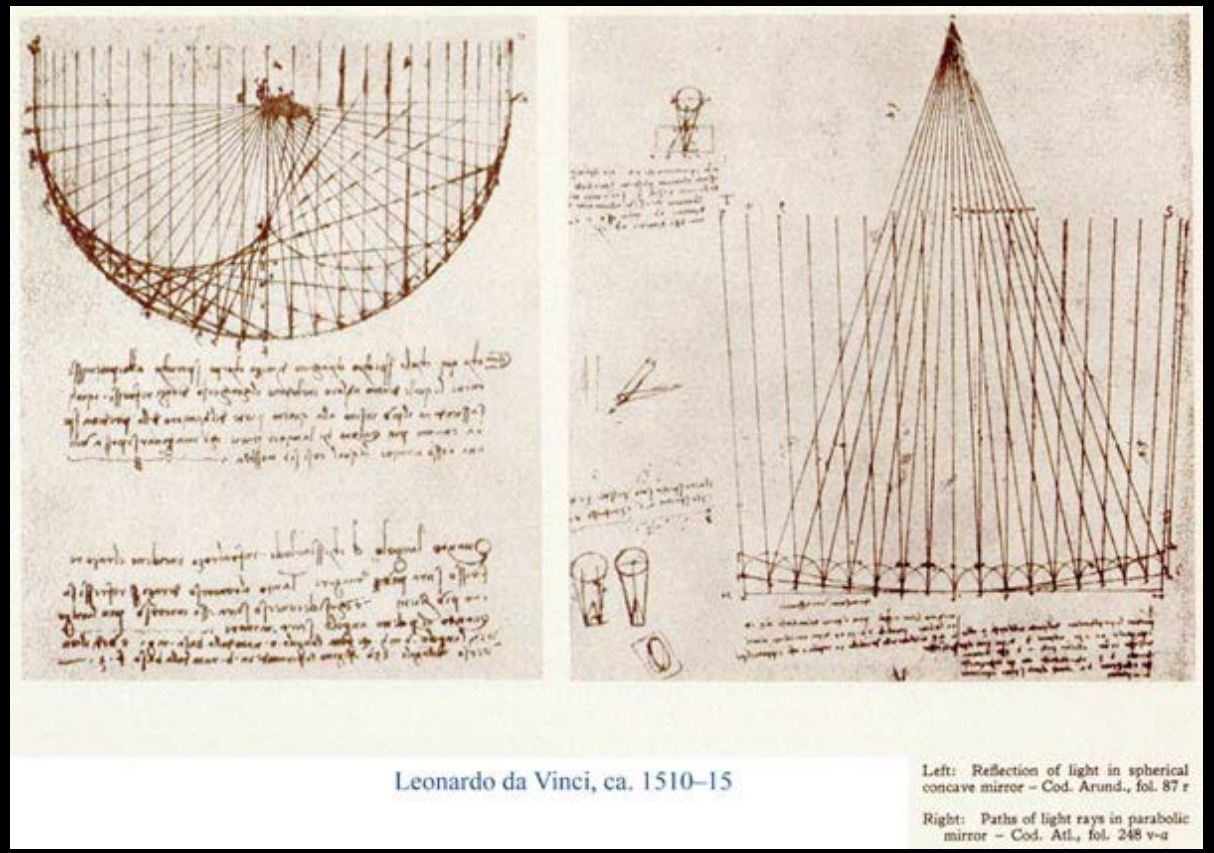
AHST 2331-001 (20045)
Understanding Art
Dr. Charissa N. Terranova
Tuesdays and Thursdays 11:30-12:45
ATC 1.102

Thursday February 23

Discussion of Optics, Lenses, and Prosthetic Vision

Extensions of the Senses and/or Prosthetic Extensions

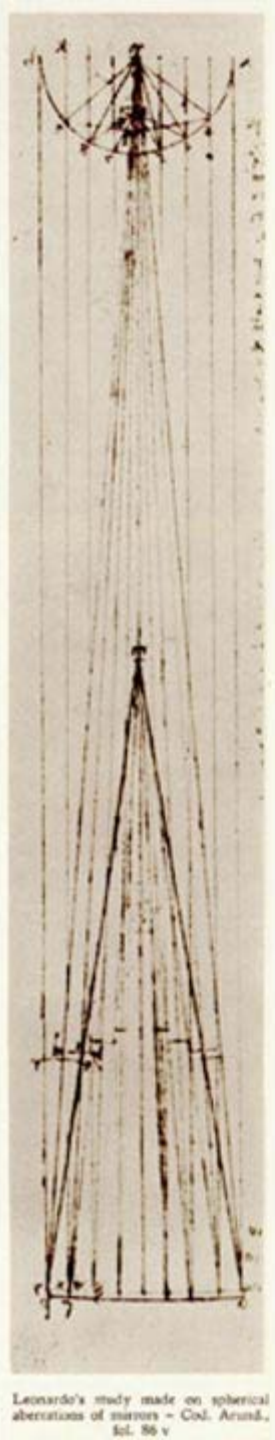
Optics: the scientific study of sight and the behavior of light, or the properties of transmission and deflection of other forms of radiation. Here we see figures from Leonardo da Vinci's surviving notebooks showing his interest in the optical properties of concave mirrors as well as in ways to use machines to replace skilled manual labor for their manufacture.



Leonardo da Vinci, ca. 1510–15

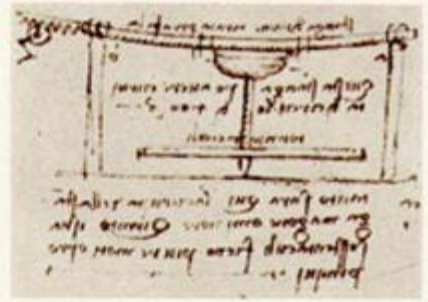
Left: Reflection of light in spherical concave mirror – Cod. Arund., fol. 87 r

Right: Paths of light rays in parabolic mirror – Cod. Atl., fol. 248 v-a

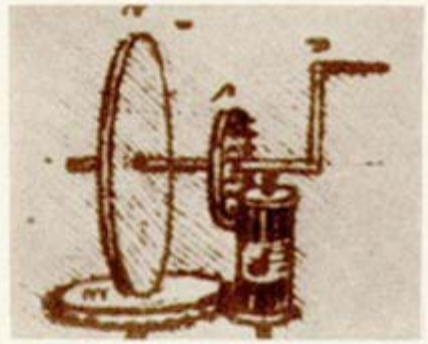


Leonardo's study made on spherical aberrations of mirrors – Cod. Arund., fol. 86 v

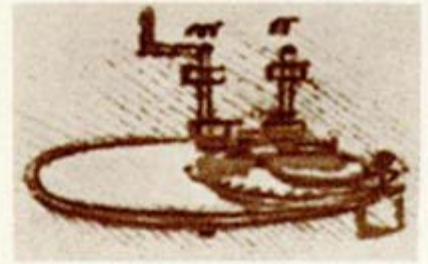
Leonardo da Vinci
ca. 1510–15



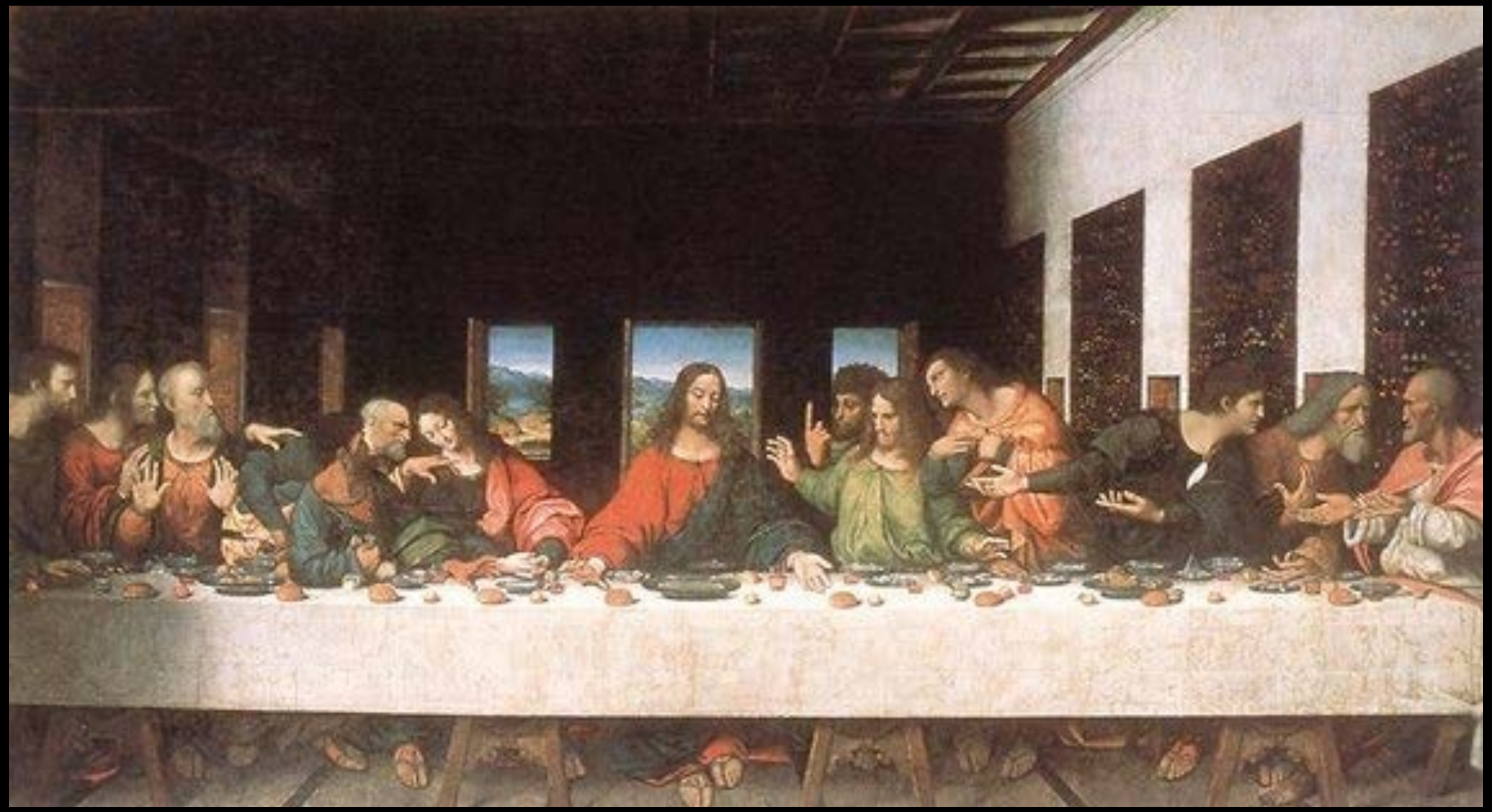
Potter's wheel for making mirrors with large focal length – Cod. Arund., fol. 84 v



Machine for grinding concave mirrors with large radius of curvature – Cod. Atl., fol. 396 v-*f*



Machine for grinding mirrors – Cod. Atl., fol. 396 v-*f*



Leonardo da Vinci, The Last Supper, 1520

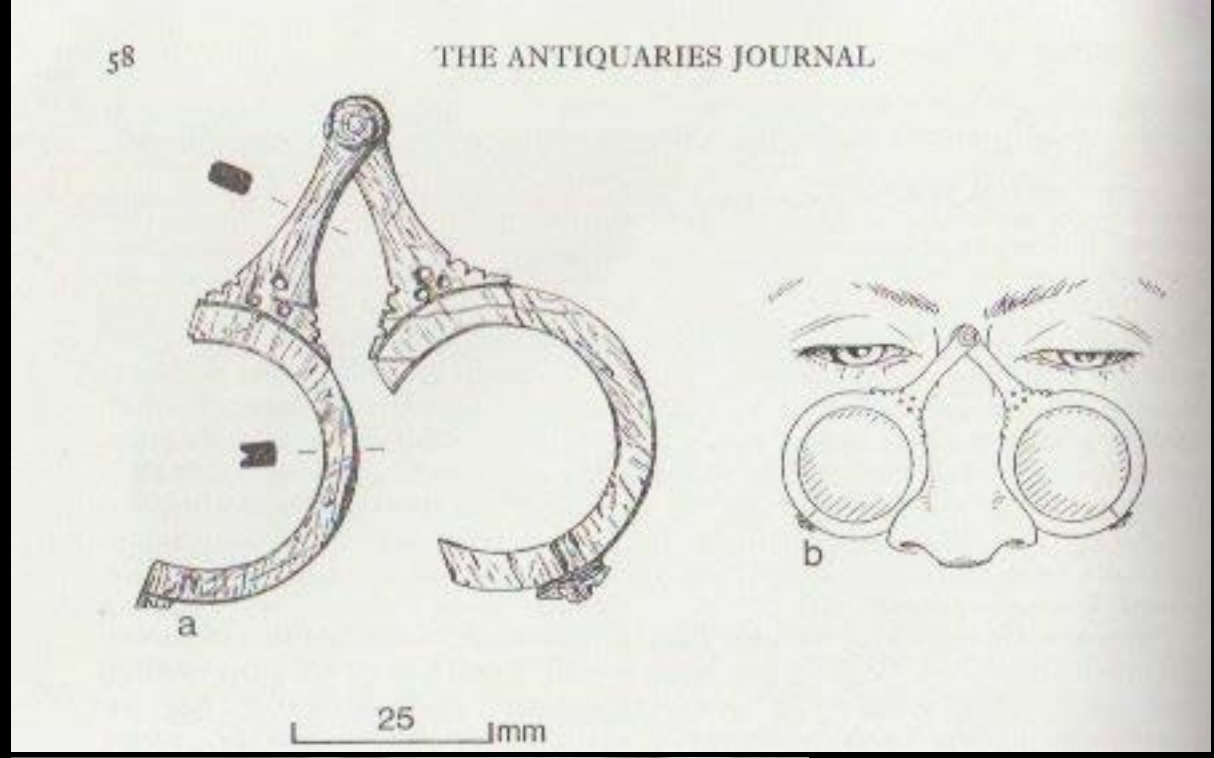
Nimrud/Layard Lens, 750-710 BCE,
Assyrian palace of Nimrud, modern Iraq

Reading Stones

A **reading stone** was an approximately hemispherical lens that was placed on top of text to magnify the letters so that people with presbyopia could read it more easily. Reading stones were among the earliest common uses of lenses.

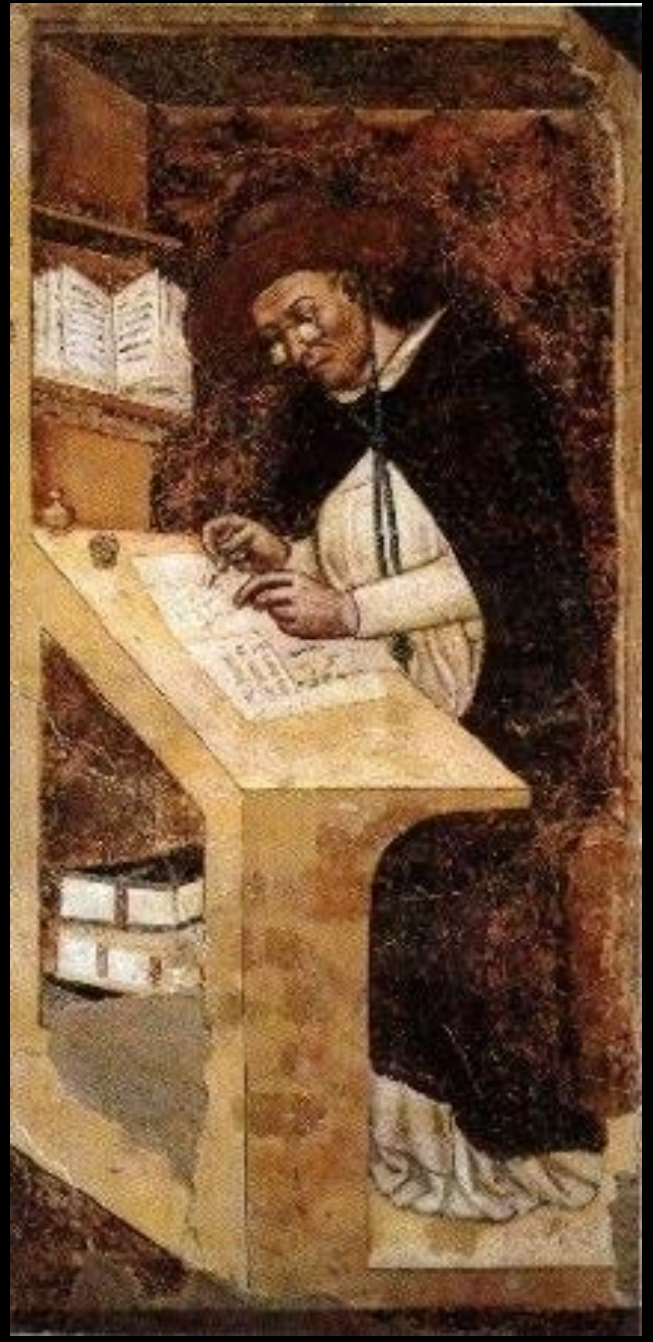
The use of a convex lens to create a magnified image is discussed in the Muslim scholar Alhazen's [Ibn al-Hatham in Egypt] 11th century *Book of Optics* (below), a seven-volume treatise translated from Arabic into Latin in the 12th century. On the left we see the visual system according to Ibn al-Hatham. The diagram shows two human eyes seen from above, the principal humors and the optic nerves connecting the eyeballs to the brain.

Early frames for glasses consisted of two magnifying glasses riveted together by the handles so that they could grip the nose. These are referred to as "rivet spectacles.”

