Scientific English

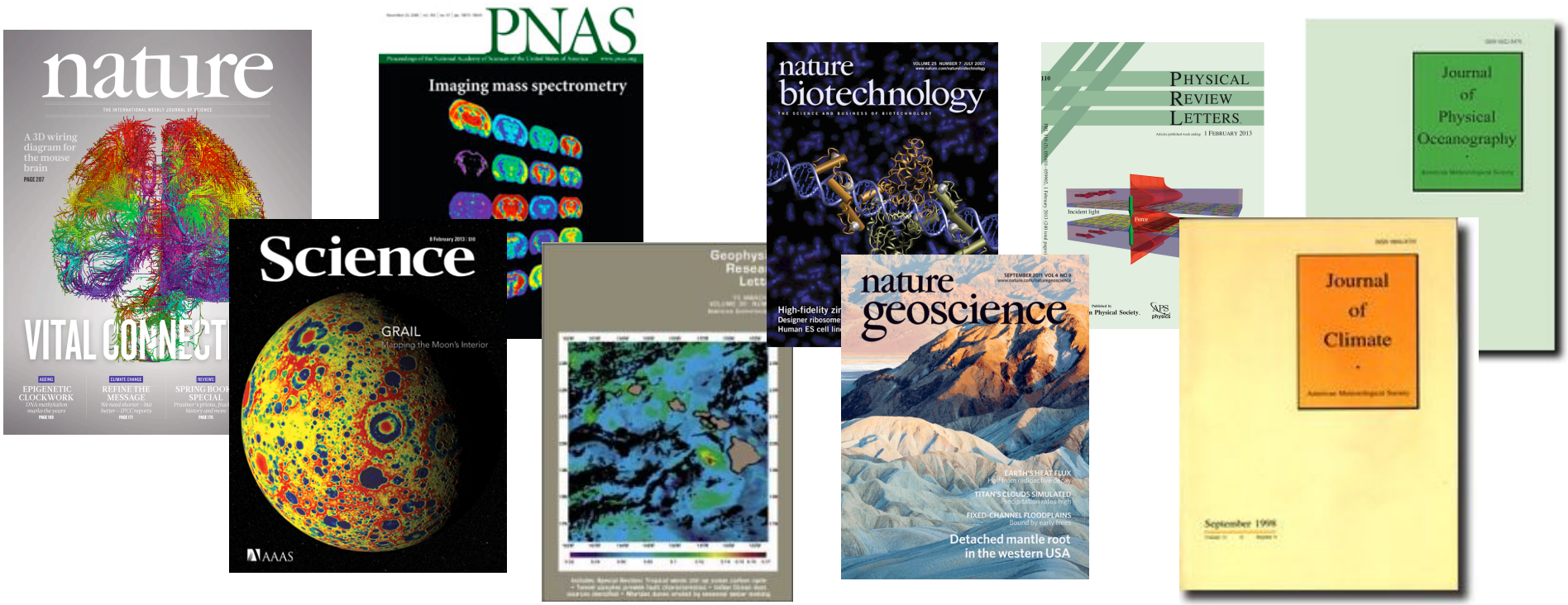
Jonathan GULA
gula@univ-brest.fr

Quentin Jamet
quentin.jamet@shom.fr

Writing a scientific paper

Jonathan GULA
gula@univ-brest.fr

- A critical aspect of the scientific process is the **reporting of new results in scientific journals** in order to disseminate that information to the larger community of scientists.
- Most journals accept papers for publication only after **peer review by a small group of scientists** who work in the same field and who recommend the paper be published (usually with some revision).



Writing a scientific paper

Jonathan GULA
gula@univ-brest.fr

- This course will not teach you how to write in English, i.e. it is **not a grammar course**.
- The aim is to teach you the **basics of academic writing** and to introduce you to the most common **format and structure of academic papers**.
- To improve your academic writing skills, you'll need to continue practising reading, writing, and critiquing others' work.

Scientific English

M2 Marine Physics

Jonathan GULA
gula@univ-brest.fr

Lectures

Introduction:

- Brief History of Science and Scientific Writing

Scientific writing:

- Structure and content of a paper
- Writing and revising a scientific paper
- Writing reports, proposals, etc.

Effective Scientific writing:

- How to write more effectively

The peer-review process

Activities

- Read and discuss recent scientific articles
- Write a short article
- Review articles

Presentations and articles will be available at jgula.fr/SE

Scientific English

Jonathan GULA
gula@univ-brest.fr

M2 Marine Physics

Evaluation

- Participation in class and mini-assignments (20%)
- Write a short scientific article (50%)
  - Choose a M1/M2 report to use as a test bed
  - Write a short paper out of it **[due Feb. 12]**
- Review a scientific article (30%)
  - Write a review of your colleagues papers **[due Mar. 5]**

#1
A very Brief History of Science and Scientific Writing

Jonathan GULA
gula@univ-brest.fr

History of science:

Sumer and Babylon (-3500, -500)

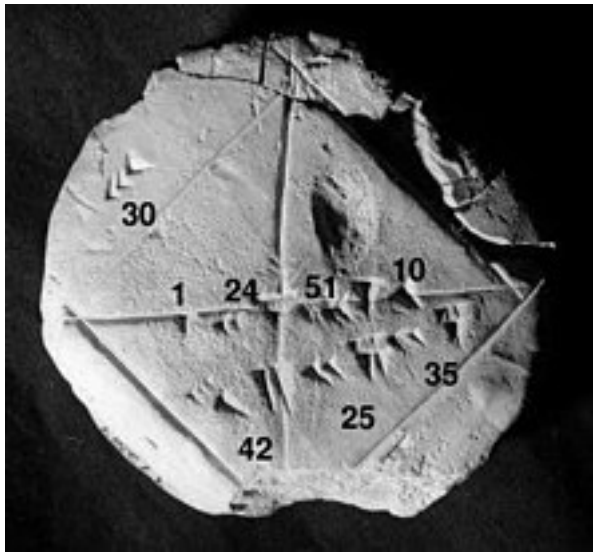
- Techniques (making tools, mastering fire) came before science
- Data written on clay tablets using cuneiform

- The Mesopotamian people accumulated observations and numerical data but essentially for **practical purposes** [no abstract science]
  - *geometry → property, building*
  - *calculus → trade*
  - *astronomy → agriculture, travel*

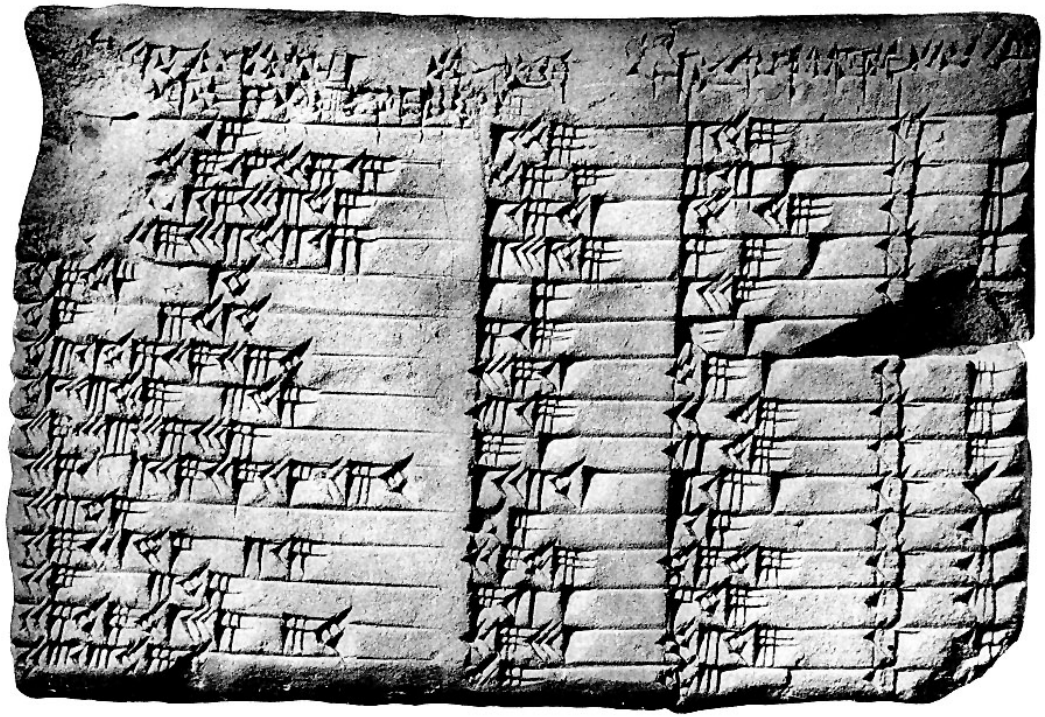
History of science:

Sumer and Babylon (-3500, -500)

- Development of **mathematics:** master four operations (+,-,x,:)



Photograph of tablet YBC 7289 with annotations showing the approximation of √2 by sexagesimal numeration.



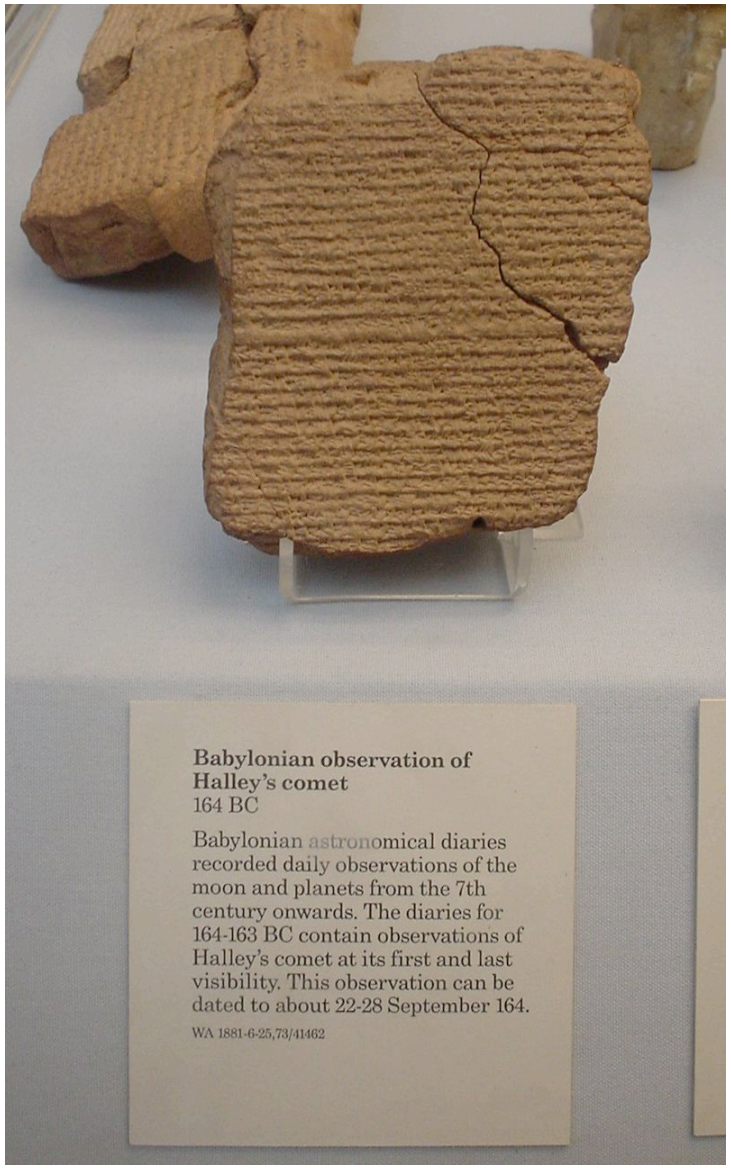
Babylonian Mathematical Tablet Depicting Their Functional Knowledge of the Pythagorean Theorem

History of science:

Sumer and Babylon (-3500, -500)

- Among the earliest people to develop the study of **astronomy** (and along with it astrology)
  - *Created very accurate calendars [later used by greeks to predict eclipses]*

- **Medicine**: Classified plants; a few effective practices, but only empiricism and often harmful drugs.



