

# Creativity and Genius

## Inside the Minds of

Leonardo, Shakespeare, Newton, Beethoven, and Einstein



1452-1519

1564-1616

1642-1727

1770-1827

1879-1955

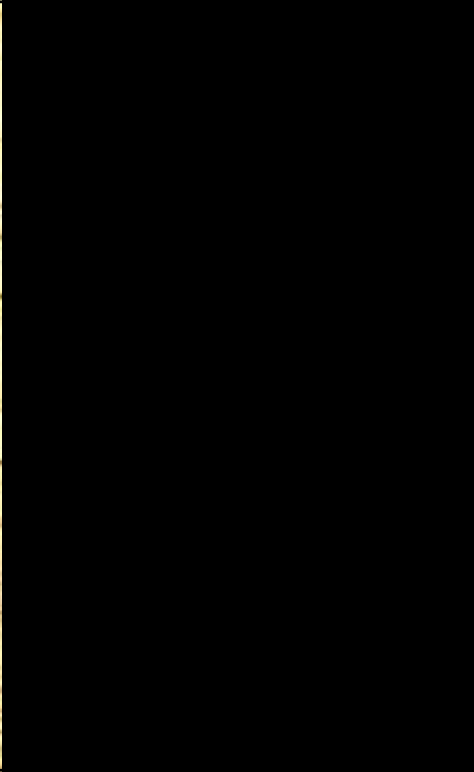
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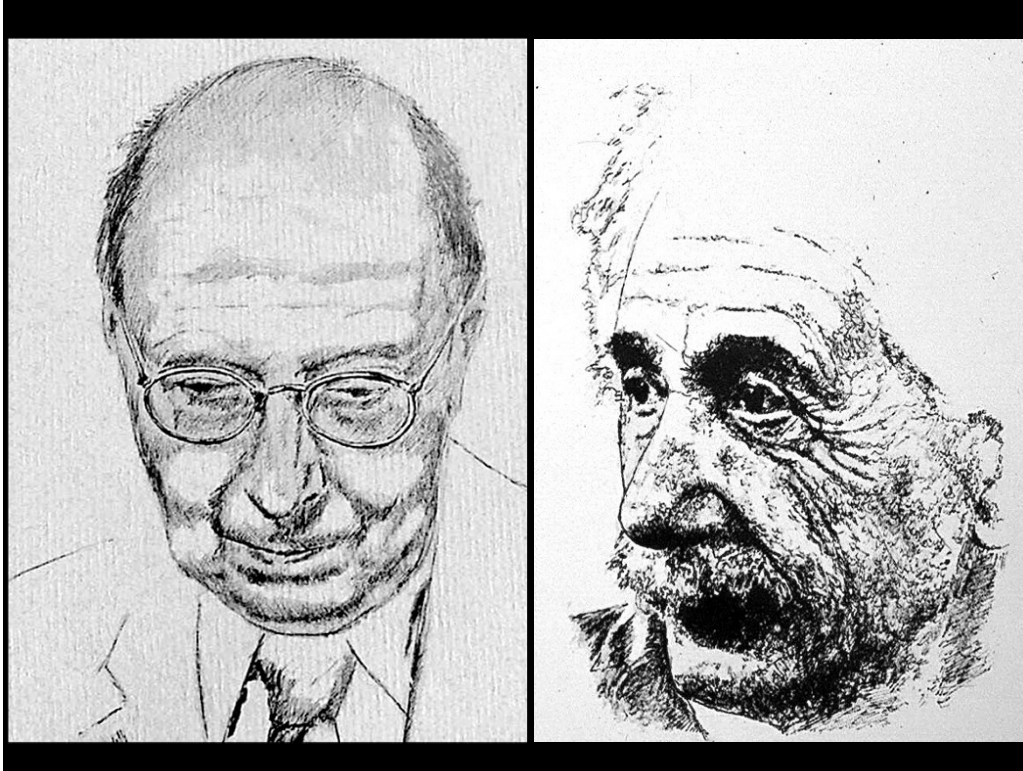
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43

52

Bulent Atalay • PICMET '16 Honolulu, Hawaii Sept 4-9/2016





- Ordinary vs. Transformative Genius
- Great Man Theory of History
- Zeitgeist Factor — Competition
  - Agents for Change
- Competition — Melding of Diverse Fields
- *The Parable of Laszlo Rätz*
- Age factor for reaching creative peak.
- A proclivity for artistic and scientific rebirths, “Miracle Years”
- Physical and psychological traits
- Overwhelming curiosity and drive
- “Tales of the Fifth Child”
- It takes a genius to recognize Genius
- Nature can be fooled... (Art)
- Nature can't be fooled... (Science)
- Einstein's Brain
- Mathematical Intuition  
Psychological Insight
- Overwhelming curiosity and drive
- Their own greatest critics
- The years 1564, 1642, 1879
- Inventing the Future — Test of Time

# Leonardo

*The Enigma of the Mona Lisa*

Born in Vinci, Tuscany

on April 15, 1452

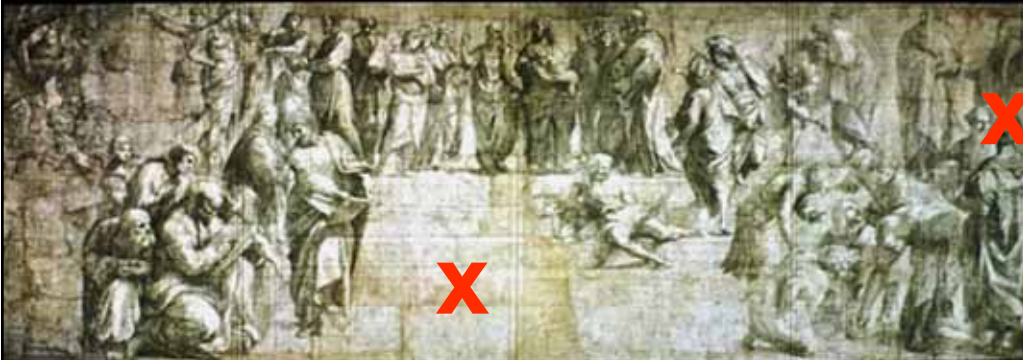
Died in Amboise, France

on May 2, 1519



5

Raphael, Cartoon for "The School of Athens" (c. 1510)

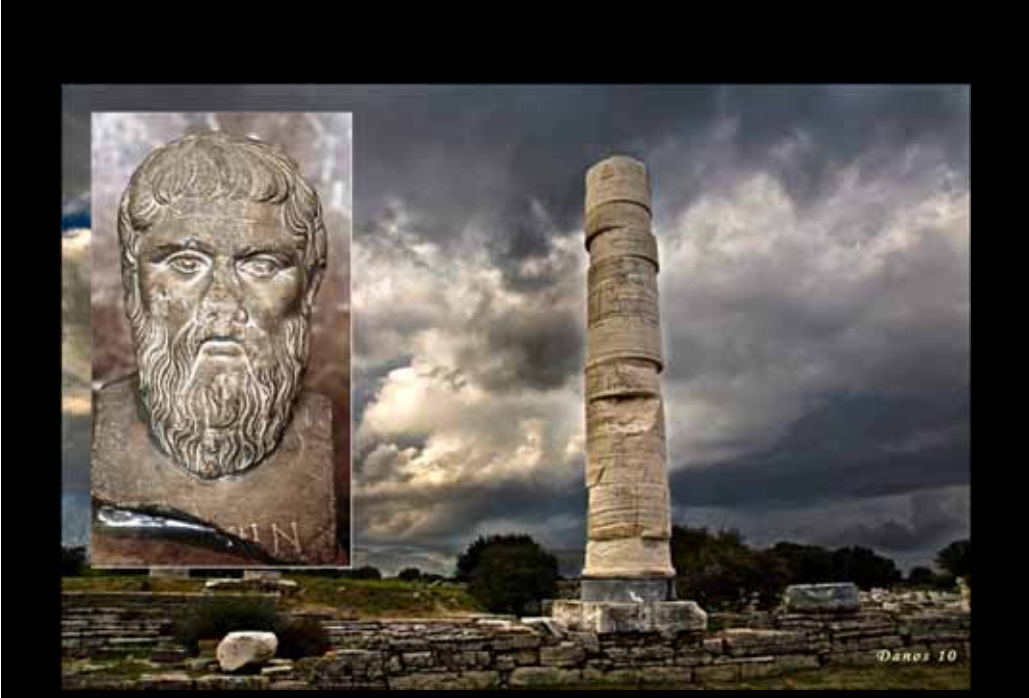


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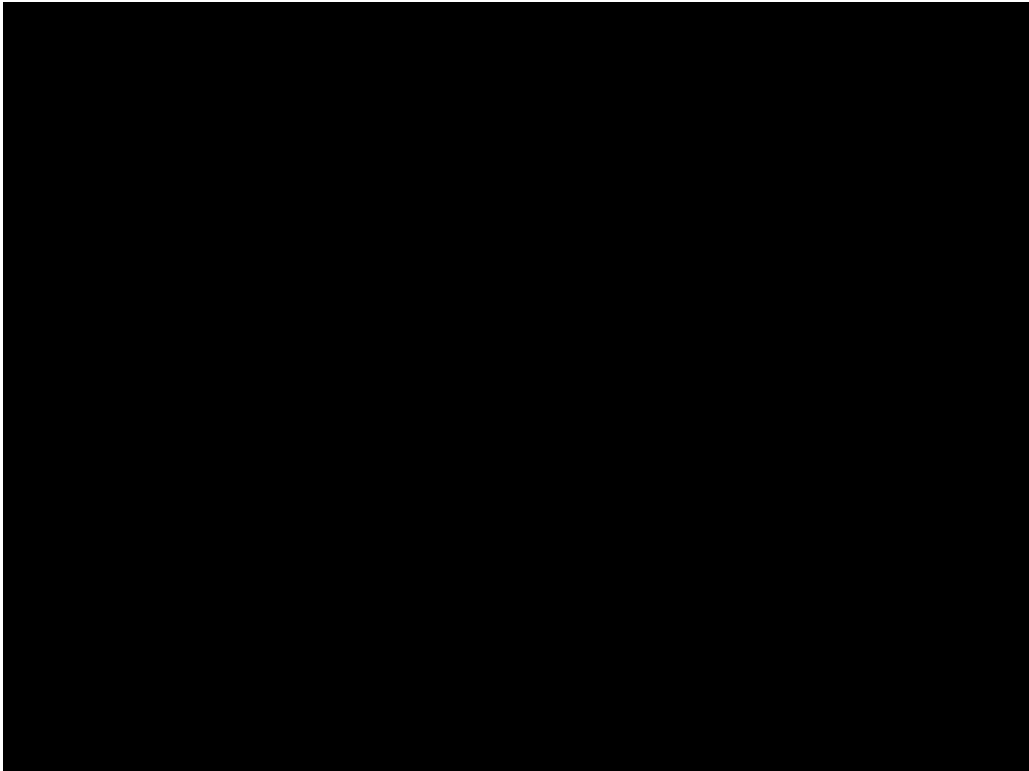
7



