Unintended Consequences

The Historical Transformations Caused by Print

- Aniket Alam
- **Gutenberg Parenthesis**
- HS3.304
- Spring 2023

Quantification

- Process started well before the printing revolution
- Time
- Space
- Mathematics
- Music
- Painting
- Bookkeeping

Quantification Standards

- Hindu-Arabic numerals
- Alphabets
- All reality can be broken up into constitutive units
- A small set of symbols can combine infinitely to represent all reality
- Emerging in Europe as social phenomenon before printing
- Printing standarised these across Europe

Advantages of Backwardness

- Europe had a (relatively) backward and weak economy
- Dependant on low yield agriculture
- Small(er) agriculture surplus equaled
  - Weaker States, decentralised
  - Small(er) trade
  - Small(er) urban areas
- Backward manufacturing meant more dependant on trade
- Relative power of merchants vis-à-vis State
  - Merchant Cities were relatively autonomous

Quantification of Time

- Society cannot emerge without measure of time
- What Units Measure Time
- Basis of production and reproduction of society
- How do we measure time
  - Individually
  - As a polity and society
  - As a civilisation
- Who Controls Time
  - Religion
  - State

Medieval Time

- Attempt to get standard units
- Solar time changes 4 mins every Longitude

Religion Controlled Time

- Cannonical Hours
- Azaan
- Buddhist / Hindu Prayer times
- Calendars
- Dates decided by religious leaders
- Imprecise
- Spatially Fragmented

Church Tower dominates the city

Clock Tower Dwarfed by Church Towers

Typical Rural Church, Medieval Europe

The major trade centres saw merchant power rising and taking control of time

TYPICALLY SMALL CLOCK TOWERS ON MERCHANT BUILDINGS

MERCHANT GUILDS' CLOCK TOWER, BERN, SWITZERLAND

- Low tower
- Enclosed space for merchants and guildsmen
- Precision time

PRECISION OF THE CLOCK

BERN PANORAMA

- Notice the dominance of the Church Towers
- Merchants' Clock Tower is nowhere to be seen.

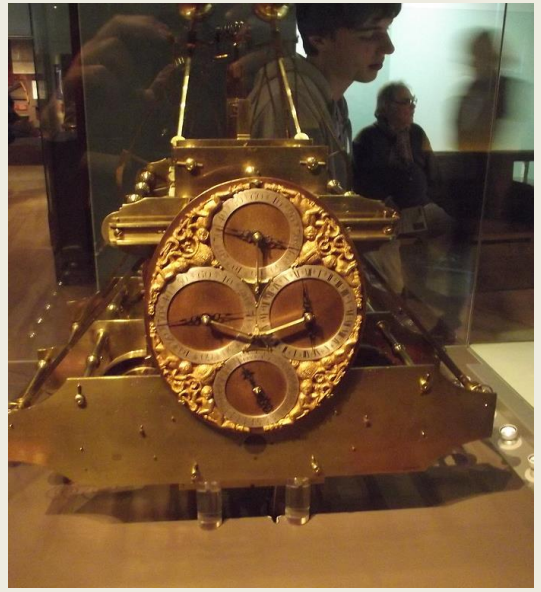
Merchant power reached its pinnacle in Venice

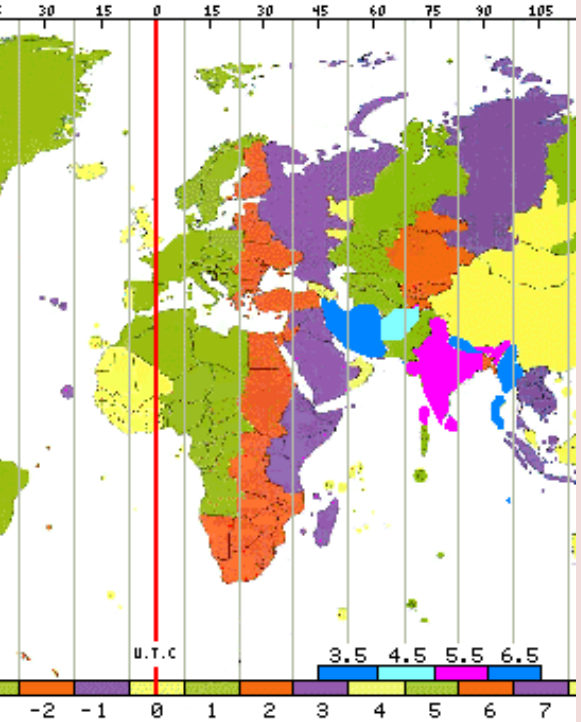
Change in Time

- Rationalisation of Time
  - Fixed hours, even minutes
  - Currency and Finance
  - Each unit of time same as the other
  - “Waste”, “gain”, “lose” time
  - “Use” time.... Usury
- Secularisation of Time
  - Not owned by God, but fixed by common consent
- TOOK FIVE CENTURIES TO STABILISE
- ...and yet is it so?