History of science:

Sumer and Babylon (-3500, -500)

- **Science, magics and religion** were intertwined for a long time:
  - Planets were all associated with different deities and ziggurats in the city,
  - Astronomical observations were made by priests in religious temples to make predictions for the king and state, which were sanctioned by the Mesopotamian deities.

History of science:

Ancient Egypt (-3500, -500)

- Advances in Maths, astronomy, medicine:

  - **Maths -** Knowledge of pi, the 3-4-5 right triangle, geometry for areas of fields when rising of the Nile, large efficiency in building,

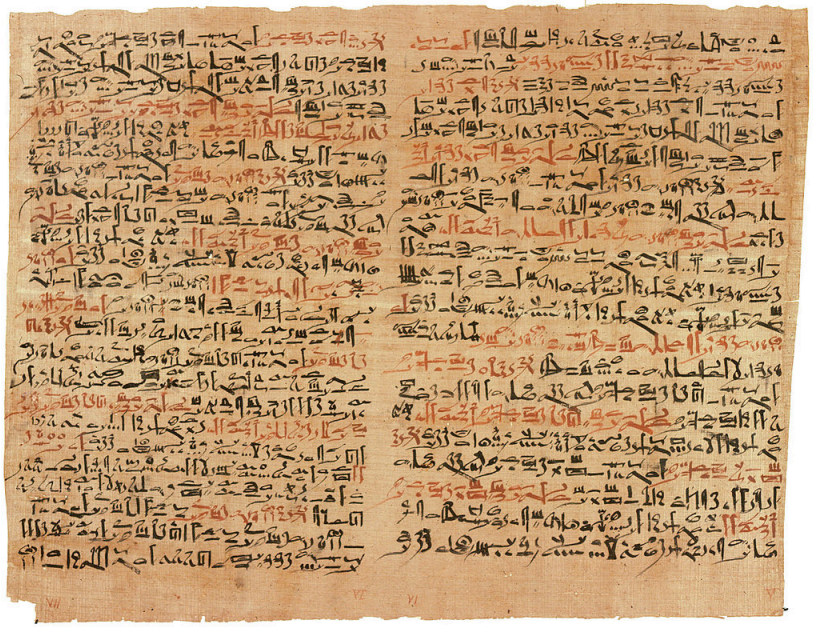
  - **Astronomy -** observations for seasons and orientation.
    - *Worked out that constellation of stars were in exactly the same place after 365¼ days*

first people to learn how to make glass

History of science:

Ancient Egypt (-3500, -500)

- Advances in Maths, astronomy, medicine:
  - **Medicine** - Identified diseases, practiced surgery, ophtalmology, cardiology and gastrology.



Edwin Smith Papyrus [1600 BCE]

- Scribes master writing and knowledge
- More conceptualization of problems (more than empirical practical rules), but not for a rationalization of the world (no proof)

History of science:

Ancient Greece (-700, -350)

- Greek Scientists/philosophers realized that it was possible to find regularities and patterns hidden in nature and that those regularities were the key to unlocking the secrets of the universe.
- ***Thales*** *[the father of science]* was first to explain natural phenomena without Gods' action (-640, -546)
  - *for example, that land floats on water and that earthquakes are caused by the agitation of the water upon which the land floats, rather than the god Poseidon.*
  - *Thales visited Egypt as the Nile ports were opened for the first time. The astronomical knowledge that Thales got from Egyptian and Babylonian astronomy allowed him to predict a solar eclipse which took place in May 28th 585 BCE.*
-

History of science:

Ancient Greece (-700, -350)

- ***Pythagoreas of Samos*** *[Thales's student]* – study of mathematics, first postulate of spherical Earth
  - *Took the 3-4-5 right triangle "rule of thumb" and deduced a general mathematical theorem*

- ***Leucippus*** *and* ***Democritus*** → atomicism *[all matter is made of indivisible, imperishable units called atoms]*
- ***Anaximander*** → early form of evolution *[since human infants are helpless at birth, if the first human had somehow appeared on earth as an infant, it would not have survived. Anaximander reasoned that people must, therefore, have evolved from other animals whose young are hardier.]*

History of science:

Ancient Greece (-700, -350)

The School of Athens, by Raphael

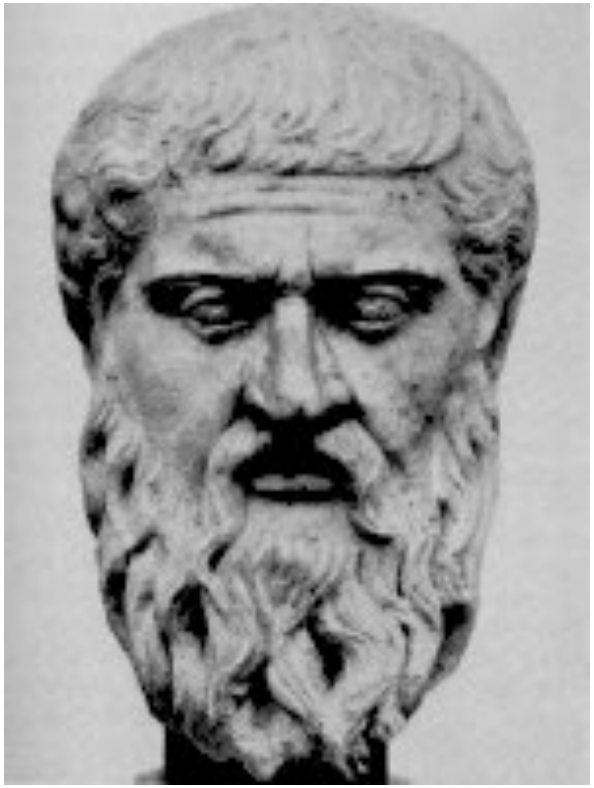
- **Plato** - questioning
- **Aristotle** - rhetorics, empiricism

- Great advances in geometry, logic and natural sciences *[zoology, botany, mineral sciences, astronomy, geography]*

recognition of the methodological importance of applying mathematics to natural phenomena and of undertaking empirical research = **basis of modern science**

Plato (427 - 347 BCE)

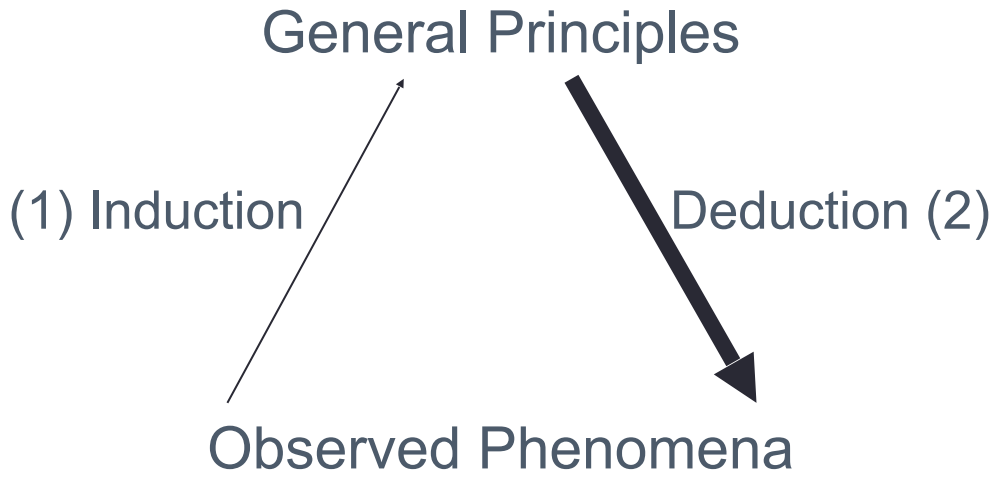
- Plato's epistemology denigrated scientific knowledge (knowledge of natural and material regularities) —such knowledge was not of the true reality, but merely "shadows in the cave"
- Most important for Plato was **knowledge of the Forms**, the abstract entities which define the moral and metaphysical structure of the universe
- Knowledge of the Forms was to be gained not via observation and inference, but through pure reason and philosophical discourse **(deduction alone).**

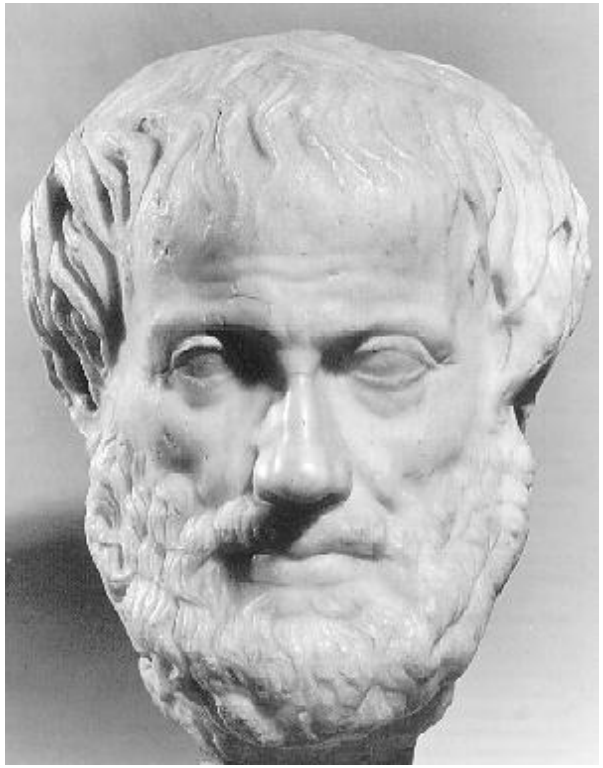


- *This approach proved to be powerful in mathematics but had serious limitations when it was applied to other areas of knowledge*

Aristotle (384-322 BCE)

Inductive-Deductive Model:





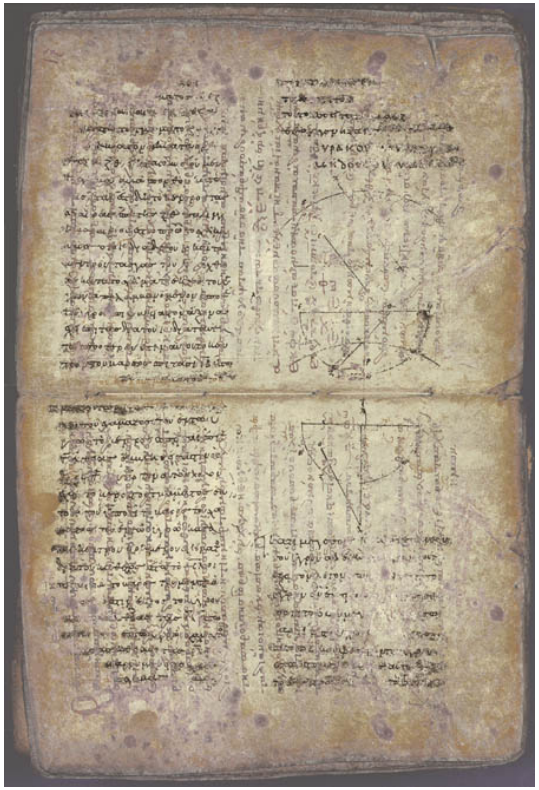
From observations one proceeds by inductive inference (1) to General Principles which explain the observations in virtue of the fact that those same observations can be deduced (2) from the principles

