glycerine.

\*\*\* Gave descriptions of equipment processes and methods in his book **Kitab al-Asrar (book of secrets) in 925.**

9Th Century Islamic Science

\*\*\* **826 – 901: Thabit ibn Qurra** (Latinized,Thebit.) Studied math in Baghdad’s House of Wisdom under the **Banu Musa** brothers.

\*\*\* Discovered a theorem which enables pairs of amicable numbers to be found

\*\*\* **Later, al-Baghdadi** (b.980) developed a variant of the theorem.

he studied math in uh

36:07

under the rule of

36:09

musa brothers

36:25

mv or abbasi

36:28

800 abbasi i think

36:37

he tabit discovered the term that

36:39

enables pairs of numbers to be found

36:42

so

36:45

consecutive numbers come numbers coming

36:47

after another

36:50

he studied

36:51

number crunching again

36:53

later

36:54

el badadi

36:58

improved

36:59

his

37:00

theorems

37:01

habit was tabith was famous because he

37:04

was from

37:05

iran

37:09

today he is very famous

37:11

i

37:12

it is either because

37:17

the name is

37:18

interesting or is from haram

37:22

i have no

37:25

idea

37:31

he translated certain things

37:34

they

37:36

they can read write latin

37:38

they can read like greek they can read

37:40

write other languages so

37:43

they are very good in translation so

10th Century Islamic Science

\*\*\* By this century, three systems of counting are used in the Arab World.

\*\*\* Finger-reckoning arithmetic,with numerals written entirely in words, used by the business community;

The sexagesimal system, a remnant originating with the Babylonians, with numerals denoted by letters of the arabic alphabet and used by Arab mathematicians in astronomical work; and the Indian numeral system, which was used with various sets of symbols.

\*\*\* Its arithmetic at first required the use of a dust board ( a sort of handheld blackboard) because “the methods required moving the numbers around in the calculation and rubbing some out as the calculation proceeded.”

sexagesimon system

40:28

it originated with the ancient sumerians

40:30

in the third millennium bc and passed

40:32

down to ancient babylonians sumerians to

40:34

babylonians

40:36

and

40:37

today it is satir

40:39

uh

40:40

i said it still

40:42

used

40:43

because

40:45

one minute is of 60 seconds one hour is

40:49

60 minutes so that is the result of

40:52

sex against small

40:54

system

10th Century Islamic Science

\*\*\* 957: Abul Hasan Ali Al-Masudi, wrote on the reaction of alkali water with zaj (vitriol) water giving sulfuric acid.

\*\*\* 920: al-Uqlidisi. Modified arithmetic methods fort he Indian numeral system to make it possible for pen and paper use. Hitherto, doing calculations with the Indian numerals necessitated the use of a dust board as noted earlier.

\*\*\* 940: Born Abu’l – Wafa al-Buzjani. Wrote several treatises using the finger-counting system of arithmetic,, and was also an expert on the Indian numerals system. About the Indian system he wrote: “[it] did not find application in business circles and among the population of the Eastern Caliphate for a long time.” Using the Indian numeral system, abu’l Wafa was able to extract roots.

\*\*\* 980: al – Baghdadi Studied a slight variant of Thabit ibn Qurra’s theorem on amicable numbers.

\*\*\* Al- Baghdadi also wrote about and compared the three systems of counting and arithmetic used in the region during this period.

11th century: 1048-1131: Omar Khayyam.

\*\*\* Persian/Turkish mathematician and poet.

\*\*\*” Gave a complete classification of cubic equations with geometric solutions found by means of intersecting conic sections.”

\*\*\* Extracted roots using the decimal system (the Indian numeral system).

uh cubic equations i understand

43:41

geometric solutions found by means of

43:43

intersecting conic sections

43:46

it is difficult

43:48

he extracted roots using the decimal

43:50

system

43:51

decimal system is indian system okay

43:55

indians use decimals use this

so he

43:59

knew

44:02

how to extract roots

44:06

he

44:08

did study euclid’s elements

44:34

earthquakes elements

44:37

on proof of problems

44:39

concerning algebra

11th century: 1048 – 1131: Omar Khayyam

\*\*\* In 1074-5, Omar Khayyam was commissoned by Sultan Malik-Shah to build an observatory at Isfahan and reform the Persian calendar

\*\*\* Omar must have known the formula for the expansion of the binomial(a+b)^n, where n is a positive integer.

\*\*\* The case of power 2 is explicitly stated in Euclid’s elements and the case of at most power 3 had been established by Indian mathematicians. Khayyam was the mathematician who noticed the importance of a general binomial theorem.

\*Note: His philosophic attitude toward life as a combination of pessimism,nihilism,Epicurenaism,fatalism and agnosticism.

12th century

\*\*\* **1100-1165: Muhammad al-Idris**i, aka Idris al-Saqalli aka al-idrissi of Andalusia and Sicily.Known for having drawn some of the most advanced ancient World maps.

\*\*\* 1130-1180**: Al-Samawal**. An important member of al- Karaji’s school of algebra. Gave this **definition of algebra**:

“[it is concerned] with operating on unknowns using all the arithmetical tools, in the same way as the arithmetician operates on the known.”

\*\*\* **1135: Sharaf al- Dın al-Tusi**. Follows al-Khayyam’s application of algebra of geometry,rather than follow the general development that came through al-Karaji’s school of algebra. Wrote a treatise on cubic equations which describes thus:

“ [the treatise] represents an essential contribution to another algebra which aimed to study curves by means of equations, thus inaugurating the beginning of algebraic geometry.”

these are

48:14

also

48:16

worked in

48:17

algebra and mathematics

48:23

these are really important

48:28

as you see

48:29

there are a lot of

48:32

arabic persian

48:36

scientific

48:37

scholars

48:40

in those years

48:42

before medieval times

48:44

when medieval times

48:48

okay

48:49

and

48:50

scientific uh scientific advanced

48:53

advancement

48:55

declined

48:57

after 1200

13th Century

\*\*\***1260: al-Farisi**. Gave a new proof of Thabit ibn Qurra’s theorem, introducing important new ideas concerning factorization and combinatorial methods.He also gave the pair of amicable numbers 17296, 18416 which have also been joint attributed to Fermat as well as Thabit ibn Qurra.

**\*\*\* Ismail al-Jazai** described 100 mechanical devices, some 80 of which are trick vessels of various kinds, along with instructions on how to construct them.

14th century

\*\*\***1393-1449: Ulugh Beg** commissions an observatory at Samarqand in present-day Uzbekistan.

\*\*\* He was a Timurid sultan, as well as an astronomer and mathematician.

\*Note: Ulugh Beg’s scientific expertise was not matched by his skills in governance. During his short reign, he failed to establish his power and authority. As a result, other rulers, including his family, took advantage of his lack of control, and he was subsequently overthrown and assassinated.

he was all

50:24

so sutan he was the king

50:28

so

50:29

money was not an issue

50:32

he was a astronomer and

50:34

mathematician

50:36

but the problem was

50:38

since he was very interested in science

50:42

he was probably a good guy

50:44

and

50:45

later

50:47

he was overthrown and assassinated

50:54

is he failed to establish power

50:57

so in order to

51:00

rule the people

51:03

probably in those years

51:04

you need to be a bad person i think

51:09

so

51:10

he was overthrown and assassinated

14th Century

\*\*\***1380-1429: al-Kashi.** He contributed to the development of decimal fractions not only for approximating algebraic numbers,but also for real numbers such as pi.