Longitude

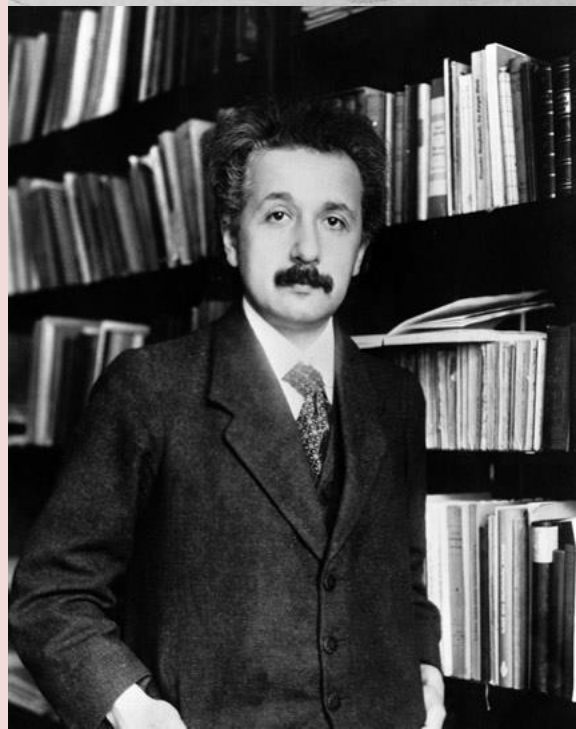
- Political Issue
- Along with trade and mercantilism, important contributor to secularisation of Time
- Where is the prime meridian 0°
- How does one calculate one degree Longitude
  - Gallileo's Moons of Jupiter (1612 AD)
  - Lunar calculations and Almanac
  - John Harrison's Marine Chronometer (1761 AD)
  - How many degrees will a sphere be divided into?





Universal Time

- 1884: International Meridian Conference
  - Fixed Greenwich as zero longitude
  - One time for the entire globe
- Travel rationalised
- Global business transactions
- “Backward Linkage”
- Calendar universalised



Measuring Space

How does one measure space?

- By abstract measures of distance
  - Miles, *Kos*, Kilometres
- By time taken to travel
- By difficulties of approach
- By emotional and moral parametres?

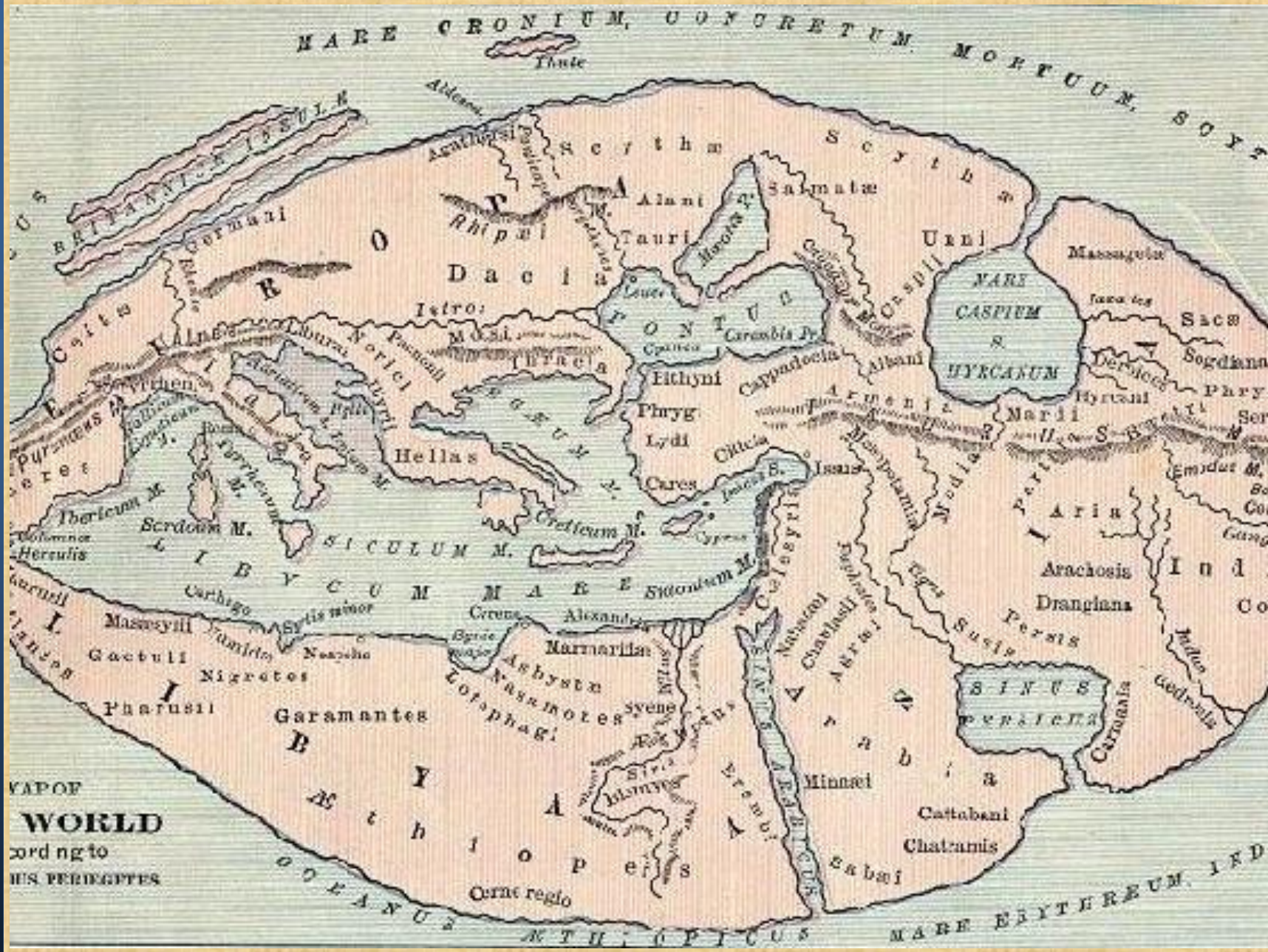
This is how “India” and the world was represented in ancient and medieval maps