History of science:

Ancient Greece (-350, -100)

- ***Archimedes of Syracuse*** (-287, -212)
  - mathematician [geometrical theorems, infinitesimals] and physicist [hydrostatics, statics]

Archimedes Palimpsest

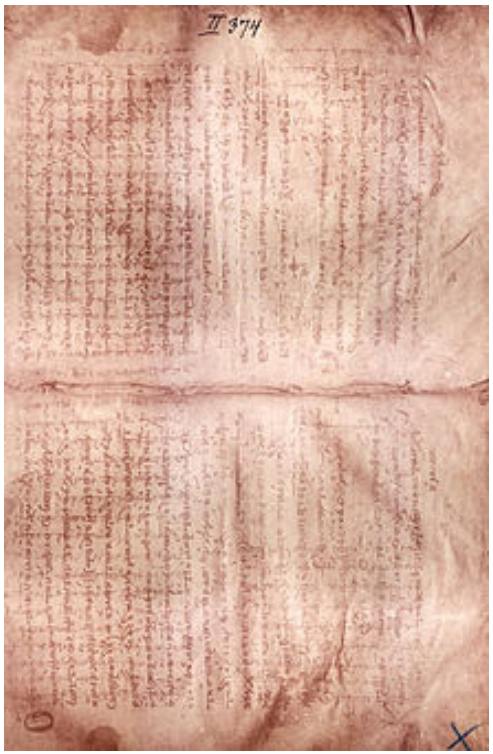


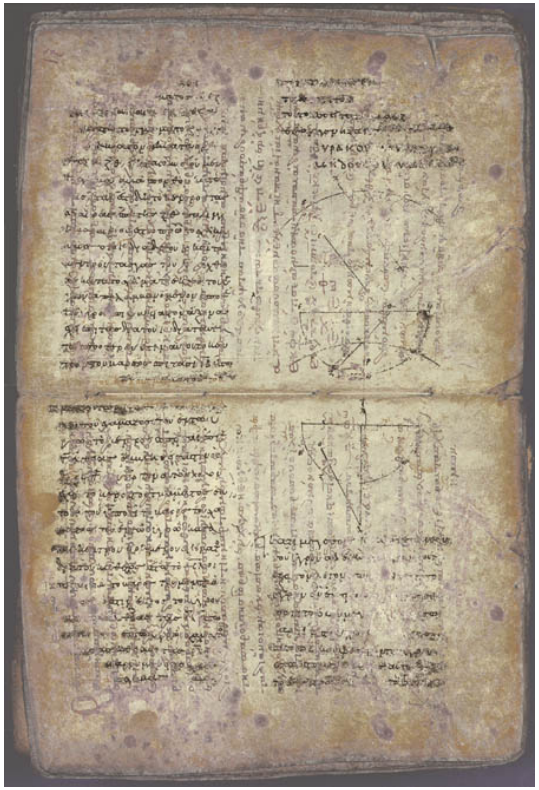
History of science:

Ancient Greece (-350, -100)

- ***Archimedes of Syracuse (-287, -212)***
  - mathematician [geometrical theorems, infinitesimals] and physicist [hydrostatics, statics]

Archimedes Palimpsest

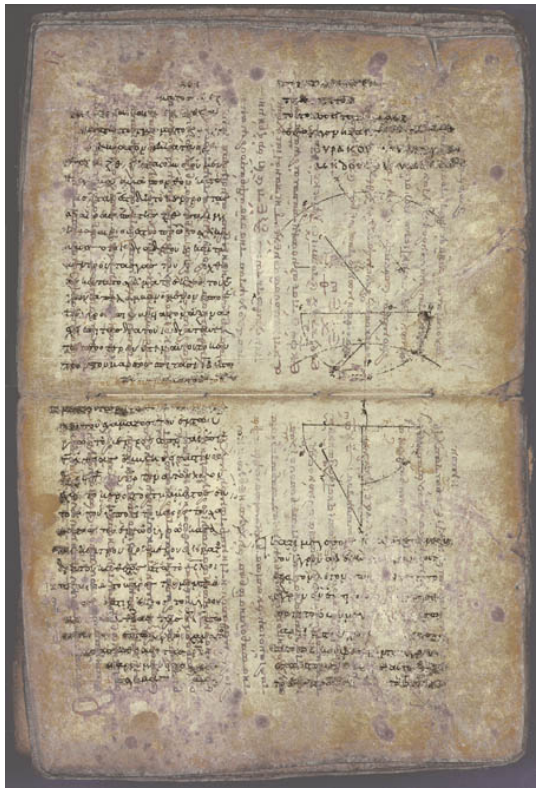




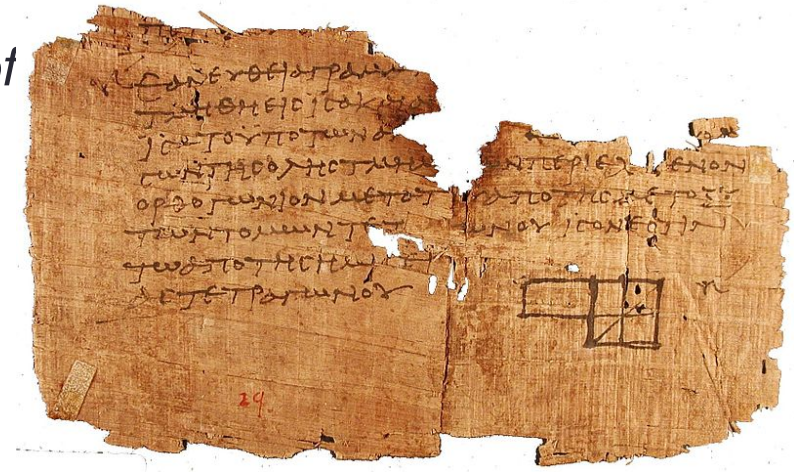
History of science:

Ancient Greece (-350, -100)

- ***Archimedes of Syracuse*** (-287, -212)
  - mathematician [geometrical theorems, infinitesimals] and physicist [hydrostatics, statics]
- ***Aristarchus of Samos*** - *heliocentric model*
- ***Hipparchus*** (-190, -120) - *star catalogue, calculation of distance to the sun*
- ***Euclid*** - *introduce mathematical concepts of definition, axiom, theorem and proof*



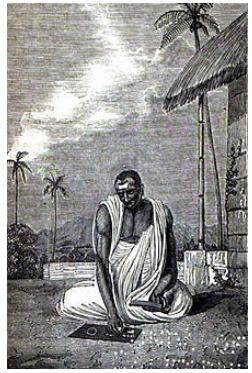
Archimedes Palimpsest



Fragment of Euclid's elements

History of science:

India



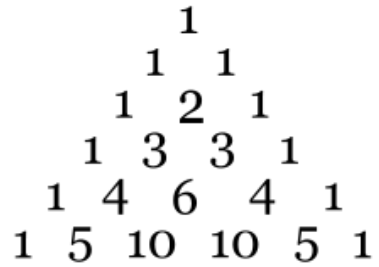
- India : -600,-500 **Aryabhata and Bramagupta** contribute to maths:
  - use of zero
  - trigonometric functions
  - square roots
  - computation of pi
  - Etc.
- Knowledge of surgery, diseases, mastery of metallurgy.

Rules of Brahmagupta:

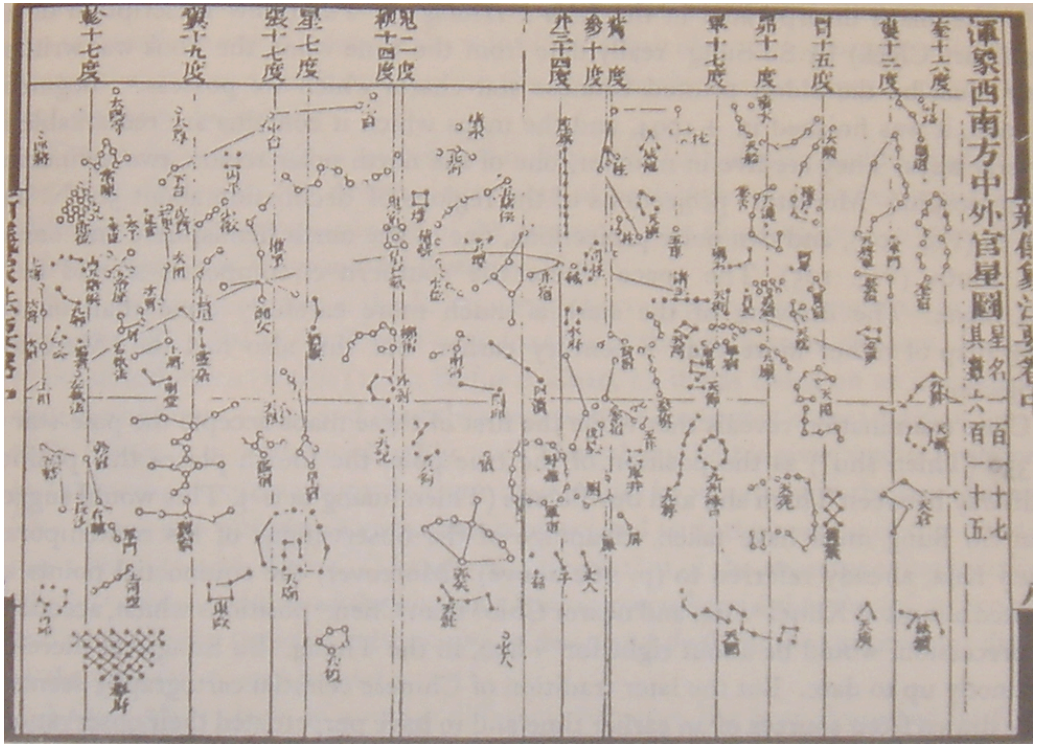
- The sum of zero and a negative number is negative.
- The sum of zero and a positive number is positive.
- The sum of zero and zero is zero.
- The sum of a positive and a negative is their difference; or, if their absolute values are equal, zero.
- A positive or negative number when divided by zero is a fraction with the zero as denominator.
- Zero divided by a negative or positive number is either zero or is expressed as a fraction with zero as numerator and the finite quantity as denominator.
- Zero divided by zero is zero.