Pythagoras and Aristarchus of Samos

8

# “The Other Leonardo” Leonardo Fibonacci di Pisa



### The Golden Rectangle

1.0

0.5      1.118034

The ratio of the the sides:

# φ = 1.618034

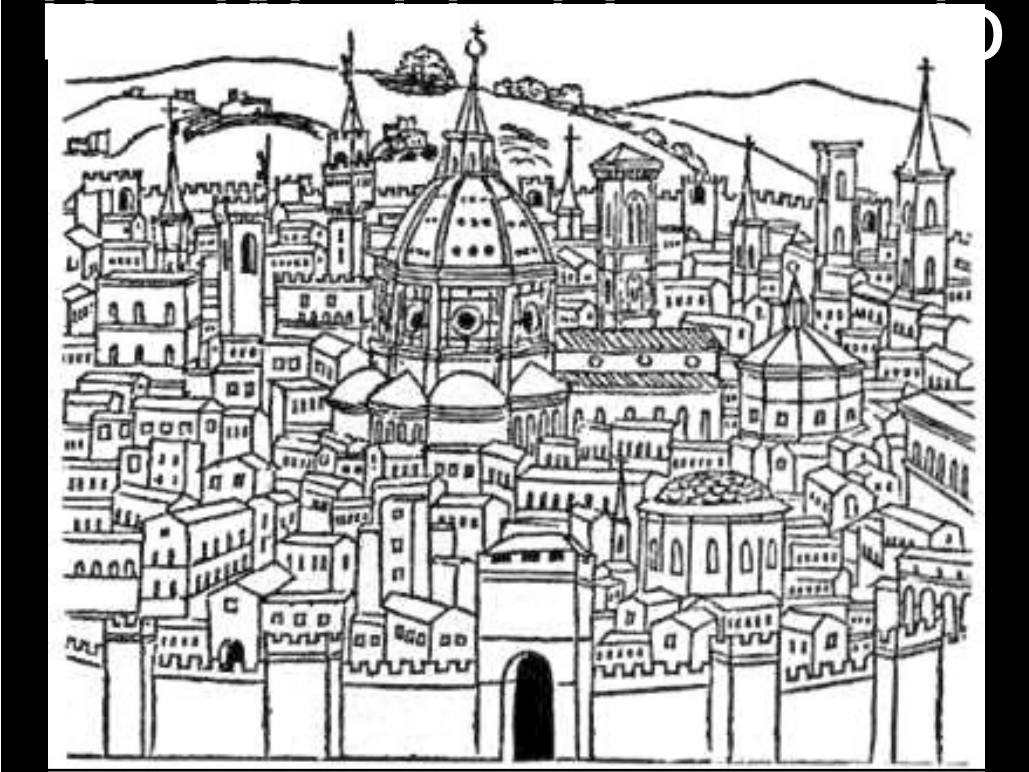
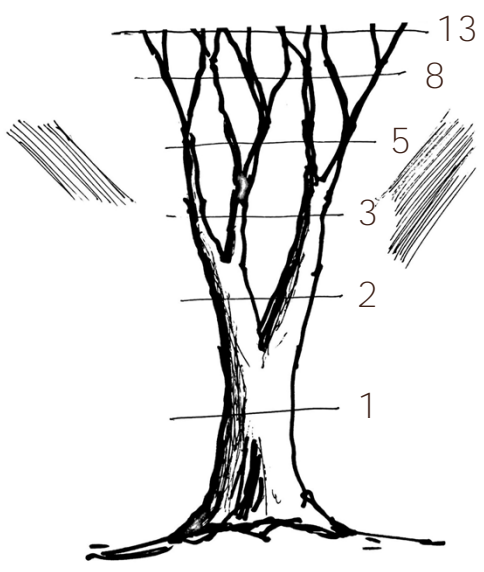
### Fibonacci Sequence

Jan												
Feb		1	1	2	3	5	8	13	21	34	55	89
March		1	1.5	2	2.33	3	3.77	5	6.10	9.87	15.97	
April												
May												
June												

2584... / 1597 = 1.618 φ

034... =

### Branching in trees





# Florence from Piazza Michelangelo









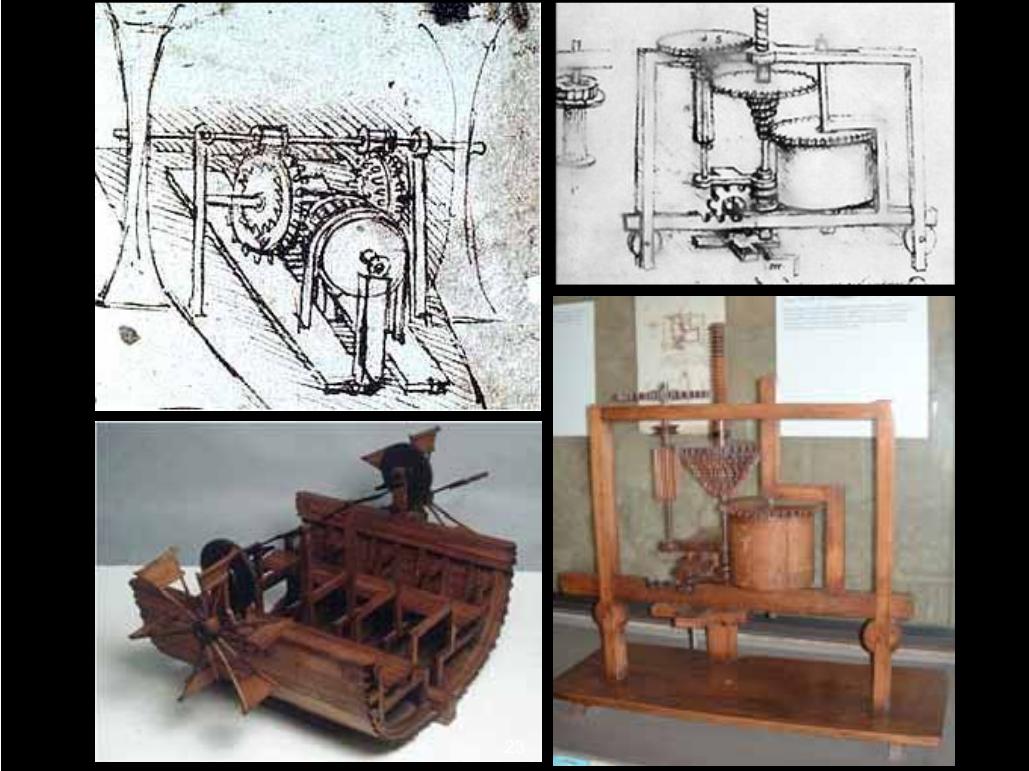
# David



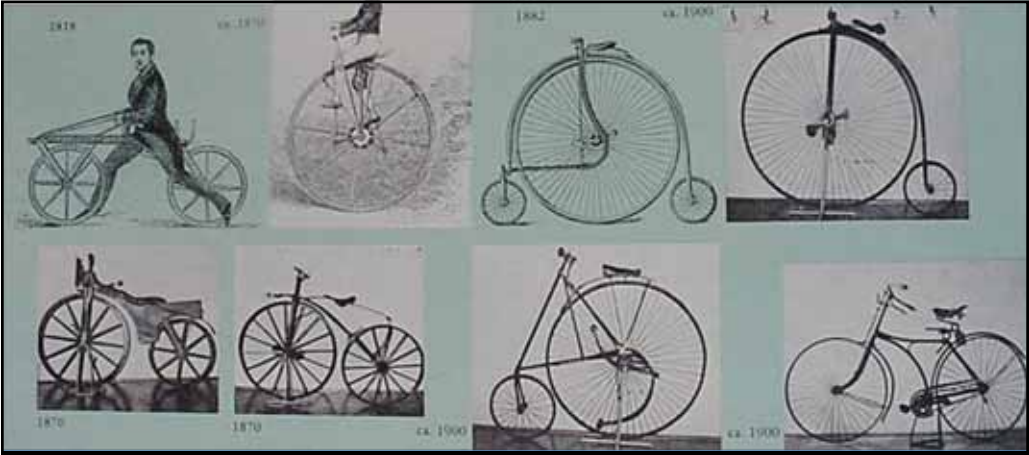
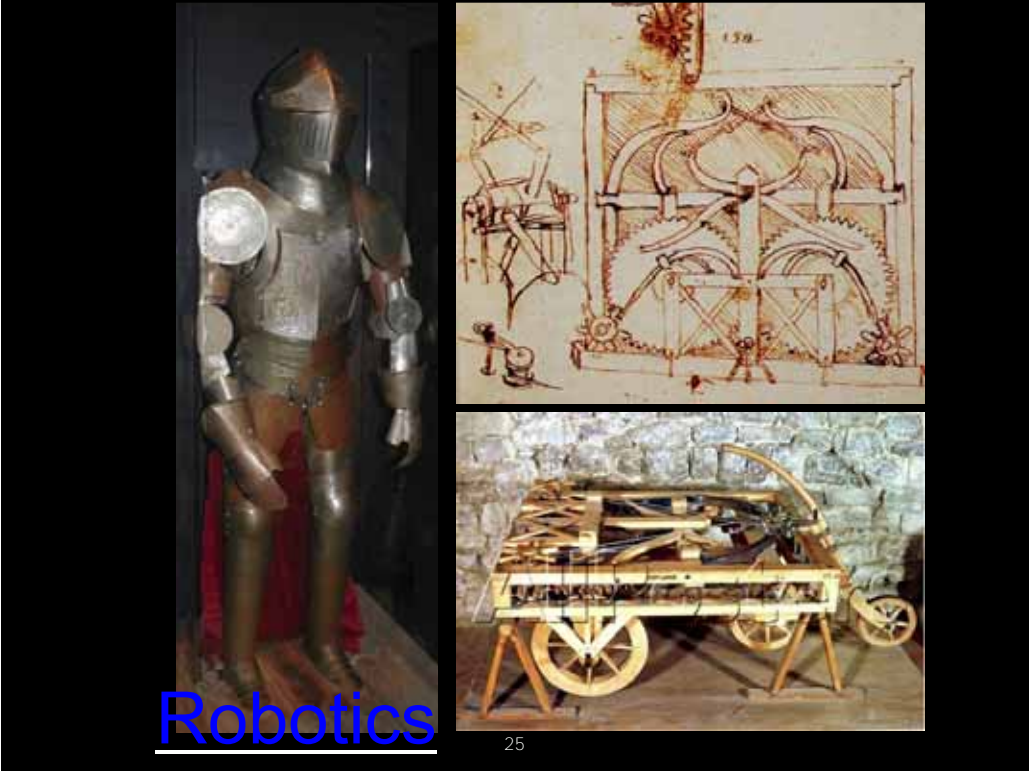