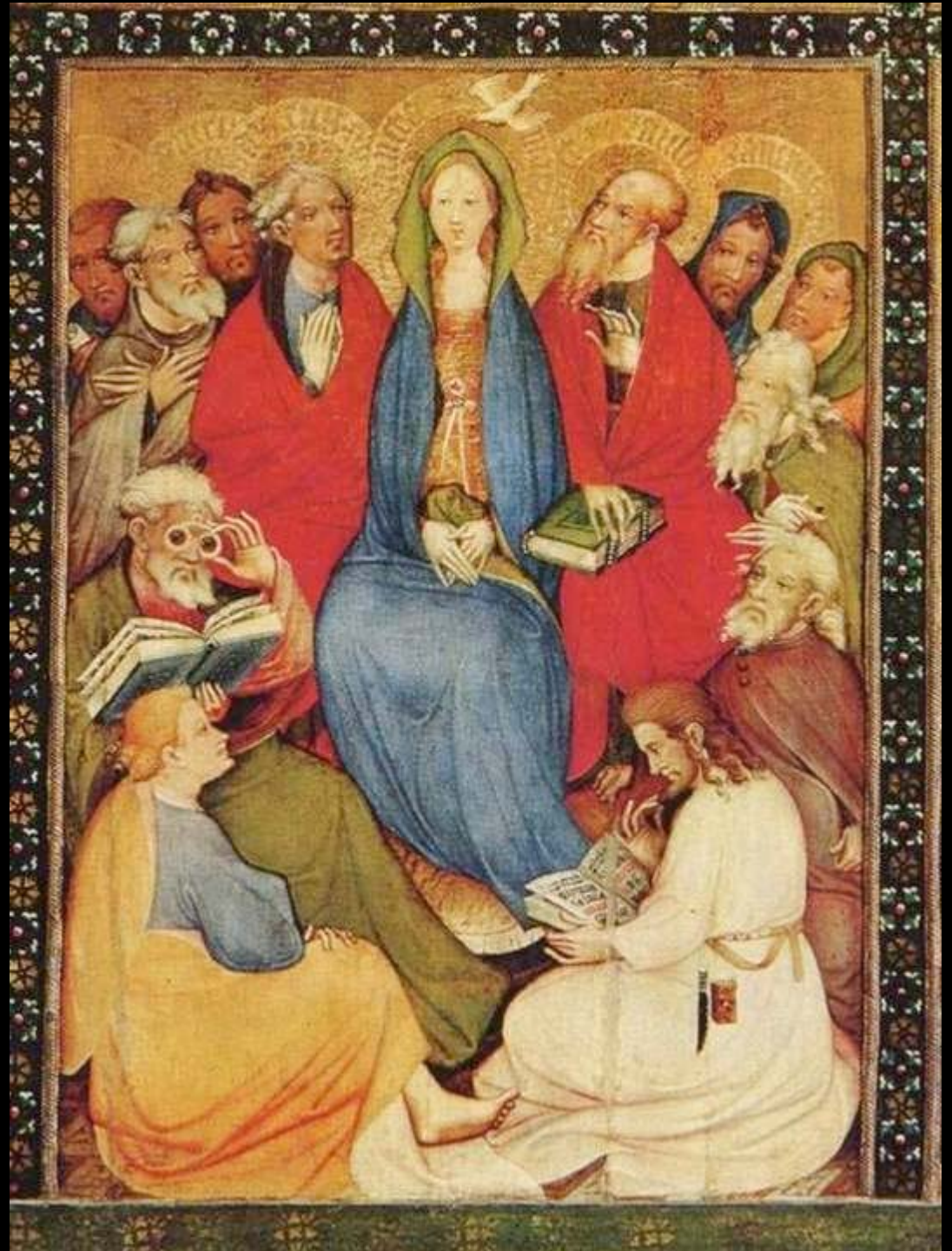


Above: rivet spectacles

Bottom Left: corbel displayed high up in the church of St Martin, Salisbury in Wiltshire, England, 1430-1440

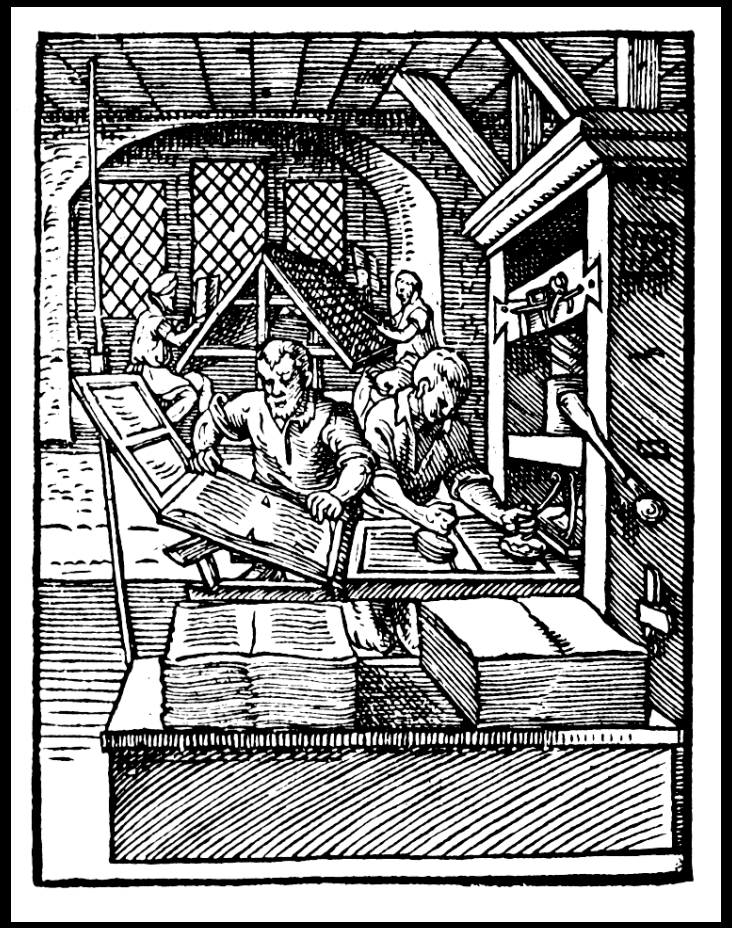


Tommaso da Modena, Portrait of Cardinal Hugh de Provence Reading in a Scriptorium, 1352



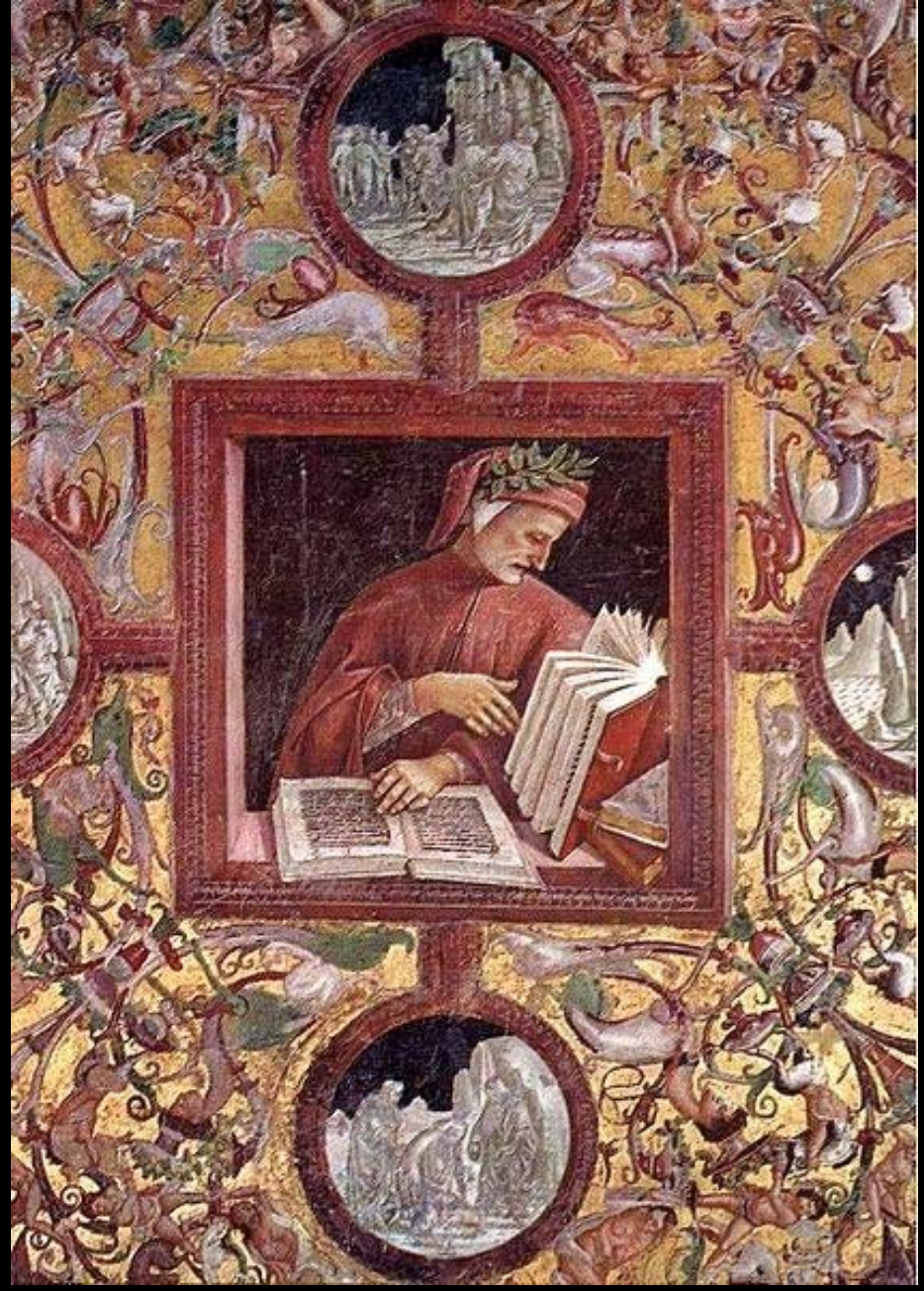
Left and Above: Conrad von Soest, Virgin Enthroned with bespectacled Apostle, 1403, in the Altarpiece of the church of Bad Wildungen, Germany

Movable print and the mechanized Gutenberg printing press 1450

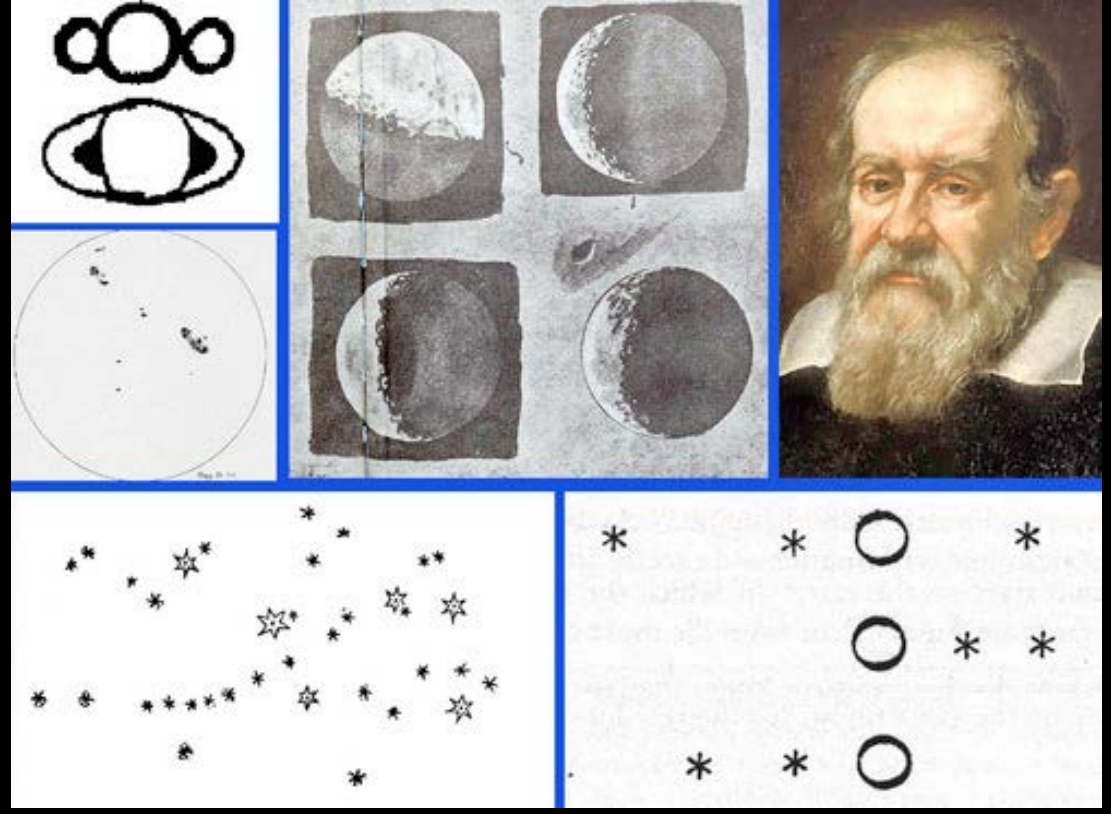


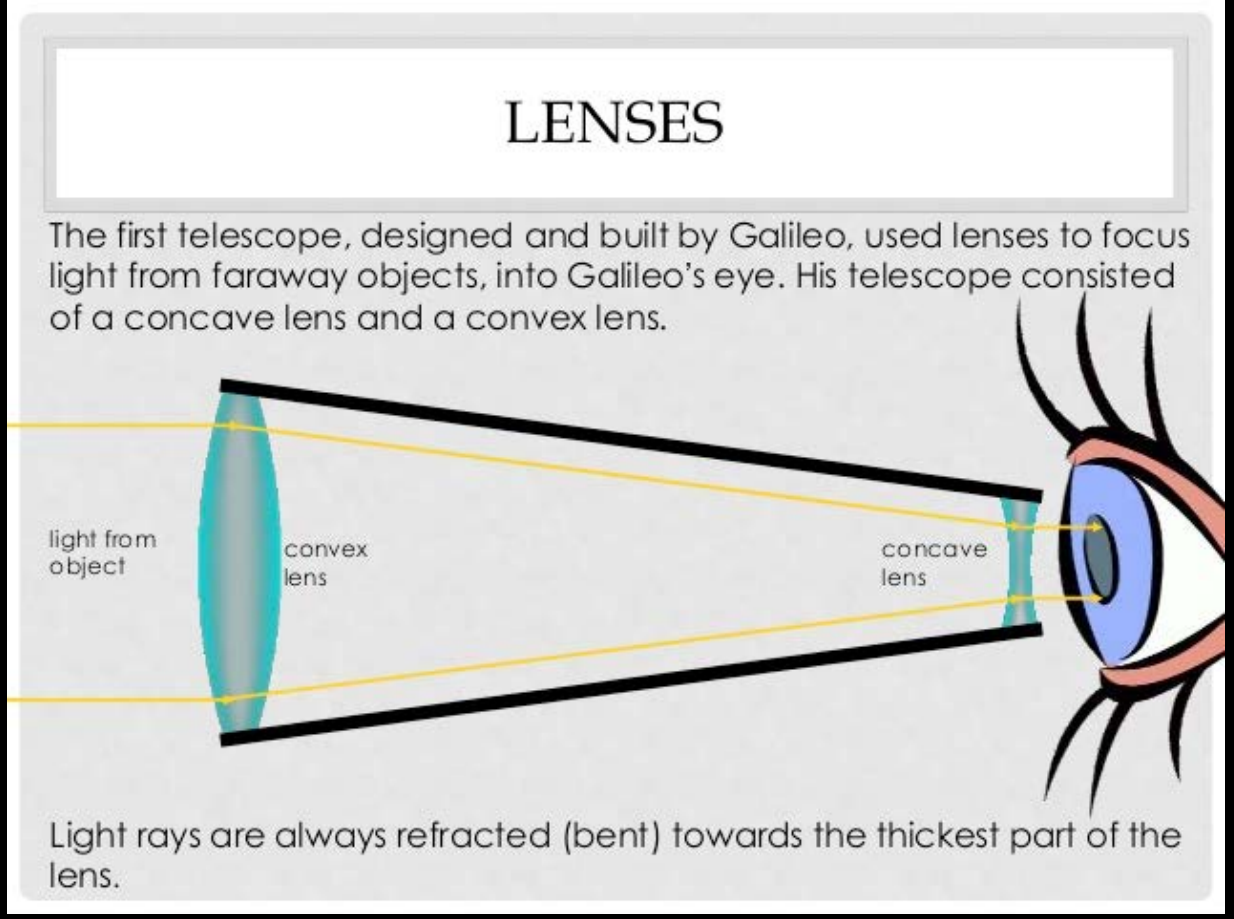
Early wooden printing press, depicted in 1568. Such presses could produce up to 240 impressions per hour.

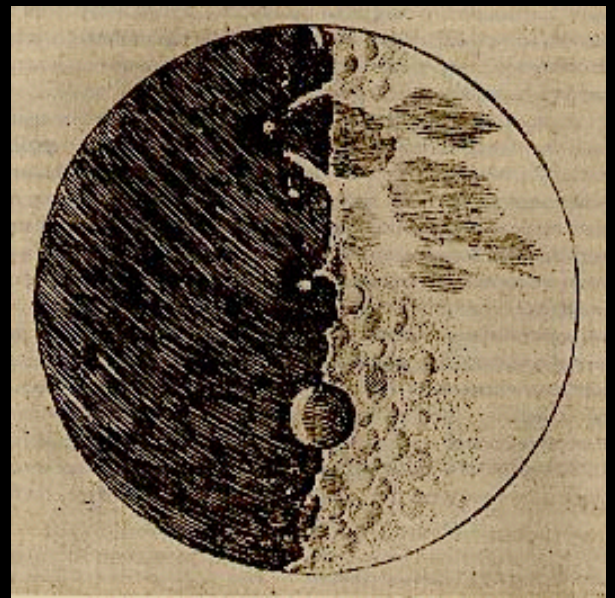
Johannes Gutenberg [1398-1468] An artist's visualization of Johannes Gutenberg in his workshop, showing his first proof sheet. Gutenberg conceptualized and then built the first print with movable type in 1450.