History of science:

China



- **Mathematics** - solving equations, base 10 algebra, Pascal's triangle, pi = 355/113, geometry
- **Astronomy** – use cylindrical/Mercator projection, armillar sphere

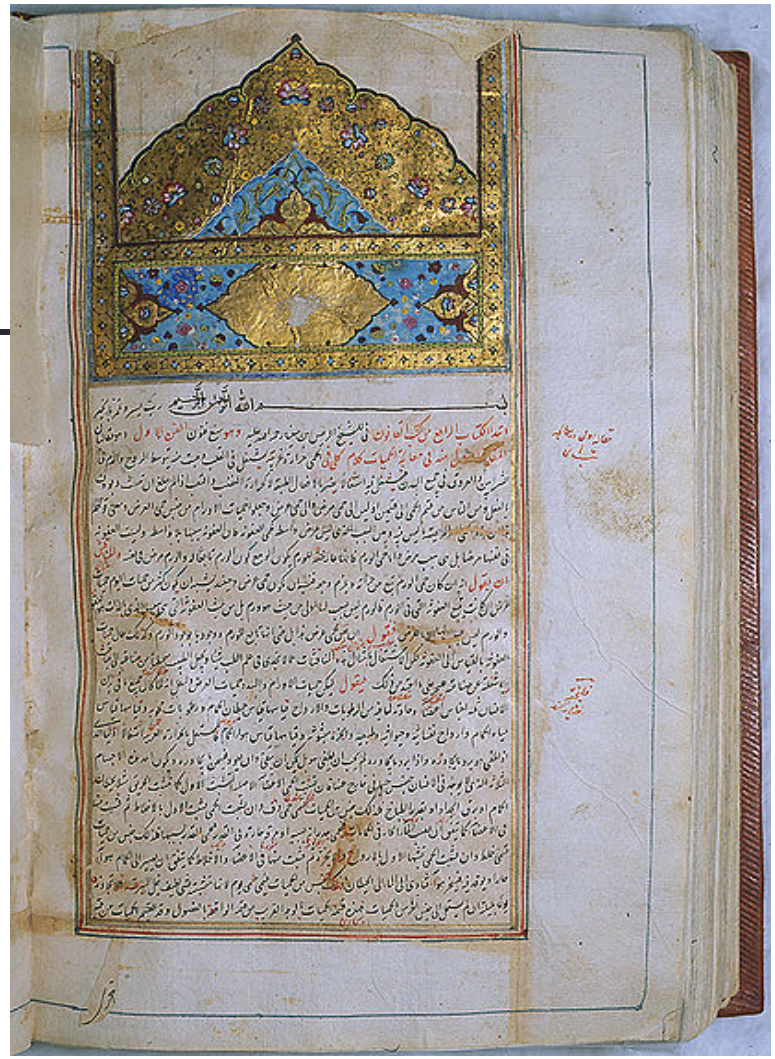


Star maps from Su Song's Xin Yi Xiang Fa Yao [1092]

History of science:

Islamic world

- Muslim scientists put more emphasis on experiments than Greeks = *Emergence of inductive experimental method*
- ***Ibn al-Haytham*** (Alhazen) (965-1040) - book of Optics *[experiments, refraction of light]*
- Persian mathematician Muhammad ibn Musa ***al-Khwarizmi*** (780-850)
  - name algorithm
  - al-jabr (beginning of title of one of his publications) → algebra



History of science:

Islamic world

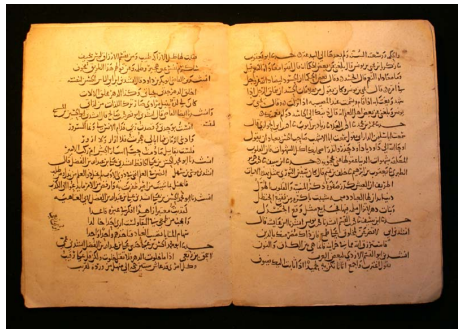
- ***Al-Battani*** - improved the measurements of Hipparchus *[precession of Earth]*

- Corrections made to the geocentric model by Al-Battani, Averroes and astronomers Nasir al-Din al-Tusi, Mo'ayyeduddin Urdi and Ibn al-Shatir are similar to Copernician heliocentric model.

History of science:

European Medieval thinking

- After the fall of the Roman Empire (~478 AD), Europe would be politically fragmented and a period of intellectual conservatism would be the norm.
- In Europe, intellectual activity would be under the purview of the church – monasteries would be the loci of study, contemplation, documentation.
- According to the Church, all that could be known about the world came from the bible.
- Meanwhile, Arab civilization would be the center of intellectual development – esp. in mathematics, optics, medicine.



History of science:

Muslim and western worlds (until 1500)

- Knowledge held in Constantinople, libraries of the Islamic world (Alexandria, Damascus, Cairo);
- Islamic science began its decline in the 12th century, 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 Baghdad in 1258.
- Western scholars introduce the zero that they bring back from the Islamic world and translate the Greek and Muslim scientists into Latin.

History of science:

western middle ages and renaissance

- Several universities are created in Europe in the 1200's (Oxford, Cambridge, Bologna, Salamanca, Paris) but the teaching is often in theology, law

- A larger diffusion of scientific information begins with printing (Gutenberg) and with translation into western languages rather than into latin

History of science:

Printing

- 1500 → printing, diffusion of information in all languages (+ improvement of postal services) + in the western world, the Reformation which challenges the authority of the catholic church – slow decrease of authority ; beginning of scientific research in the western world

- 1450-1500: 40,000 editions of books
- 1500-1700: 300,000
- 1700-1800: 2 millions!

Larger amount of information, faster circulation.

But still limited to circulate new ideas

History of science:

the Copernician revolution


NICOLAI CO
PERNICI TORINENSIS
DE REVOLVTIONIBVS ORBI-
um coelestium, Libri VI.

Habes in hoc opere iam recens natо, & ædito, studiosè lector, Motus stellarum, tam fixarum, quàm erraticarum, cum ex ueteribus, tum etiam ex recentibus obseruationibus restitutos: & nouis insuper ac admirabilibus hypothesibus ornatos. Habes etiam Tabulas expeditissimas, ex quibus eosdem ad quoduis tempus quàm facilli me calculare poteris. Igitur eme, lege, fruere.

Norimbergæ apud Ioh. Petreium,
Anno M. D. XLIII.

1543 - Publication of *« De revolutionibus orbium coelestium »* by Nicolaus **Copernicus**

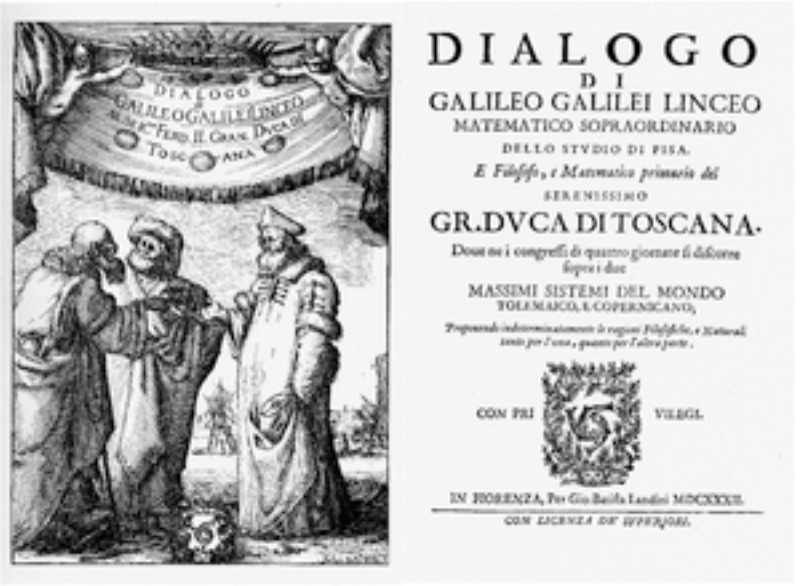
= beginning of the **scientific revolution**.

Copernic and Tycho Brahe accumulate astronomic observations which lead Kepler to state his three laws of orbital motion.

Refracting telescope is designed in 1608-1609 (in the Netherlands, then by **Galileo**) = theory of **heliocentrism**

History of science:

the Scientific revolution

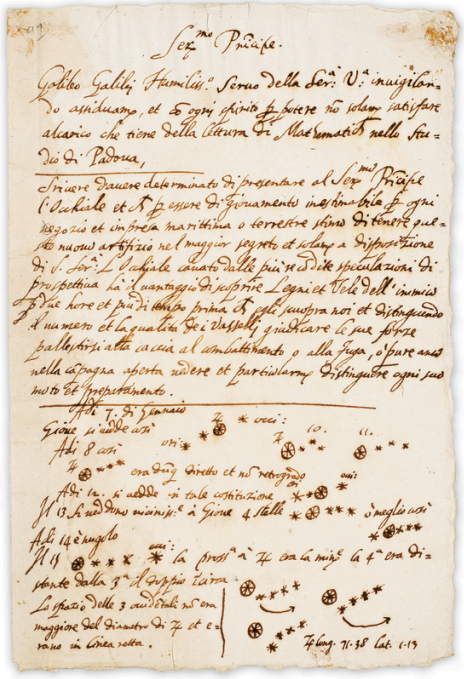


1632 - Publication of ***« Dialogue Concerning the Two Chief World Systems»*** by Galileo Galilei.

marks the end of the first phase of the scientific revolution = the *Scientific Renaissance*

→ *Galileo is sentenced to prison by catholic church.*

The book is placed on *the Index of Forbidden Books*, from which it will not be removed until 1835.



History of science:

the Scientific revolution

the Index of Forbidden Books

[protect the faith and morals of the faithful by preventing the reading of heretical and immoral books]

Nicolaus Copernicus

- *De revolutionibus orbium coelestium (1543)*

Johannes Kepler

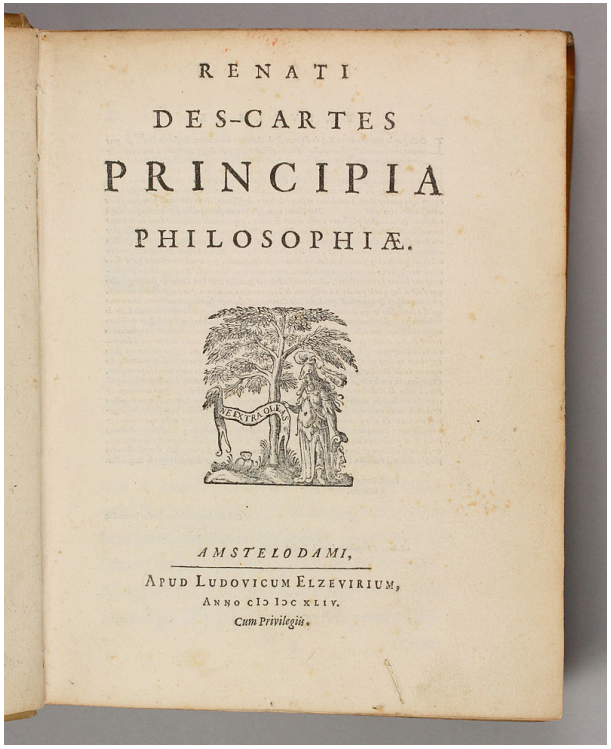
- *Astronomia nova (1609);*
- *Harmonices Mundi (1619);*
- *Epitome Astronomiae Copernicanae (1617–21)*

Also included notable authors: Jean-Paul Sartre, Montaigne, Voltaire, Denis Diderot, Victor Hugo, Jean-Jacques Rousseau, André Gide, Emanuel Swedenborg, Baruch Spinoza, Immanuel Kant, David Hume, René Descartes, Francis Bacon, Thomas Browne, John Milton, John Locke, Nicolaus Copernicus, Galileo Galilei, Blaise Pascal, and Hugo Grotius.

History of science:

Rene Descartes (1596-1650)

- Descartes is often called the 'father' of modern philosophy.
- He rejected religious authority in the quest for scientific and philosophical knowledge
- Descartes argued a mathematically-based scientific knowledge of the material world is possible.
- 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.