\*\*\* His contribution to decimal fractions is so major that for many years he was considered as their inventor.

\*\*\* Although not the first to do so,al-Kashi gave an algorithm for calculating nth roots which is a special case of the methods given many centuries later by Ruffini and Horner.

\*Note: Al-Koshi also invented a mechanical planetary computer which he called the Plate of Zones, which could graphically solve a number of planetary problems,including the prediction of the true positions in longtude of the Sun and Moon, and the planets in terms of elliptical orbits; the latitudes of the Sun, Moon,and planets; and the ecliptic of the Sun. The instrument also incorporated an alhidade and ruler.

15th Century

\*\*\***Ibn al-Banna and al-Qalasadi** used symbols for mathematics “and, although we do not know exactly when their use began, we know that symbols were used at least a century before this.”

\*\*\***Ibn Masoud** Wrote on the decimal system. Computed and observed the solar eclipses of 809AH,810AH and 811AH, after being invited by Ulugh Beg, based in Samarqand to pursue his study of mathematics, astronomy and physics.

\*\*\* His works include “The Key of arithmetics”; “Discoveries in mathematics”; The decimal point”; “the benefits of the zero”. The contents of the Benefits of the Zero are an introduction followed by five essays: On whole number arithmetic; On fractional arithmetic; on astrology; on areas; on finding the unknowns [unknown variables].

\*Note:He also wrote a “thesis on the sine and the chord”; “thesis on the circumference” in which he found the ratio of the circumference to the Radius of a circle to sixteen decimal places; “The garden of gardens” or “promenade of the gardens” descibing an instrument he devised and used at the Samarqand observatory to compile an ephemeris, and for computing solar and lunar eclipses; The ephemeris “Zayj Al-Khaqani” which also includes mathematical tables and corrections of the ephemeresis by Al-Tusi; “Thesis on finding the first degree sine.”

17th Century

\*\*\* The arabic mathematician Mohammed Baqir Yazdi discovered the pair of amicable numbers 9.363.584 and 9.437.056 for which he is jointly credited with Descartes

Decline

\*\*\*Islamic science began its decline in the 12th or 13th century, before the Renaissance in Europe, and due in part to the 11th-13th century Mongol conquests, during which libraries, observatories, hospitals and universities were destroyed.

\*\*\*The end of the Islamic Golden Age is marked by the destruction of the intellectual center of Baghdad, the capital of the Abbasid caliphate in 1258.

the conditions of

55:05

conditions of those years were very

55:07

different

55:08

so i should repeat that

55:11

the the motivations of people were very

55:14

different slavery were present

55:17

although it's not mentioned that much

55:21

human life was very

55:24

negligible

55:28

there were different parts in the

55:30

society so

55:32

classes of people in the society

55:34

uh so one

55:36

when you are thinking in terms of

55:39

scientific advancement

55:41

you should always

55:43

uh take this into consideration

55:48

the understanding of human life

55:49

understanding of religion they were all

55:52

different

55:53

than today's

55:55

so

55:58

something normal for those years is not

56:00

normal for today

56:03

that's very important

European Science

• By the 11th century, most of Europe had become Christian

• Stronger monarchies were present

• Borders were restored

• Technological developments and agricultural innovations were made, increasing the food supply and population.

• Classical Greek texts were translated from Arabic and Greek into Latin, stimulating scientific discussion in Western Europe

Shift to Europe

• An intellectual revitalization of Western Europe started with the birth of medieval universities(scientific and religious works was done,heavily religious) in the 12th century • Contact with the Byzantine Empire and with the Islamic world during the Reconquista and the Crusades(haçlı seferleri), allowed Latin Europe access to scientific Greek and Arabic texts • European scholars had access to the translation programs of Raymond of Toledo, who sponsored the 12th century Toledo School of Translators from Arabic to Latin.

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Toledo School of Translators • A group of scholars who worked together in the city of Toledo during the 12th and 13th centuries, to translate many of the philosophical and scientific works from Classical Arabic.

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Shift to Europe

• Later translators like Michael Scotus would learn Arabic in order to study these texts directly. • The European universities(studied nature as a main topic just like the Greek time) aided materially in the translation and propagation(yayılma) of these texts and started a new infrastructure which was needed for scientific communities. • In fact, European university put many works about the natural world and the study of **nature at the center of its curriculum**, with the result that the "medieval university laid far greater emphasis on science than does its modern counterpart and descendent(sonradan gelen) (need to find items related to bible because they were highly believer of Christianity)

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Medicine and Anatomy

• In classical antiquity, Greek and Roman taboos had meant that dissection was usually banned • In the Middle Ages medical teachers and students at Bologna began to open human bodies, and Mondino de Luzzi (c. 1275–1326) produced the first known anatomy textbook based on human dissection

Expansion

• As a result of the Pax Mongolica(bir tür barış,savaşın olmadığı zaman), Europeans, such as Marco Polo, began to venture further and further east. • Increased awareness of Indian and even Chinese culture and civilization within the European tradition • Technological advances were also made, such as the early flight of Eilmer of Malmesbury (also studied Mathematics in 11th century England) and the metallurgical achievements of the Cistercian blast furnace at Laskill.

Eilmer of Malmesbury ( approx 1010) (just like hazerfen Ahmet çelebi, her tried to fly)

• He was a man learned for those times, of ripe old age, and in his early youth had hazarded a deed of remarkable boldness. • He had by some means, I scarcely know what, fastened wings to his hands and feet so that, mistaking fable for truth, he might fly like Daedalus, and, collecting the breeze upon the summit of a tower, flew for more than a furlong [201 metres]. • But agitated by the violence of the wind and the swirling of air, as well as by the awareness of his rash attempt, he fell, broke both his legs and was lame ever after. • He used to relate as the cause of his failure, his forgetting to provide himself a tail.

13th Century

• At the beginning of the 13th century, there were reasonably accurate Latin translations of the main works of almost all the intellectually crucial ancient authors, allowing a sound transfer of scientific ideas via both the universities and the monasteries.(universities and monasteries were related, boundaries wasn’t defined) • By then, the natural philosophy in these texts began to be extended by scholastics such as Robert Grosseteste, Roger Bacon, Albertus Magnus and Duns Scotus.