Dante Alighieri, detail from Luca Signorelli's fresco, Chapel of San Brizio, Orvieto Cathedral, 1500-1503; he was influential in establishing their Tuscan dialect as the most prominent literary language in all of Italy

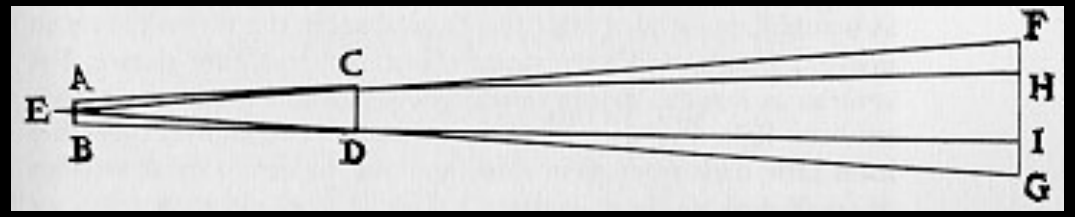






Galileo Galilei [1564-1642] did not invent the telescope. The Dutch, notably Christiaan Huygens, were the first to invent and experiment with lenses (to improve eye sight). But Galileo was the first to use the telescope to study the heavens systematically. His little telescope was poorer than even a cheap modern amateur telescope, but what he observed in the heavens rocked the very foundations of Aristotle's universe and the theological-philosophical worldview that it supported. It is said that what Galileo saw was so disturbing for some officials of the Church that they refused to even look through his telescope; they reasoned that the Devil was capable of making anything appear in the telescope, so it was best not to look through it. That is, the telescope was an instrument of the Devil. That such was so could be no clearer than the image of the moon as it appeared through Galileo's telescope.

http://homework.uoregon.edu/pub/class/301/galileo.html

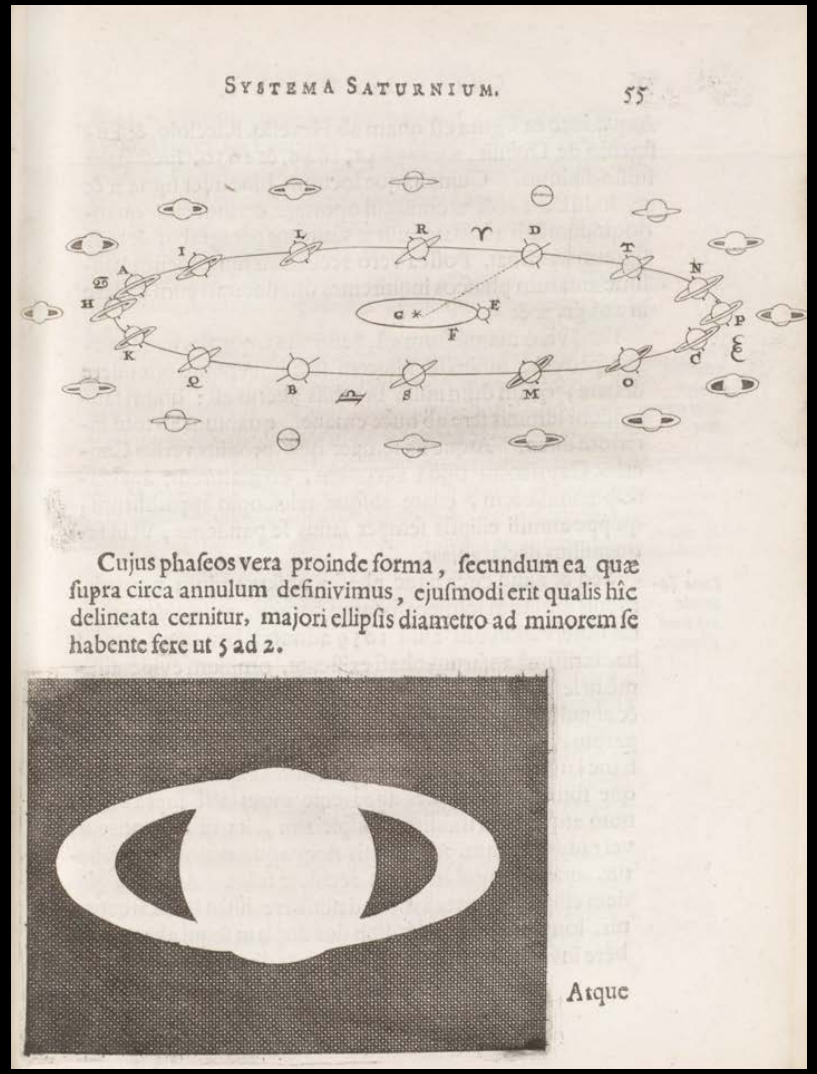


Galileo's drawing of the optical path of his telescope

Galileo made his first telescope in 1609, modeled after telescopes produced in other parts of Europe that could magnify objects three times. He created a telescope later that same year that could magnify objects twenty times. With this telescope, he was able to look at the moon, discover the four satellites of Jupiter, observe a supernova, verify the phases of Venus, and discover sunspots. His discoveries proved the Copernican system which states that the earth and other planets revolve around the sun. Prior to the Copernican system, it was held that the universe was geocentric, meaning the sun revolved around the earth.

“The telescope was one of the central instruments of what has been called the Scientific Revolution of the seventeenth century. It revealed hitherto unsuspected phenomena in the heavens and had a profound influence on the controversy between followers of the traditional geocentric astronomy and cosmology and those who favored the heliocentric system of Copernicus. It was the first extension of one of man's senses, and demonstrated that ordinary observers could see things that the great Aristotle had not dreamed of. **It therefore helped shift authority in the observation of nature from men to instruments.”**

- Nicolaus Copernicus [1473-1543] Royal Prussia, Kingdom of Poland: mathematician and astronomer who formulated a model of the universe that placed the Sun rather than the Earth at the center of the universe.
- What are the repercussions of shifting “the authority in the observation of nature from men to instruments”?



SYSTEMA SATURNIUM. 55

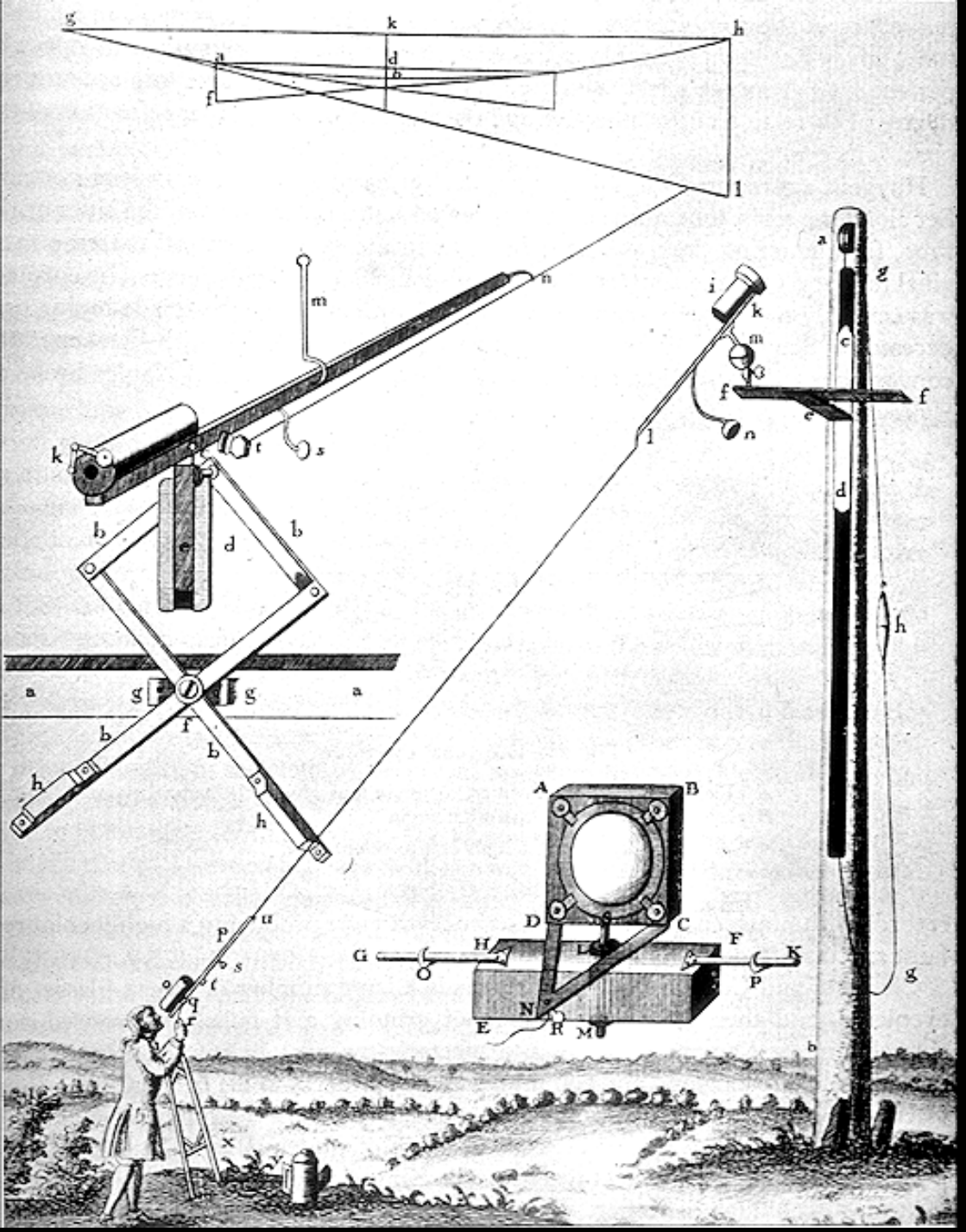
Cujus phaſeos vera proinde forma, ſecundum ea quæ ſupra circa annulum definivimus, ejuſmodi erit qualis hîc delineata cernitur, majori ellipſis diametro ad minorem ſe habente fere ut 5 ad 2.

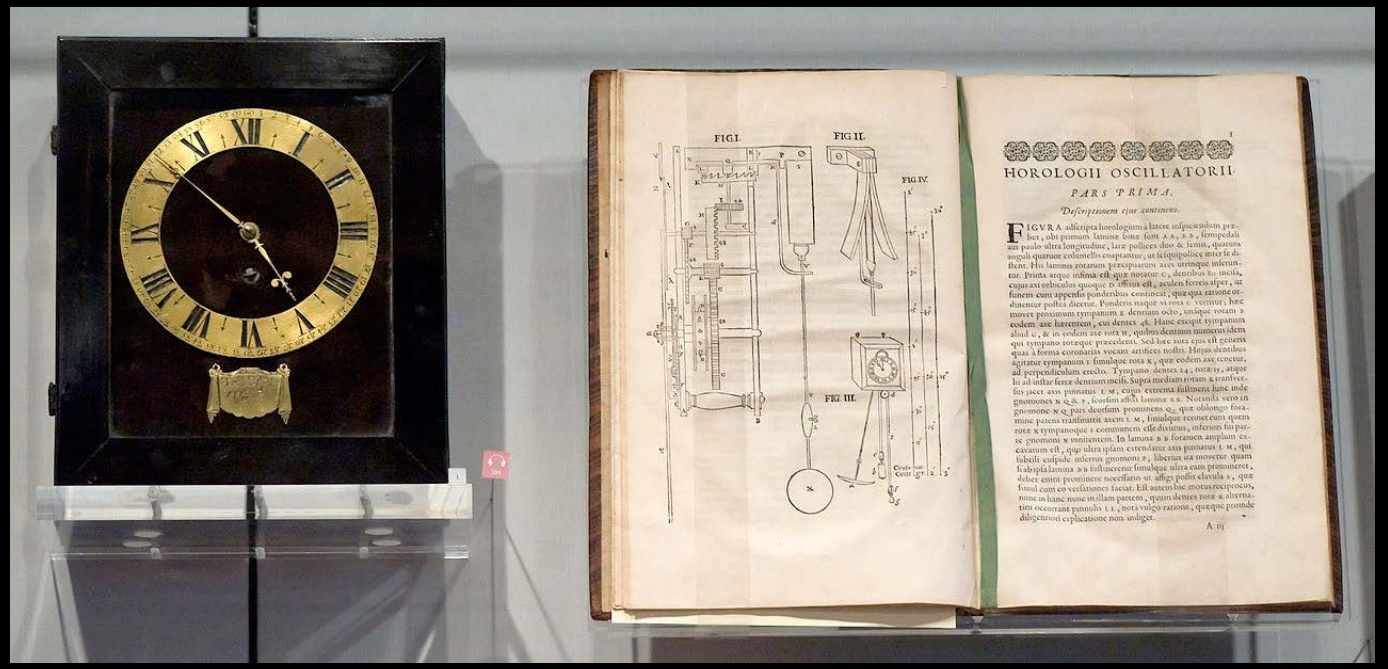
Atque

Huygens' explanation for the aspects of Saturn, Systema Saturnium, 1659

In 1655, the Dutchman Christiaan Huygens proposed that Saturn was surrounded by a solid ring, "a thin, flat ring, nowhere touching, and inclined to the ecliptic." Using a 50 power refracting telescope that he designed himself, Huygens also discovered the first of Saturn's moons, Titan. In the same year he observed and sketched the Orion Nebula. His drawing, the first such known of the Orion nebula, was published in *Systema Saturnium* in 1659. Using his modern telescope he succeeded in subdividing the nebula into different stars. The brighter interior now bears the name of the Huygenian region in his honor. He also discovered several interstellar nebulae and some double stars. Shortly before his death in 1695, Huygens completed *Cosmotheoros*, published posthumously in 1698. In it he speculated on the existence of extraterrestrial life, on other planets, which he imagined was similar to that on Earth.

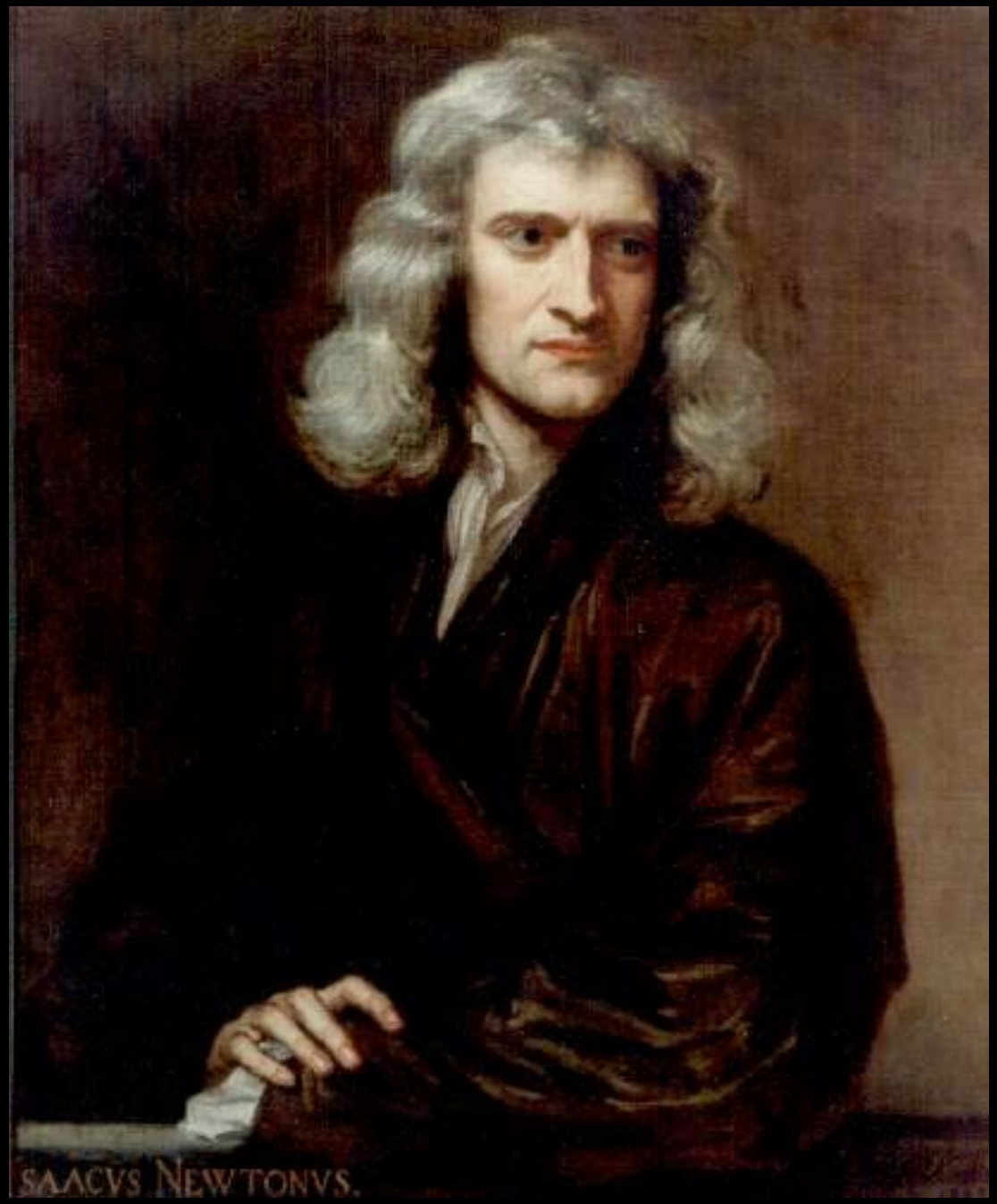
Christiaan Huygens [1629-1695]. Cut from the engraving following the painting of Caspart Netscher by G. Edelinck, between 1684 and 1687.