JAMBUDVIPA

Jaina Cosmological map

- Note the attempt at cartographical precision
- Map based on evidence from travelers

GREEK MAP OF THE WORLD 4TH CENTURY BC



Again, cartography based on evidence from travelers

PTOLEMY'S WORLD MAP

Note the conceptual similarity with Jambudvipa

WORLD MAP
15-16C EUROPE

Cartography which shares the conceptual world of Jambudvipa

MEDIEVAL KOREAN WORLD MAP

Drawn for Roger II, king of Sicily

AL-IDRISI'S MAP OF THE WORLD, 1154

Map Drawn in Amsterdam

INDIA ORIENTALIS 1611

Map drawn in London ten years before the Battle of Plassey

PERSIANATE WORLD, 1747

Map drawn in the second half of the 19th Century
(according to Mercator projection)

EUROPEAN EMPIRES IN ASIA

MAP OF BRITISH EMPIRE IN INDIA, 1909

It was only in the late 19th and early 20th centuries that India's cartographic visual look came to be what we recognise today.

Technology of the New Maps

Cadastral Maps

- (Re) Emerged in early modern Europe
- Clear identification of land among private owners

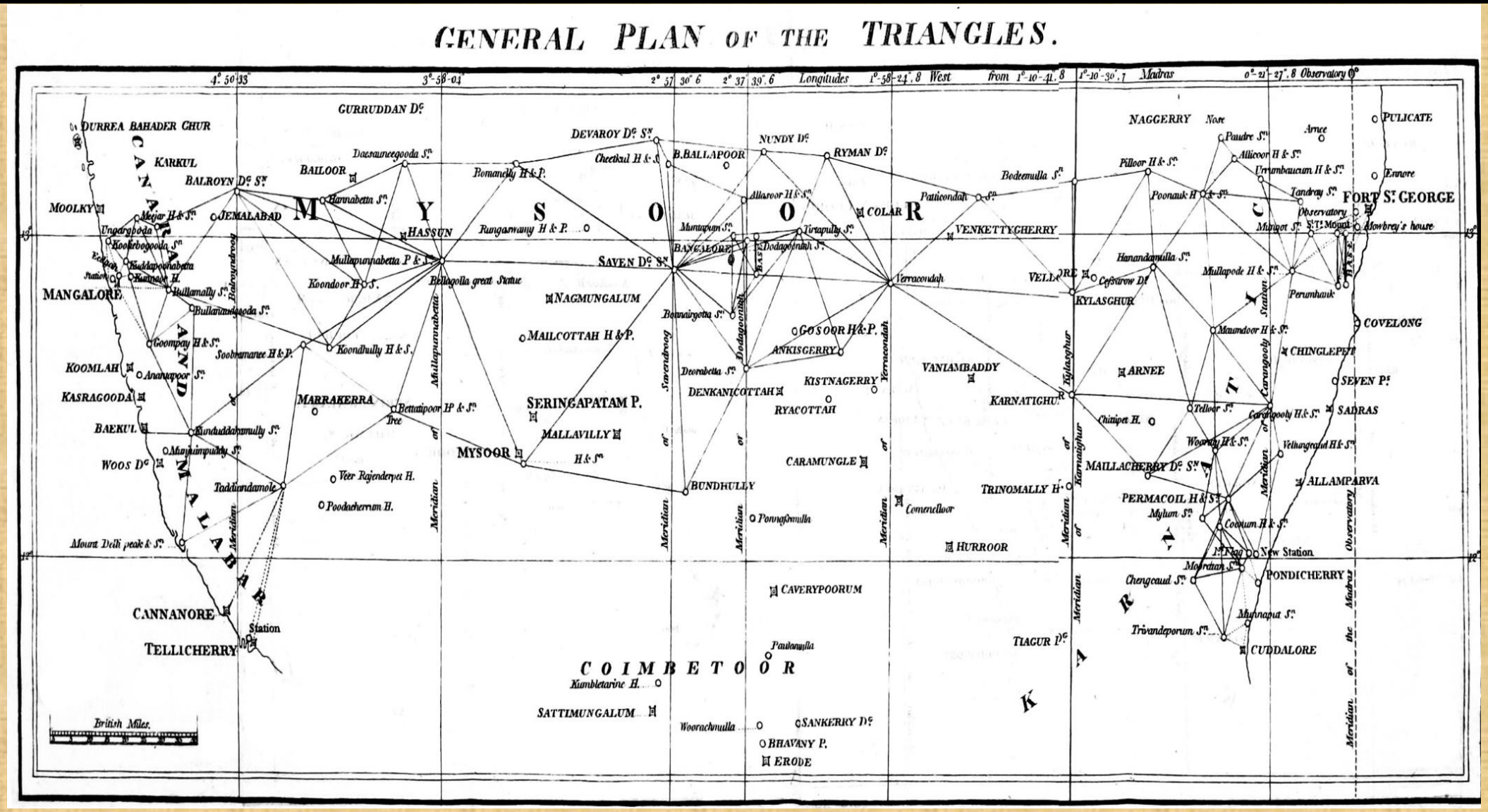
Trignometrical Surveys

- Mapping entire territory using geometry after identifying a single base length
- Great Trignometrical Survey of India (1802-1872)

Latitude and Longitude

- Latitude is a scientific calculations based on Sun position; has been known for long
- Longitude is a political decision; took many centuries to determine

First Triangulation
Madras to Mangalore through Mysore



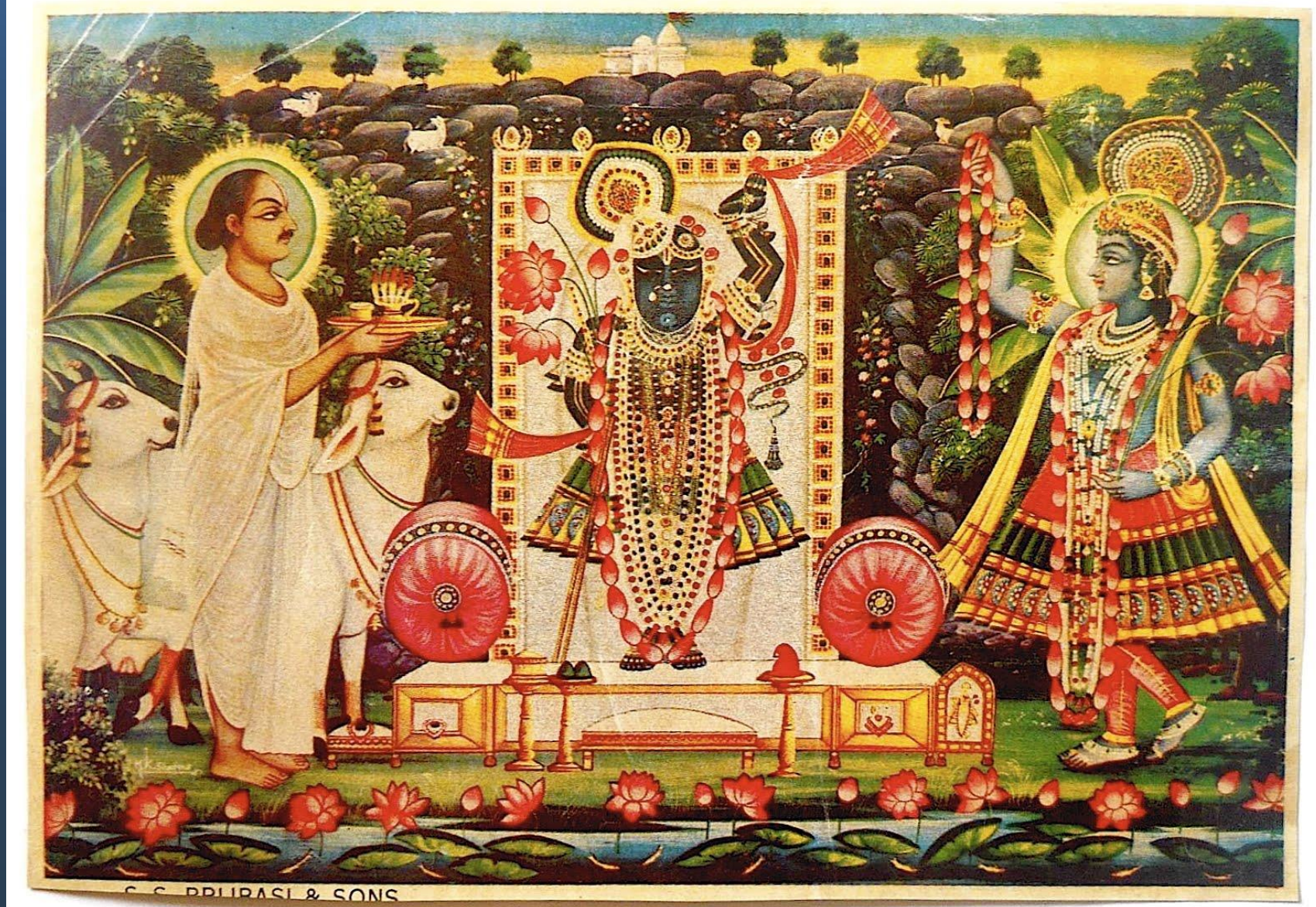
COMPILED UNDER THE ORDERS OF COL. J. T. WALKER, R.E., F.R.S. &c. SUPERINTENDENT GREAT TRIGONOMETRICAL SURVEY OF INDIA AT DEHRA DOON, AUGUST 1870.