14th Century

• The first half of the 14th century saw much important scientific work, largely within the framework of scholastic commentaries on Aristotle's scientific writings • William of Ockham emphasised the principle of parsimony(tutumluluk): natural philosophers should not postulate unnecessary entities, so that motion is not a distinct thing but is only the moving object and an intermediary "sensible species" is not needed to transmit an image of an object to the eye • Scholars such as Jean Buridan and Nicole Oresme started to reinterpret elements of Aristotle's mechanics • In particular, Buridan developed the theory that impetus was the cause of the motion of projectiles, which was a first step towards the modern concept of inertia • The Oxford Calculators began to mathematically analyze the kinematics of motion, making this analysis without considering the causes of motion

Oxford Calculators

• The Oxford Calculators were a group of 14th-century thinkers, almost all associated with Merton College, Oxford • These men took a strikingly logico-mathematical approach to philosophical problems. – The advances these men made were initially purely mathematical but later became relevant to mechanics. They used Aristotelian logic and physics. – They also studied and attempted to quantify every physical and observable characteristic, like heat, force, color, density, and light. – Aristotle believed that only length and motion were able to be quantified. But they used his philosophy and proved it untrue by being able to calculate things such as temperature and power.

Black Death

• In 1348, the Black Death and other disasters sealed a sudden end to philosophic and scientific development(it was thought to have come from ottoman because they were invading Europe) (it was seen Anatolia,ottoman as well.)

Fall of Constantinople

• Rediscovery of ancient texts was stimulated by the Fall of Constantinople in 1453, when many Byzantine scholars sought refuge in the West • Meanwhile, the introduction of printing was to have great effect on European society • The facilitated dissemination(yayılma) of the printed word democratized learning and allowed ideas such as algebra to propagate more rapidly • These developments paved the way for the Scientific Revolution(Osmanlı zamanına kadar çiftçiler anadoluda köleydi ve kral ne derse yapmak zorundaydılar)(invention of the printing was the corner point, not reason, of the scientific revolution is invention of the printing)

Movement

• The renewal of learning in Europe began with 12th century Scholasticism. • The Northern Renaissance showed a decisive shift in focus from Aristotelian natural philosophy to chemistry and the biological sciences (botany, anatomy, and medicine).

Modern Science in Europe

• Modern science in Europe was resumed in a period of great upheaval: – the Protestant Reformation – Catholic Counter-Reformation – The discovery of the Americas by Christopher Columbus – The Fall of Constantinople – The re-discovery of Aristotle during the Scholastic period indicated large social and political changes(catholic = marriage is a sin / protestant = marriage is good)

Northern Renaissance

• Renaissance that occurred in Europe north of the Alps • From the last years of the 15th century, its Renaissance spread around Europe

Copernicus

• Nicolaus Copernicus published a formulated model of the universe that placed the Sun rather than the Earth at the center of the universe in his book De revolutionibus orbium coelestium (On the Revolutions of the Heavenly Spheres), in 1543. • The book was dedicated to Pope Paul III, who was known for his interests in astronomy. • In 1616, the Roman Inquisition's consultants judged the proposition that the sun is immobile and at the center of the universe and that the Earth moves around it, to be "foolish and absurd in philosophy" and that the first was "formally heretical(inanışa ters düşen)" while the second was "at least erroneous in faith".

Italian Renaissance

• A period in the Italian history that covered the 15th and 16th centuries, spreading across Europe and marking the transition from the Middle Ages to Modernity • Began in Tuscany (Central Italy), and was centred in the city of Florence • Florence, one of the several city-states of the peninsula, rose to economic and political prominence by providing credit for European monarchs and laying down the groundwork for capitalism and banking • The Renaissance later spread to Venice, heart of a mediterranean empire and in control of the trade routes with the east since the participation in the crusades and the voyages of Marco Polo, where the remains of ancient Greek culture were brought together and provided humanist scholars with new texts(it was more about ships and trade in mediterranean and rest of the world

Italian Renaissance

• The Italian Renaissance is best known for its achievements in painting, architecture, sculpture, literature, music, philosophy, science and technology, and exploration

Galileo Galilei (1564 –1642 )

• Italian astronomer, physicist and engineer, sometimes described as a polymath, from Pisa • "father of observational astronomy " • "father of modern physics " • "father of the scientific method " • "father of modern science "

Galileo

• Although Galileo seriously considered the priesthood as a young man, at his father's urging he instead enrolled in 1580 at the University of Pisa for a medical degree • Galileo had deliberately been kept away from mathematics, since a physician earned a higher income than a mathematician. • However, after accidentally attending a lecture on geometry, he talked his reluctant father into letting him study mathematics and natural philosophy instead of medicine

Copernican Heliocentrism - 1543

• This model positioned the Sun at the center of the Universe, motionless, with Earth and the other planets orbiting around it in circular paths, modified by epicycles, and at uniform speeds. • The Copernican model displaced the geocentric model of Ptolemy that had prevailed for centuries, which had placed Earth at the center of the Universe. • Copernican heliocentrism is often regarded as the launching point to modern astronomy and the Scientific Revolution.

Ptolemaic system • The prevailing astronomical model of the cosmos in Europe in the 1,400 years leading up to the 16th century was the Ptolemaic System, a geocentric model created by the Roman citizen Claudius Ptolemy in his Almagest, dating from about 150 CE. • Throughout the Middle Ages it was spoken of as the authoritative text on astronomy, although its author remained a little understood figure frequently mistaken as one of the Ptolemaic rulers of Egypt

Dispute with Church

• By 1615, Galileo's writings on heliocentrism had been submitted to the Roman Inquisition by Father Niccolò Lorini, who claimed that Galileo and his followers were attempting to reinterpret the Bible

Note: The Roman Inquisition, formally the Supreme Sacred Congregation of the Roman and Universal Inquisition, was a system of tribunals developed by the Holy See of the Roman Catholic Church, during the second half of the 16th century, responsible for prosecuting individuals accused of a wide array of crimes relating to religious doctrine or alternative religious doctrine or alternative religious beliefs. ( Anyone trying to say something was punished because it was against the ongoing church.)

Final Years of Galileo – 1638 publishing

\*\*\* published in 1638 was Galileo Galilei's final book and a scientific testament covering much of his work in physics over the preceding thirty years. It was written partly in Italian and partly in Latin.(it is a mathematical book)(it is a printed book, printing is available)

Spread

• Universities and the printed book helped spread the spirit of the age through France, the Low Countries and the Holy Roman Empire, and then to Scandinavia and finally Britain by the late 16th century. • Writers and humanists such as Rabelais, Pierre de Ronsard and Desiderius Erasmus were greatly influenced by the Italian Renaissance model and were part of the same intellectual movement.

Spread

• During the English Renaissance (which overlapped with the Elizabethan era) writers such as William Shakespeare and Christopher Marlowe composed works of lasting influence. • The Renaissance was brought to Poland directly from Italy by artists from Florence and the Low Countries, starting the Polish Renaissance.