Milan (1482-1489)









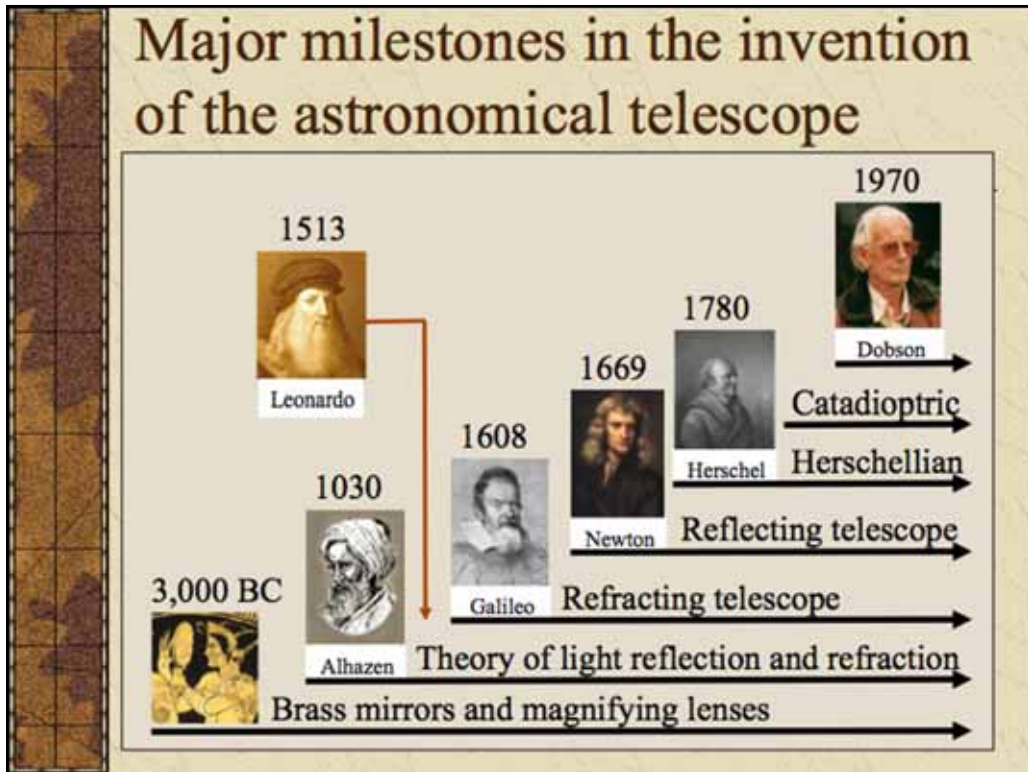
The evolution of the Bicycle  
1818 - 1895

- T rek 6. \$6,000 Competition bicycle
- Leonardo's Drawing of sprocket and chain (top right)
- T he design for a bicycle (Codex Madrid)

**Aeronautics**





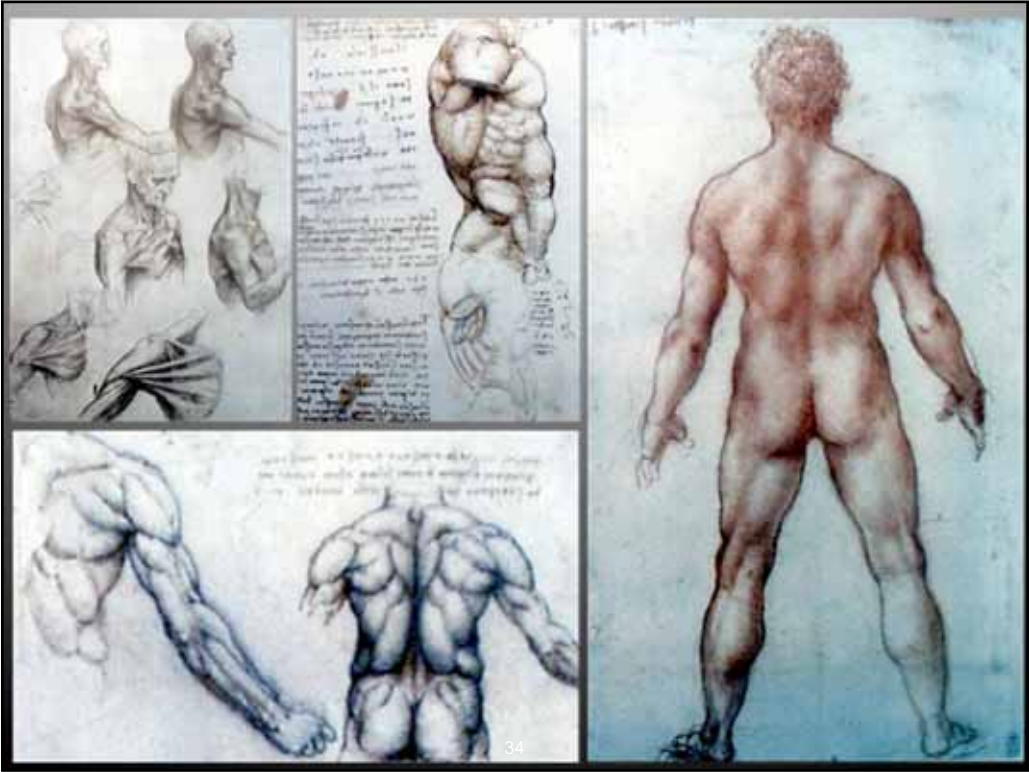
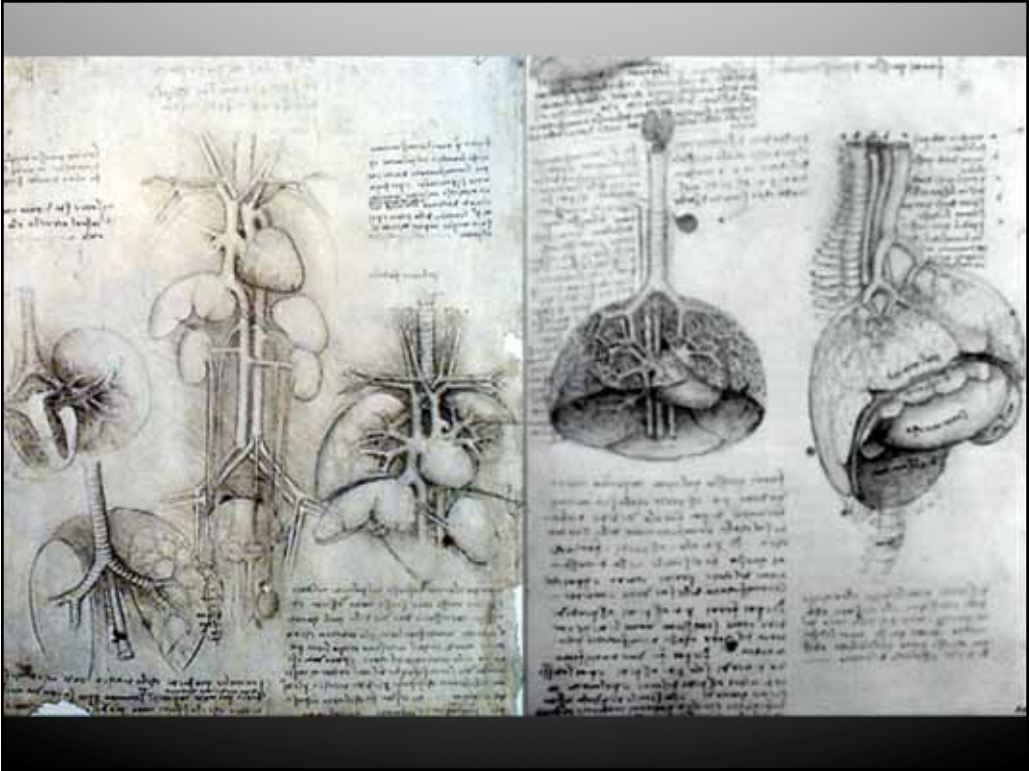


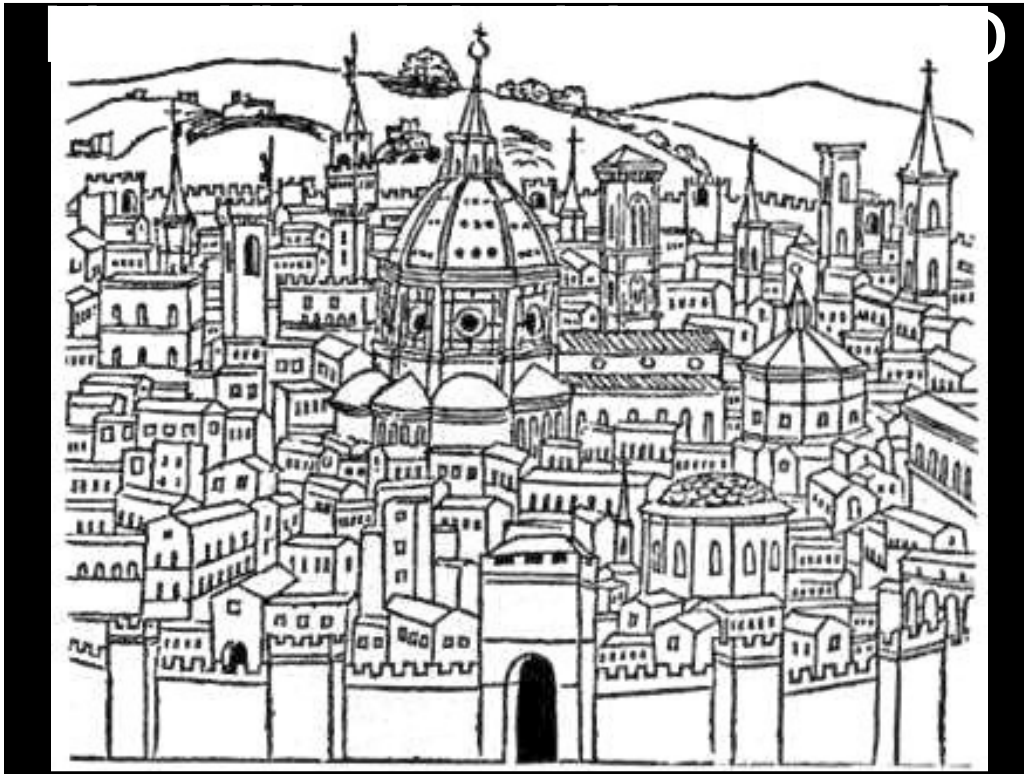
## Leonardo's drawing of the full moon

Modern telescope photograph

G. Reeves used this drawing to determine the lunar libration to  $\pm 2^\circ$ . He then calculated that the drawing was made in the early evening on Dec 12, 1513. The notebook is for 1513 -1514.