Engraved at the Surveyor Generals Office
Calcutta Nov. 1870

Perspective in Painting

- Perspective is mathematical
- Emerged at the end of medieval Europe
- Shifting visual representation from two to three dimension
- Realism

- Illustrations of how perspective emerged over the past five or six centuries


S. S. PRURASI & SONS

How many Dimensions to Space

Two Dimensional view

- Events from different spaces shown together
- Events from different times shown together

Empty Space, Moving Time

- What is gained
  - Perspective
  - Time as motion
- Enumeration of Time and Space
  - *Mere* numbers


OilPaintingFactory.com
Toperfect Art

Notice the shift over the next three paintings

The three paintings are of the same topic:
Madonna and Child (Jesus)

These paintings span a period of about 150 years of late medieval and early modern Europe

Notice the shift in the following two paintings

Same scene:

Raas Leela of Krishna

Krishna Storms Citadel of Narakasura

- Mysore Painting Workshop, 1840.
- Double Page from a manuscript of Bhagavata Purana
- Painter Unknown, Painting commissioned by “High Highness, Rajah of Mysore” (Krishnaraja Wodeyar III)
- Paper from “Gior Magnani”; seal in English
- Krishna breaks the fortifications, the army marches in, bitter battle, the beheading of the demon; Krishna honoured by the demon’s own mother…
- European Ships in the Sea
- Gods watch the battle from the skies

Battle of Waterloo, 1815
William Sadler

- Shows the Different Armies Arrayed
- Depicts the Different Main Incidents and Features of the Battle
- Depth of Field and Snapshot of Time

Roman Numbers

I	1
II	2
III	3
IV	4
V	5
VI	6
VII	7
VIII	8
IX	9
X	10
XI	11
XII	12
XIII	13
XIV	14
XV	15
XVI	16
XVII	17
XVIII	18
XIX	19
XX	20

XXI	21
XXII	22
XXIII	23
XXIV	24
XXV	25
XXVI	26
XXVII	27
XXVIII	28
XXIX	29
XXX	30
XXXI	31
XXXII	32
XXXIII	33
XXXIV	34
XXXV	35
XXXVI	36
XXXVII	37
XXXVIII	38
XXXIX	39
XL	40