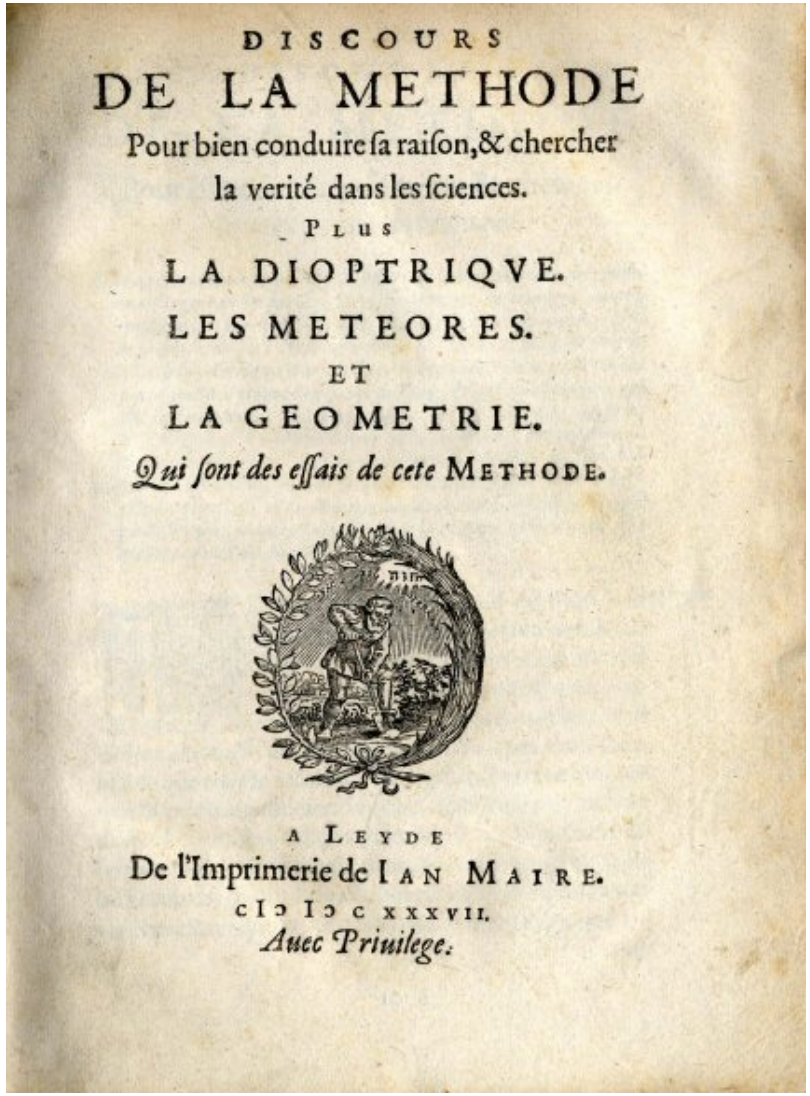


History of science:

Rene Descartes (1596-1650)

1637 - Publication of ***« Discours de la méthode pour bien conduire sa raison, et chercher la vérité dans les sciences »***

- one of the most influential works in the history of modern philosophy
- introduction of the Cartesian coordinate system


DISCOURS
DE LA METHODE
Pour bien conduire ſa raiſon,& chercher
la verité dans les ſciences.
PLUS
LA DIOPTRIQVE.
LES METEORES.
ET
LA GEOMETRIE.
Qui ſont des eſſais de cete METHODE.
A LEYDE
De l'Imprimerie de IAN MAIRE.
cIↃ IↃ c XXXVII.
Auec Priuilege.

History of science:

Rene Descartes (1596-1650)

"Instead of the great number of precepts of which Logic is composed, I believed that I should find the four which I shall state quite sufficient…

- 1. Doubt everything.
  "The first of these was to accept nothing as true which I did not clearly recognize to be so: that is to say, carefully to avoid haste and prejudice in judgments, and to accept in them nothing more than what was presented to my mind so clearly and distinctly that I could have no occasion to doubt it.
- 2. Break every problem into smaller parts.
  "The second was to divide up each of the difficulties which I examined into as many parts as possible, and as seemed requisite in order that it might be resolved in the best manner possible.
- 3. Solve the simplest problems first.
  "The third was to carry on my reflections in due order, commencing with objects that were the most simple and easy to understand, in order to rise little by little, or by degrees, to knowledge of the most complex, assuming an order, even if a fictitious one, among those which do not follow a natural sequence relatively to one another.
- 4. Be thorough.
  "The last was in all cases to make enumerations so complete and reviews so general that I should be certain of having omitted nothing."

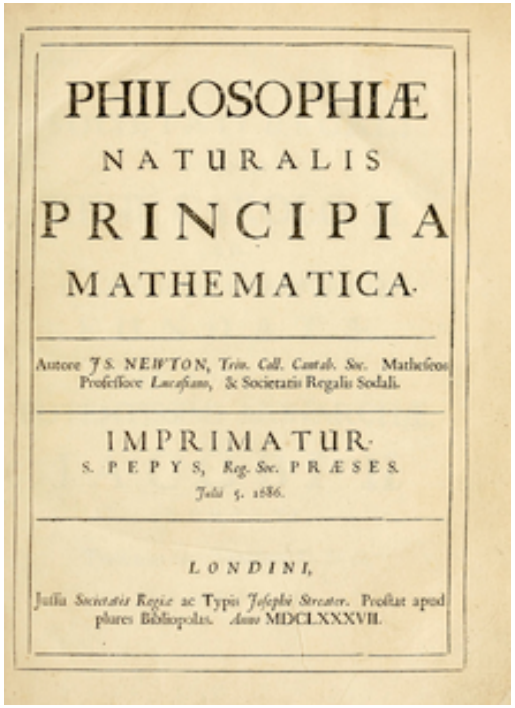
History of science:

Isaac Newton (1643-1727)

1687 - Publication of ***« Philosophiæ Naturalis Principia Mathematica »*** by Isaac Newton

[laws of motion and universal gravitation]

= completion of the **scientific revolution**

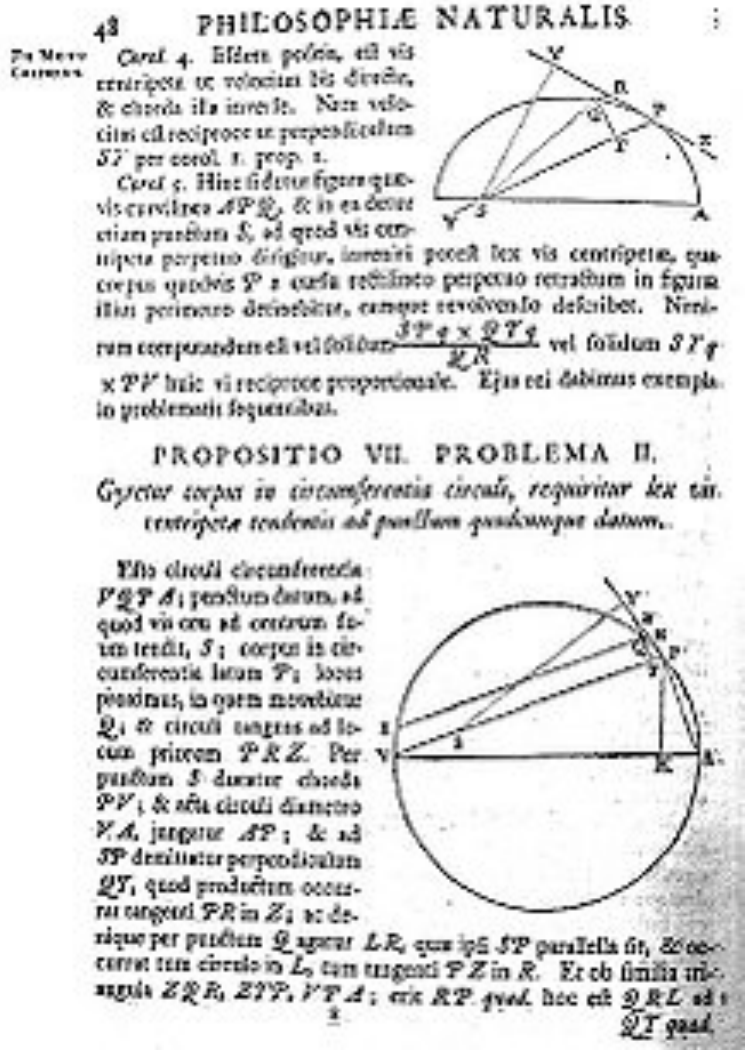


PHILOSOPHIÆ
NATURALIS
PRINCIPIA
MATHEMATICA.

Autore *IS. NEWTON*, Trin. Coll. Cantab. Soc. Matheseos Professore Lucasiano, & Societatis Regalis Sodali.

IMPRIMATUR.
S. PEPYS, Reg. Soc. PRÆSES.
Julii 5. 1686.

LONDINI,
Justu Societatis Regiæ ac Typis Josephi Streater. Prostat apud plures Bibliopolas. Anno MDCLXXXVII.



43 PHILOSOPHIÆ NATURALIS

Coroll. 4. Ellipsis, circulus, et vis centripeta ut velocitas ibi directe, & chorda ibi inverse. Nam velocitas ibi reciproce ut perpendiculum *ST* per coroll. 1. prop. 1.

Coroll. 5. Hinc si datur figura quævis curvilinea *APQ*, & in ea detur etiam punctum *S*, ad quod vis centripeta perpetuo dirigitur, invenitur pariter lex vis centripetæ, qua corpus quodvis *P* a data recta linea perpetuo retrahitur in figura illius perimetro describenda, eamque revolvendo describet. Nempe ut computandum est vel solidum $\frac{ST^2 \times QT^2}{QR}$ vel solidum $ST^2 \times PV$ huic vi reciprocæ proportionale. Ejus rei dabimus exempla in problematis sequentibus.

PROPOSITIO VII. PROBLEMA II.

Gyretur corpus in circumferentia circuli, requiritur lex vis centripetæ tendentis ad punctum quodcunque datum.

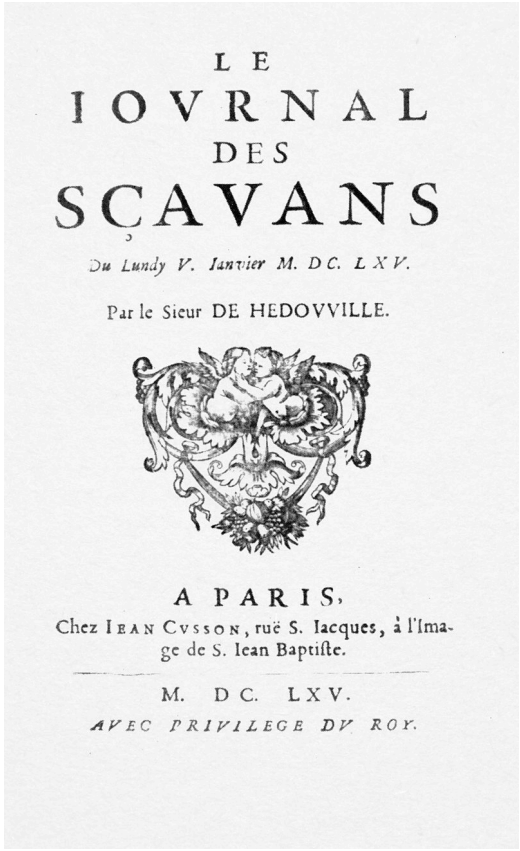
Sit circuli circumferentia *PQA*; punctum datum, ad quod vis ceu ad centrum tota tendit, *S*; corpus in circumferentia latum *P*; locus proximus, in quem movebitur *Q*; & circuli tangens ad locum priorem *PRZ*. Per punctum *S* ducatur chorda *PV*; & acta circuli diametro *VA*, jungatur *AP*; & ad *SP* demittatur perpendiculum *QT*, quod productum occurrat tangenti *PR* in *Z*; ac denique per punctum *Q* agatur *LR*, quæ ipsi *SP* parallela sit, & occurrat tam circulo in *L*, quam tangenti *PZ* in *R*. Et ob similia triangula *ZQR*, *ZTP*, *VPA*; erit *RP quad.* hoc est *QRL* ad *QT quad.*

History of science:

The first journals

1665:

- Philosophical Transactions
- Journal des sçavans



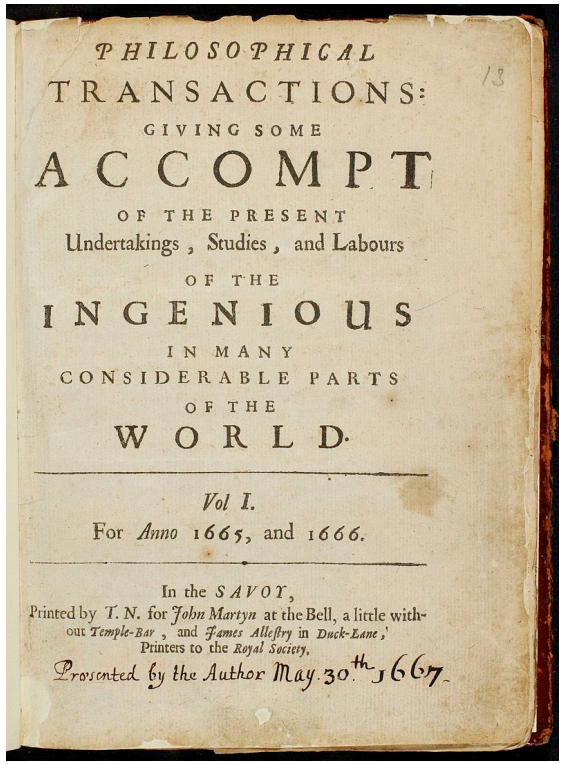
LE
IOVRNAL
DES
SÇAVANS

Du Lundy V. Ianvier M. DC. LXV.