Above: Spring driven pendulum clock, designed by Huygens, built by instrument maker Salomon Coster (1657), and copy of the *Horologium Oscillatorium*

Left: An engraving of Christiaan Huygens's 210-foot aerial telescope showing the eyepiece and objective mounts and connecting string. The aerial telescope is a type of very long focal length refracting telescope, built in the second half of the 17th century, that did not use a tube. Instead, the objective* was mounted on a pole, tree, tower, building or other structure on a swivel ball-joint. The observer stood on the ground and held the eyepiece, which was connected to the objective by a string or connecting rod. By holding the string tight and maneuvering the eyepiece, the observer could aim the telescope at objects in the sky. the **objective** is the optical element that gathers light from the object being observed and focuses the light rays to produce a real image. Objectives can be a single lens or mirror, or combinations of several optical elements.

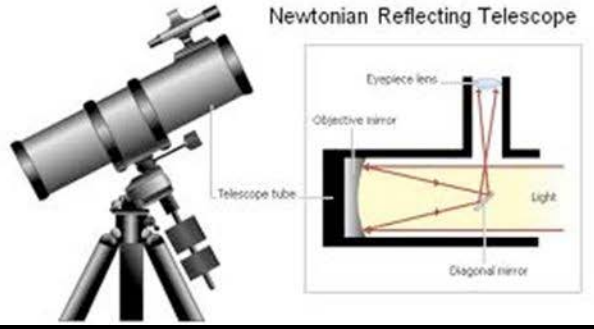


This is the earliest portrait of Sir Isaac Newton [1642-1727] to survive. It was painted in 1689 when Newton was in London as a member of the Convention Parliament, following the "Glorious Revolution" of 1688. The artist was Godfrey Kneller, perhaps the greatest portrait painter of his day.

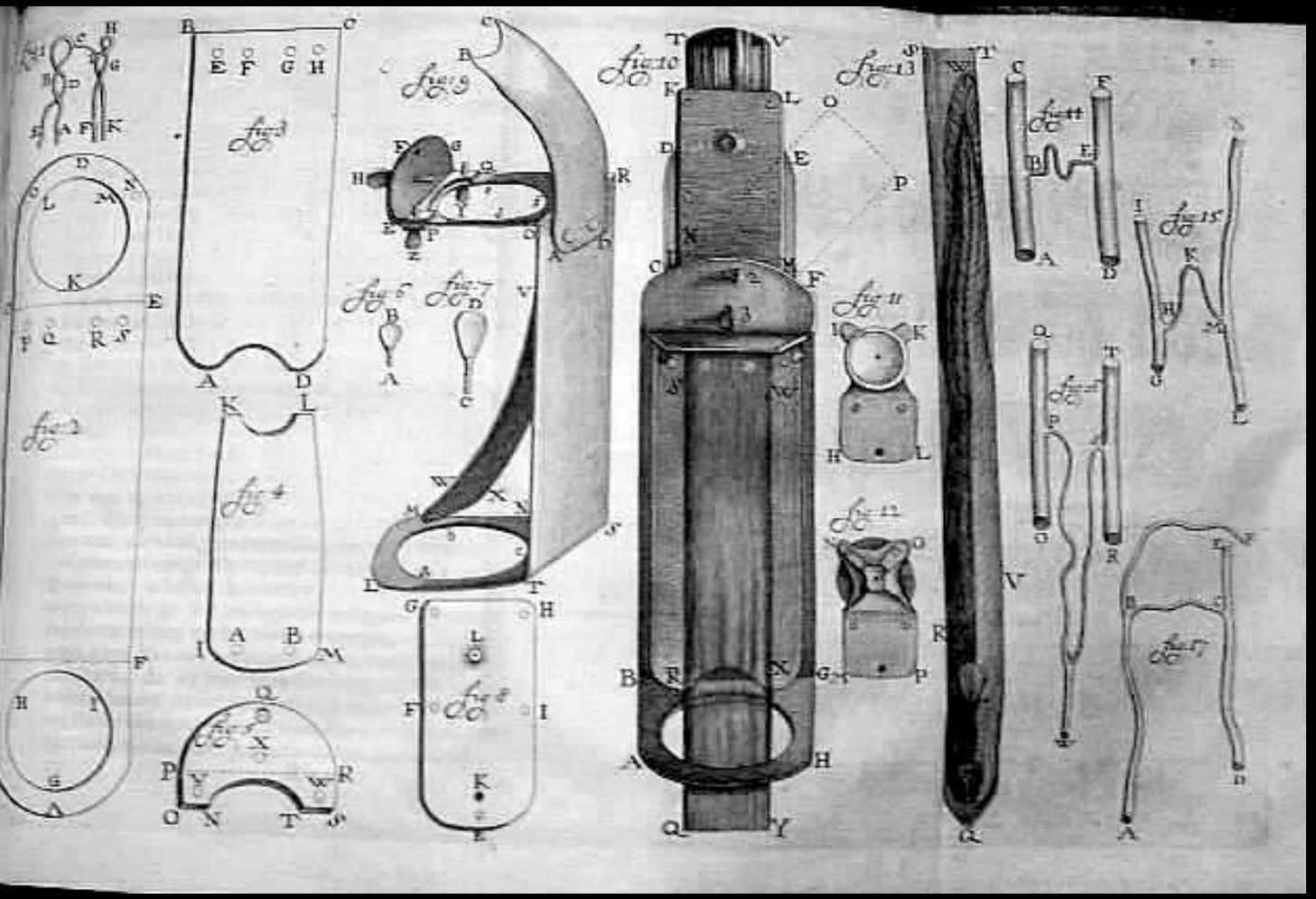
Newton was 46 years old and *Principia*, or *Mathematical Principles of Natural Philosophy*, had been published two years previously. It represents Newton "at the height of his powers."

Reflecting Telescope

- **Reflecting Telescopes** use a large concave mirror to gather light
  - The mirror collects light from distant objects and focuses the rays to form a *real* image
  - A *small* mirror inside the telescope reflects the image to the **eyepiece**
    - **The images you see are upside down**



Replica of Newton's second Reflecting Telescope that he presented to the Royal Society in 1672



Leeuwenhoek made more than 500 optical lenses. He also created at least 25 single-lens microscopes, of differing types, of which only nine have survived. These microscopes were made of silver or copper frames, holding hand-made lenses. Those that have survived are capable of magnification up to 275 times.

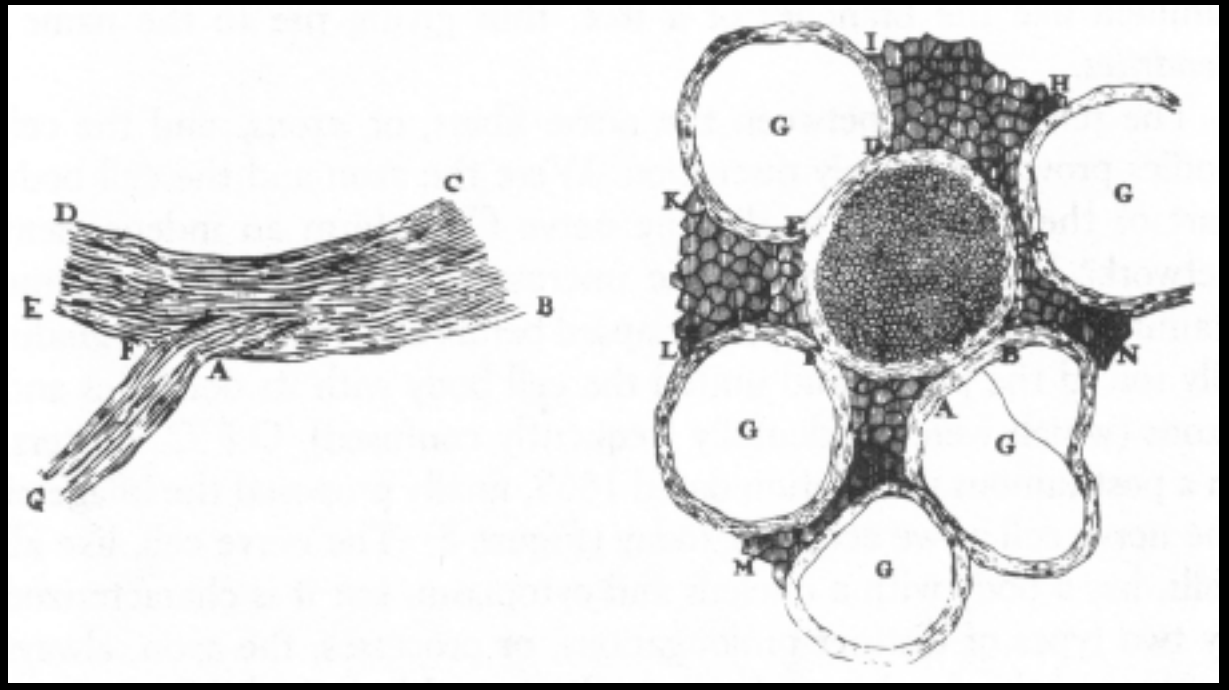
Anton van Leeuwenhoek [1632-1723]

Cell Theory

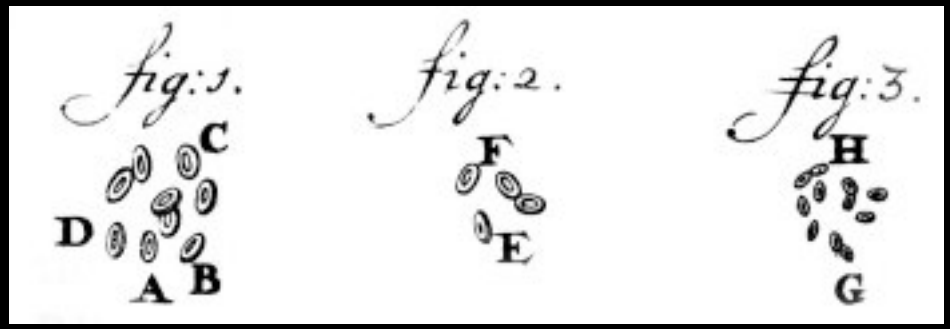
Anton van Leeuwenhoek (1632-1723)

Dutch microscopist

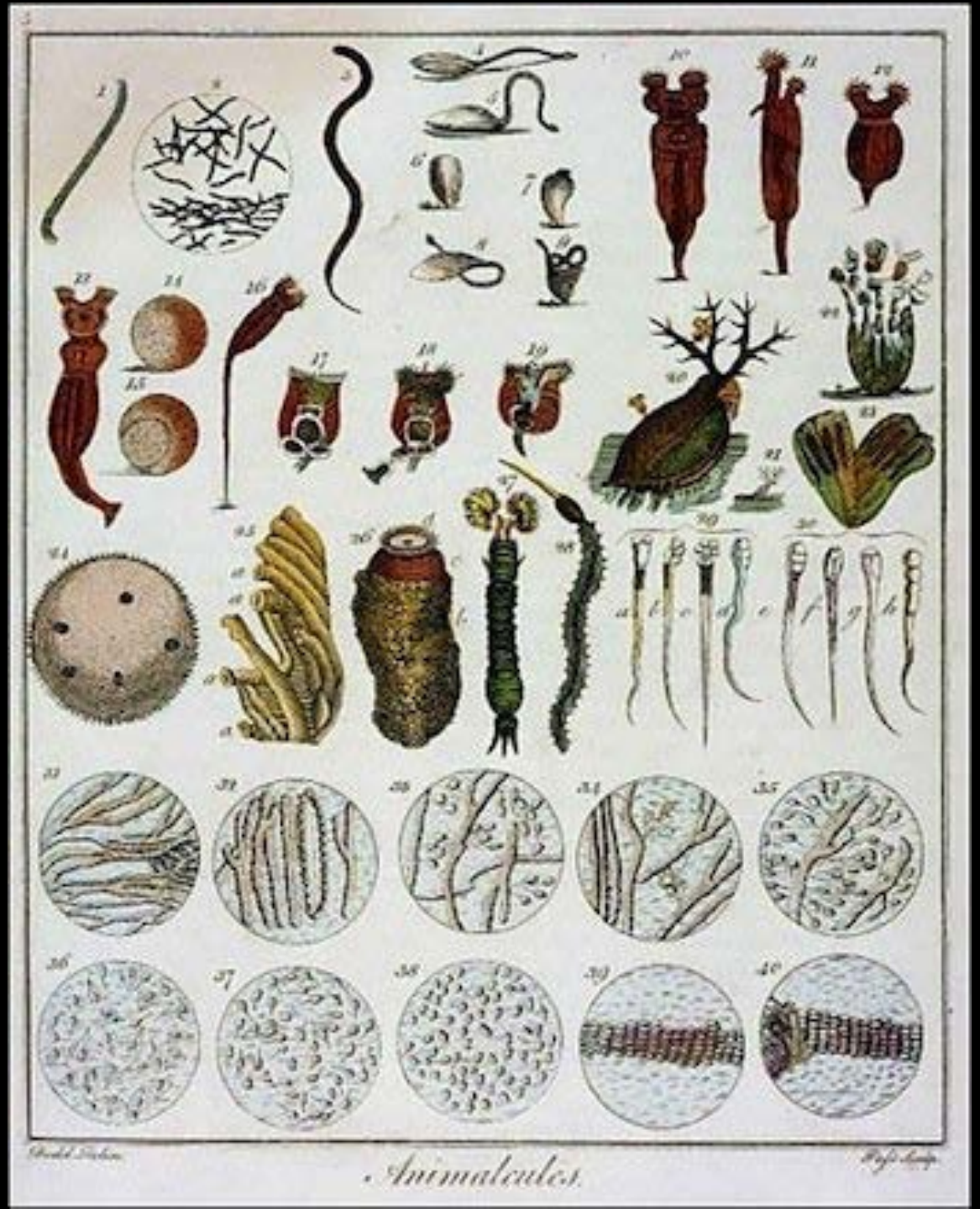
AKA: Antony van Leeuwenhoek was an unlikely scientist. Yet with skill, diligence, an endless curiosity, Leeuwenhoek succeeded in making some of the most important discoveries in the history of biology***. It was he who discovered bacteria in 1676***, his observations on the plaque between his own teeth, "a little white matter, which is as thick as if 'twere batter." He repeated these observations on two ladies (probably his own wife and daughter), and on two old men who had never cleaned their teeth in their lives. Leeuwenhoek found "an unbelievably great company of living ***animalcules***, These were among the first observations on living bacteria ever recorded. ***He observed and recorded living cells for the first time.***



Drawings by van Leeuwenhoek in 1719, showing a longitudinal and a cross section of a nerve.



Red Blood Cells drawn by Leeuwenhoek in 1719



On September 17, 1683, Leeuwenhoek wrote to the Royal Society about his observations on the plaque between his own teeth, "a little white matter, which is as thick as if 'twere batter." He repeated these observations on two ladies (probably his own wife and daughter), and on two old men who had never cleaned their teeth in their lives. Looking at these samples with his microscope, Leeuwenhoek reported how in his own mouth: "I then most always saw, with great wonder, that in the said matter **there were many very little living animalcules, very prettily a-moving**. The biggest sort. . . had a very strong and swift motion, and shot through the water (or spittle) like a pike does through the water. The second sort. . . oft-times spun round like a top. . . and these were far more in number." In the mouth of one of the old men, Leeuwenhoek found "an unbelievably great company of living animalcules, a-swimming more nimbly than any I had ever seen up to this time. The biggest sort. . . bent their body into curves in going forwards. . . Moreover, the other animalcules were in such enormous numbers, that all the water. . . seemed to be alive."

Above: One of Leeukenhoek's actual microscopes.

Left: Author Alan Gillen's personal replica of Leeuwenhoek's microscope in Leiden. It has a 100X objective.