Political Effects in Europe

• A suitable environment was created in which it became possible to question scientific doctrine, in much the same way that Martin Luther and John Calvin questioned religious doctrine • The works of Ptolemy (astronomy) and Galen (medicine) were found not always to match everyday observations. • Work by Vesalius on human cadavers found problems with the Galenic view of anatomy( when people study science, there are some political consequences)

Scientific Revolution in Europe

• Scientific Revolution is traditionally held by most historians to have begun in 1543, when the books De humani corporis fabrica (On the Workings of the Human Body) by Andreas Vesalius, and also De Revolutionibus, by the astronomer Nicolaus Copernicus, were first printed. • The thesis of Copernicus' book was that the Earth moved around the Sun. • The period culminated(en yüksek noktaya varmak) with the publication of the Philosophiæ Naturalis Principia Mathematica in 1687 by Isaac Newton, representative of the unprecedented(eşi benzeri görülmemiş)growth of scientific publications throughout Europe

More..

• Edmond Halley, Robert Hooke, Christiaan Huygens, Tycho Brahe, Johannes Kepler, Gottfried Leibniz, and Blaise Pascal. • In philosophy, major contributions were made by Francis Bacon, Sir Thomas Browne, René Descartes, and Thomas Hobbes. • The scientific method was also better developed as the modern way of thinking emphasized experimentation and reason over traditional considerations.

Age of Enlightenment

• The 17th century brought decisive steps towards modern science, which accelerated during the 18th century. • A critical innovation was the creation of permanent scientific societies in the major , and their scholarly journals, which dramatically speeded the diffusion(yayılma) of new ideas. • Typical was the founding of the Royal Society in London in 1660.

Progress

• Directly based on the Works of Newton, Descartes, Pascal and Leibniz, the way was now clear to the development of modern mathematics, physics and technology by the generation of Benjamin Franklin (1706–1790), Leonhard Euler (1707–1783), Mikhail Lomonosov (1711–1765) and Jean le Rond d'Alembert (1717–1783). • Denis Diderot's Encyclopédie, published between 1751 and 1772 brought this new understanding to a wider audience

Philosophical progress

• The impact of this process was not limited to science and technology, but affected philosophy (Immanuel Kant, David Hume), religion (the increasingly significant impact of science upon religion), and society and politics in general (Adam Smith, Voltaire). • The early modern period is seen as a flowering of the European Renaissance, in what is often known as the Scientific Revolution, viewed as a foundation of modern science(philosophical progress and scientific progress are related to each other, very tightly.)

Progress through institutions

• Philosophers and scientists of the period widely circulated their ideas through meetings at scientific academies, Masonic lodges, literary salons, coffeehouses and in printed books, journals, and pamphlets • The ideas of the Enlightenment undermined the authority of the monarchy and the Catholic Church and paved the way for the political revolutions of the 18th and 19th centuries • A variety of 19th-century movements, including liberalism and neoclassicism, trace their intellectual heritage to the Enlightenment

Progress through institutions

• The Enlightenment included a range of ideas centered on the sovereignty of **reason and the evidence of the senses as the primary sources of knowledge** and **advanced ideals such as liberty, progress, toleration, fraternity, constitutional government and separation of church and state** • In France, the central doctrines of the Enlightenment philosophers were individual liberty and religious tolerance, in opposition to an absolute monarchy and the fixed dogmas of the Church.

Progress through institutions

• **The Enlightenment was marked by an emphasis on the scientific method and reductionism**,(karmaşık bir fikir veya konuyu küçültme veya çarpıtma yoluyla aşırı basitleştirme) along with increased questioning of religious orthodoxy (an attitude captured by Immanuel Kant's essay Answering the Question: What is Enlightenment)

Kant: What is Enlightenment

• Kant's opening paragraph of the essay is a much-cited definition of a lack of enlightenment as people's inability to think for themselves due not to their lack of intellect, but lack of courage. • Kant's essay also addressed the causes of a lack of enlightenment and the preconditions necessary to make it possible for people to enlighten themselves. • He held it necessary that all church and state paternalism be abolished and people be given the freedom to use their own intellect

Luigi Galvani

• In 1780, he and his wife Lucia discovered that the muscles of dead frogs' legs twitched when struck by an electrical spark • He is recognized as the pioneer of bioelectromagnetics

Alessandro Volta

• invented the Voltaic pile in 1799, and reported the results of his experiments in 1800 in a two-part letter to the President of the Royal Society • With this invention Volta proved that electricity could be generated chemically and debunked(çürütmek) the prevalent(yaygın) theory that electricity was generated solely by living beings • Volta's invention sparked a great amount of scientific excitement and led others to conduct similar experiments which eventually led to the development of the field of electrochemistry

(In Europe kings were interested in science because it might used in military.) (pil kimyasal madde yığınından oluşmuş bir maddedir. Bu yüzden “volta pile” denir.)

Encyclopédie

• General encyclopedia published in France between 1751 and 1772, with later supplements, was edited by Denis Diderot • The Encyclopédie is most famous for representing the thought of the Enlightenment.

Encyclopedie

• Extract from the frontispiece of the Encyclopédie (1772). It was drawn by Charles-Nicolas Cochin and engraved by Bonaventure-Louis Prévost. • The work is laden with symbolism: The figure in the centre represents truth—surrounded by bright light (the central symbol of the Enlightenment). • Two other figures on the right, reason and philosophy, are tearing the veil from truth. \*\*\* 28 volumes, with 71,818 articles and 3,129 illustrations. The first seventeen volumes were published between 1751 and 1765; eleven volumes of plates were finished by 1772. Engraver Robert Bénard provided at least 1,800 plates for the work. • The Encyclopédia sold 4,000 copies during its first twenty years of publicationé and earned a profit of 2 million livres for its investors. • Because of its occasional radical contents, the Encyclopédie caused much controversy in conservative circles, and on the initiative of the Parlement of Paris, the French government suspended the encyclopedia's privilège in 1759 • Interestingly enough, the Encyclopédie had also been banned 1752 after publication of the second volume. • Despite these issues, work continued "in secret," partially because the project had highly placed supporters, such as Malesherbes and Madame de Pompadour • The authorities deliberately ignored the continued work; they thought their official ban was sufficient to appease the church and other enemies of the project.

Stats of Encyclopedie • 17 volumes of articles, issued from 1751 to 1765 • 11 volumes of illustrations, issued from 1762 to 1772 • 18,000 pages of text • 75,000 entries • 44,000 main articles • 28,000 secondary articles • 2,500 illustration indices • 20,000,000 words in total • Print run: 4,250 copies (very large for that time)

Progess of Technology wrto Science

• Mezopotamia, Egypt, China, India • Mediterrenean, Roman, Greek • South America Inca, Maya.. • Islamic World

there is difference between technology

00:56

and science technology is the

00:59

application of the science

01:01

science includes philosophy and

01:03

mathematics astronomy etc but technology

01:06

is more into

01:08

daily

01:09

fulfilling the daily needs providing

01:13

tools and techniques for

01:16

for the actual life

01:18

usable techniques

01:21

in terms of philosophy

01:23

it is kind

01:24

of significantly different

01:27

because technology

01:30

is more materialistic

Islamic World

• Hydropower • Wind power • Mills • Paper making • Spinning Wheel • Automated flute player – invented by the Banu Musa brothers • Al-Jazari invented programmable automata/robots.