Par le Sieur DE HEDOVVILLE.

A PARIS,
Chez IEAN CVSSON, ruë S. Iacques, à l'Image de S. Iean Baptiſte.

M. DC. LXV.
AVEC PRIVILEGE DV ROY.



PHILOSOPHICAL
TRANSACTIONS:
GIVING SOME
ACCOMPT
OF THE PRESENT
Undertakings, Studies, and Labours
OF THE
INGENIOUS
IN MANY
CONSIDERABLE PARTS
OF THE
WORLD.

Vol I.
For *Anno* 1665, and 1666.

In the *SAVOY*,
Printed by *T. N.* for *John Martyn* at the Bell, a little without *Temple-Bar*, and *James Allestry* in *Duck-Lane*,
Printers to the *Royal Society*,
Presented by the Author May 30th 1667

Academies are born:

- Royal Society
- Académie des Sciences

History of science:

The first journals

- Over a thousand journals were founded in the 18th century
- Journals often report findings already published in books – *multiple publications*
- Journals in several European languages
- This multiplication of journals is characterized by more publications by individuals or private companies than by academies → problem of access to journals

History of science:

The journals

- In mid XVIIIth century, specialisation of journals
- Periodicals for large audiences in the XIXth century
- Review process first by Philosophical Transactions in the XIXth century → structuring of papers (introduction, method, results, discussion; references)

NATURE

A WEEKLY ILLUSTRATED JOURNAL OF SCIENCE

"To the solid ground
Of Nature trusts the mind which builds for aye."—WORDSWORTH

THURSDAY, NOVEMBER 4, 1869

NATURE: APHORISMS BY GOETHE

NATURE! We are surrounded and embraced by her: powerless to separate ourselves from her, and powerless to penetrate beyond her.

Without asking, or warning, she snatches us up into her circling dance, and whirls us on until we are tired, and drop from her arms.

She is ever shaping new forms: what is, has never yet been; what has been, comes not again. Everything is new, and yet nought but the old.

We live in her midst and know her not. She is incessantly speaking to us, but betrays not her secret. We constantly act upon her, and yet have no power over her.

The one thing she seems to aim at is Individuality; yet she cares nothing for individuals. She is always building up and destroying; but her workshop is inaccessible.

Her life is in her children; but where is the mother? She is the only artist; working-up the most uniform material into utter opposites; arriving, without a trace of effort, at perfection, at the most exact precision, though always veiled under a certain softness.

Each of her works has an essence of its own; each of her phenomena a special characterisation: and yet their diversity is in unity.

She performs a play; we know not whether she sees it herself, and yet she acts for us, the lookers-on.

Incessant life, development, and movement are in her, but she advances not. She changes for ever and ever, and rests not a moment. Quietude is inconceivable to her, and she has laid her curse upon rest. She is firm. Her steps are measured, her exceptions rare, her laws unchangeable.

She has always thought and always thinks; though not as a man, but as Nature. She broods over an all-comprehending idea, which no searching can find out.

Mankind dwell in her and she in them. With all men she plays a game for love, and rejoices the more they win. With many, her moves are so hidden, that the game is over before they know it.

That which is most unnatural is still Nature; the stupidest philistinism has a touch of her genius. Whoso cannot see her everywhere, sees her nowhere rightly.

She loves herself, and her innumerable eyes and affections are fixed upon herself. She has divided herself that she may be her own delight. She causes an endless succession of new capacities for enjoyment to spring up, that her insatiable sympathy may be assuaged.

She rejoices in illusion. Whoso destroys it in himself and others, him she punishes with the sternest tyranny. Whoso follows her in faith, him she takes as a child to her bosom.

Her children are numberless. To none is she altogether miserly; but she has her favourites, on whom she squanders much, and for whom she makes great sacrifices. Over greatness she spreads her shield.

She tosses her creatures out of nothingness, and tells them not whence they came, nor whither they go. It is their business to run, she knows the road.

Her mechanism has few springs—but they never wear out, are always active and manifold.

The spectacle of Nature is always new, for she is always renewing the spectators. Life is her most exquisite invention; and death is her expert contrivance to get plenty of life.

She wraps man in darkness, and makes him for ever long for light. She creates him dependent upon the earth, dull and heavy; and yet is always shaking him until he attempts to soar above it.

B

Cover of the first issue of Nature, 4 November 1869

History of science:

The style

- In the XVIIth and XVIIIth century, two styles, one simple (ex: I think…), one complex (ex: In my opinion it is a not unjustifiable assumption to suppose that...).
- In 1664, the Royal Society sets up a committee to study this problem, the committee decides ***”to reject all the amplifications, digressions and swelling of styles: to return back to the primitive purity, and shortness, when men deliver'd so many things, almost in an equal number of words"***.
- English which has several origins has a larger variety of synonyms → ”fine tuning”, richness of expression, but need to avoid ambiguity.

#2
Scientific Writing Today

Jonathan GULA
gula@univ-brest.fr

Scientific writing

- **Why write science ? For which purpose(s) ?**
- *To let other scientists know about your results so that they do not reproduce your work without need*
- *To add to scientific knowledge – a pyramid – hopefully for progress*
- *To teach younger people – education*
- *To communicate towards large public – dissemination of scientific knowledge*

Scientific writing

- **Where do you write science in ?**
-

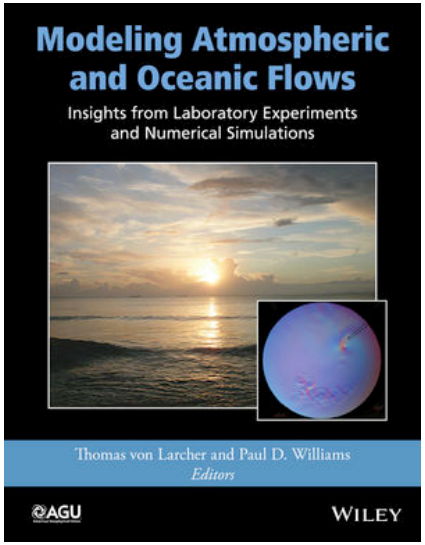
Scientific writing

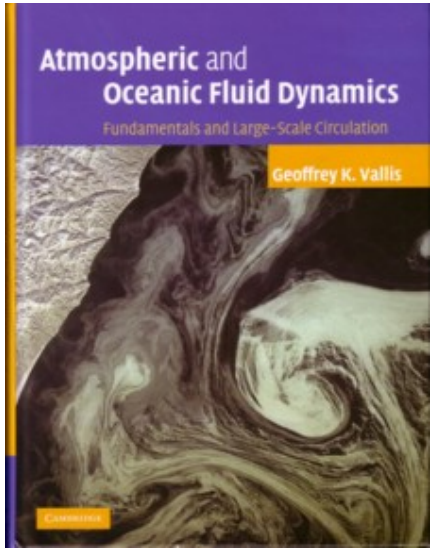
- **Where do you write science in ?**
- *Scientific reports (general, PhD, Msc theses)*
- *Technical reports, users' manuals*
- *Books (specialized, large audience)*
- *Journals for wide audiences (Scient. Amer., La Recherche, etc.)*
- *General scientific journals (multidisciplinary)*
- *Specialized scientific journals (disciplinary)*

Scientific writing

- **Where do you write science in ?**
- *Scientific reports (general, PhD, Msc theses)*

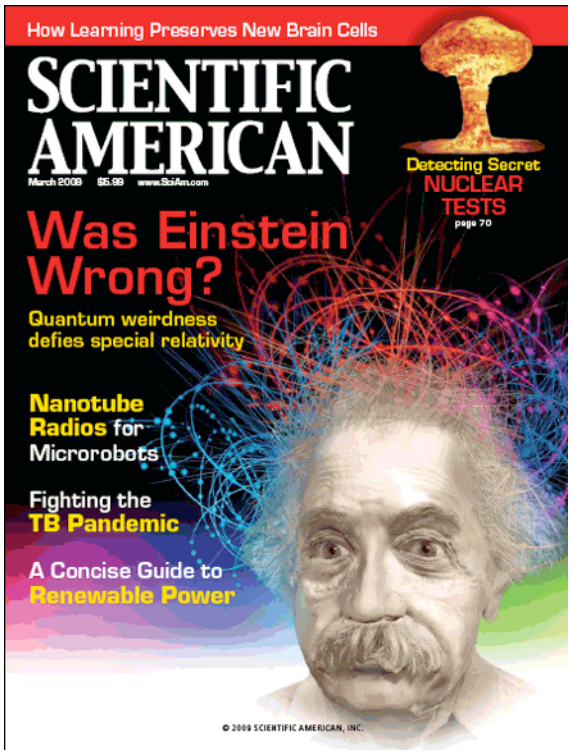
- *Technical reports, users' manuals*
- *Books (specialized, large audience)...*





Scientific writing

- **Where do you write science in ?**
- *Journals for wide audiences (Scient. Amer.)*

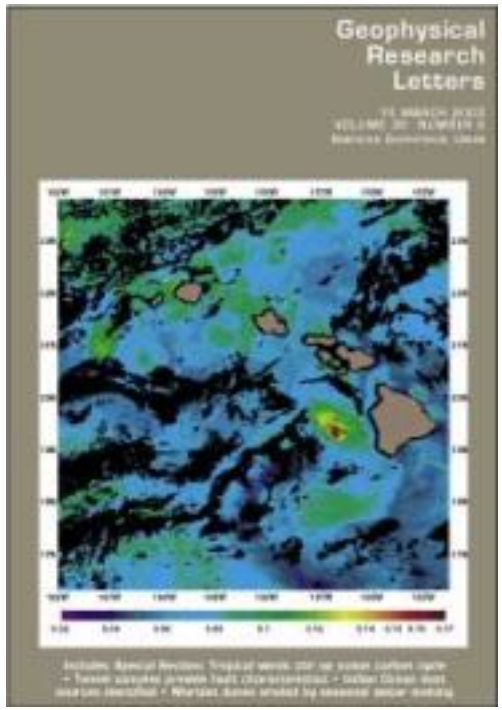


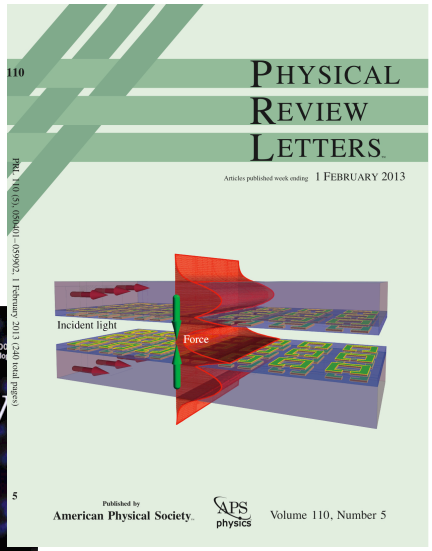
Scientific writing

- **Where do you write science in ?**
- *General scientific journals (multidisciplinary)*

Scientific writing

- **Where do you write science in ?**
- *Multidisciplinary scientific journals inside a field*





Scientific writing

- **Where do you write science in ?**
- *Ex: Nature Geosciences* *(http://www.nature.com/ngeo/authors/index.html)*

Aims and scope of the journal

Understanding the Earth's history and its future evolution is becoming ever more important as the human influence on climate and landscapes, the oceans and the atmosphere expands.