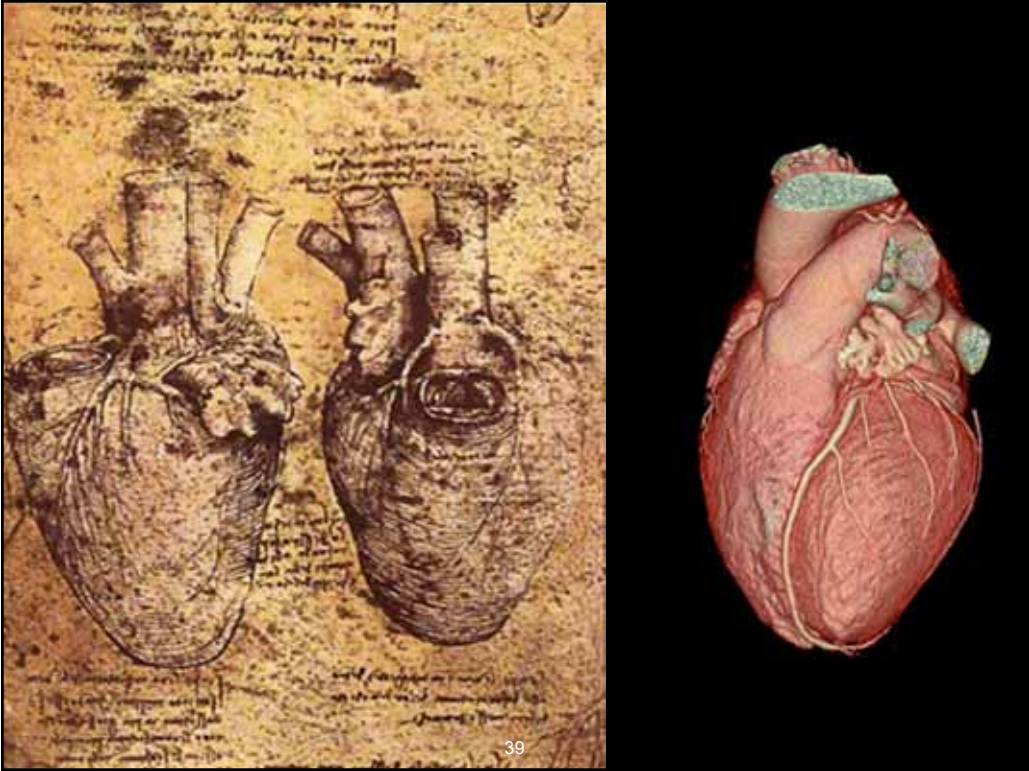
# Florence from Piazza Michelangelo







"In order to obtain an exact and complete knowledge, I have dissected more than ten human bodies, destroying all the various members, and removing even the smallest particles of the flesh which surrounded these veins without causing any effusion of blood other than the imperceptible bleeding of the capillary veins. And, as one single body did not suffice for a long time, it was necessary to proceed by stages with so many bodies as would render my knowledge complete and this I repeated twice over in order to discover the differences"



"Nature, being inconstant and taking pleasure in  
 creating and continually producing new forms,  
 because she knows that her terrestrial materials  
 are thereby augmented, is more ready and more  
 swift in her creating than in her destruction."  
 — Leonardo da Vinci

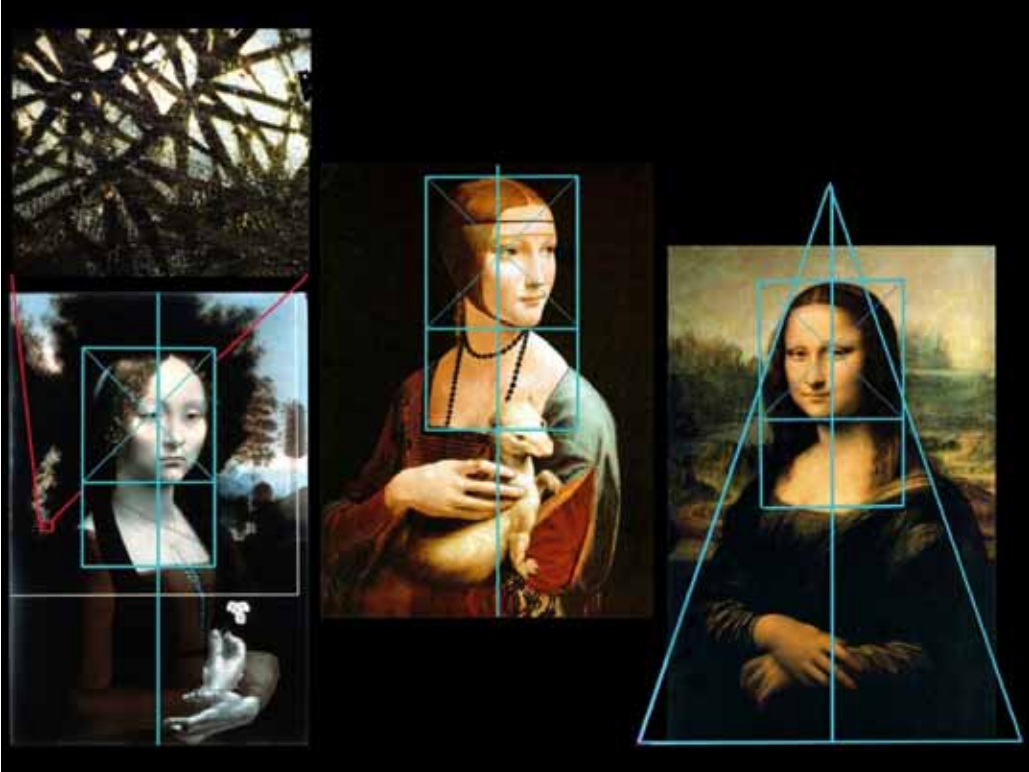
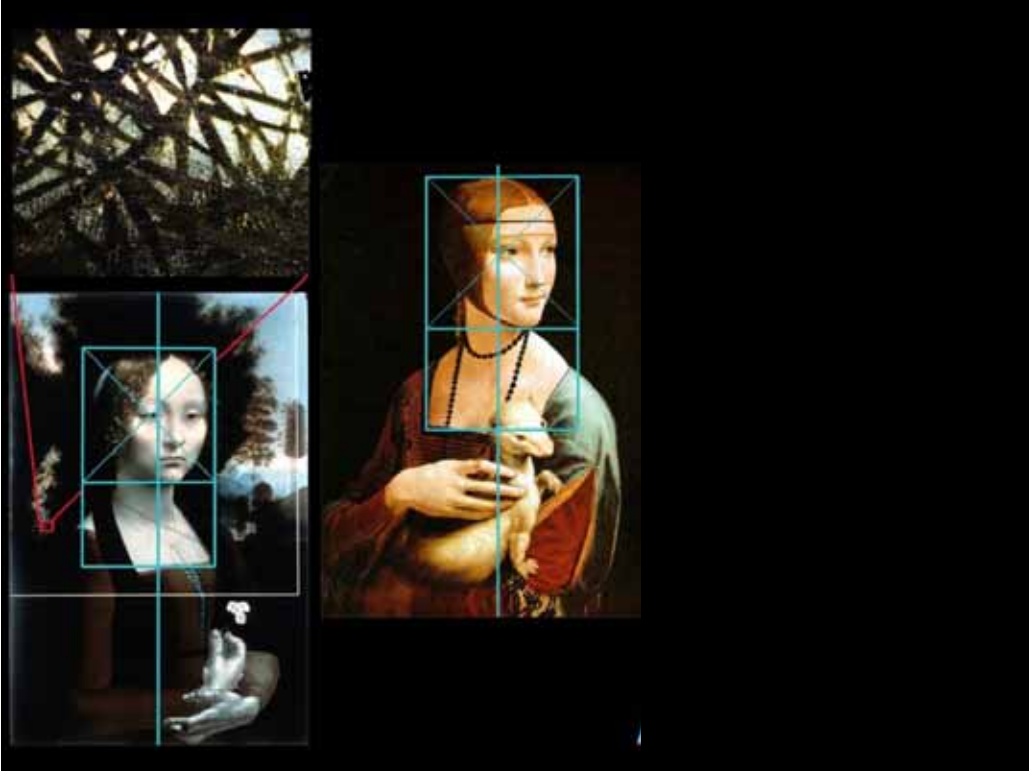


"Nature, being inconstant and taking pleasure in creating and continually producing new forms, because she knows that her terrestrial materials are thereby augmented, is more ready and more swift in her creating than is time in his destruction."

— Leonardo da Vinci







# Chiaroscuro, Sfumato, Velatura



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"The Lady with an Ermine"  
(Portrait of Cecilia Gallerani)  
(1492)





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**William Shakespeare**  
*Explorer of the  
Human Heart*

Born in Stratford upon Avon  
on April 23, 1564  
Died on April 23, 1616

A portrait of William Shakespeare, showing him from the chest up. He has a dark beard and mustache, and is wearing a dark, patterned doublet with a large, white, lace-trimmed ruff collar. The background is dark with the Latin motto "Principium amicitias!" written in gold script at the top.