on the other hand

01:39

science

01:40

is mostly due to curiosity

01:43

not for

01:44

uh selling something not for solving a

01:47

particular day day-to-day problem

01:50

although they are related

01:54

technology examples are seen in

01:56

mesopotamia egypt china india

02:00

greek and roman places in mediterranean

02:04

islamic world south america

02:07

also have seen some technology

02:10

technological advancements

02:17

in the for example

02:19

in the islamic world

02:30

there was

02:32

hydropower wind power mills

02:35

sailman

02:36

paper making

02:38

spinning wheel like the one that lady

02:41

uses

02:43

automated

02:44

instruments automated music players

02:48

and

02:49

simple robots robotic

02:52

automated behaviors of machines

02:54

driven usually by

02:57

clockwork

03:00

or

03:03

water power

03:05

so using water power

03:07

uh lgz for example invented programmable

03:11

robots

03:13

so that you can change the behavior of

03:15

the robot by

03:17

turning on and off certain places by

03:19

switching certain places so the behavior

03:21

changes automatic behavior changes

Medieval Technology

• Mechanical clocks, spectacles and vertical windmills • Medieval ingenuity was also displayed in the invention of seemingly inconspicuous items like the watermark or the functional button • In navigation, the foundation to the subsequent age of exploration was laid by the introduction of pintle-andgudgeon rudders, lateen sails, the dry compass, the horseshoe and the astrolabe.

in the uh in the medieval technology

03:31

clocking clocks were

03:33

and still work and clock is

03:35

was interesting

03:37

mechanical clocks spectacles and

03:39

vertical windmills

03:44

with

03:51

[Music]

03:55

with a

03:57

with human power or animal power or

04:00

water power

04:01

or

04:03

clock power

04:06

till steel

04:08

spring power

04:11

became popular

04:15

ingenious people

04:16

were

04:18

made

04:18

things

04:24

like

04:25

some items were

04:28

found like watermark or the watermark or

04:31

the function functional button

04:36

when the button is pressed

04:38

some operation is performed button

04:41

pressed different button is pressed

04:43

another function is executed so

04:45

like cyber teams we have been talking

04:48

buttons are connected to certain

04:50

functions or arms certain functions

04:55

furthermore

04:58

science and technology

05:00

driven

05:02

partly by

05:03

navigation

05:05

navigation and see

05:07

a

05:13

and sea exploration means ship

05:16

technology

05:17

chip technology included sails

05:20

compass rudders

05:23

as to love

05:25

and

05:26

furthermore exploration with the

05:29

regular uh horses

05:32

included technologies like horseshoe

05:37

technological advancement

05:43

also the

05:45

armory

05:46

where people wear

05:49

during the fight

Medieval Technology

• Significant advances were also made in military technology with the development of plate armour, steel crossbows and cannon. • The Middle Ages are perhaps best known for their architectural heritage • While the invention of the rib vault and pointed arch gave rise to the high rising Gothic style, the ubiquitous medieval fortifications gave the era the almost proverbial title of the 'age of castles'.

while the invention of the rip vault

07:14

revolt

07:20

rise to the high rise in gothic style

07:22

ubiquitous medieval fortifications gave

07:24

the era the almost

07:26

proverbial title of age of castles so

07:29

castles were made

07:30

castles were built during medieval times

07:35

because of

07:38

local protection of certain people

07:40

for castle technology castle making

07:42

technology with opening doors gates etc

07:45

are made with the

07:47

defense mechanisms

Paper making

• Papermaking, a 2nd-century Chinese technology, was carried to the Middle East when a group of Chinese papermakers were captured in the 8th century. • Papermaking technology was spread to Europe by the Umayyad conquest of Hispania. • A paper mill was established in Sicily in the 12th century. In Europe the fiber to make pulp for making paper was obtained from linen and cotton rags. • Lynn Townsend White Jr. credited the spinning wheel with increasing the supply of rags, which led to cheap paper, which was a factor in the development of printing

Renaissance technology

• Set of European artifacts and inventions which spread through the Renaissance period, roughly the 14th century through the 16th century. • The era is marked by profound technical advancements such as the printing press, linear perspective in drawing, patent law, double shell domes and bastion fortresses. • Sketchbooks from artisans of the period (Taccola and Leonardo da Vinci, for example) give a deep insight into the mechanical technology then known and applied. • Renaissance science spawned the Scientific Revolution; science and technology began a cycle of mutual advancement

technological people

12:03

uh inventors

12:04

draw a lot of mechanical mechanical

12:06

devices and inventions some of them are

12:10

unimplemented

12:12

in papers

12:15

drawing and inventing certain things

12:18

were

12:21

becoming

12:22

more and more uh found

12:25

a renaissance science

12:28

introduced to scientific revolution

12:30

science and technology began

12:32

psych began a cycle of a mutual

12:35

advancement before as i said

12:37

science and technology was kind of

12:39

different science was

12:41

more philosophy related

12:43

the technology was day to day like bread

12:46

making

salt making so chemical technologies or

12:52

gold extractors those are technologies

12:54

for daily routines or construction in

12:57

roman period for example

12:59

science was in roma science was not

13:03

that much

13:04

advanced but technology was advanced so

13:07

they were building a lot of roads

13:11

buildings etc but they didn't think

13:13

about

13:15

life they didn't

13:16

try to understand

13:18

human body etc

13:21

or astronomy

13:26

but after renaissance science and

13:28

technology

13:29

came closer and they moved together

15th Century

• The technologies that developed in Europe during the second half of the 15th century were commonly associated by authorities of the time with a key theme in Renaissance thought: the rivalry of the Moderns and the Ancients. • Three inventions in particular - the printing press, firearms, and the nautical compass — were indeed seen as evidence that the Moderns could not only compete with the Ancients, but had surpassed them, for these three inventions allowed modern people to communicate, exercise power, and finally travel at distances unimaginable in earlier times.

crank and connecting rod

• The crank and connecting rod mechanism which converts circular into reciprocal motion is of utmost importance for the mechanization of work processes; it is first attested for Roman water-powered sawmills. • During the Renaissance, its use is greatly diversified and mechanically refined; now connecting-rods are also applied to double compound cranks, while the flywheel is employed to get these cranks over the 'dead-spot’ • Early evidence of such machines appears, among other things, in the works of the 15th-century engineers Anonymous of the Hussite Wars and Taccola

so something is rotating

17:13

when something is rotating

17:17

some arm is connected

17:22

so as this rotates

17:25

the arm goes

17:27

back and forth

17:29

or up and down

17:30

so

17:31

rotational motion is converted to

17:37

linear motion or vice versa

17:40

that is what we call crank and the

17:42

connecting rod

crank and connecting rod

• From then on, cranks and connecting rods become an integral part of machine design and are applied in ever more elaborate ways: – Agostino Ramelli's The Diverse and Artifactitious Machines of 1588 depicts eighteen different applications, a number which rises in the 17th-century Theatrum Machinarum Novum by Georg Andreas Böckler to forty-five.