Nature Geoscience is a monthly multi-disciplinary journal aimed at bringing together top-quality research across the entire spectrum of the Earth Sciences along with relevant work in related areas.

The journal's content reflects all the disciplines within the geosciences, encompassing field work, modelling and theoretical studies.

Scientific writing

- **Where do you write science in ?**
- *Ex: Nature Geosciences* *(http://www.nature.com/ngeo/authors/index.html)*

Topics covered in the journal include:

Atmospheric science
Biogeochemistry
Climate science
Geobiology
Geochemistry
Geoinformatics and remote sensing
Geology
Geomagnetism and palaeomagnetism
Geomorphology
Geophysics
Glaciology
Hydrology and limnology
Mineralogy and mineral physics
Oceanography
Palaeontology
Palaeoclimatology and palaeoceanography
Petrology
Planetary science
Seismology
Space physics
Tectonics
Volcanology

Scientific writing

- **Where do you write science in ?**
- *Specialized scientific journals (disciplinary)*

Scientific writing

- **about 40000 - 50000** journals in 2025 publishing **5 to 6 millions articles per year**

- Many of them are now **online-only journal**

Review of articles

- Publication in scientific journals based on **peer-review**
  - A **journal editor** decides if you fit the scope of the journal
  - If yes, the paper is sent to **reviewers** (2 to 4 scientists in general), who give recommandations such as:
    - *Reject, Major Revision, Minor revision, Accept*
  - The editor decides to reject, ask for a revision, or publish based on the reviews (and eventually his own).

- The process is in general **a blind review** and **reviews are unpublished**, but many journals also have an open review process (e.g. https://www.ocean-science.net) or at least "transparent" review process (e.g. https://www.nature.com/ncomms/submit/tpr-faq)

Scientific writing

- **Ex: Where do researcher in LOPS *(Laboratoire d'océanographie Physique et Spatiale)* published between 2020-2024:**

Répartition des publications par principales revues, avec quartiles (titres de revue avec au minimum 5 publications) :

Revues	Nb publis	Quartiles	Revue Open access
Journal Of Geophysical Research-Oceans	83	Q1	
Other (Arxiv, ESS OA, Preprint, SSRN, Egusphere, IEEE Conferences IGARSS, ...)	59		
Geophysical Research Letters	43	Q1	1
Remote Sensing	33	Q1	1
Frontiers In Marine Science	33	Q1	1
Journal Of Physical Oceanography	32	Q1	
Ocean Science	25	Q1	1
Ieee Transactions On Geoscience And Remote Sensing	21	Q1	
Ocean Modelling	16	Q1	
Journal Of Climate	14	Q1	
Geoscientific Model Development	13	Q1	1
Earth System Science Data	13	Q1	1
Scientific Reports	12	Q1	1
Astronomy & Astrophysics	11	Q1	
Geophysical And Astrophysical Fluid Dynamics	10	Q3	
Journal Of Atmospheric And Oceanic Technology	10	Q2	
Journal Of Advances In Modeling Earth Systems	9	Q1	1
Surveys In Geophysics	8	Q1	
Marine Pollution Bulletin	8	Q1	
Progress In Oceanography	8	Q1	

Journal impact?

- **Impact factor :** In any given year, the impact factor of a journal is the number of citations received in that year by articles published in that journal during the two preceding years, divided by the total number of articles published in that journal during the two preceding years

- Database from JOURNAL CITATION REPORTS updated every year [see e.g. https://impactfactorforjournal.com/jcr-impact-factor-2022/]

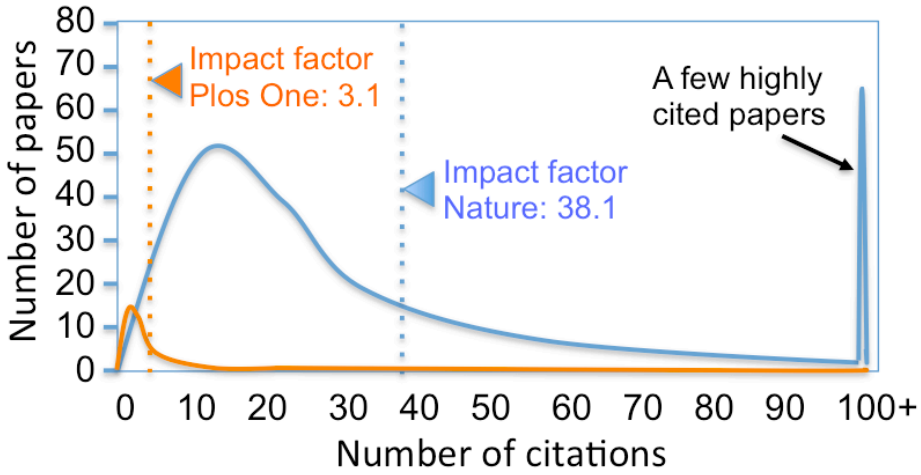
- It is the most used proxy for the relative importance of a journal within its field.

- Big differences depending on the fields - Multidisciplinary journals often have larger IF's, - Review journals as well.

Journal impact?

- **Impact factor :** In any given year, the impact factor of a journal is ***the number of citations received in that year by articles published in that journal during the two preceding years***, divided by the total number of articles published in that journal during the two preceding years

- Citation counts have highly skewed distributions:



- The effect of outliers can be seen in the case of the article "A short history of SHELX", which included this sentence: "This paper could serve as a general literature citation when one or more of the open-source SHELX programs (and the Bruker AXS version SHELXTL) are employed in the course of a crystal-structure determination". This article received more than 6,600 citations. As a consequence, the impact factor of the journal Acta Crystallographica Section A rose from 2.051 in 2008 to 49.926 in 2009, more than Nature (at 31.434) and Science (at 28.103).[28] The second-most cited article in Acta Crystallographica Section A in 2008 only had 28 citations ***[https://en.wikipedia.org/wiki/Impact_factor]***

Journal impact?

- **H5-index :** h5-index is the h-index for articles published in the last 5 complete years. It is the largest number h such that h articles published in 2020-2024 have at least h citations each.

Publication	h5-index	h5-median
1. Nature	379	560
2. The New England Journal of Medicine	342	548
3. Science	312	464
4. The Lancet	259	418
5. Cell	224	339
6. Chemical Society reviews	224	329
7. Journal of the American Chemical Society	218	293
8. Proceedings of the National Academy of Sciences	215	286
9. Advanced Materials	201	301
10. Angewandte Chemie International Edition	198	276
11. Journal of Clinical Oncology	197	265
12. Physical Review Letters	196	282
13. Chemical Reviews	194	332

- [https://scholar.google.fr/citations?view_op=top_venues&hl=en]

Journal impact?

Categories > Physics & Mathematics > **Geophysics**

	Publication	h5-index	h5-median
1.	Nature Geoscience	96	133
2.	Journal of Geophysical Research	89	121
3.	Geophysical Research Letters	87	116
4.	Earth and Planetary Science Letters	63	80
5.	Geophysics	52	77
6.	Tectonophysics	51	64
7.	Geophysical Journal International	49	66
8.	Reviews of Geophysics	46	84
9.	Bulletin of the Seismological Society of America	43	61
10.	Journal of Volcanology and Geothermal Research	43	54
11.	Geochemistry, Geophysics, Geosystems	42	55
12.	Tectonics	40	51
13.	Journal of Physical Oceanography	40	50
14.	Journal of Geodesy	38	52
15.	Seismological Research Letters	38	49
16.	Journal of Glaciology	34	48
17.	Solid Earth	34	45

- [https://scholar.google.fr/citations?view_op=top_venues&hl=en&vq=phy_geophysics]

Journal impact?

- **Other indicators:**

Table 1
Methodological differences between the SJR2 indicator, SJR indicator, Article Influence, Influence Weight, SNIP and Impact Factor.

	SJR2	SJR	Article Influence	Influence Weight	SNIP	Impact Factor
General differences						
Source database	Scopus	Scopus	Web of Science	N.A.	Scopus	Web of Science
Citation time frame	3 years	3 years	5 years	N.A.	3 years	2 years
Journal self-citation	Limited	Limited	Excluded	Included	Included	Included
Citation value	Weighted	Weighted	Weighted	Weighted	Unweighted	Unweighted
Size normalization	Citable document rate	Citable documents	Citable documents	Documents	Citable documents	Citable documents
Specific Influence Measures differences						
Connection normalization	Normalized by the cosine weighted sum of active references in the citing journal	Normalized by the total number of references in the citing journal	Normalized by the number of active references in the citing journal	Normalized by the number of active references in the citing journal	N.A.	N.A.
Closeness weight	Cosine of cocitation profiles	N.A.	N.A.	N.A.	N.A.	N.A.

Vicente P. Guerrero-Bote, Félix Moya-Anegón, A further step forward in measuring journals' scientific prestige: The SJR2 indicator, Journal of Informetrics, Volume 6, Issue 4, October 2012, Pages 674-688, ISSN 1751-1577, http://dx.doi.org/10.1016/j.joi.2012.07.001.

Journal impact?

- **Evaluation of researchers** still relies a lot on the number of publications and impact factors.
  - **= *Publish or Perish !***

- Articles from journals with IF < 1 are often not counted.
- Articles from high IF journals (e.g. Science, Nature) weigh more.

Who are the publishers?

- **Private publishers** (making a lot of profit!)
  - Elsevier, Springer, Wiley-Blackwell, Taylor & Francis, SAGE Publications,
  - Including more recent (border-line "predatory") publishers: MDPI, Frontiers, Hindawi, etc.

- **Non-profit organisation:**
  - PLOS, Annual Reviews, AGU, AMS, etc.
- **University publishers:**
  - Cambridge, Oxford, Yale, etc.

- **CNRS publications in 2017:**
  - Elsevier (26%), Springer (15%), Wiley (9%)

Who are the publishers?