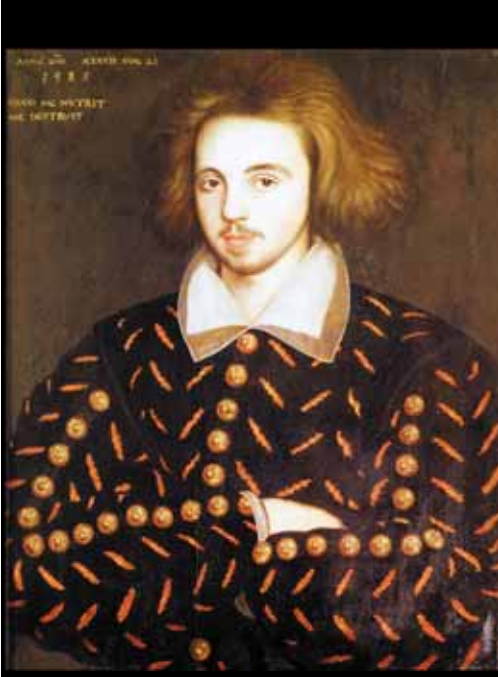




Statue of Ovid in Constanta, Romania



Hollinshed Chronicles (1577)



Christopher Marlowe (1564-1593)



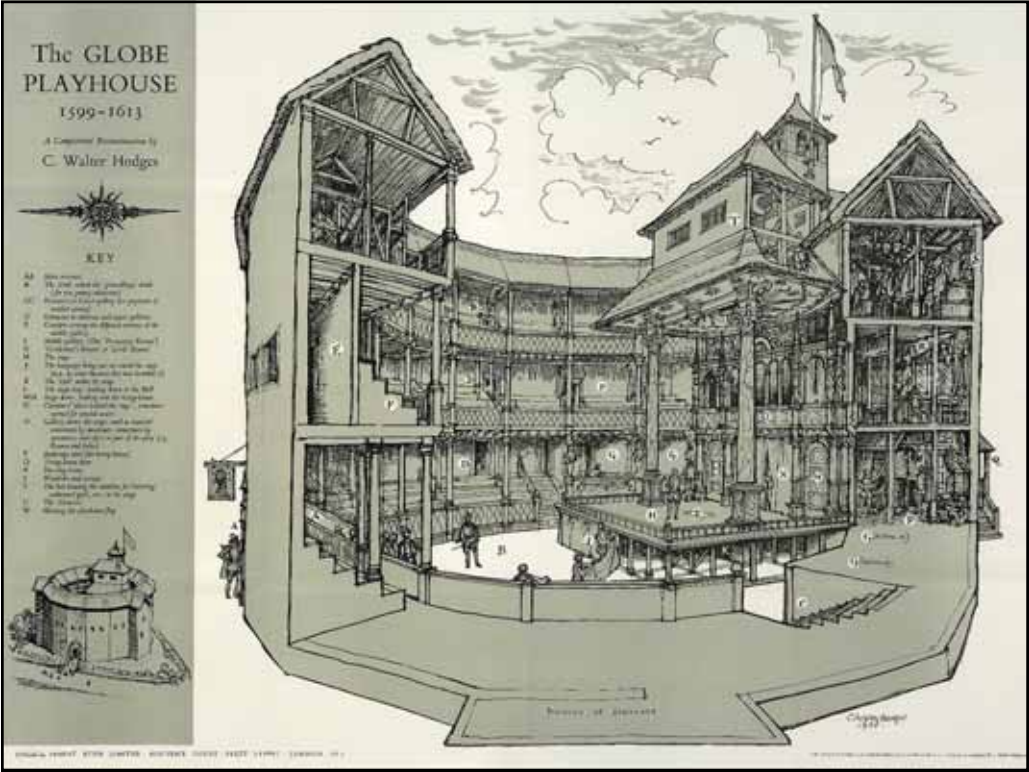
Earl of Southampton(1573-1624)



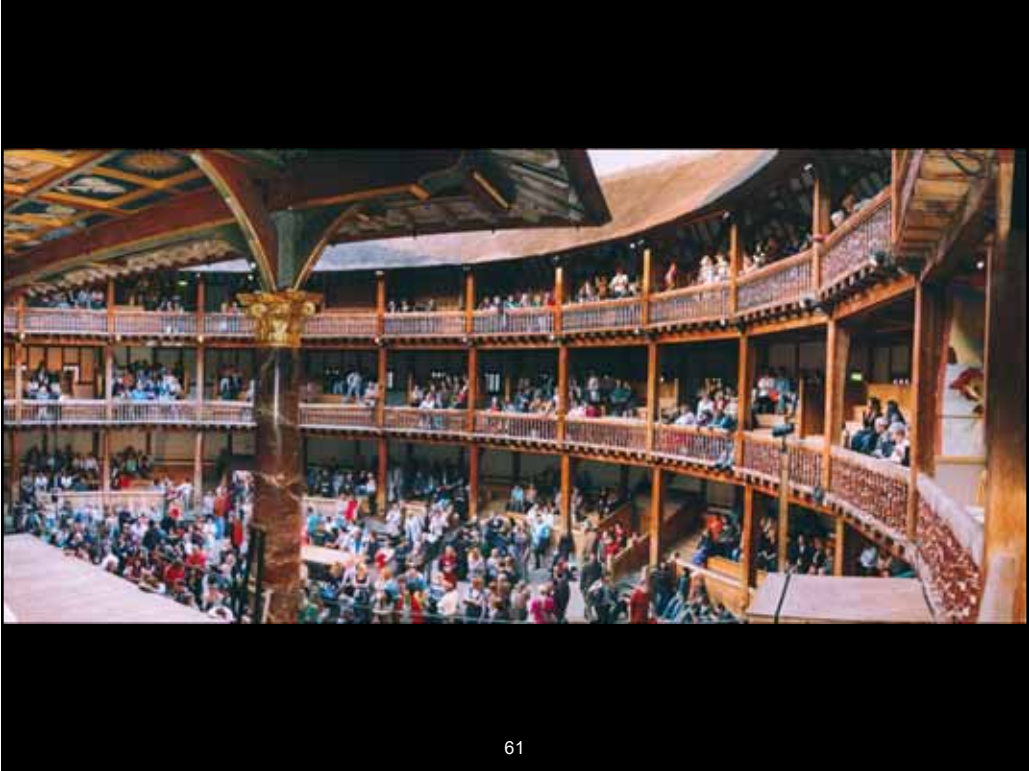
*“Friends, Romans, Countrymen, Lend me your ears!”*

*“To be, or not to be.” “O Romeo, Romeo! Wherefore art thou Romeo?” “The lady doth protest too much.” “All the world's a stage, and all the men and women merely players.” “We are such stuff as dreams are made on.”*

*“In my mind’s eye,” “Don’t kill the messenger,” “a wild goose chase,” “a heart of gold,” “all that glitters is not gold,” “Brevity is the soul of wit,” “...it was Greek to me,” “bated breath,” “I’ll not budge an inch.”*







# ISAAC NEWTON

*The Unlikely Architect  
of the Modern Age*

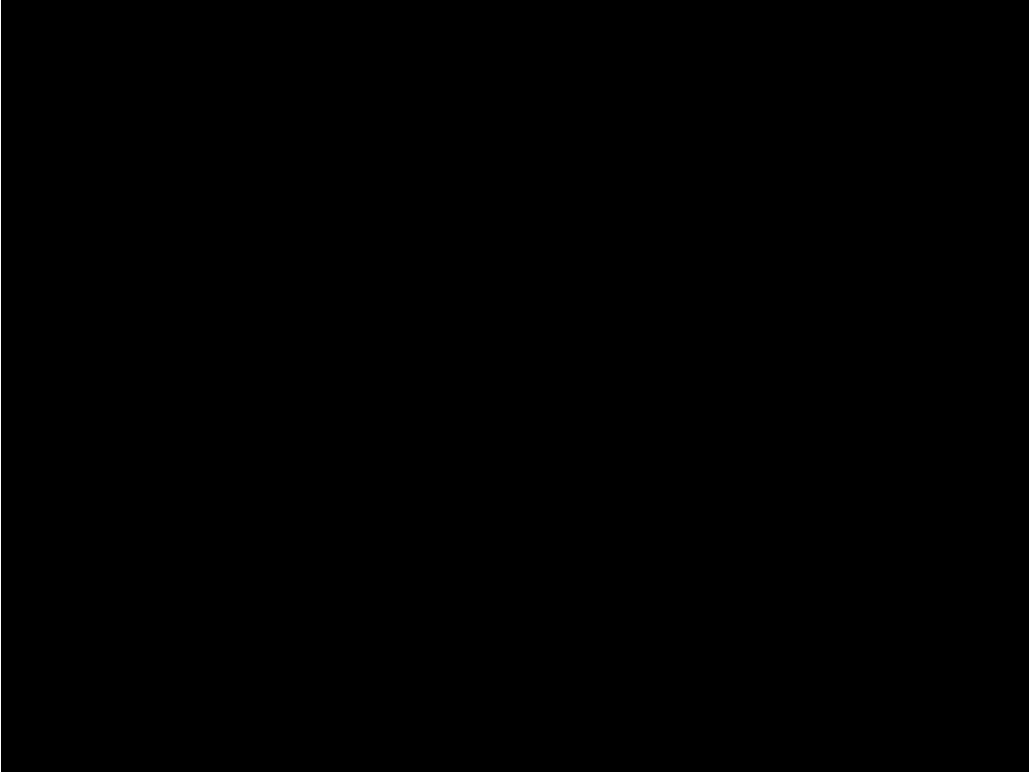
1642-1727

- *Anni Mirabilis:*
- 1665-1666
- 1684-1686





23 Newton Way, Woolsthorpe by Coltersworth, Grantham, Lincolnshire. UK

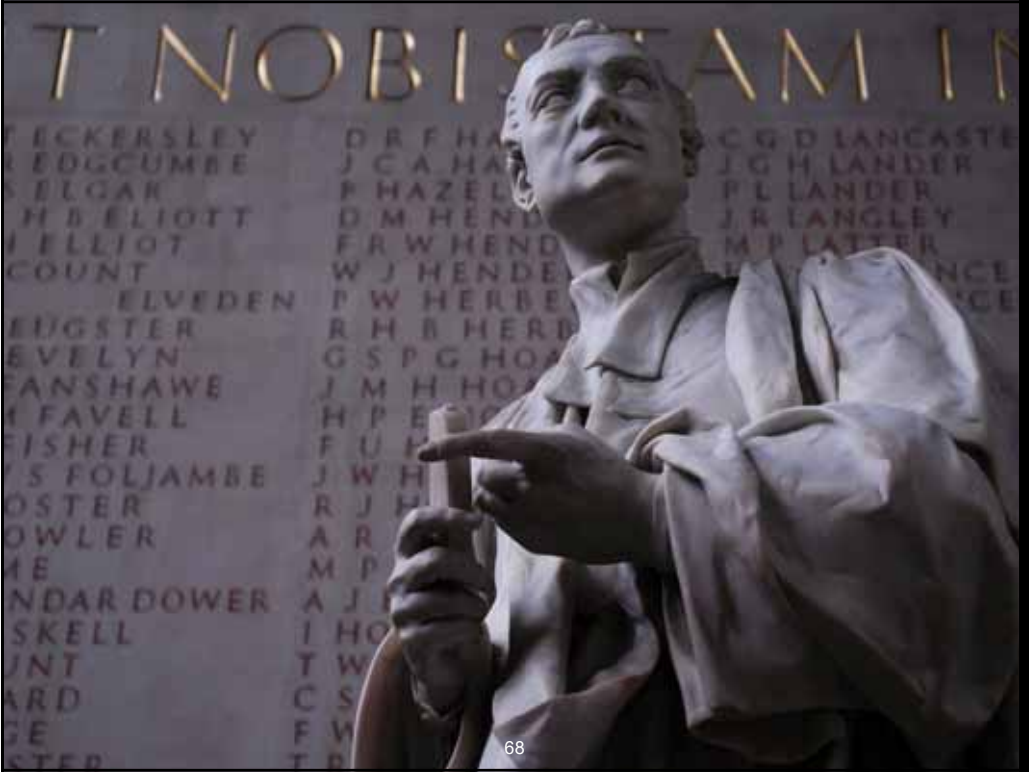




Isaac Newton

Edmond Halley







Newton's Prism — at the Whipple Library of Science



est  $OP$ , e item  $EK$ , 20. 10.  
 vel  $OMP$  est  $\mu v$ . e hyp. &  
 ergo  $OP(\sqrt{AD})$  22. 10.  
 est major. Q. E. D d 40. 13!