Printing press

• The introduction of the mechanical movable type printing press by the German goldsmith Johannes Gutenberg (1398–1468) is widely regarded as the single most important event of the second millennium, and is one of the defining moments of the Renaissance. • The Printing Revolution which it sparks throughout Europe works as a modern "agent of change" in the transformation of medieval society

one of the defining moments of the

21:41

renaissance printing revolution that

21:43

sparks throughout europe works of a

21:44

modern agent of change parenting

21:47

revolution

21:48

in the transformation of medieval

21:50

society for transformation of medieval

21:52

society to

21:54

renaissance was

21:56

ignited by

21:58

the

21:59

printing press

worker classes started to read

23:00

and they started to think

23:02

when they started to think

23:04

they started to disobey

23:07

to christian church because christian

23:10

church was very

23:12

powerful on the

23:13

peasants

23:15

in germany

Printing press effects

• The relatively free flow of information transcends borders and induced a sharp rise in Renaissance literacy, learning and education; the circulation of (revolutionary) ideas among the rising middle classes, but also the peasants, threatens the traditional power monopoly of the ruling nobility and is a key factor in the rapid spread of the Protestant Reformation. • The dawn of the Gutenberg Galaxy, the era of mass communication, is instrumental in fostering the gradual democratization of knowledge which sees for the first time modern media phenomena such as the press or bestsellers emerging. • The prized incunables, which are testimony to the aesthetic taste and high proficient competence of Renaissance book printers, are one lasting legacy of the 15th century.

Newspaper

• The 16th century sees a rising demand for up-to-date information which can not be covered effectively by the circulating hand-written newssheets. For "gaining time" from the slow copying process, Johann Carolus of Strassburg is the first to publish his German- language Relation by using a printing press (1605). • In rapid succession, further German newspapers are established in Wolfenbüttel (Avisa Relation oder Zeitung), Basel, Frankfurt and Berlin. • From 1618 onwards, enterprising Dutch printers take up the practice and begin to provide the English and French market with translated news. • By the mid-17th century it is estimated that political newspapers which enjoyed the widest popularity reach up to 250,000 readers in the Holy Roman Empire, around one quarter of the literate population

so 16th century sees rising demand for

24:49

up-to-date information that cannot be

24:52

covered effectively by circulating the

24:54

handwritten news sheets

Mining

• Water powered mine hoist to raise mine ore 1556

Mechanical Devices

• Books of the Renaissance artistengineers such as Taccola and Leonardo da Vinci give a deep insight into the mechanical technology then known and applied

Age of Exploration

• An improved sailing ship, the (nau or carrack), enabled the Age of Exploration with the European colonization of the Americas • Pioneers like Vasco da Gama, Cabral, Magellan and Christopher Columbus explored the world in search of new trade routes for their goods and contacts with Africa, India and China to shorten the journey compared with traditional routes overland. • They produced new maps and charts which enabled following mariners to explore further with greater confidence. • Navigation was generally difficult, however, owing to the problem of longitude and the absence of accurate chronometers. • European powers rediscovered the idea of the civil code(medeni kanun), lost since the time of the Ancient Greeks.

compass

31:18

sailing long distances

31:22

was

31:22

becoming

31:24

possible

31:26

that

31:27

led to european colonization of

31:30

other continents

one americas south america north america

31:38

christopher etc

31:41

before they

31:43

traveled around the world

31:47

they found new routes too

31:52

china china was ready

31:54

china was like united states of

31:58

those

31:58

years in terms of production and gdp

First Industrial Revolution

• transition to new manufacturing processes in Europe and the United States, in the period from about 1760 to sometime between 1820 and 1840. • This transition included going from hand production methods to machines, new chemical manufacturing and iron production processes, the increasing use of steam power and water power, the development of machine tools and the rise of the mechanized factory system. • The Industrial Revolution also led to an unprecedented rise in the rate of population growth.

and development of machine tools and

34:04

rise of mechanic mechanized factory

34:06

system so the factory

34:10

concept

34:14

became

34:16

the fact

34:17

in first industrial revolution before

34:19

that everybody was producing something

34:22

at home

34:23

but after the first industrial

34:24

revolution factories were built because

34:27

production speed is increased at one

34:30

certain

34:31

mechanical setting and that is context

34:33

factory to fabricate things

before that people were unable to

34:41

feed themselves money was not

34:44

good enough so population was not rising

34:50

since people produced more

34:53

they were able to

34:55

get married more they were able to make

34:57

more child and the life

34:59

and the

35:00

because they were able to

35:02

buy more food

35:04

they were able to make more child so it

35:06

it also increased

35:08

the population

Textiles

• Textiles were the dominant industry of the Industrial Revolution in terms of employment, value of output and capital invested. • The textile industry was also the first to use modern production methods

textile

35:25

in the early times a textile was very

35:28

common in turkey on ottoman

35:31

and india

35:34

but

35:35

in the first industrial revolution

35:37

europe invented

35:40

a steam

35:42

machine supported textile

35:46

industry and modern production methods

35:50

so that

35:51

handmaking became slowly obsolete(modası geçmiş,eski)

35:55

because speed was not

35:57

fast enough

you see

38:35

there is a line here

38:40

at the ceiling

38:41

those ceiling lines are rods

38:45

and these are rotating drums

38:48

in the outside of the building

38:51

there is a steam engine or water mill

38:54

so there is a big rotating thing single

38:57

engine for the factory

38:58

so that power is distributed through

39:01

rotating ropes from the ceiling and this

39:04

each machine

39:07

gets the power from the ceiling

39:09

by

39:11

belts

39:15

so a single machine for the single steam

39:18

engine for the factory outside someone

39:20

is burning coal for the

39:22

but inside the factory

39:23

there is a there are lines at the

39:25

ceiling for power distribution

39:31

and then

39:33

these

39:35

weaving

39:42

these viewing machines

39:45

run

39:46

automatically

39:48

without a person that we have seen a few

39:50

minutes ago

that created especially in the united

39:57

kingdom is very significant

40:00

great power for selling to other

40:05

countries

Steam Engine

Machines-Steam-Iron

• Tools included the screw cutting lathe, cylinder boring machine and the milling machine. • Machine tools made the economical manufacture of precision metal parts possible, although it took several decades to develop effective techniques

Torna tezgahları [ağaç tornalama](https://tr.wikipedia.org/w/index.php?title=A%C4%9Fa%C3%A7_tornalama&action=edit&redlink=1" \o "Ağaç tornalama (sayfa mevcut değil)), [metal işleme](https://tr.wikipedia.org/wiki/Metal_i%C5%9Fleme), [metal sıvama](https://tr.wikipedia.org/w/index.php?title=Metal_s%C4%B1vama&action=edit&redlink=1), [termal püskürtme](https://tr.wikipedia.org/w/index.php?title=Termal_p%C3%BCsk%C3%BCrtme&action=edit&redlink=1" \o "Termal püskürtme (sayfa mevcut değil)), parça ıslahı ve cam işlemede kullanılır. Torna tezgahının en iyi bilinen tasarımı çanak çömlek yapımında çömlek çamurunu şekillendirmek için kullanılan [çömlekçi çarkı](https://tr.wikipedia.org/w/index.php?title=%C3%87%C3%B6mlek%C3%A7i_%C3%A7ark%C4%B1&action=edit&redlink=1" \o "Çömlekçi çarkı (sayfa mevcut değil))’dır. En uygun şekilde donatılmış tornalar aynı zamanda katı malzemeleri döndürerek düz silindirik yüzeylerin yapımında ve vida dişleri açmada veya [helis](https://tr.wikipedia.org/w/index.php?title=Helis&action=edit&redlink=1" \o "Helis (sayfa mevcut değil)) yüzeyler yapımında da kullanılır. Çıtalarla inanılmaz karmaşıklıkta üç boyutlu katılar yapılabilir.

