

BO1 History of Mathematics  
Lecture II

Dissemination and development  
(AD 500 – AD 1600)

Part 1: Transmission of mathematics from the  
ancient world

MT 2020 Week 1

# Summary

## Part 1

- ▶ Influence of the ancient world
- ▶ The Renaissance (15th and 16th centuries)
- ▶ The 16th century

## Part 2

- ▶ A case study: Napier's invention of logarithms 1614

# Remnants of the collapse of the ancient world

in Greek: manuscripts preserved at Constantinople and in libraries or collections around the Mediterranean

in Latin: writings by Boethius (c. 480–524) on philosophy, arithmetic, geometry, music

# The spread of Islam and Islamic learning

- 632–732: Islam spreads throughout Middle East, north Africa, and into Spain and Portugal
- c. 820: *Bayt al-Ḥikma*, the House of Wisdom, founded in Baghdad under Caliph al-Ma'mūn; it became a centre for translation into Arabic from Greek, Persian, Sanskrit
- c. 825: al-Khwārizmī active in Baghdad
- 9th century: texts on arithmetic, algebra, astronomy reach Spain
- 12th century: translations from Arabic to Latin

## Oxford in the 14th century

The Merton School, a.k.a. the Merton Calculators (principally, Thomas Bradwardine, William Heytesbury, Richard Swineshead, John Dumbleton):

- ▶ arithmetic using Hindu-Arabic numerals
- ▶ translations of Euclid (some partial)
- ▶ possibly a little algebra
- ▶ computus texts (calculation of time)
- ▶ astronomy and astrology

<http://www.oxforddnb.com/view/theme/95034>

# The mid-Renaissance (15th and 16th centuries)

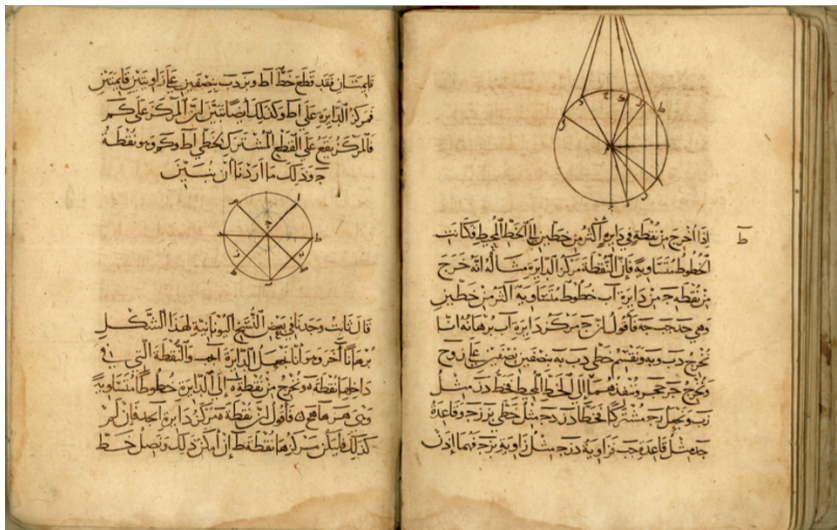
Classical mathematical texts more widely available due to:

- ▶ rediscovery of manuscripts
- ▶ revival of knowledge of Greek
- ▶ (Western) invention of printing (Gutenberg, c. 1436)

## Euclid's *Elements*: transmission history

- ▶ commentaries written by Pappus (c. AD 320), Theon (c. AD 380), Proclus (c. AD 450)
- ▶ a few propositions in Boethius (c. AD 500)
- ▶ copies in Greek (earliest from Constantinople, AD 888)
- ▶ many translations or commentaries in Arabic (AD 750–1250)
- ▶ mediaeval translations from Arabic to Latin: Adelard of Bath (1130), Robert of Chester (1145), Gerard of Cremona (mid-12th century)
- ▶ printed editions in Latin or Greek from 1482 onwards