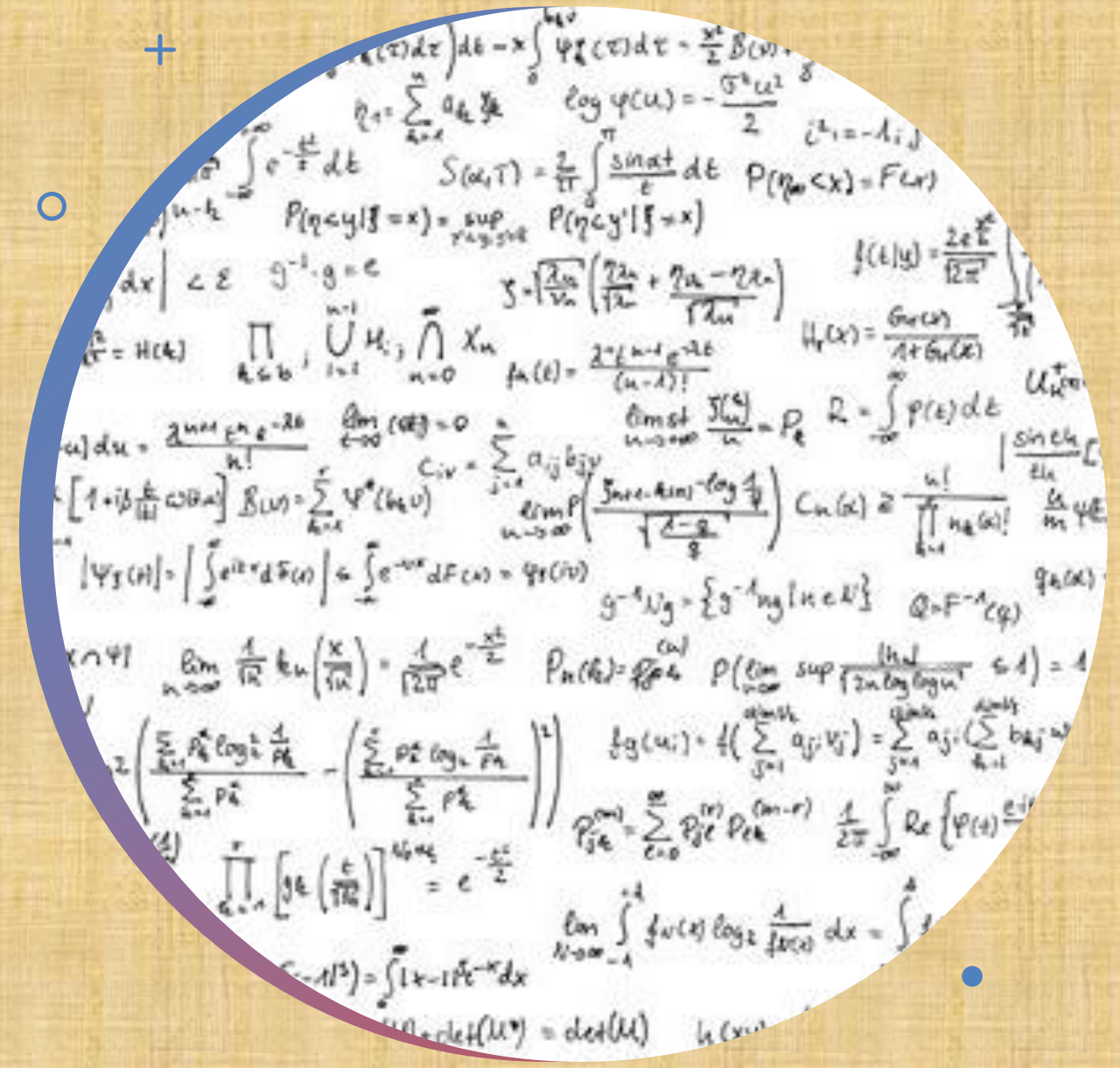
XLI	41
XLII	42
XLIII	43
XLIV	44
XLV	45
XLVI	46
XLVII	47
XLVIII	48
XLIX	49
L	50
LI	51
LII	52
LIII	53
LIV	54
LV	55
LVI	56
LVII	57
LVIII	58
LIX	59
LX	60

LXI	61
LXII	62
LXIII	63
LXIV	64
LXV	65
LXVI	66
LXVII	67
LXVIII	68
LXIX	69
LXX	70
LXXI	71
LXXII	72
LXXIII	73
LXXIV	74
LXXV	75
LXXVI	76
LXXVII	77
LXXVIII	78
LXXIX	79
LXXX	80

LXXXI	81
LXXXII	82
LXXXIII	83
LXXXIV	84
LXXXV	85
LXXXVI	86
LXXXVII	87
LXXXVIII	88
LXXXIX	89
XC	90
XCI	91
XCII	92
XCIII	93
XCIV	94
XCV	95
XCVI	96
XCVII	97
XCVIII	98
XCIX	99
C	100
D	500
M	1000

Indo-Arabic Numerals

European	0	1	2	3	4	5	6	7	8	9
Arabic-Indic	٠	١	٢	٣	٤	٥	٦	٧	٨	٩
Eastern Arabic-Indic (Persian and Urdu)	۰	۱	۲	۳	۴	۵	۶	۷	۸	۹
Devanagari (Hindi)	०	१	२	३	४	५	६	७	८	९
Tamil		க	உ	ங	ச	ஞ	ண	ன	அ	ஙை



Indo-Arabaic Conquest of Europe

- 1514: Last arithmetic book with Roman Numerals
- Uncomfortable with idea of Zero

- 1350 to 1550 when +, - , ÷, x, =, etc was standardised

- Algebraic notation remained a mishmash of letters and symbols
- Standardised only in the late 1500s

- Johannes Kepler 1571-1630
- Galileo Galeli 1564 – 1642
- Rene Decartes 1596 - 1650