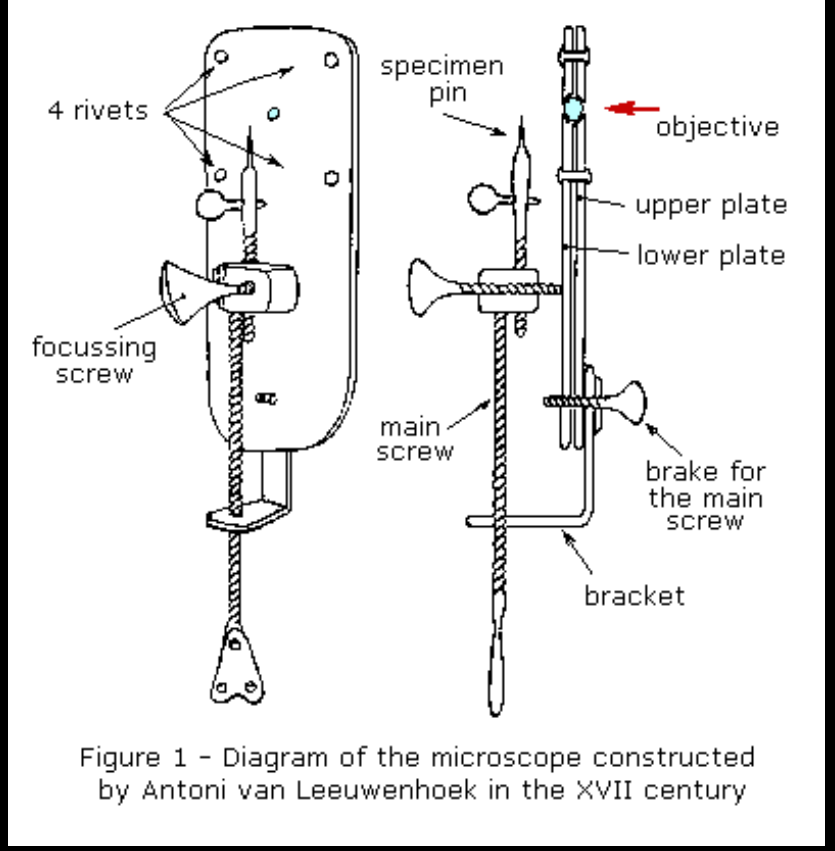
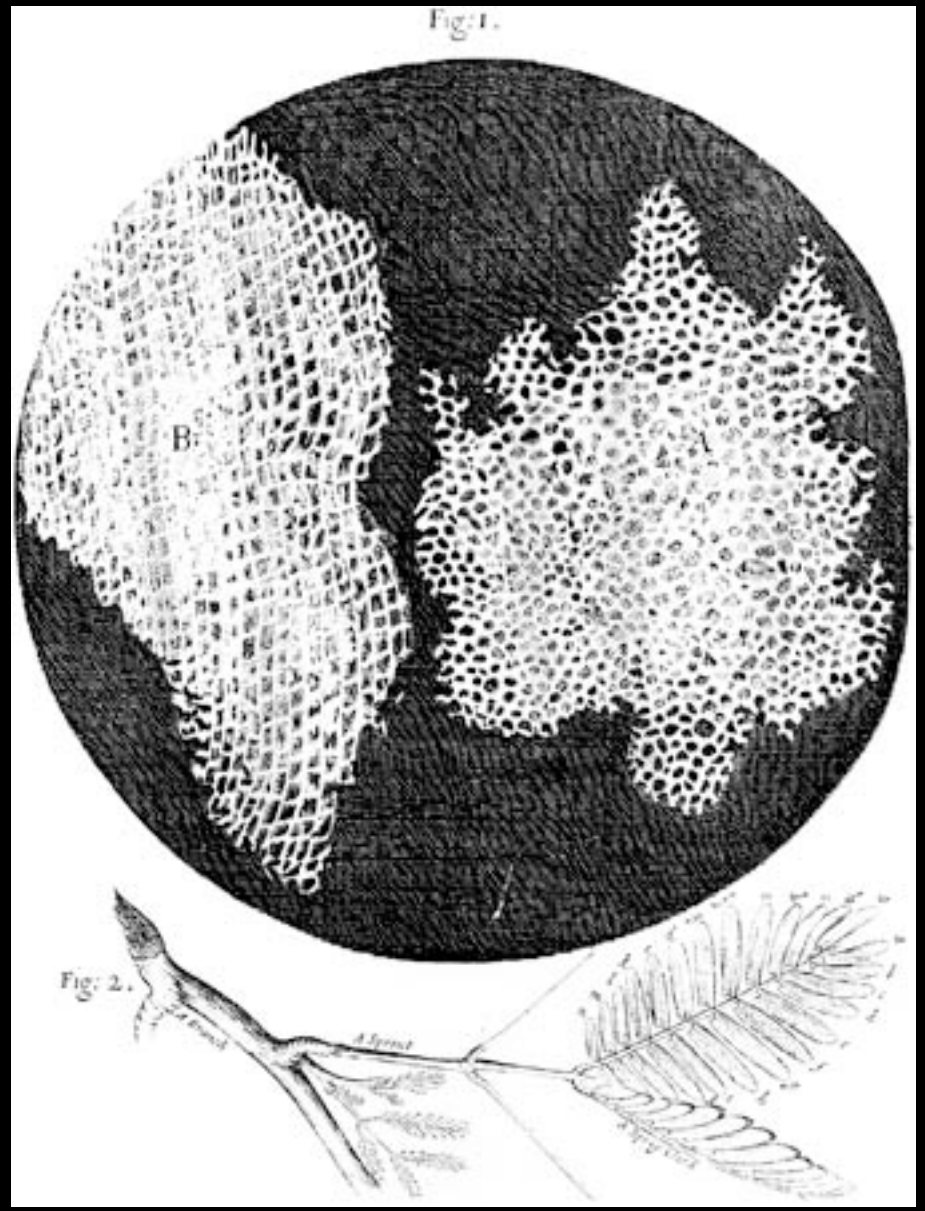


Figure 1 – Diagram of the microscope constructed by Antoni van Leeuwenhoek in the XVII century

Although van Leeuwenhoek's microscopes were diverse, they all had a similar construction design: their ground lenses were sandwiched between two metal (silver, brass, or gold) plates that were tightly riveted at their corners. A long screw passed up from the microscope bottom and supported a stage block, into which a focusing screw was set. This screw projected through the block and pushed against the plate when screwed in, moving the stage block slowly away from the lens. By turning the screw carefully, the object could be brought into focus. On the top of the stage lock was a third screw terminating in a blunt point. This was the place where the specimen was set, either by being pierced or stuck in position with glue. Into the side of this was a little handle that enabled the specimen-holder to be turned around, so the object could be examined from all sides.



Robert Hooke's drawings of the cellular structure of cork and a sprig of sensitive plant

MICROGRAPHIA:

OR SOME

Physiological Descriptions

OF

MINUTE BODIES

MADE BY

MAGNIFYING GLASSES.

WITH

OBSERVATIONS and INQUIRIES thereupon.

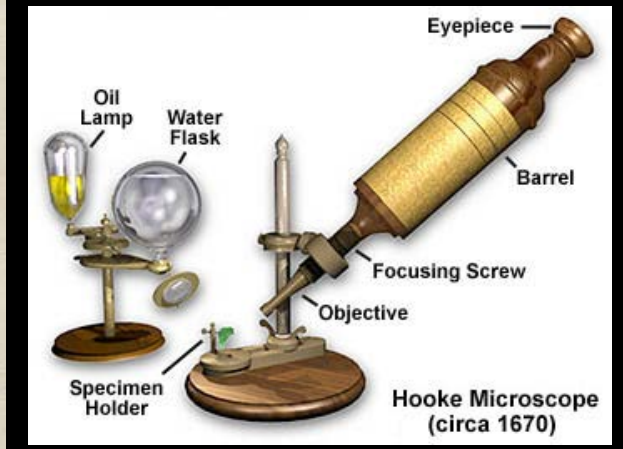
By *R. HOOKE*, Fellow of the ROYAL SOCIETY.

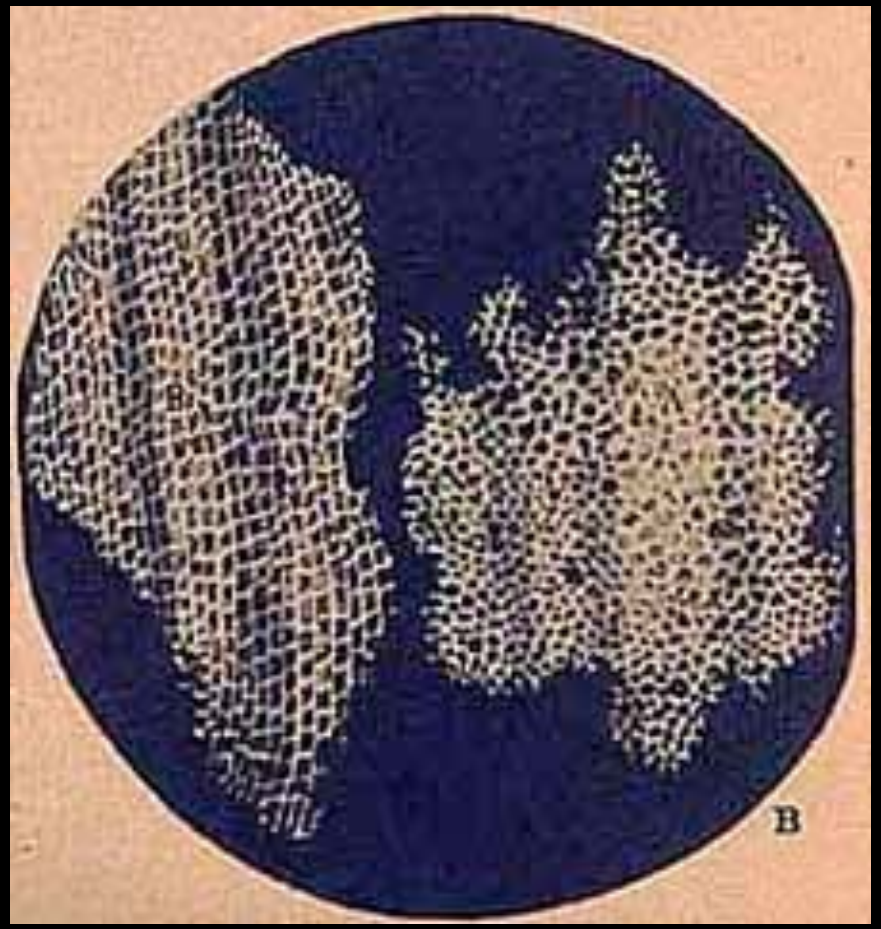
Non possis oculo quantum contendere Linceus,
Non tamen idcirco contemnas Lippus inungi. Horat. Ep. lib. 1.

LONDON, Printed by *Jo. Martyn*, and *Ja. Allestry*, Printers to the ROYAL SOCIETY, and are to be sold at their Shop at the *Bell* in S. *Paul's* Church-yard. M DC LX V.

Robert Hooke (1635–1703)

Hooke coined the term *cell* for describing biological organisms, the term being suggested by the resemblance of plant cells to cells of a honeycomb.





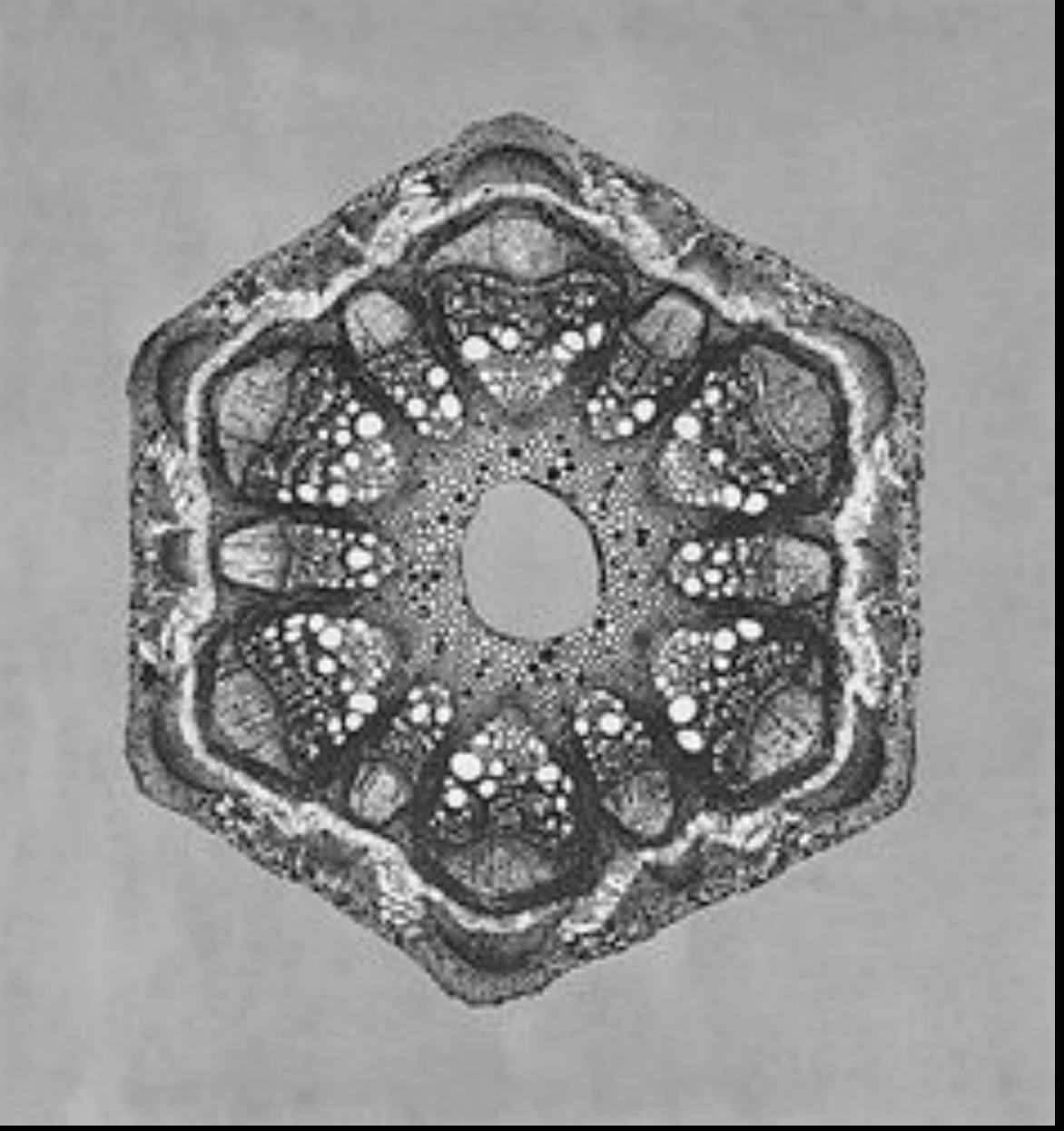
In "Observation XVIII" of the *Micrographia*, Hooke wrote:

. . . I could exceedingly plainly perceive it to be all perforated and porous, much like a Honey-comb, but that the pores of it were not regular. . . . these pores, or cells, . . . were indeed the first microscopical pores I ever saw, and perhaps, that were ever seen, for I had not met with any Writer or Person, that had made any mention of them before this. . .

Hooke had discovered plant cells -- more precisely, what Hooke saw were the cell walls in cork tissue. In fact, it was Hooke who coined the term "cells": the boxlike cells of cork reminded him of the cells of a monastery. Hooke also reported seeing similar structures in wood and in other plants. In 1678, after Leeuwenhoek had written to the Royal Society with a report of discovering "little animals" -- bacteria and protozoa -- Hooke was asked by the Society to confirm Leeuwenhoek's findings. He successfully did so, thus paving the way for the wide acceptance of Leeuwenhoek's discoveries. Hooke noted that Leeuwenhoek's simple microscopes gave clearer images than his compound microscope, but found simple microscopes difficult to use: he called them "offensive to my eye" and complained that they "much strained and weakened the sight."

BIOLOGY IN ART and BIOART
MODERN AND CONTEMPORARY ART

Above: Wassily Kandinsky, Réciproque, 1942-44
Left: Wassily Kandinsky, Variegated Black, 1935



Photomicrograph of a cross section of a twig, from *Structures in Art and in Science* in the *Vision + Value Series,* ed. by György Kepes (1965)

György Kepes [1906-2001]

Bacterial Sublime

Cellular Sublime

Scientific Sublime

Anna Dumitriu, “Engineered Antibody,” 21 amino acids, polymer clay, Coomassie Brilliant Blue dye, jewellery wire, cotton calico, vintage tatted linen lace, silk, and embroidery, Based on research by Liu Lab member Xiang Li. 2015-2016

The shapes and forms of Dumitriu’s work elicit meaning within and beyond gender. The artist-scientist collaboration at work in all three pieces embodies an equally if not more powerful meaning-maker than sexual categories, even while the presence of Dumitriu – a woman *and* artist – in the lab is a resounding, even revolutionary, symbol of open frontiers and progressive thinking. A result of her residency working with researchers in the Liu Lab for Synthetic Evolution at the University of California Irvine, Dumitriu’s “Engineered Antibody” plays on the metaphor that amino acids are the “beads of life:” the idea that scientists enlist to describe structures of proteins constructed from chains of amino acids. The work is a necklace made up of 452 handmade beads containing the actual 21 amino acids of an antibody purified from the blood of an HIV positive patient.

Robert Hooke (1635-1703)
English natural philosopher, architect and polymath. English natural philosopher, architect and polymath, Surveyor for the City of London after the fire of 1666

Christopher Wren (1632-1723)
English polymath, architect, King's Surveyor for the City of London after the fire of 1666

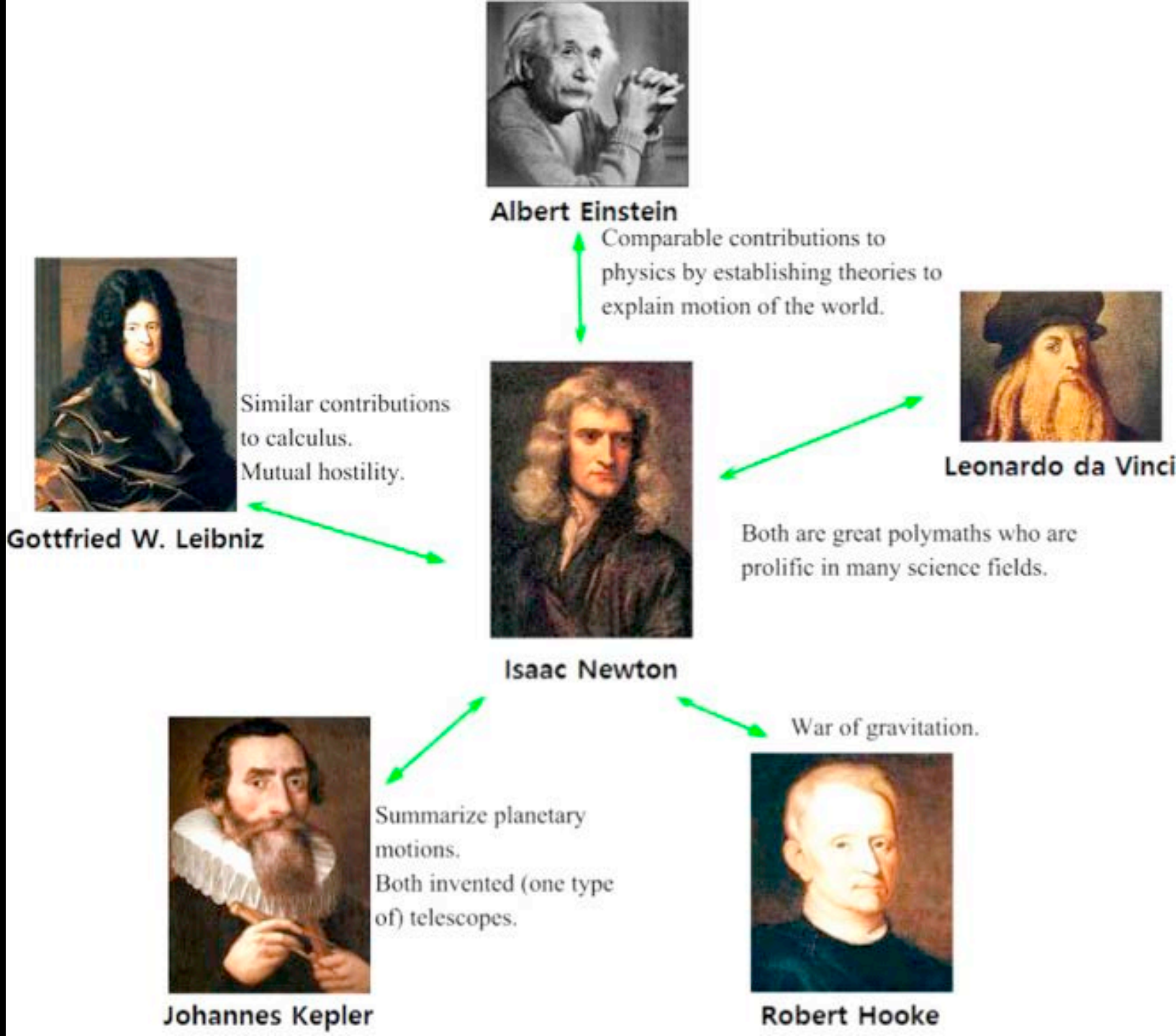
What is Matthew F. Walker’s basic thesis in “The Limits of Collaboration: Robert Hooke, Christopher Wren, and the Designing of the Monument to the Great Fire of London”?