GB(Great Britain)

• The Industrial Revolution began in Great Britain, and many of the technological innovations were of British origin • By the mid-18th century Britain was the world's leading commercial nation, controlling a global trading empire with colonies in North America and the Caribbean, and with major military and political hegemony on the Indian subcontinent, particularly with the proto-industrialised Mughal Bengal, through the activities of the East India Company. • The development of trade and the rise of business were among the major causes of the Industrial Revolution

 since britain was

46:09

ireland

46:10

great britain was an island country

46:12

they have to have ships

46:16

therefore it is

46:18

improved

46:19

over the years

46:25

since they were able to use they were

46:27

able to make good ships because they had

46:29

to

46:31

by mid 18th century

46:33

britain was holding

46:35

leading

46:37

commercial routes

Higher Standards

• The Industrial Revolution marks a major turning point in history; almost every aspect of daily life was influenced in some way. • In particular, average income and population began to exhibit unprecedented sustained growth. • Some economists have said the most important effect of the Industrial Revolution was that the standard of living for the general population in the western world began to increase consistently for the first time in history, although others have said that it did not begin to meaningfully improve until the late 19th and 20th centuries

some economists this is important some

48:49

economists said that most important

48:51

effect of industrial revolution was the

48:53

standard of living for the general

48:55

population

48:57

in western world began to increase

48:59

consistently population began to

49:01

increase consistency for the first time

49:03

in history

so industrial revolution

49:19

fed people

49:20

of europe

49:22

otherwise they were very poor

How was the factory system structured

• CENTRALIZED WORKPLACE – Rather than have individual workers spread out in their homes and workshops, the factory was a large central place where many workers came together to make products. – Factories were necessary because the machinery was expensive, large, and needed both power and many workers to be operated

this is interesting

49:31

the terms of

49:33

school

49:34

factory

49:36

factory housing

49:38

were invented during first industrial

49:40

revolution

49:42

people were

49:43

leaving

49:44

because it because

49:46

before they were living at home

49:48

they were working at home they were

49:50

doing some piece of work at home and

49:53

going back to bazaar and selling

49:55

but after factories machines were built

49:59

they thought they have to live closer to

50:02

factory

50:03

so factories and houses were

50:07

built together

50:08

like dormitories

and they thought there were childs what

50:14

will happen to childs

50:17

what would happen to children and they

50:19

invented school

50:22

for the elementary school etc so

50:25

care became an issue while the parents

50:28

were working

How was the factory system structured

• DIVISION OF LABOR – Different workers each have a specific task in making the product. – Each worker can specialize in one small task and doesn’t have to know how to make the entire product. – Many of the workers could be “unskilled” workers because they only needed to be taught one simple task that they would repeat over and over

How was the factory system structured

• STANDARDIZED PARTS – Different parts of a product were standardized. This meant they were built the same way and to the same measurements. – This concept eventually led to interchangeable parts where individual parts could easily be replaced and repaired

there were migration from villages to

53:34

cities

53:36

in the first

53:37

industrial revolution in england and

53:40

germany and netherlands

Iron Industry

• Bar iron was the commodity(alınıp satılan şey) form of iron used as the raw material for making hardware goods such as nails, wire, hinges, horse shoes, wagon tires, chains, etc. and for structural shapes. A small amount of bar iron was converted into steel. • Cast iron was used for pots, stoves and other items where its brittleness(kırılganlık) was tolerable. Most cast iron was refined and converted to bar iron, with substantial losses. Bar iron was also made by the bloomery process, which was the predominant iron smelting process until the late 18th century.

Iron Industry

• In the UK in 1720 there were 20,500 tons of cast iron produced with charcoal and 400 tons with coke. In 1750 charcoal iron production was 24,500 and coke iron was 2,500 tons. • In 1788 the production of charcoal cast iron was 14,000 tons while coke iron production was 54,000 tons. In 1806 charcoal cast iron production was 7,800 tons and coke cast iron was 250,000 tons

okay because you need high temperature

58:14

for

58:16

smelting

58:19

still 20 000 tons very big number

58:23

for those years

Child Labor

\*\*\* Child labor was a common practice throughout much of the Industrial Revolution. Estimates show that over 50% of the workers in some British factories in the early 1800s were under the age of 14. In the United States, there were over 750,000 children under the age of 15 working in 1870

in medieval times too

60:10

people were slaves basically there were

60:13

three people there were not free people

60:15

not three people regular peasants etc

60:18

they had to work so their children had

60:20

to also have to work they were working

60:23

in very bad conditions with the

60:25

industrial revolution child workforce

60:27

was considered as a very cheap labor

60:30

because

60:31

people were making families were making

60:34

a lot of children

60:36

and they were unable to feed them

60:39

so

60:40

they had to work and they worked in

60:43

miles because they were small children

60:45

were working working in mines and other

60:48

processes

60:56

in all parts of the industry

Social Movements and Reforms

worker classes worker classes were very

62:07

poor whereas businessmen

62:10

are gaining a lot of

62:13

wealth and power

62:16

that will that lets that will lead to

62:19

worker movements

62:21

and

62:25

asking for more payments

62:29

Slow Down

• An economic recession occurred from the late 1830s to the early 1840s when the adoption of the Industrial Revolution's early innovations, such as mechanized spinning and weaving, slowed and their markets matured. • Innovations developed late in the period, such as the increasing adoption of locomotives, steamboats and steamships, hot blast iron smelting and new technologies, such as the electrical telegraph, widely introduced in the 1840s and 1850s, were not powerful enough to drive high rates of growth.

their markets matured

62:54

their markets increased and stabilized

62:56

so there was a slowing down

62:59

innovations developed in late

63:01

this period such as the increasing

63:03

adoptions of locomotives steamboats

63:05

steamships hot blast islands melting

63:08

iron smelting

63:10

and other technologies such as

63:12

electrical telegraph

63:14

widely introduced in the 1840s 50s were

63:16

not powerful enough to drive high rest

63:19

of growth

63:20

there were technological advancements

63:22

but growth rate

63:24

reduced because

63:26

they were unable to sell basically they

63:29

were unable to sell their goods to other

63:31

people

63:32

it's finished textile is finished

63:36

it was basically textile

63:45

so there was a

63:46

stabilization time

63:49

slowing down

63:51

that ends with

63:52

that ends

63:54

about first industrial revolution

Working conditions

further

64:59

accommodation of

65:01

women in workforce

65:03

was high

65:05

unlike

65:07

unlike the

65:08

ottoman case

Holland

Move forward

• Rapid economic growth began to occur after 1870, springing from a new group of innovations in what has been called the Second Industrial Revolution. • These innovations included new steel making processes, mass-production, assembly lines, electrical grid systems, the large-scale manufacture of machine tools and the use of increasingly advanced machinery in steam-powered factories.