Double Entry Book Keeping

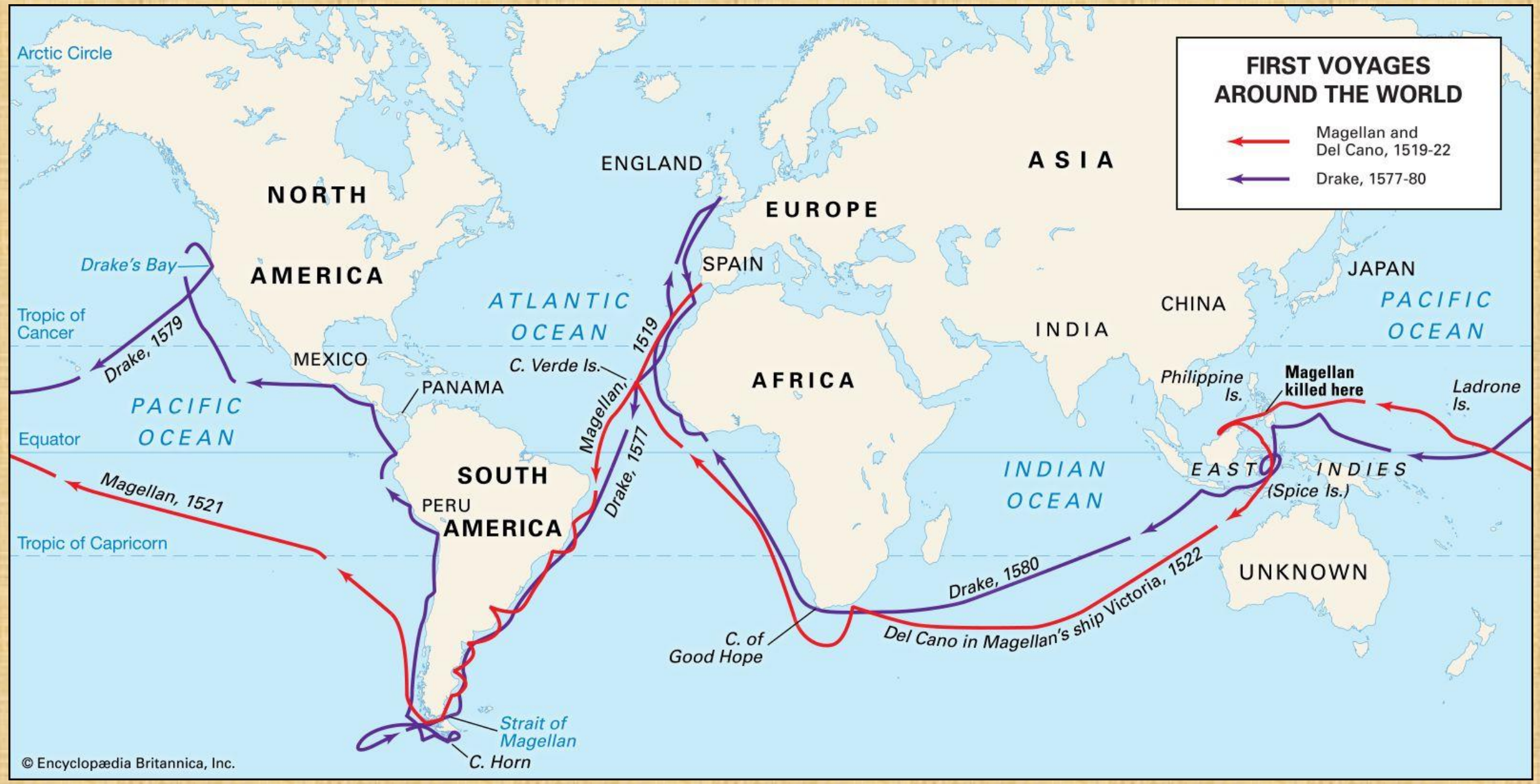
- Credit and Debit side to all accounts
  - Improved Financial Information
  - Exactitude and clarity of information
  - Invented in 1300s
- Expanded with Printing
- Business with many offices and accounts could consolidate and publish single accounts
- Impact on Banking

Joint Stock Company

- Shareholders own a private business collectively
- Equal value of shares
- Legal Protection
- Company of Merchant Adventurers to New Lands, founded in 1551 with 240 shareholders
  - Muscovy Company
- 1600: East India Company

Geographical Knowledge

- The accumulating nature of print knowledge
  - Compendia, Encyclopaedia, Manuals
  - Log Books, Journals, Travelogues, Maps
  - Astronomical Charts, Weather Charts, Sea Currents
- Finding the sea route to the Orient
  - Christopher Columbus 1492-1493
  - Vasco da Gama 1497-1499
- Circumnavigation of the Earth
  - Ferdinand Magellan, Juan Sebastian Elcano Expedition 1519-1522
  - Francis Drake 1577-1580


FIRST VOYAGES AROUND THE WORLD
Magellan and Del Cano, 1519-22
Drake, 1577-80
Arctic Circle
NORTH AMERICA
ENGLAND
EUROPE
ASIA
SPAIN
Drake's Bay
Drake, 1579
Tropic of Cancer
ATLANTIC OCEAN
MEXICO
C. Verde Is.
Magellan, 1519
AFRICA
INDIA
CHINA
JAPAN
PACIFIC OCEAN
PANAMA
Philippine Is.
Magellan killed here
Ladrone Is.
Equator
PACIFIC OCEAN
Drake, 1577
INDIAN OCEAN
EAST INDIES
(Spice Is.)
SOUTH AMERICA
PERU
Magellan, 1521
Tropic of Capricorn
Drake, 1580
UNKNOWN
C. of Good Hope
Del Cano in Magellan's ship Victoria, 1522
Strait of Magellan
C. Horn
© Encyclopædia Britannica, Inc.