THE WREN–HOOKE RELATIONSHIP RE-EXAMINED

That Wren and Hooke were friends is undeniable, but the recent tendency to portray. Hooke first and foremost as ‘Sir Christopher Wren’s close friend’ is perhaps unhelpful. Notably, it has led to the portrayal of Wren as Isaac Newton’s antithesis in terms of influence on Hooke’s career; the great friend and ally in contrast to the bitter enemy and rival. Indeed, a recent monograph on Hooke presented portraits of Wren and Newton as the first images in the book, side by side, in a Manichaean diptych of best friend and bitter enemy. Yet whereas Hooke and Newton were clearly intellectual rivals, such unequivocally positive summaries of Wren and Hooke’s relationship fail to realize that seventeenth-century friendships, intellectual or otherwise, were socially constructed and socially constrained in a way that is unfamiliar today. Instead, Wren and Hooke’s friendship was, in the socio-scientific domain, a more formalized union, typical among Royal Society philosophers and by no means the dominant masculine relationship in either of their lives.

What does this tell us?

- Politics of Royal Science in the early years of the Scientific Revolution
- Hooke was the primary architect of the Monument to the Great Fire of London, according to Walker.



0 10 20 30 40 50 Miles
0 20 40 60 80 Kms
Principal road
Other main road
Urban area
Major City
Large City
City
Large Town
Town
Small Town
SCOTLAND
England
Wales
North Sea
English Channel
Glasgow
Edinburgh
Berwick-upon-Tweed
Greenlaw
Coldstream
Kelso
Seahouses
Wooler
Embleton
Jedburgh
Alnwick
Teviothead
Amble
Rothbury
Langholm
Morpeth
Newbiggin-by-the-Sea
Brampton
Haltwhistle
Bedlington
Blyth
Carlisle
Newcastle-upon-Tyne
Hexham
Sunderland
Maryport
Wigton
Workington
Keswick
Penrith
Peterlee
Whitehaven
Appleby
Hartlepool
Shap
Brough
Ambleside
Stockton-on-Tees
Middlesbrough
Seascale
Kerby Stephen
Broughton-in-Furness
Kendal
Millom
Richmond
Catterick
Whitby
Ulverston
Robin Hood's Bay
Burrow-in-Furness
Leyburn
Pickering
Cloughton
Thirsk
Heysham
Morecambe
Easingwold
Scarborough
Lancaster
Settle
Ripon
Malton
Filey
fleetwood
Knaresborough
Boroughbridge
Sledmere
Cleverleys
Skipton
York
Bridlington
Blackpool
Preston
Harrogate
Great Driffield
Pocklington
Hornsea
Bradford
Leeds
Beverly
Selby
Goole
Kingston upon Hull
Huddersfield
Withernsea
Bolton
Scunthorpe
Wigan
Manchester
Grimsby
Liverpool
Doncaster
Stockport
Cleethorpes
Warrington
Rotherham
Sheffield
Saltfleet
Macclesfield
Dronfield
Mablethorpe
Chester
Worksop
Wragby
Louth
Congleton
Buxton
Clowne
Crewe
Matlock
Lincoln
Kidsgrove
Spilsby
Skegness
Wrexham
Stoke-on-Trent
Bolsover
Coningsby
Wrangle
Llangollen
Whitchurch
Upper Tean
Belper
Sleaford
Wells next the sea
Derby
Nottingham
Boston
Sheringham
Wem
Market Drayton
Hunstanton
Docking
Cromer
West Felton
Grantham
Stafford
Donington
Sandringham
North
Kings Lynn
Holt
Walsham
Spalding
Shrewsbury
Swaffham
Norwich
Coalville
Wolverhampton
Leicester
Wisbech
Westbromwich
Corby
Peterborough
Great Yarmouth
Dudley
Birmingham
Attleborough
Lowestoft
Warley
Rugby
Kettering
Ludlow
Southwold
Coventry
Ely
Diss
Yoxford
Leominster
Redish
Bury St. Edmonds
Cambridge
Worcester
Northampton
Stowmarket
Stratford-upon-Avon
Ledbury
Broadway
Letchworth
Ipswich
Bedford
Sudbury
Hereford
Tewkesbury
Banbury
Stevenage
Felixstowe
Bishop's Stortford
Cheltenham
Braintree
Chippingham Norton
Ross on Wye
Colchester
Whitney
Aylesbury
Luton
Gloucester
Harlow
Maldon
Monmouth
Oxford
Clacton on Sea
Cirencester
Hemel Hempstead
St. Albans
Chelmsford
Swansea
Chepstow
Abingdon
Didcot
London
Basildon
Cardiff
Swindon
Grays
Herne Bay
Gravesend
Clevedon
Bristol
Margate
Keynsham
Devizes
Newbury
Western-super-Mare
Bath
Farnborough
Maidstone
Lynmouth
Radstock
Basingstoke
Ramsgate
Burnham
Trowbridge
Tonbridge
Deal
Lynton
Frome
Aldershot
Guildford
Ashford
LLfracombe
Croyde
Minehead
Warminster
Wilton
Farnham
Crawley
Dover
Braunton
Barnstaple
Bridgewater
Glastonbury
Salisbury
Folkestone
Winchester
Royal Tunbridge Wells
Hythe
Taunton
Southhampton
Petersfield
Hailsham
Hartland
Bideford
Wellington
Ilminster
Lewes
Ringwood
Havant
Hove
Hastings
Tiverton
Yeovil
Gosport
Bradworthy
Uffculme
Chard
Lymington
Brighton
Eastbourne
Blandford Forum
Portsmouth
Bude
Holsworthy
Honiton
Worthing
Newhaven
Poole
Okehampton
Exeter
Dorchester
Bournemouth
Boscastle
Abbotsbury
Littlehampton
Exmouth
Weymouth
Bognor Regis
Dawlish
Camelford
Tavistock
Padstow
Liskeard
Torquay
Bodmin
Ivybridge
Newquay
Dartmouth
St. Austell
Plymouth
Perranporth
Kingsbridge
Redruth
Truro
Salcombe
St. Ives
Camborne
Penzance
Penryn
Falmouth
Helston
Sennen
Lizard
©itaveluk.co.uk

Greenland Sea
Barents Sea
Jan Mayen
Kolguyev
Ikateq
20W
10W
0
10E
20E
40E
50E
Denmark Strait
Hammerfest
Kirkenes
Alta
Murmansk
Siglufjordhur
Harstad
Reykjavik
Kiruna
ICELAND
Norwegian Sea
Rovaniemi
White Sea
Arkhangelsk
Mo
Lulea
Severodvinsk
60N
Skelleftea
Gulf of Bothnia
FINLAND
Umea
Faroe Islands
Trondheim
Ostersund
Vaasa
Torshavn
NORWAY
SWEDEN
L. Ladoga
Vologda
Shetland Islands
Helsinki
Rybinsk Res.
Lerwick
Bergen
Gavle
Gulf of Finland
St. Petersburg
Volga
Orkney Islands
Oslo
Tallinn
Novgorod
Yaroslavl
Rostov
Hebrides
Inverness
Stockholm
ESTONIA
Pskov
North Sea
Parnu
Moscow
U. K.
Goteborg
Volga
Glasgow
Edinburgh
DENMARK
Riga
Baltic Sea
Liepaja
Kaluga
RUSSIA
IRELAND
Belfast
Vejle
Klaipeda
LITHUANIA
Vilnius
Smolensk
Dublin
Sunderland
Copenhagen
Leeds
Gdansk
Orel
Limerick
Manchester
Olsztyn
Minsk
Voronezh
Liverpool
Hamburg
Cork
NETH.
POLAND
BELARUS
Gomel
Birmingham
Amsterdam
Voronezh
London
The Hague
Berlin
Poznan
Warsaw
Rotterdam
GERMANY
ATLANTIC OCEAN
Plymouth
Brussels
Leipzig
Lutsk
Kiev
Kharkov
English Channel
BELGIUM
Lodz
Luxembourg
Bonn
Prague
UKRAINE
Donetsk
LUX.
Frankfurt
Krakow
Lvov
Paris
Numberg
CZECH
Brno
Krivoy Rog
Nantes
SLOVAKIA
MOLDOVA
Strasbourg
Bratislava
Chisinau
FRANCE
Vienna
Sea of Azov
Bern
Zurich
AUSTRIA
Budapest
Odessa
Bay of Biscay
Geneva
Vaduz
Graz
Gyor
Cluj
SWITZERLAND
HUNGARY
Arad
Braila
Simferopol
La Coruna
Ljubljana
SLOVENIA
Pecs
Bordeaux
Lyon
Timisoara
Milano
Zagreb
ROMANIA
Bucharest
Bayonne
Rijeka
Genova
CROATIA
Belgrade
Black Sea
Monaco
BOSNIA
Porto
Firenze
Sarajevo
Varna
40N
Valladolid
Coimbra
Rio Douro
Marseille
Sofia
Burgas
ANDORRA
Zaragoza
YUGOSLAVIA
BULGARIA
PORTUGAL
Madrid
Corsica
Rome
Skopje
Istanbul
Ankara
Lisbon
SPAIN
Barcelona
Adriatic Sea
MACEDONIA
Tagus River
Tirane
ALBANIA
Thessaloniki
Bursa
TURKEY
Valencia
Sardinia
Naples
GREECE
Larissa
Lesbos
Cordoba
Majorca
Tyrrhenian Sea
Ioannina
Izmir
Adana
Agrinion
Malaga
Palermo
Antalya
Strait of Gibraltar
Tangier
Gibraltar
Mediterranean Sea
Sicily
Patrai
Athens
Annaba
Peloponnesus
Oran
Algers
Tunis
Catania
Nicosia
Rabat
Ionian Sea
Constantine
Khania
Iraklion
Rhodes
Vallelta
CYPRUS
Casablanca
Batna
TUNISIA
Crete
LEBANON
Damascus
MOROCCO
Marrakech
Gafsa
Sfax
Mediterranean Sea
Tel Aviv
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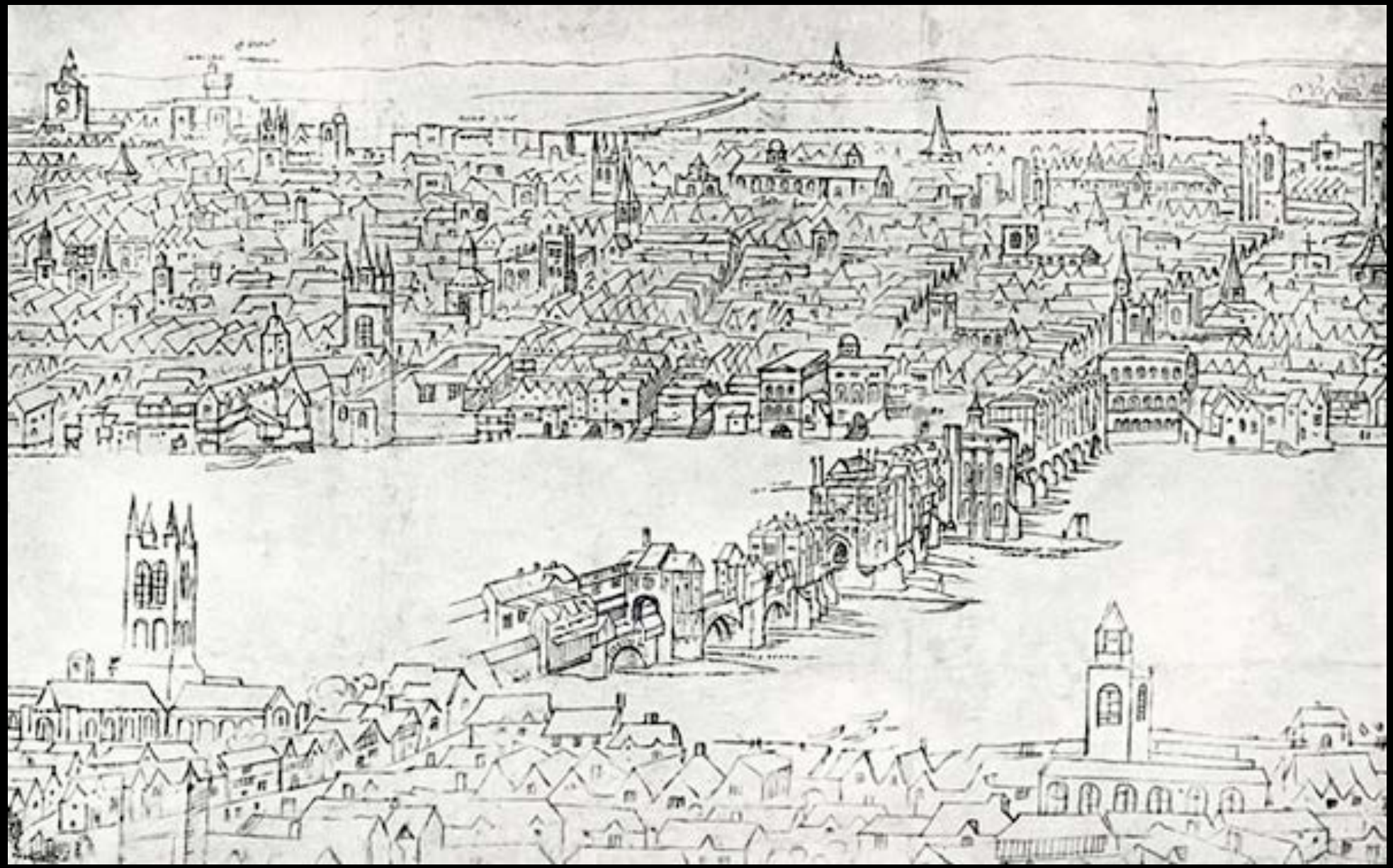
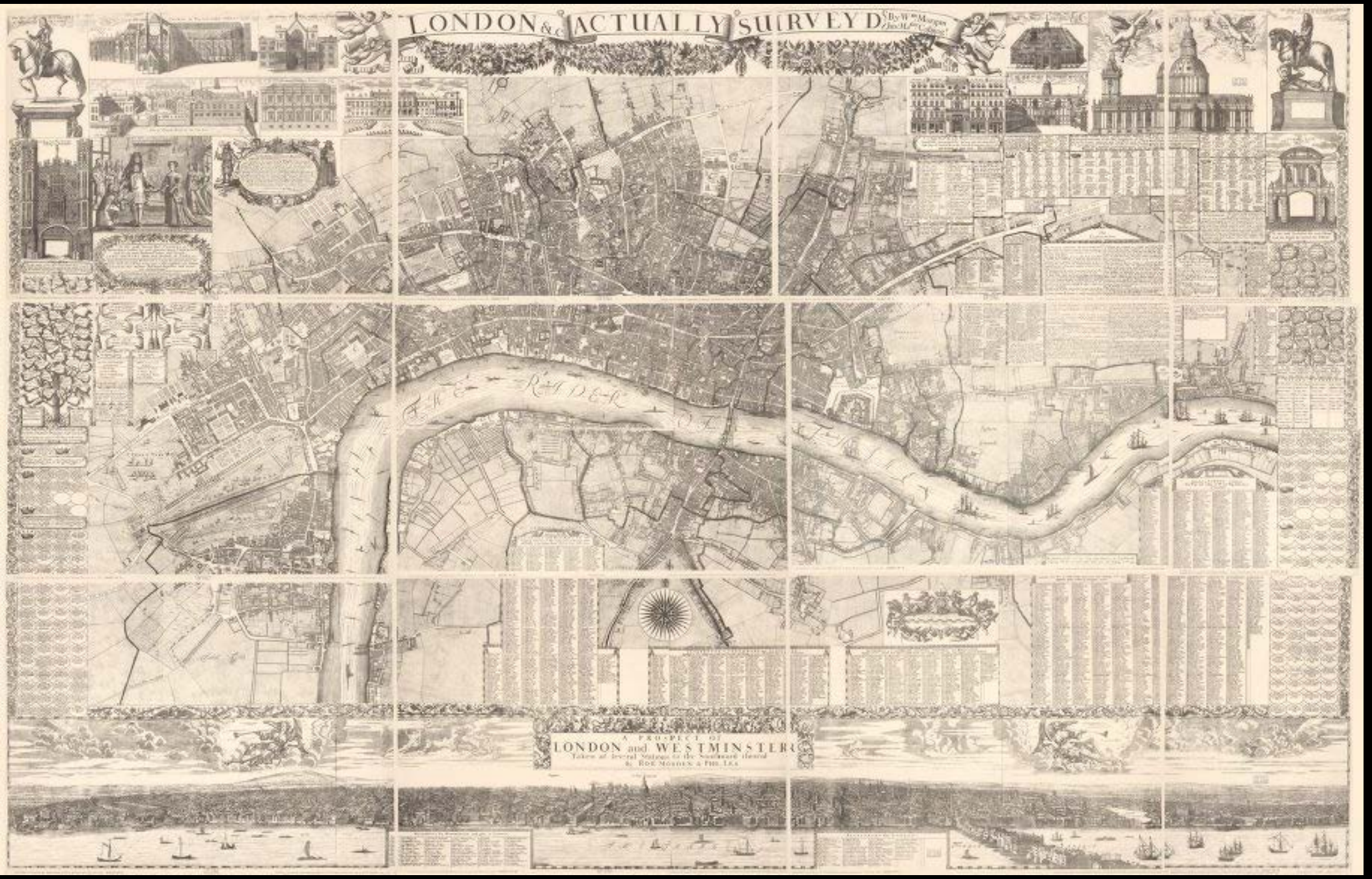


London Bridge 1554-57

A guide for Cuntrey men In the Famous Cittey of LONDON by the helpe of wich pilot they shall be able to Know how farr it is to any Street. As alsso to go vnto the same without forder trouble. Anno 1653.