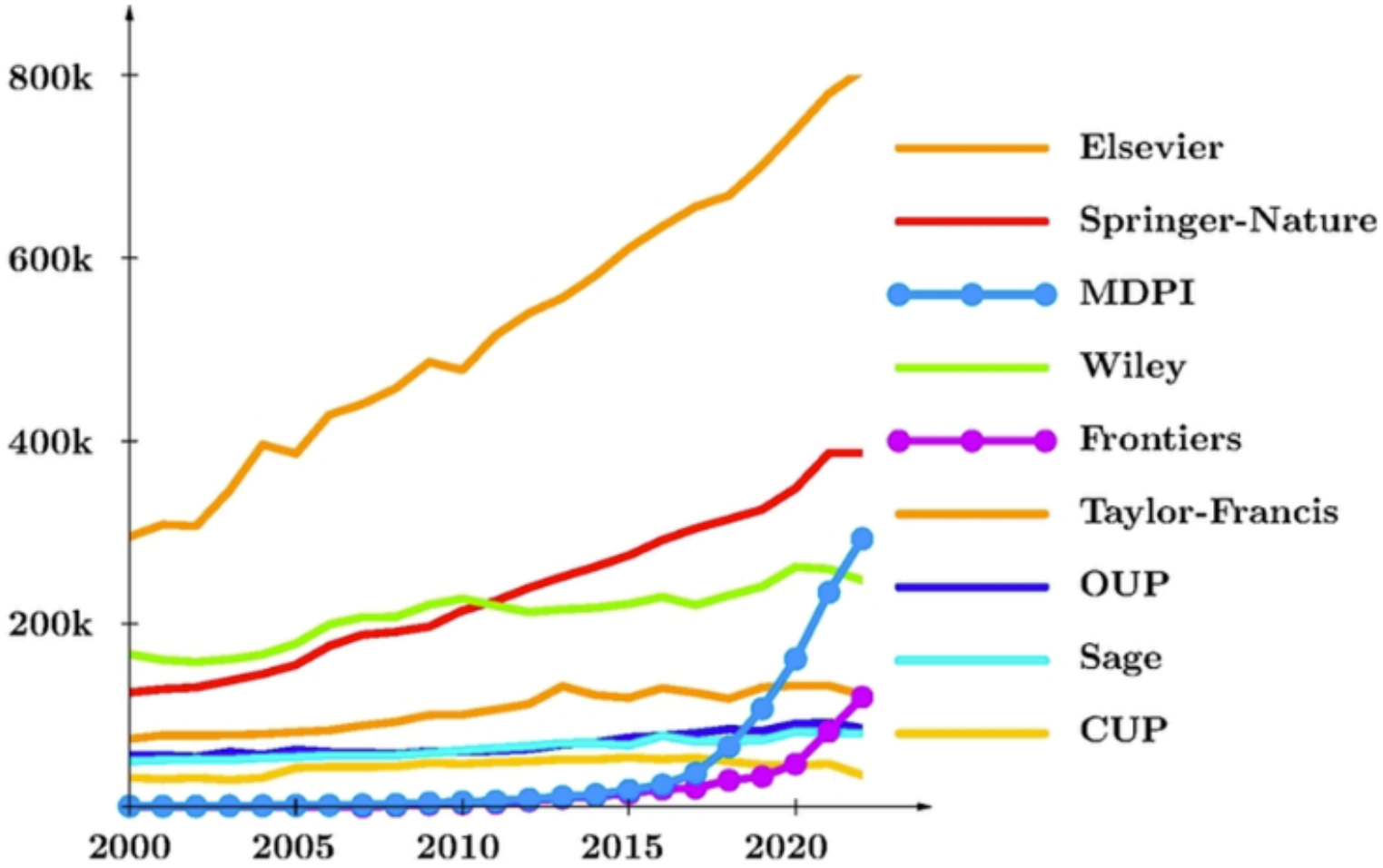


Figure 1: Evolution of the total number of articles published per year and per publisher, data from OpenAlex.

https://www.ouvrirlascience.fr/excessive-growth-in-the-number-of-scientific-publications/

Subscription Vs Open-access

- Most journal have *(very expensive)* subscription fees, paid by university libraries. Hundreds of dollars to millions a year paid by universities and institutes to publishers.

- **Problems:**
  - 1. Prices are too expensive. More and more universities protesting and refusing to pay subscription fees.
  - 2. Science is not available to the public (especially publicly funded science!)

- See e.g. https://jussieucall.org/jussieu-call/
  -

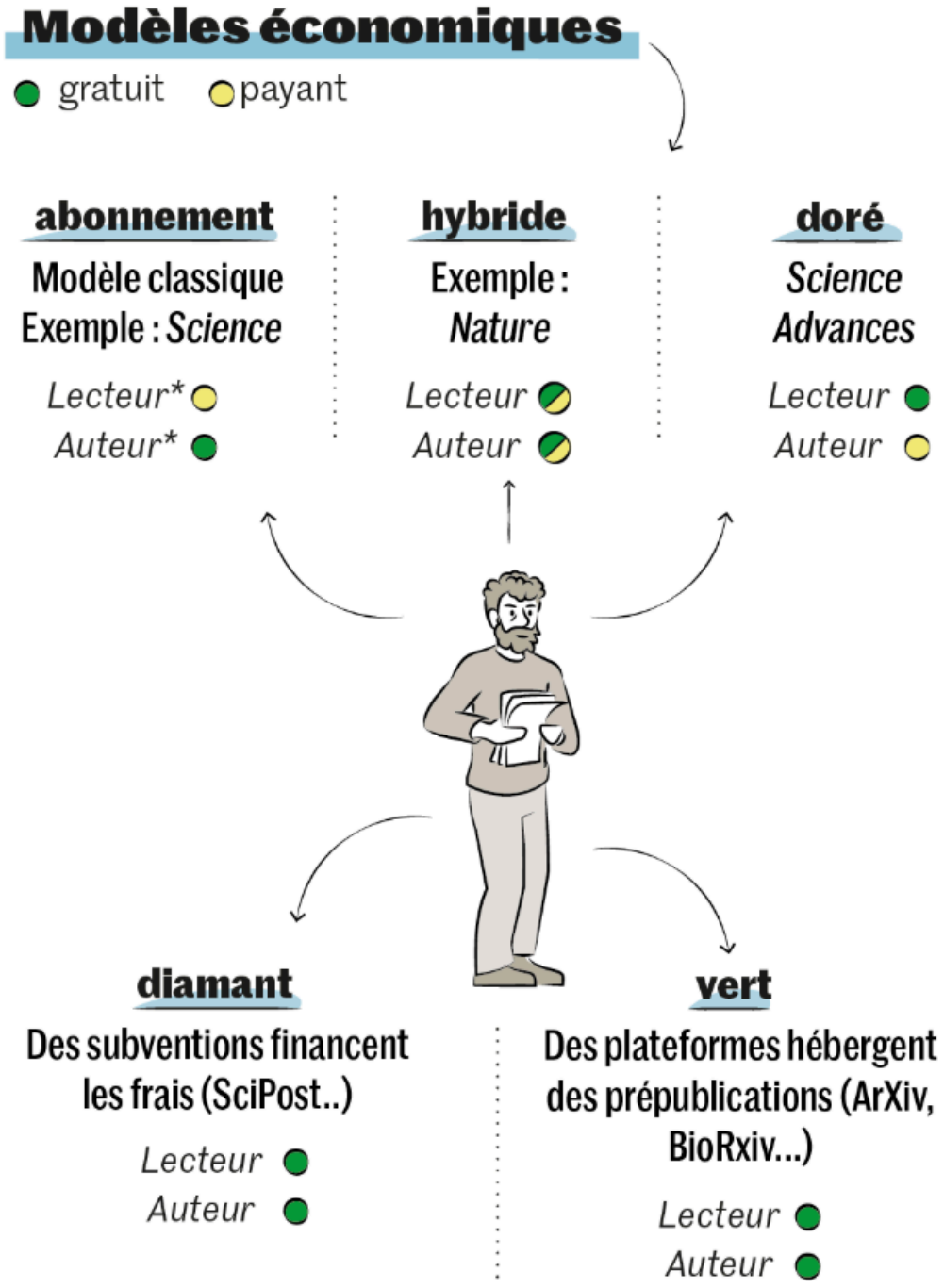
Subscription Vs Open-access

- Subscription fee (per year) for:
  - French institutions = 100 M€
  - CNRS = 12 M€

- The richest Indian university had access to 12 % of journals (compared to Harvard's)

Subscription Vs Open-access

- More and more **OPEN ACCESS journals** (= no subscription)
  - Such as PLOS One, Nature Communications, Nature Scientific Reports, etc.
  - example: **Public Library Of Science (PloS)**, created in 2001 by researchers
- About 50% are now open-access
- Mandatory for some funding agencies



Infographie *Le Monde*

How much does it cost?

- **Journals with subscription (with hybrid open access)**
  - Ex: AMS journals = **$145 per page** (typically $2000) / $ 800 for open access (OA)
  - Ex: Journal of Fluid Mechanics = **$0** for publication / $5000 for OA
  - Ex: AGU journals = https://www.agu.org/publish-with-agu/publish/author-resources/publication-fees
- **Open access journals:**
  - Ex: Nature Communications = **$5000** (OA mandatory)
  - Ex: PLOS One = **$1595** (OA mandatory)
-

Alternative solutions?

- **Self-Archive:**
  - Started as hep-th in Los Alamos in 1991
  - Became **arXiv** (https://arxiv.org/) in 1999
  - Then BioRxiv, EarthArXiv, etc.
  - French researchers created **HAL** (https://hal.archives-ouvertes.fr/
    - with (connected) versions for UBO (https://hal.univ-brest.fr), CNRS (https://cnrs.hal.science), etc.
  - Ifremer has **Archimer** https://archimer.ifremer.fr

Alternative solutions

The problem with self-archiving is the lack of a consistent **peer-review** process.

Possible solutions are:

- **Peer-community:**
  - Peer community in … (https://peercommunityin.org/)

    The “Peer Community in” (PCI) is a non-profit scientific organization that aims to create specific communities of researchers reviewing and recommending, for free, unpublished preprints in their field (i.e. unpublished articles deposited on open online archives like arXiv.org and bioRxiv.org). To a lesser extent, they may also recommend postprints (i.e. articles already published in journals).

    https://peercommunityin.org/movies-and-posters/

Alternative solutions

But so far, the model is in-between, with people publishing in traditional journals and putting their paper on self-archive (in a non-edited form) for open access.

For example, funding agencies like ANR and institutes like CNRS/ INRIA require that a copy of each publication is available on HAL.

Evaluation of researchers

Evaluation is likely to evolve :

See **San Francisco Declaration on Research Assessment** (DORA). https://sfdora.org/ and COARA (https://coara.fr)

- suggest reforming the system and banning indicators such as the “h-index” and the “journal impact factor” and encouraging narrative CVs.

~~Future~~ Present of scientific writing

Current revolution due to AI

More and more authors use AI (e.g. https://arxiv.org/pdf/2406.07016)

Is it OK for AI to write science papers?

https://www.nature.com/articles/d41586-025-01463-8 or jgula.fr/SE/Nature_AI.pdf

Homework

Presentations and articles will be available at jgula.fr/SE

For next lecture :

- Read **Dongetal25.pdf and Kobaketal25.pdf**
- We will discuss these articles collectively

History of science:

Ancient Greece and Rome

- Persuasive arguments in discussions directed by free-lance teachers, the **sophists**
- Plato deplored them as users of any verbal trick to achieve their ends irrespective of truth [see Gorgias]
- Lead to Aristotle ”*Art of Rhetoric*” in -348 = art of persuasion
- Later amplified by Cicero in *De Oratore*.

History of science:

The first journals

- Simultaneous discoveries ending in dispute:
  - 92% in the 17th century
  - 72% in the 18th century
  - 59% by the latter half of the 19th century,
  - 33% by the first half of the 20th century