fit  $AB, 5$ . &  $AC, 4 + \sqrt{8}$ . ergo  
 est  $20 + \sqrt{100}$ . quare  $OP$  est  $\sqrt{}$ :

PROP. LIX.  $\sqrt{c + \frac{ca}{aa-e}} = \frac{\sqrt{c+ae}}{\sqrt{2a-e}} + \frac{\sqrt{c-a}}{\sqrt{2a+e}}$

D continetur sub rationali  $AB, = \frac{\sqrt{ca+ce} + \sqrt{ca-ce}}{\sqrt{2aa-e}}$   
 bus quinta  $AC$ ; recta linea  $OP$   
 ut, irrationalis est, que rationalis  
 appellatur.

MPa. rectang. verba  $AB$

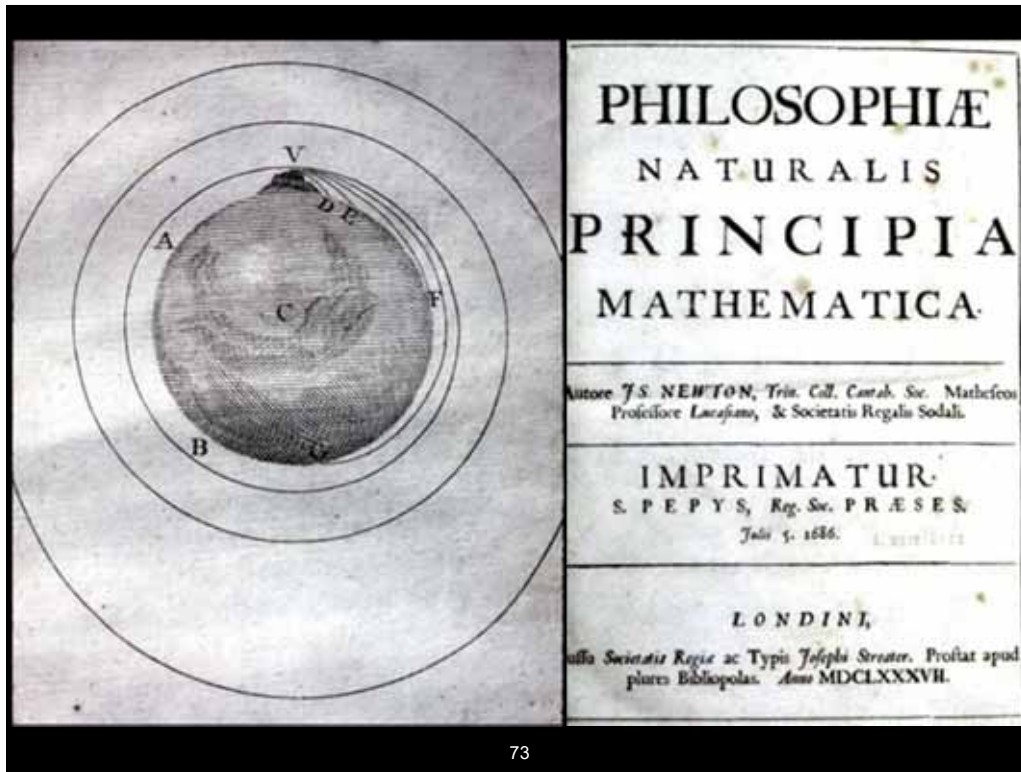
tween it and the Eye-Glass.  
 ment bear a larger aperture,  
 posing the Speculum of ev  
 them.

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The Reflecting Telescope

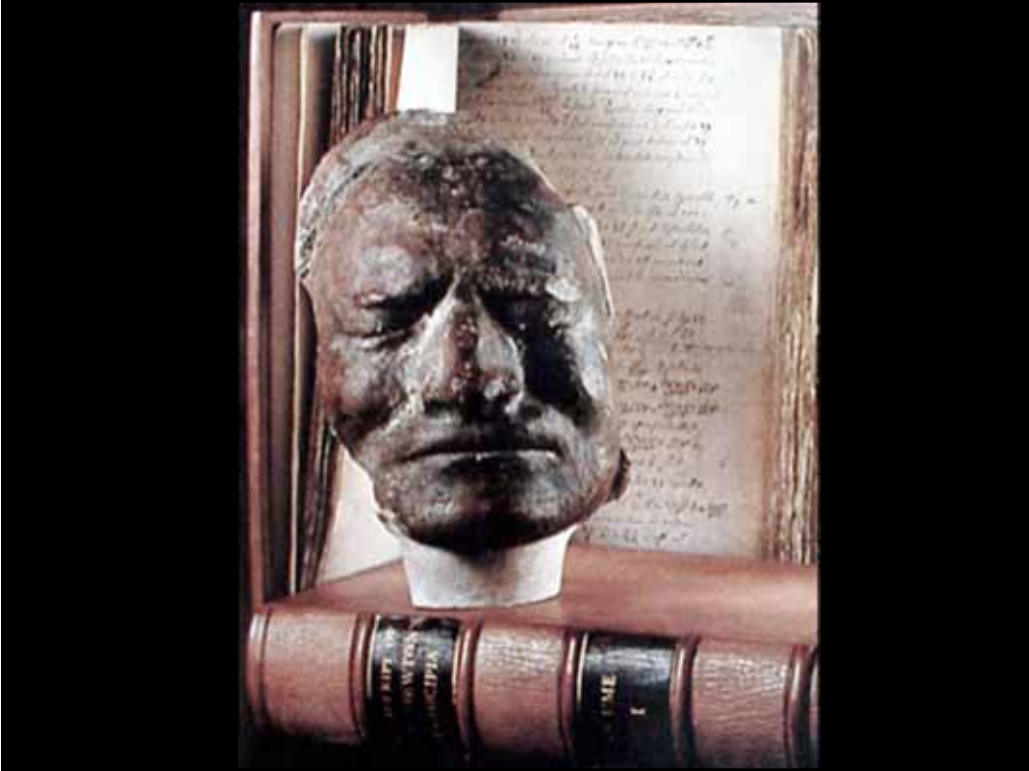




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*"I keep the subject constantly before me, and wait  
'till the first dawnings open slowly, by little and  
little, into a full and clear light."*

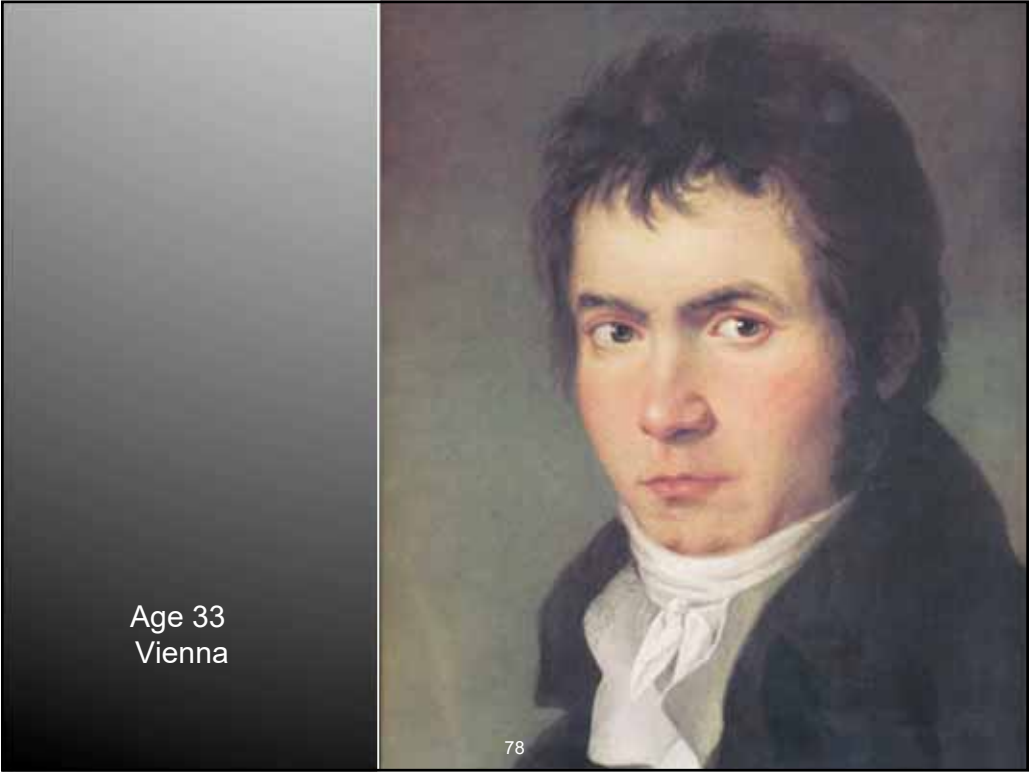
*— Isaac Newton*



Age 13  
Bonn



Heiligenstadt Testament (1802)