William Morgan
Map of London
1682

VISSCHER'S VIEW OF LONDON, 1616

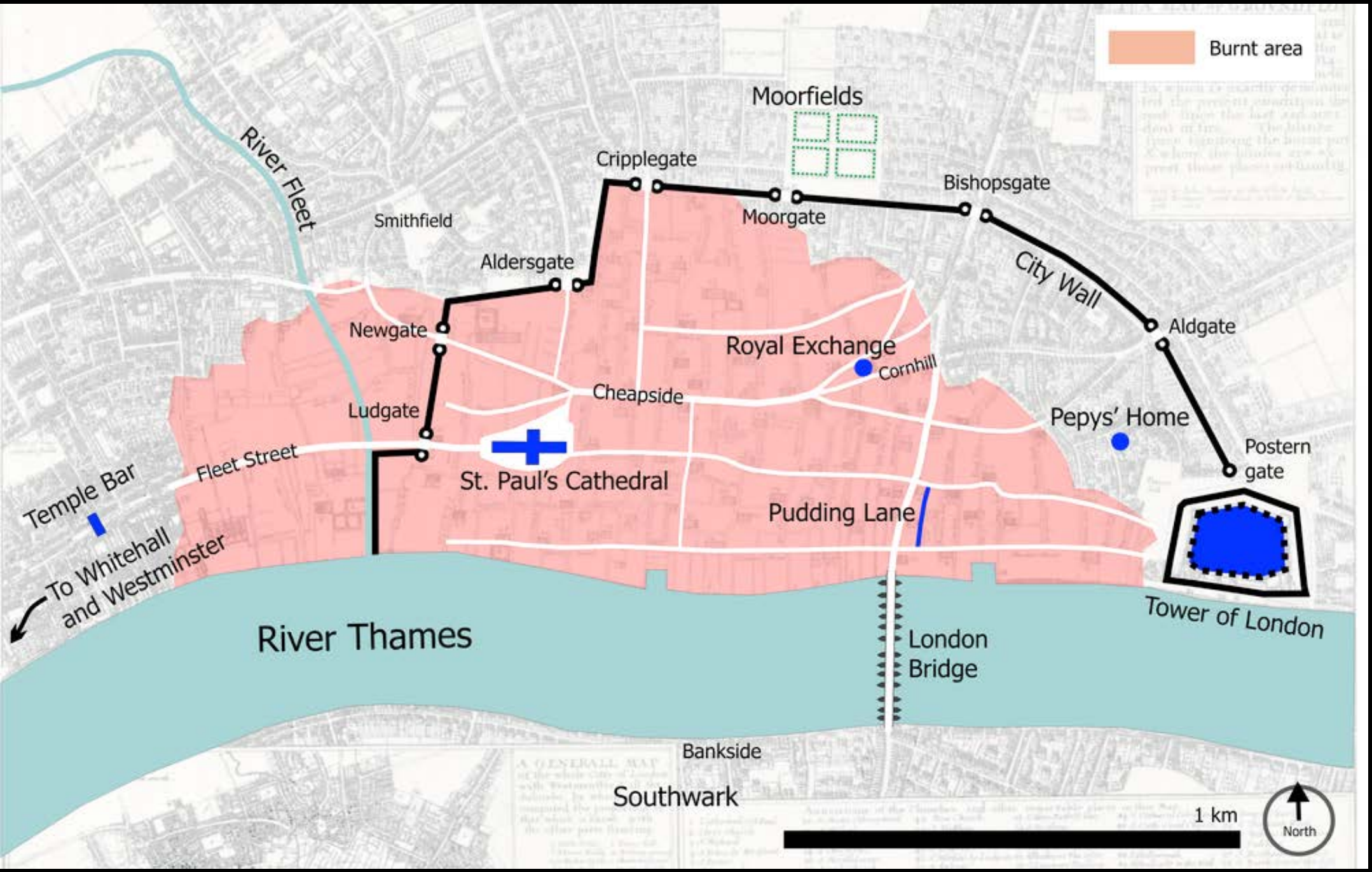
A panorama of London by Claes Visscher, 1616; The tenement housing on London Bridge (detail at right) was a notorious death-trap in case of fire, although much would be destroyed in an earlier fire in 1632.


THE BRIDGE
ke

The Great Fire of London which happened in 1666, here painted later by an unknown painter. The painter depicts the fire as it would have appeared on the evening of Tuesday, 4 September 1666 from a boat in the vicinity of Tower Wharf. The Tower of London is on the right and London Bridge on the left, with St. Paul's Cathedral in the distance, surrounded by the tallest flames.

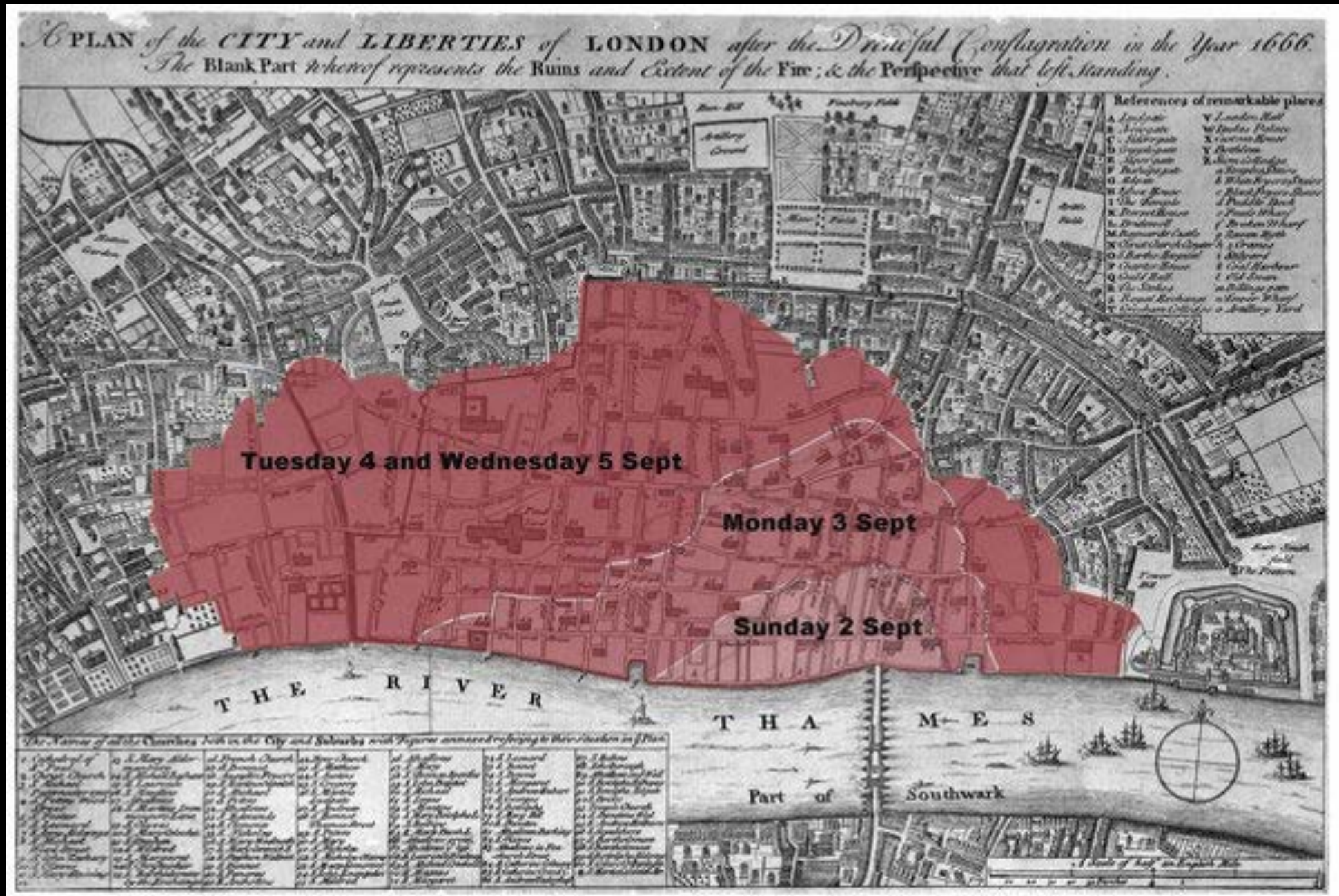
Matteus Merian, London on the left in 1650 and on the right during the fire of 1666

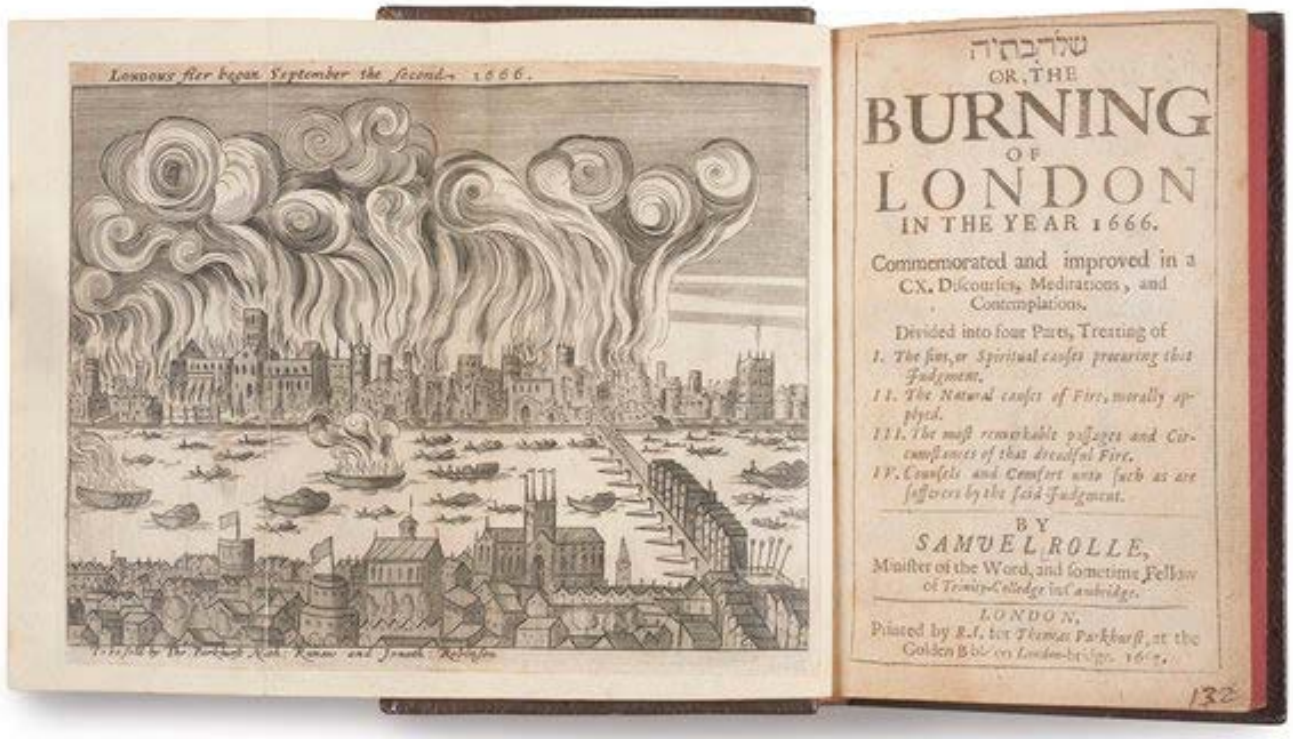
Wenceslaus Hollar, Before and After the Great Fire



London in 1666, with the burnt area shown in pink

The fire raged for four days in the late hot, dry summer of early September. It began in a bakery in Pudding Lane.

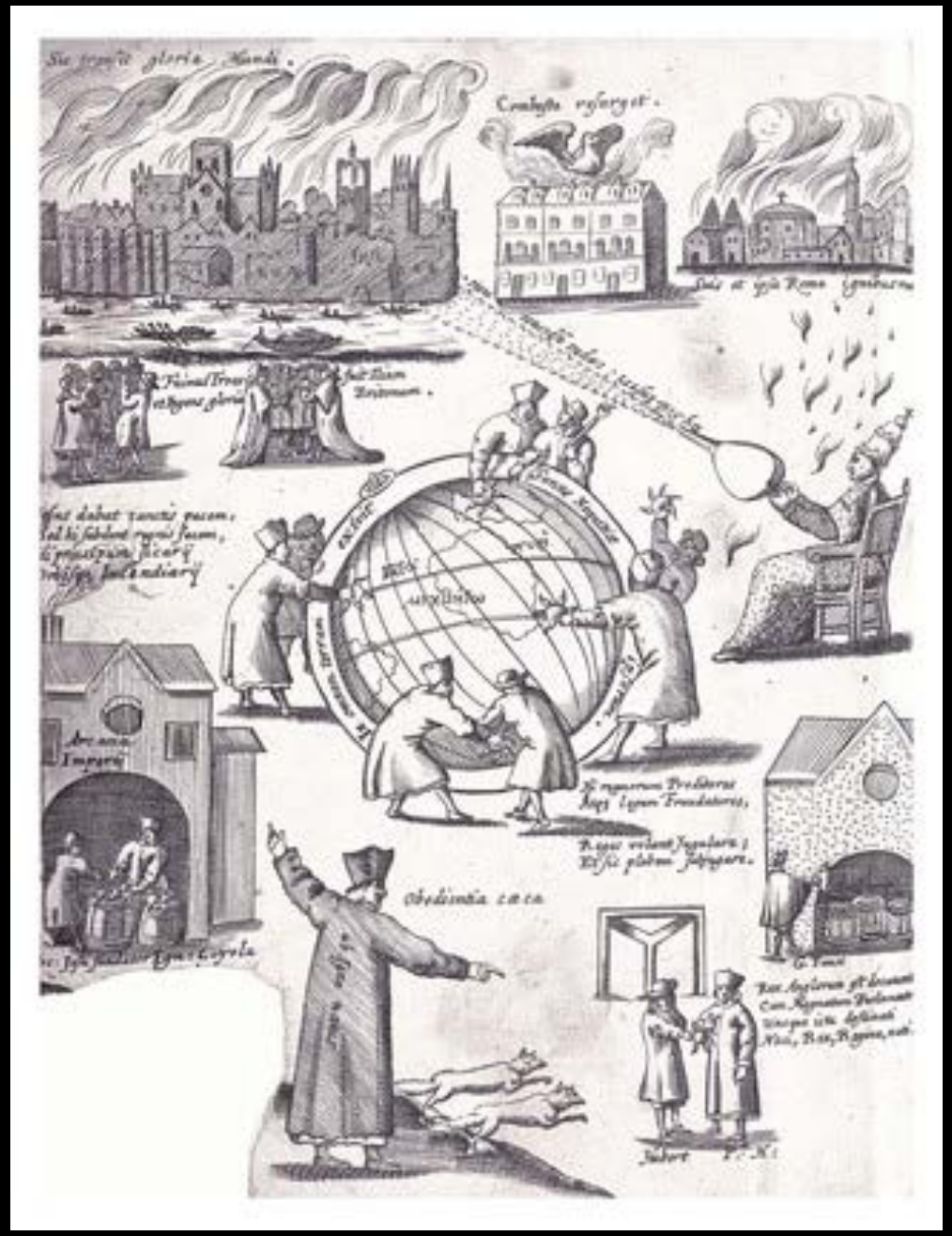

A PLAN of the CITY and LIBERTIES of LONDON after the Dreadful Conflagration in the Year 1666.
The Blank Part whereof represents the Ruins and Extent of the Fire; & the Perspective that left Standing.
References of remarkable places
Tuesday 4 and Wednesday 5 Sept
Monday 3 Sept
Sunday 2 Sept
THE RIVER
THAMES
Part of Southwark



Samuel Rolle's book about the Great Fire; information about the emotional and financial toll on Londoners

17th-century glass found beneath burnt debris in the Great Fire

http://www.smithsonianmag.com/history/great-fire-london-was-blamed-religious-terrorism-180960332/



Left: Detail from anti-Jesuit book: *Pyrotechnica loyolana*, *ignatian fire-works; or, the fiery Jesuits temper and behaviour*, 1667

Most of the blame for the Great Fire was put onto Catholics. London was a Protestant city and many people feared that Catholics in England would help foreign armies invade the country and force the population to convert to Catholicism. They saw the fire as a Catholic plot. Anti-Catholic books were written for many years, even though the fire was declared an accident in January 1667. This book, 'Pyrotechnica loyolana, ignatian fire-works; or, the fiery jesuits temper and behaviour', printed in 1667, claims to be written by a 'Catholick-Christian' and blames the fire on Jesuits (a Catholic religious order). The first illustration in the book shows the Pope fanning the flames of London with a pair of bellows, and various scenes of conspirators with fire balls, including Robert Hubert (the innocent Frenchman hung for starting the fire).