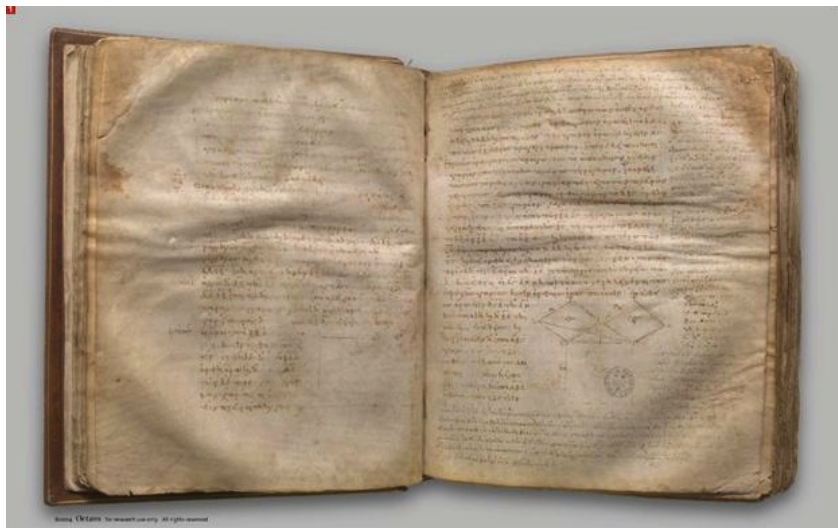
# Euclid in Arabic



Translated from the Greek by Ishaq ibn Hunayn, AD 1466



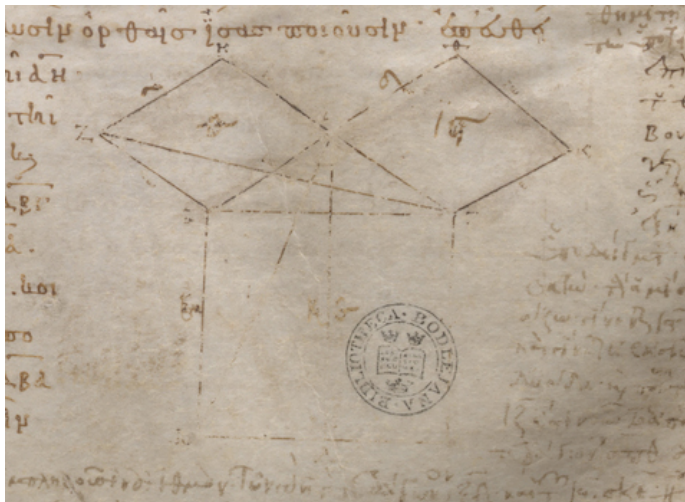
## Euclid I.47 from Bodleian ms. dated 888



Whole manuscript is digitised:

<http://www.claymath.org/library/historical/euclid/>

# Euclid I.47 from Bodleian ms. dated 888

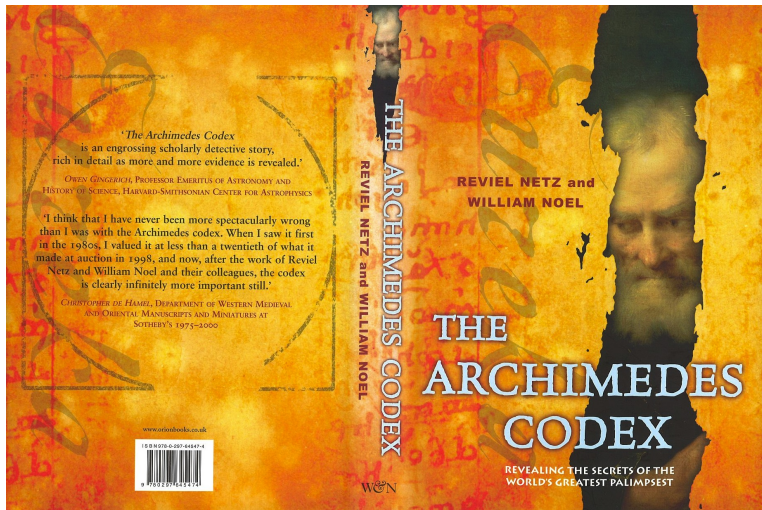


<http://www.claymath.org/library/historical/euclid/files/elem.1.47.html>

## Treatises by Archimedes: transmission history

- ▶ quoted or explained by Pappus (c. 320 AD), Theon (c. 380 AD), Eutocius (c. 520 AD)
- ▶ 6th-century Byzantine 'collected works' (Isidore of Miletus)
- ▶ several translations of individual treatises into Arabic
- ▶ translations from Arabic into Latin
- ▶ a new find in the twentieth century:  
[www.archimedespalimpsest.org/](http://www.archimedespalimpsest.org/)

# Netz & Noel: *The Archimedes Codex*

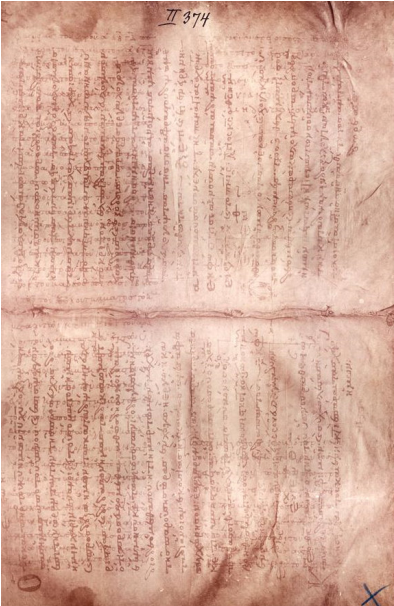


(Weidenfeld & Nicolson, 2007)

# The Archimedes palimpsest



# The Archimedes palimpsest



## Apollonius' *Conics* (c. 180 BC): transmission history

- ▶ Books I–IV survived in Greek
- ▶ Books V–VII survived only in Arabic
- ▶ Book VIII is lost, known only from commentaries
- ▶ early (Latin) printed edition, 1566

(See: *Mathematics emerging*, §1.2.4.)

# Apollonius, Oxford, 1710

*APOLLONII PERGÆI*  
**CONICORUM**  
LIBRI OCTO,  
ET  
*SERENI ANTISSENSIS*  
DE SECTIONE  
**CYLINDRI & CONI**  
LIBRI DUO.



*OXONIÆ,*  
E THEATRO SHELDONIANO, An. Dom. MDCCX.



# 16th century change

New forces at work in the 16th century:

- ▶ global exploration
- ▶ growth of international commerce
- ▶ new technology (in printing, shipping, military engineering, instrumentation, etc.)

## Simon Stevin (1548–1620), Leiden

Under the patronage of Maurice of Nassau, Prince of Orange, Stevin wrote on:

- ▶ accounting (1581)
- ▶ tables of interest (1582)
- ▶ geometry (1583)
- ▶ decimal fractions (1585)
- ▶ arithmetic (1585)
- ▶ weight and hydrostatics (1586)
- ▶ algebra (1594)
- ▶ fortification (1594)
- ▶ navigation (1599)
- ▶ mathematics (1608), including cosmography, geography, tides, heavenly motions, optics, perspective, refraction (Snell's law), pulleys, floating bodies, bookkeeping
- ▶ locks and sluices (1617)



# Thomas Harriot (1560–1621), London

Under the patronage of the Earl of Northumberland, Harriot worked on:

- ▶ navigation
- ▶ optics, refraction (Snell's law)
- ▶ rates of fall
- ▶ calculations of density
- ▶ alchemy
- ▶ geometry
- ▶ algebra
- ▶ astronomy

none of it published

Harriot papers online:

[http://echo.mpiwg-berlin.mpg.de/content/scientific\\_revolution/harriot](http://echo.mpiwg-berlin.mpg.de/content/scientific_revolution/harriot)