Age 33  
Vienna





Symphony No. 5  
Premiered December 1808

79

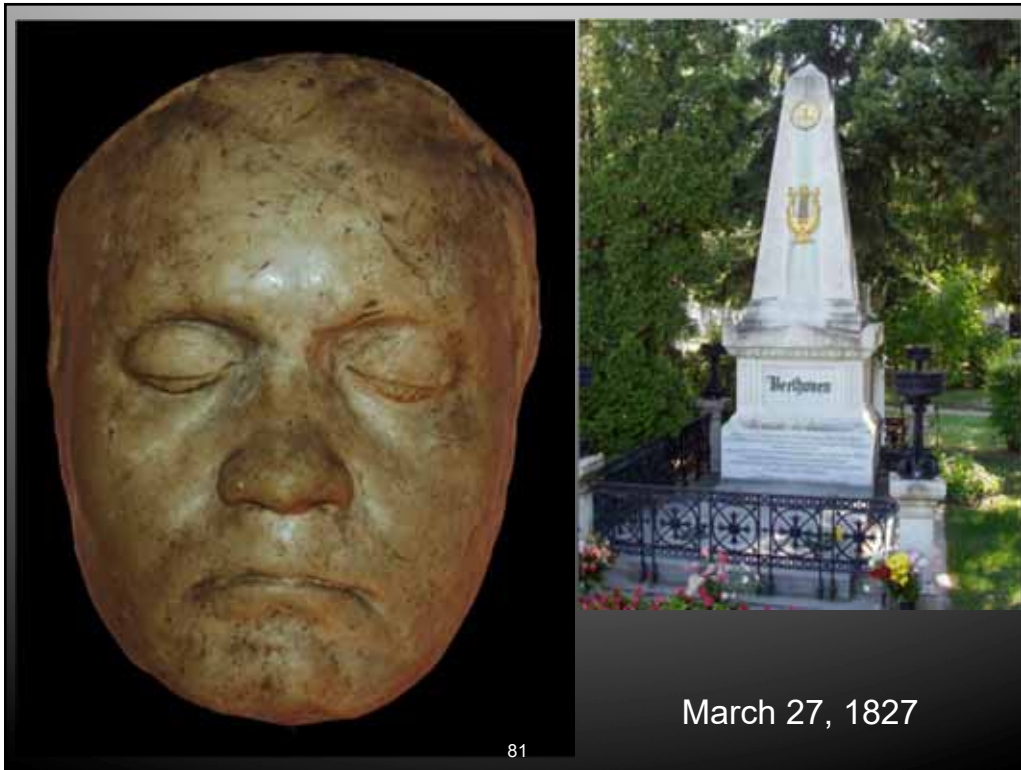


Symphony No. 9  
Premiered 1824



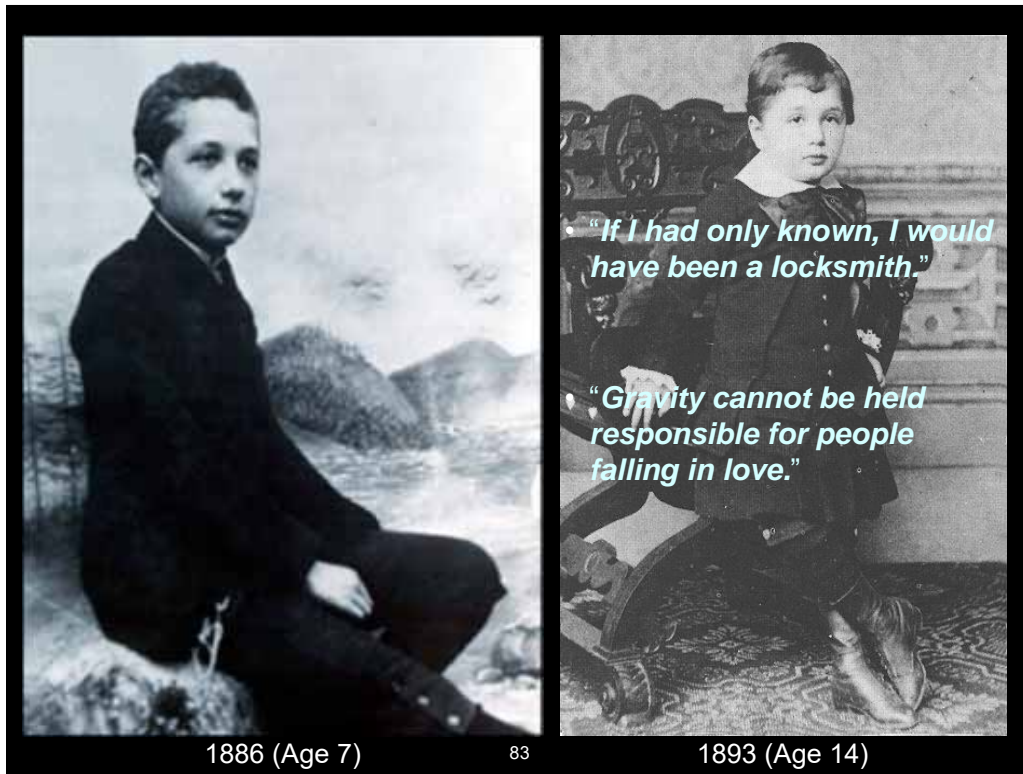
Age 49 Vienna

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“Even if Newton (or Leibniz) had never lived the world [eventually] would have had the calculus, but if Beethoven had not lived, we would never have had the C-Minor Symphony.”

— Albert Einstein




### Einstein's "First Miracle Year,"

when in 1905 (at the at age 26) he published

- 1. *The Photoelectric Effect*,
- 2. *Special Theory of Relativity*
- 3. *Equivalence of Energy and Mass*
- 4. *Brownian Motion*







Einstein's First Miracle Year

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### Einstein's "Second Miracle Year,"

when in 1915-1916 (at 35) he published

- *the General Theory of Relativity* (1915)
- *Stimulated Emission of Radiation* (1916)





First visit to the United States



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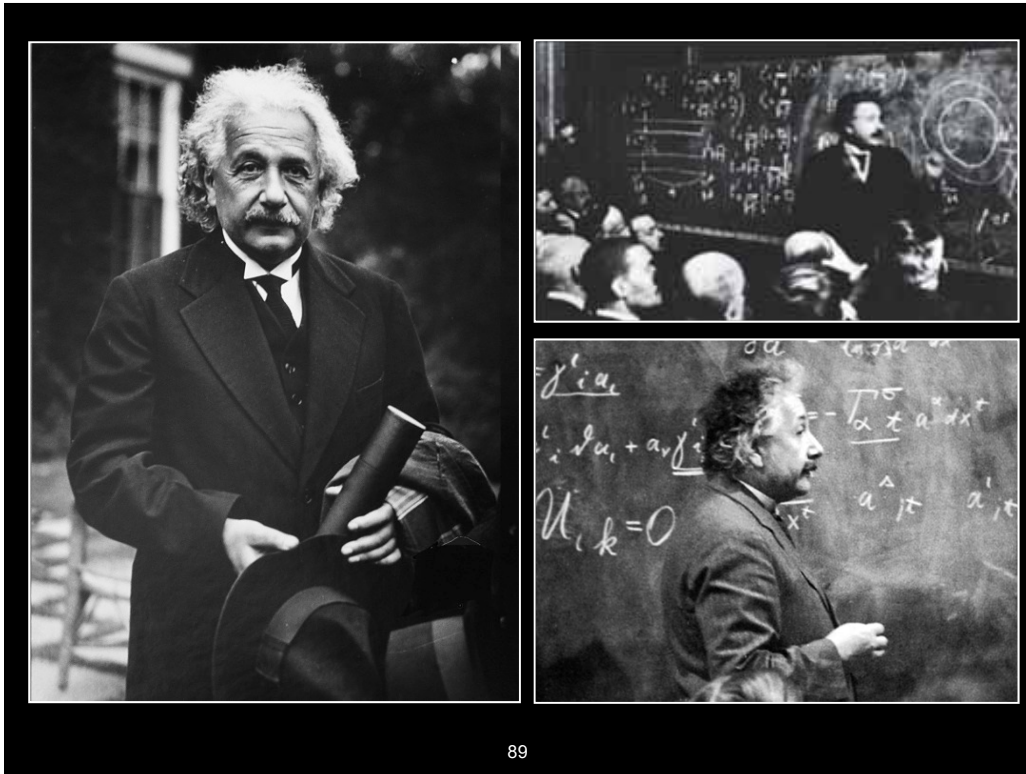
“Nature and Nature’s laws Lay hid in night,  
God said, ‘Let Newton Be!’ And all was light.”

— Alexander Pope

“It did not last, the Devil howling ‘Ho!’  
‘Let Einstein Be!’ Restore the status quo.”

— John Collins Squire

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**UNION DES SOCIÉTÉS "OSE"**  
POUR LA PROTECTION DE LA SANTÉ  
DES POPULATIONS JUIVES

COMITÉ D'HONNEUR  
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POLOGNE (ET C. 23)  
ROUMANIE.

T. C.  
BAŞBAKANLIK  
CUMHURİYET MÜHÜRÜ

PARIS (XV) le 17 September, 1933  
4, Rue Russel!

*Şirketiniz*  
*Manif. vakaletini*  
*Yazdım*  
3-40-513

Your Excellency,

As Honorary President of the World Union "OSE" I beg to apply to Your Excellency to allow forty professors and doctors from Germany to continue their scientific and medical work in Turkey. The above mentioned cannot practise further in Germany on account of the laws governing there now. The majority of these men possess vast experience, knowledge and scientific merits and could prove very useful when settling in a new country.

Out of a great number of applicants our Union has chosen forty experienced specialists and prominent scholars, and is desirous applying to Your Excellency to permit these men to settle and practise in your country. These scientists are willing to work for a year without any remuneration in any of your institutions, according to the orders of your Government.

In supporting this application, I take the liberty to express my hope, that in granting this request your Government will not only perform an act of high humanity, but will also bring profit to your own country.

I have the honour to be,

Your Excellency's obedient servant,  
*A. Einstein*  
(Prof. Albert Einstein)

His Excellency  
The President of the Cabinet of Ministers  
of the Turkish Republic.