Scientific Societies

- The Royal Society of London for Improving Natural Knowledge
  - Formed in 1660
  - Royal Charter in 1662
- French Academy of Science
  - Formed in 1666
- Prussian Academy of Sciences
  - Formed in 1700
- Investigate, Collect, Debate, Publish Scientific Research

National Library

- British Museum and Library
  - Formed in 1753
- Bibliotheque Nationale de France
  - First traces to the 1300s
  - Organised with Catalogue in 1750s
- Biblioteca Marciana
  - Venice, 1460s
- Berlin State Library
  - Started in the 1660s

Encyclopedia

- All the knowledge of the World
- *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers*
  - **English:** Encyclopedia, or a Systematic Dictionary of the Sciences, Arts, and Crafts
  - 1751 – 1772
  - Secularise, democratise knowledge
  - Bring all knowledge in one place
  - Reason and Replicability
  - Over 150 contributors
  - All named and experts in their fields
  - 17 Volumes of text, 18,000 pages, 75,000+ articles
  - 11 volumes of images, 2,500 illustrations
  - 4,250 copies printed

- Ephraim Chambers had first published his *Cyclopaedia, or an Universal Dictionary of Arts and Sciences* in two volumes in London in 1728

University

- Modern University in Europe
  - 1500 to 1800
- Modern Disciplines
  - Natural Sciences broke into Physics, Chemistry, Biology, Medicine…
  - Human Sciences broke into History, Geography, Linguistics, Economics, Sociology…
  - Philosophy and Mathematics as mother disciplines
- Based on the availability of large scale printing and publishing
- Books and Printed matter
- Ability to turn everything into text on a global scale of distribution

Scientific Revolution

- Circulation of printed works allowed
  - Circulation of knowledge and ideas outside the academy/monastery
  - Continent wide engagement with lay publics
  - Continent wide Verification, Experimentation, Debates

- “The Invisible College”

Print Capitalism

- There were 20,000,000 printed books in Europe by 1500
- This number rose to over 200,000,000 by 1600

- Early Printing in Latin with “Roman” script
- Search for markets led printer-capitalists to Vernaculars
  - Language of the lower orders: lower ranked city dwellers, women, peasants, tradesmen…

- Rise of Vernacular Book Markets
- Authors, Genres, Trades

Rise of the Vernacular

- Local Oral languages were standardised
  - One particular dialect became the standard
  - Grammar, Dictionary, Script common
  - Rise of French, German, English, Italian, Spanish, Russian….
- Which vernacular emerged as national language was fortuitous
- Vernacular language communities emerged in the interplay of
  - chance
  - print technology
  - Capitalism
- From Language of State (Latin) to “National Language”
- Vernacular languages rose in Dignity and Power

Languages of Power

- “National Languages” created unified fields of communication and exchange which had clear linguistic borders
- Laid base for Universal Literacy
  - Politics between dialect and language; of script; of grammar, accent and usage
- Over time created conditions for rise of
  - Common Laws and Legal Systems
  - Ideals of Fraternity; linked to, and built on ideas of equality and liberty
  - Common Political Systems
  - Democracy and Representative State

Legal Codes

- Laws were standardised
  - Within linguistic boundaries
  - Written in the “national language”
- Legal compendia and codes
  - Collected, Cleaned, Collated all the various laws, rules, customs
- Provided the foundation for thinking of
- Rule of Law
  - Can only be conceptualised once there is a standard version
  - Available to all across the linguistic region (Nation)
- Impersonal Government

Modern State

- State based on written Constitution
  - Widely (universally) available
  - Common Laws and Rules for entire territory
- Legal practice shifted from oral to print-textual

- Created conditions for rise of modern bureaucracy
- Rules and protocols being standardised via publication
  - Official Gazette

- Bureaucracy is an abstract structure created by a maze of printed documents, each referencing a network of other such documents

Modern Politics

- Based on circulation of news and information
- Standardised and formatted for universal easy consumption
- Part of print capitalism's market
- Elections, Parliaments – Assemblies over large nation-state area cannot be conceptualised without the foundation of print culture
- National Policy and implementation only via a print culture

Literature Consuming Publics

- Print Vernaculars became languages of art, business, science, politics
- Writing history of the nation, literature of the nation, tradition …
  - Novels, Poetry, Culture got national qualifier
  - Nation's history
- Market-place of information/ideas bounded by circuits of print commodities
- Emergence of mass literacy in the mid-19th century
- Language boundaries rarely mapped on to existing political borders
  - Created National conflicts

Nationalism

- Linked closely to the rise of
  1. Literacy
  2. Language Boundaries

- Often the early nationalists were also the pioneers of print-capitalism, journalism, literature…

- "As literacy increased, it became easier to arouse popular support, with the masses discovering a new glory in the print elevation of languages they had humbly spoken all along".
- "The new middle-class intelligentsia of nationalism had to invite the masses into [being part of the nation]; and the invitation card had to be written in a language they understood".