electrical power and assembly lines

66:26

this underlying approach and electrical

66:29

power is

66:30

the key the rest is

66:35

important but not not that important

World Balance

europe increased united states little

67:24

bit increased

67:25

so

67:26

at the time of george washington and

67:29

whites and the colonization time

67:31

when british were invading

67:34

200 years british were invading

67:40

continental america mexico etc in french

67:43

also

67:46

they were only doing

67:47

farming or

67:49

they were just occupying those places

67:51

later they started production

67:55

for the production main production was

67:57

in europe

67:59

after the first

68:02

industrial revolution

68:03

rest of the world

68:06

diminished

68:08

significantly china

68:13

it didn't diminish it stayed the same

68:16

so the ratio became

68:18

insignificant

68:22

japan was also

68:24

something significant

68:28

and

68:29

it lost certain significant part of the

68:32

economic output one important thing

68:36

japan was also japan was a producing

68:39

country

even before

68:42

uh

68:45

second world war and first world war so

68:48

japan was an interesting country even

68:50

before so years before

68:52

japan was an important country

68:54

one interesting thing was with japan one

68:57

king

68:59

how to be called japanese king

69:02

emperor yeah japanese emperor said we

69:05

are not going to

69:07

make interaction with foreigners i think

69:10

in those years they closed connection

69:13

with the

69:14

dutch

69:16

sea

69:17

tradesmen

69:19

so they preserved their culture

69:21

i i think about 200 years or so

69:24

so it was internal development

69:28

they opened their doors to

69:31

rest of the world

69:32

after some emperor decides that that we

69:35

should

69:37

get interaction with the other countries

69:41

then they started interacting at that

69:43

time for example their clock system was

69:46

different last lecture i set them

69:52

their measurement system was also

69:54

different

Pollution

there were people dying every day due to

70:40

polishing

70:44

is also london

70:49

chimneys were very important figure of

70:52

city skyline chinese

70:55

factory chimneys

Post Newton Modern Science

• With the scientific revolution, paradigms established in the time of classical antiquity were replaced with those of scientists like Nicolaus Copernicus, Galileo Galilei, Christiaan Huygens and Isaac Newton • During the 19th century, the practice of science became professionalized and institutionalized in ways that continued through the 20th century. • As the role of scientific knowledge grew in society, it became incorporated with many aspects of the functioning of nation-states.

scientific revolution

71:28

first

71:30

classical antiquity greek time

71:33

ideas were replaced by the ones with

71:35

galileo copernic and newton

71:38

but after first industrial revolution

71:42

further studies are

71:44

done on top of that

71:46

so newton

71:48

for example

71:50

newton uh theories were also improved

71:52

and visited it

71:57

in 19th century 18 something something

72:00

practice of science became

72:01

professionalized

72:03

universities and institutions and

72:05

societies

72:07

in ways that it is continued through

72:09

20th century so through

72:11

through institutions

72:15

the role of scientific knowledge

72:16

grieving society

72:18

and then it became incorporated in many

72:20

aspects of the functioning nation-states

so nation-states

72:24

try to

72:27

establish their own

72:29

science

72:31

producing and technology-producing

72:33

institutions

72:35

not like chibi-tech and the national

72:37

science foundation but more like

72:39

universities and societies and

72:41

industrial societies etc more like

72:43

societies at the beginning

later

72:53

after galileo neutron etc

72:55

physics and chemistry

73:01

those

73:03

areas were studied in more detail

Physics

• Christiaan Huygens derived the centripetal and centrifugal forces and was the first to transfer mathematical inquiry to describe unobservable physical phenomena. • William Gilbert did some of the earliest experiments with electricity and magnetism, establishing that the Earth itself is magnetic. • In 1687, Isaac Newton published the **Principia Mathematica**, detailing two comprehensive and successful physical theories: Newton's laws of motion, which led to classical mechanics; and Newton's law of universal gravitation, which describes the fundamental force of gravity.

1687 newton published

73:34

his book principle mathematica you can

73:37

find it now

73:38

you can download it and read it if you

73:40

are interested

73:42

so it contains newton's law of motion

73:47

gravitation

73:48

and for and gravity and forces and

73:51

kinematics

73:52

all of them in one book principle

73:55

mathematically

Physics

• During the late 18th and early 19th century, the behavior of electricity and magnetism was studied by Luigi Galvani, • Giovanni Aldini, • Alessandro Volta, • Michael Faraday, • Georg Ohm, and others. – These studies led to the unification of the two phenomena into a single theory of electromagnetism, by James Clerk Maxwell (known as Maxwell's equations).

Beginning of 20th century

• The long-held theories of Newton were shown not to be correct in all circumstances. • Beginning in 1900, Max Planck, Albert Einstein, Niels Bohr and others developed quantum theories to explain various anomalous experimental results, by introducing discrete energy levels. • Not only did quantum mechanics show that the laws of motion did not hold on small scales, but the theory of general relativity, proposed by Einstein in 1915, showed that the fixed background of spacetime, on which both Newtonian mechanics and special relativity depended, could not exist.

Heisenberg & Schrodinger

• In 1925, Werner Heisenberg and Erwin Schrödinger formulated quantum mechanics, which explained the preceding quantum theories. • The observation by Edwin Hubble in 1929 that the speed at which galaxies recede positively correlates with their distance, led to the understanding that the universe is expanding, and the formulation of the Big Bang theory by Georges Lemaître.

galaxies move in a certain speed

77:47

galaxies move

77:49

at certain speed so their distance is

77:52

correlated with

77:53

their speed

77:55

so there might be a Big Bang

77:58

happened

78:01

five billion years ago or so

Bohr and Wheeler

• In 1938 Otto Hahn and Fritz Strassmann discovered nuclear fission with radiochemical methods, and in 1939 Lise Meitner and Otto Robert Frisch wrote the first theoretical interpretation of the fission process, which was later improved by Niels Bohr and John A. Wheeler. • Further developments took place during World War II, which led to the practical application of radar and the development and use of the atomic bomb.

Further Research

• Though the process had begun with the invention of the cyclotron by Ernest O. Lawrence in the 1930s, physics in the postwar period entered into a phase of what historians have called "Big Science", requiring massive machines, budgets, and laboratories in order to test their theories and move into new frontiers. The primary patron of physics became state governments, who recognized that the support of "basic" research could often lead to technologies useful to both military and industrial applications. • Currently, general relativity and quantum mechanics are inconsistent with each other, and efforts are underway to unify the two.

// Solvay Conference ‘den az biraz bahsetmiş.

so today

81:54

we worked in technology

81:57

rather than

81:58

science

81:59

so how technological advancements

82:02

were

82:05

happened and first industrial revolution