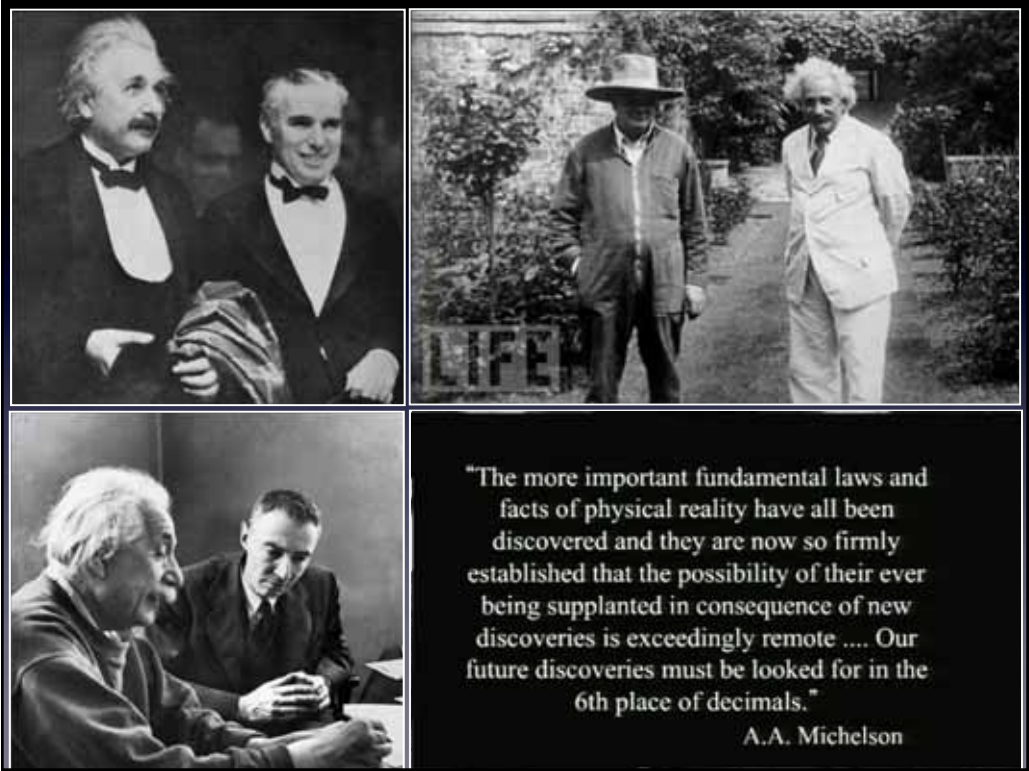
*3/17/33*  
*60 a 3/17/33*  
*1/18/33*  
*2/18/33*

Sarayın ve Cumhuriyetin  
Dışçibası  
**Sami  
Günzberg**  
RIFAT H. BALI

Einstein's Letter to Ataturk September 17, 1933





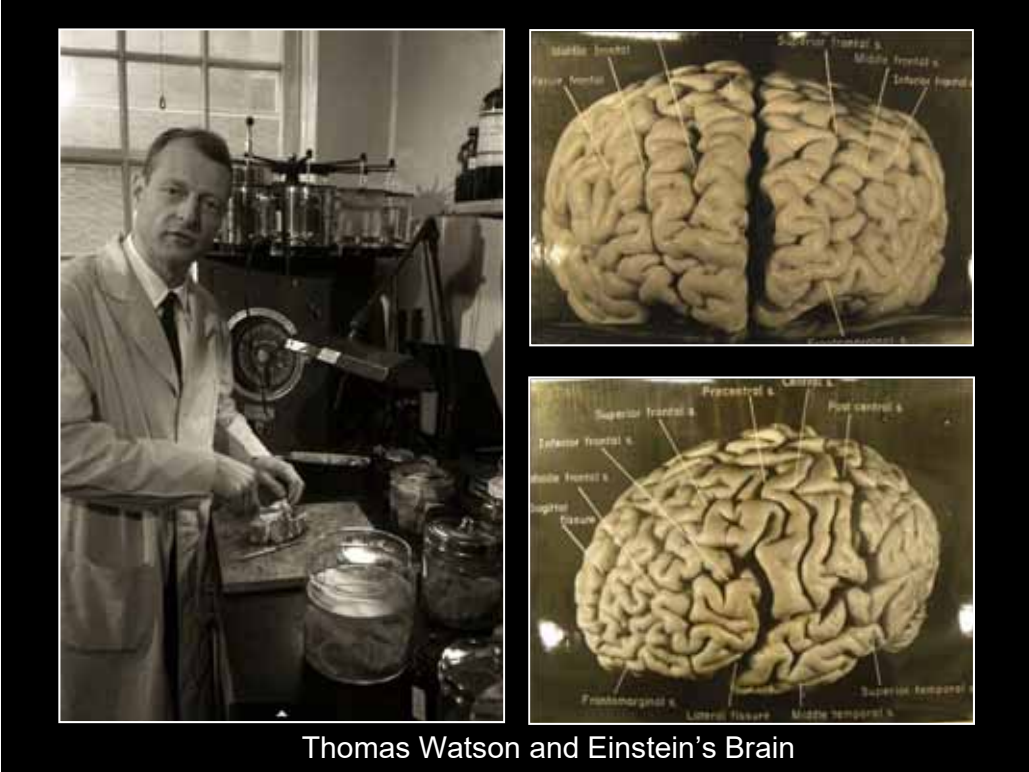
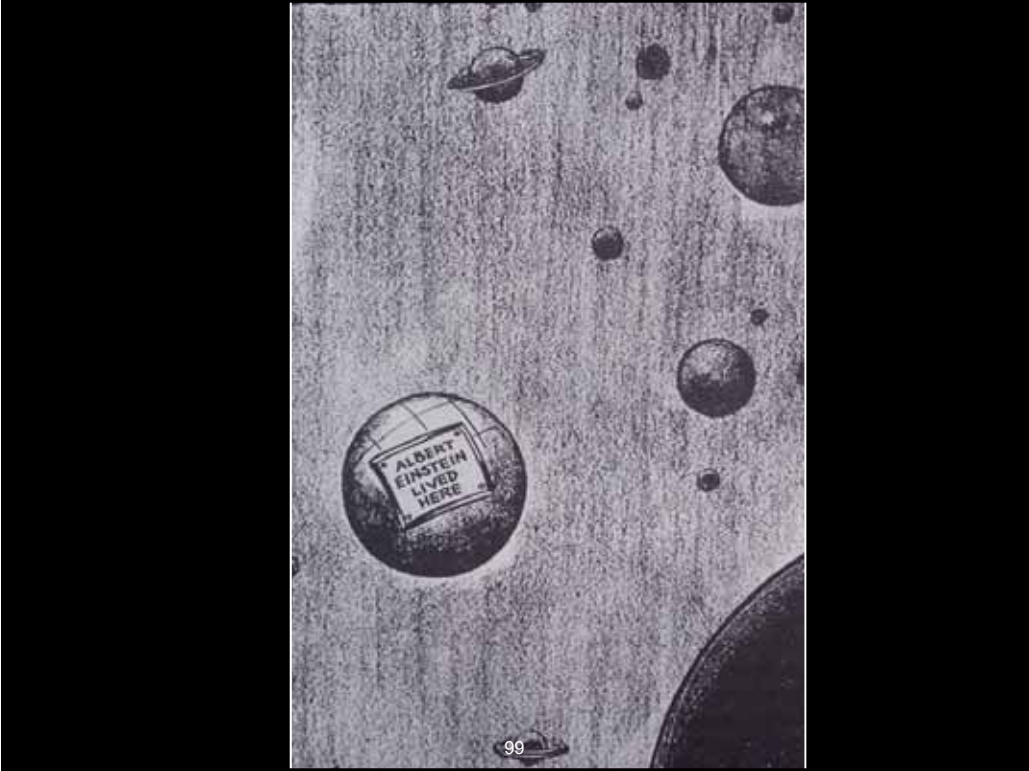




112 Mercer Street, Princeton







Thomas Watson and Einstein's Brain



Michael H. Hart

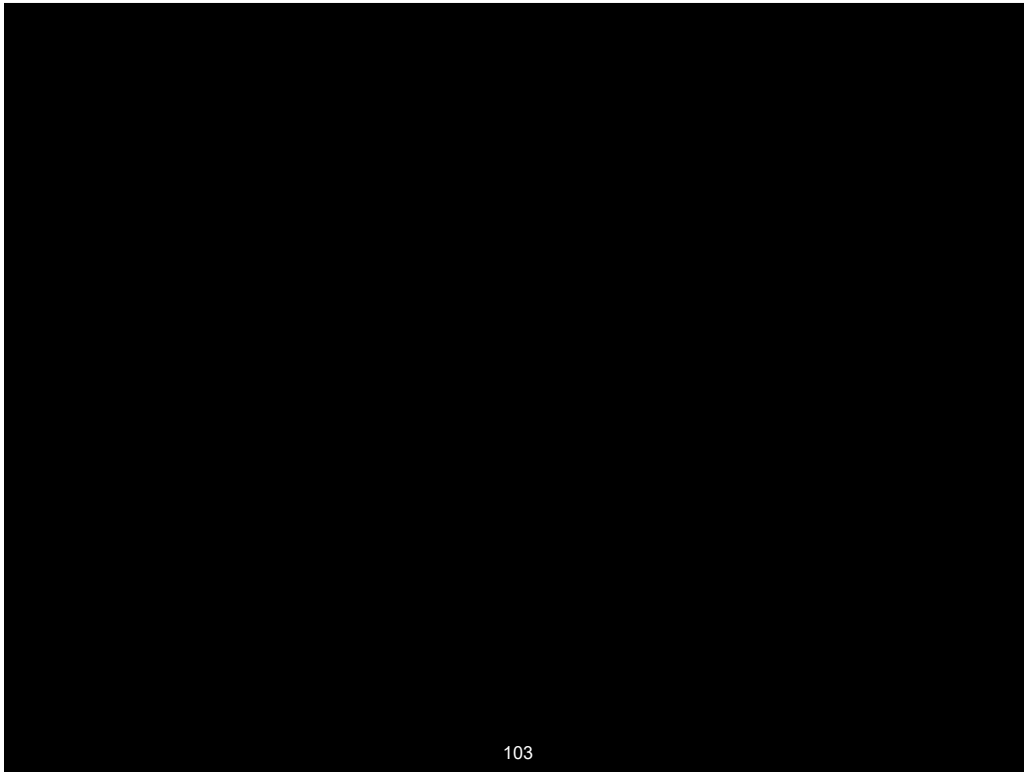
# The 100

*A Ranking of the Most Influential Persons in History*

- First Edition, 1978
- Second Edition, 1992

...OUS · ST. PAUL · TS'AI LUN · JOHANN GUTENBERG · COLUMBUS · ALBERT EINSTEIN · LORENZO · GALILEI · ARISTOTLE · EUCLID · MOSES · SHIH HUANG TI · THE · AUGUSTUS CAESAR · ANTOINE L. LAURENT LAFONT · COLOMBUS · JACQUES · MARY · BRUNO · BRILLIANT · BRVILLE · DAN SIMON · ALEXANDER · APOLEON · HOEK · HITLER · PLATO · EVERETT · WELLS · A · LOCKE · A RANKING OF THE · LUDWIG · MOST INFLUENTIAL PERSONS · SERGI · BERLANGELO · IN HISTORY · POPE · URBAN · THOMAS MAITHUS · ASOKA · JOHN F. KENNEDY · PINGUS · REVISED AND · JOHN CAHOON · LENIN · UPDATED · WILLIAM · MENDEL · VASCO DA GAMA · MAX PLANCK · JOSEPH LISTER · PETER THE GREAT · MAO ZEDONG · MICHAEL H. HART · FRANCIS · HERNANDO CORTES · HENRY FORD · TITUS · MENCIVS · QUEEN ISABELLA I · ZOF





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