Other immigrant and minority groups blamed, some lynched: Catholics, Dutch, and French

Scapegoat: A person or group that is made to bear blame for others. According to the Old Testament, on the Day of Atonement, a priest would confess all the sins of the Israelites over the head of a goat and then drive it into the wilderness, symbolically bearing their sins away.

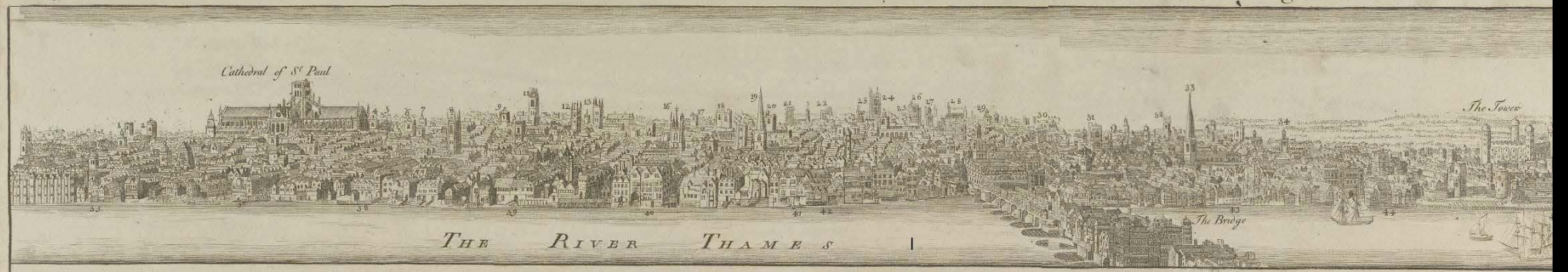

ke

TENEMENT HOUSING

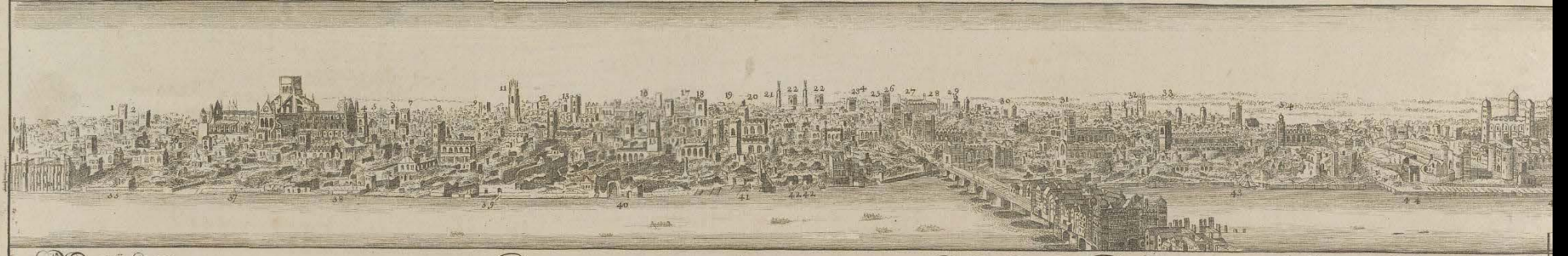
In 17th-century London, the human habitations were crowded to bursting point, intermingled with sources of heat, sparks, and pollution, and their construction increased the fire risk. The typical six- or seven-story timbered London tenement houses had ”jetties" (projecting upper floors). They had a narrow footprint at ground level, but maximized their use of land by "encroaching" on the street, as a contemporary observer put it, with the gradually increasing size of their upper stories. The fire hazard was well perceived when the top jetties all but met across the narrow alleys; "as it does facilitate a conflagration, so does it also hinder the remedy", wrote one observer —but "the covetousness of the citizens and connivancy [corruption] of Magistrates" worked in favor of jetties.


OLY'S
UDGE
NTRY
ORK
BARGHEST
SHAMBLES
SWEET
SHOP
VIA
VECCHIA
Artisan Bread
Tel
01904
627701
YE OLD
SHAMBLES TAVERN
Great Food

A PROSPECT of the CITY of LONDON from St MARIE OVERS STEEPLE in SOUTHWARK in its flourishing Condition before the FIRE



Another PROSPECT of the above CITY taken from the Same PLACE as it Appeared after that DREADFULL FIRE in 1666



A Plan for Rebuilding the CITY after the Fire Design'd by that Great Architect Sr CHRISTOPHR WREN and approv'd of by King and PARLIAMENT but unhappily Defeated by FACTION

REFERENCE to the VIEWS

1 S. Benet
2 S. Andrew in Wardrop
3 S. Peters in Thames street
4 S. Martins by Ludgate
5 S. Andrew in Holborne
6 S. Pulchers
7 S. Nicholas
8 S. Christ Church
9 S. Auguſtines
10 S. Foiter
11 S. John Zachary
12 S. Martins in Thames str.
13 S. Marys Aldermanbury
14 S. Thomas
15 Bow Church
16 S. Laurence
17 S. Mary Botolph La.
18 Allhallowes the Gr.
19 S. Stephens Colman Str.
20 S. Margaret
21 S. Mary Wilnoth
22 S. Laurence Poultney
23 S. Stephens in Walbroke
24 S. Christopher
25 S. Bartholemew
26 S. Edmunds
27 S. Michael in Cornhill
28 Allhallowes
29 S. Peters in Coralhill
30 S. Denis
31 S. Magnus
32 S. Andrew Hubart
33 S. Mary Hill
34 S. Botolph Aldgate
35 S. Dunstans Eaſt
36 Allhallowes Barking
37 Paul's Wharfe
38 Waterhouſe
39 S. Crane
40 Queen hithe
41 Stiliard
42 Col-Harbour
43 Old Swan
44 Fish mongers hall
45 Bilins gate

EXPLANATION to the PLAN

The shadowed part is that which escaped the Conflagration

C. Churches M. Markets

A Scale of 1800 Feet

VUES DE LA VILLE de LONDRES

Comme il etoit devant & apres

L'INCENDIE de 1666.

AVEC

Le PLAN pour la rebatir.

Projette par ce grand ARCHITECTE le Chevalier CHRISTOPHLE WREN, & approuvé par le Roi & PARLEMENT: mais malheureuſement rejette par Faction.

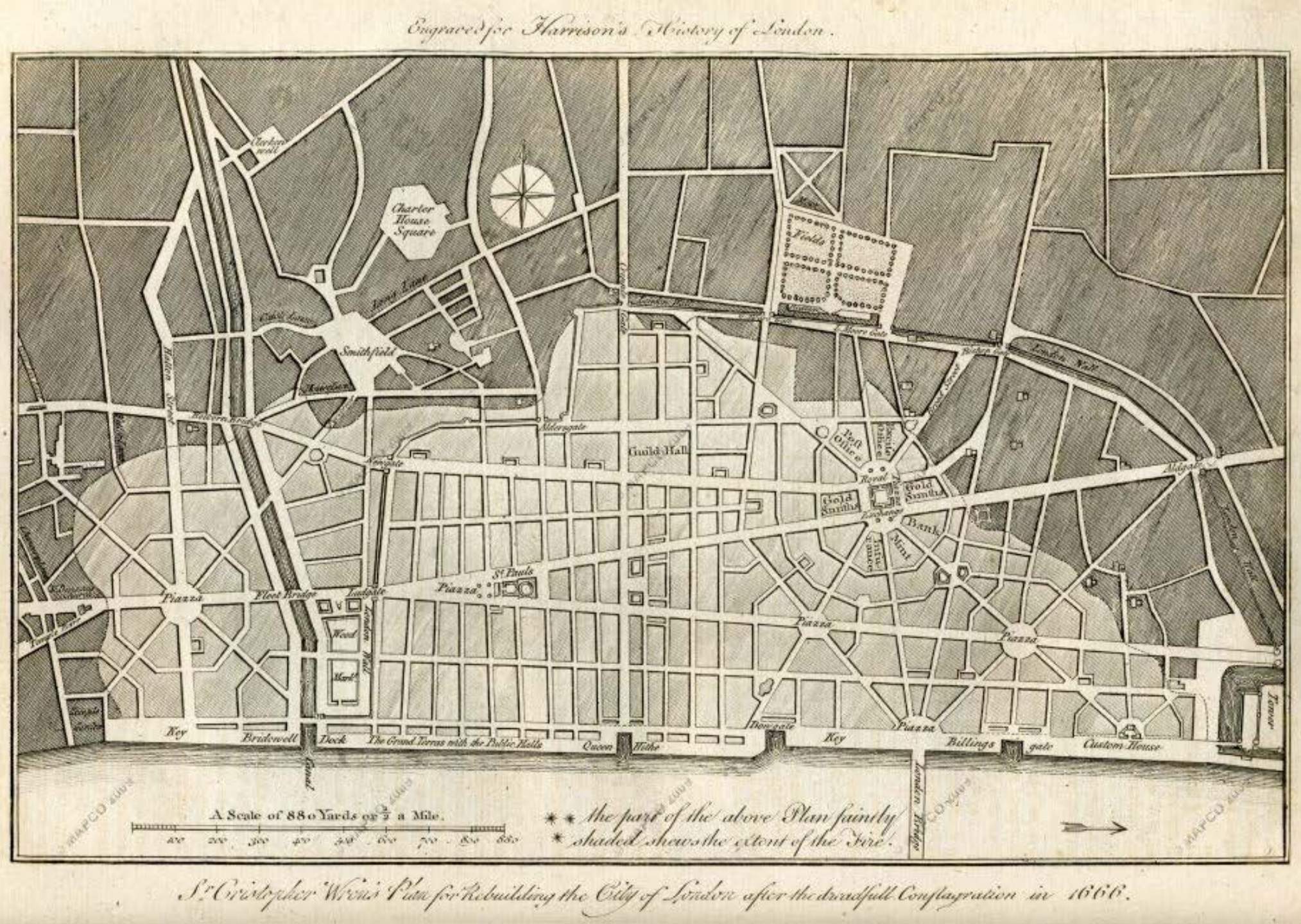
Publié par JEAN ROCQUE, Chorographe de Son Alteſſe Royalle le Prince de GALLES.

1758.

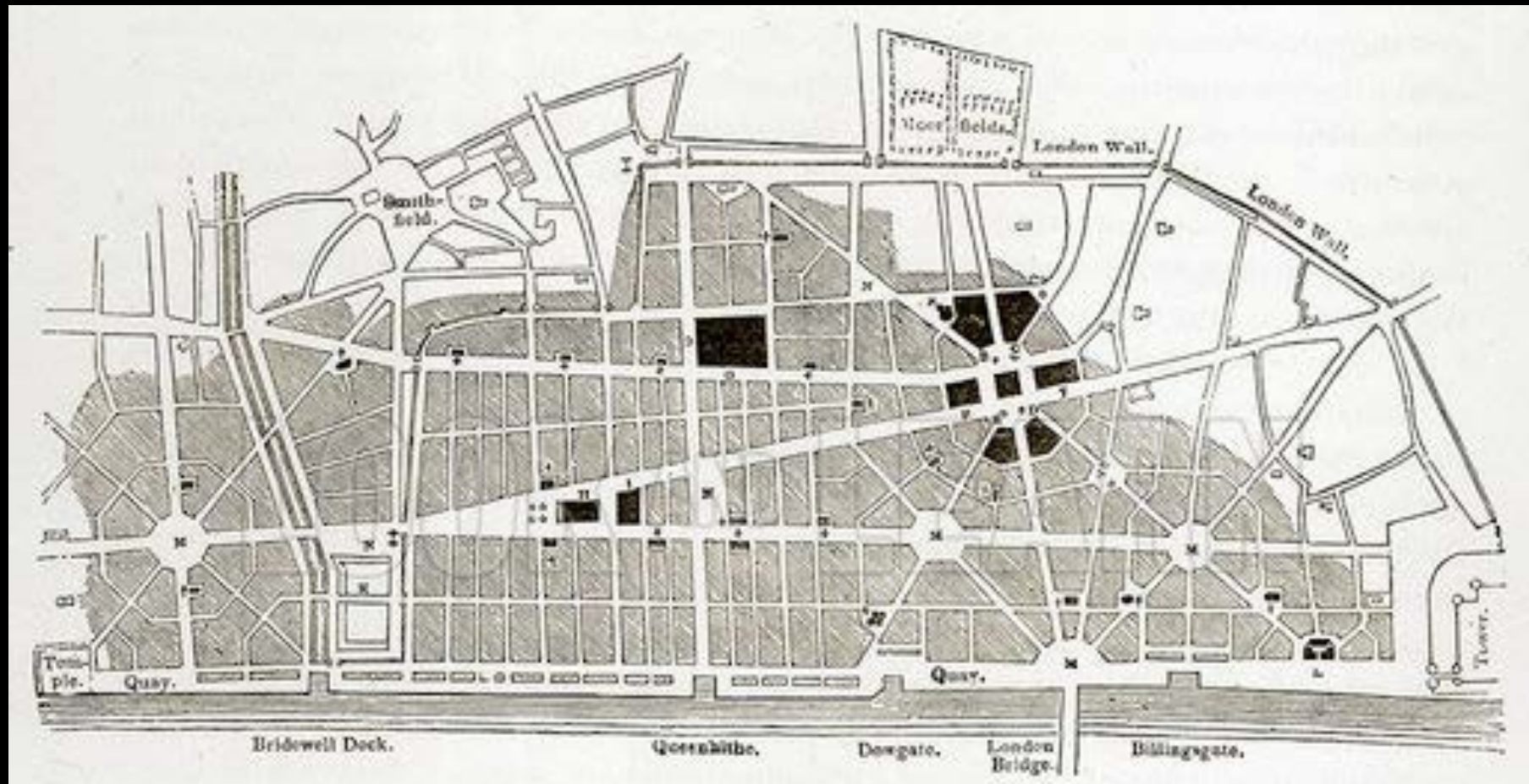
A Scale of 300 Toiſes

360 Yardsor 4 of a Mile Iriſh

440 Yards or 4 of a Mile Engliſh



Christopher Wren, Plan for Rebuilding of London, 1666



[Wren's Plan for rebuilding the City.]

[The shaded part shows the extent of the Fire.]

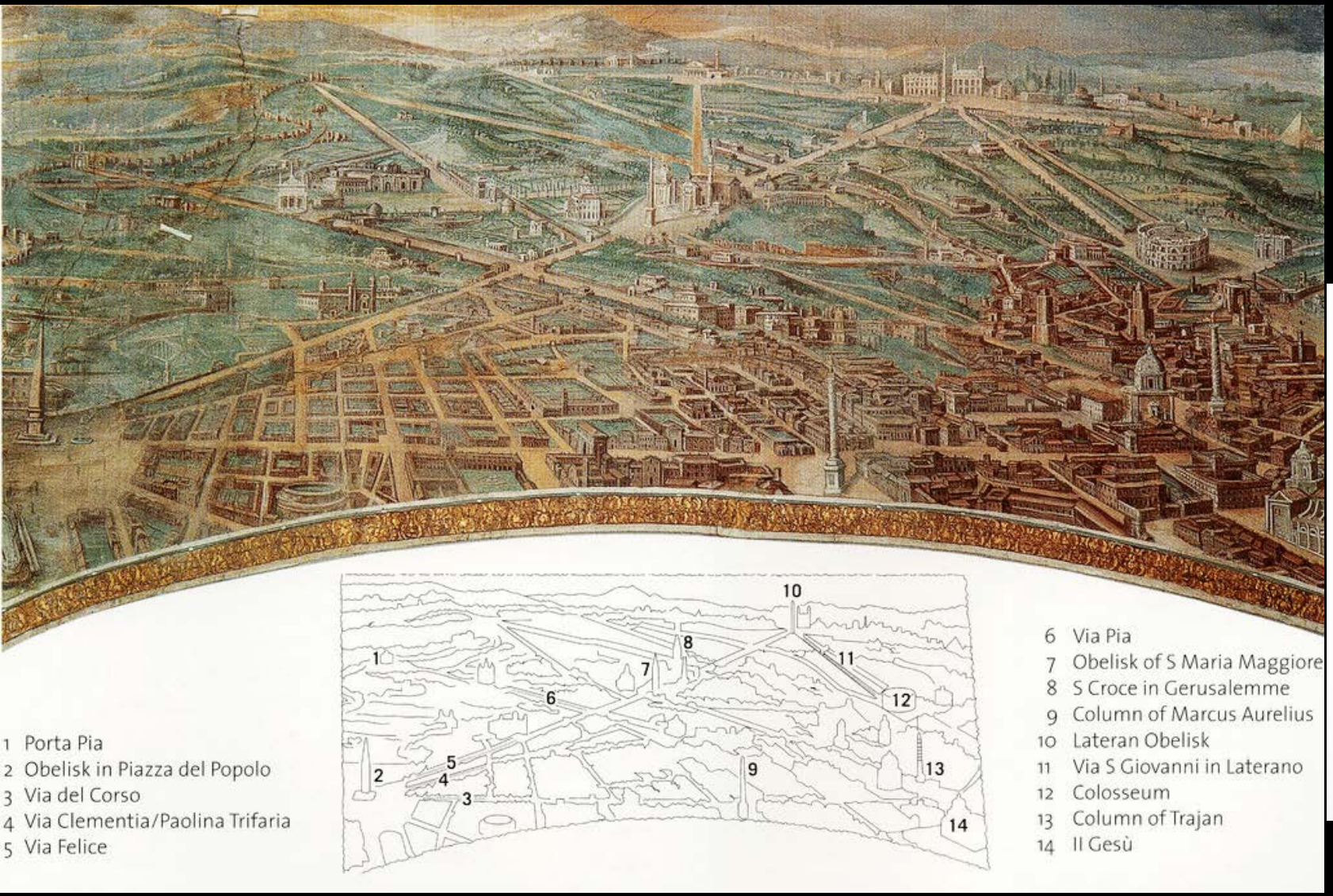
A. The Royal Exchange.
B. Post Office.
C. Excise Office.
D. Mint.

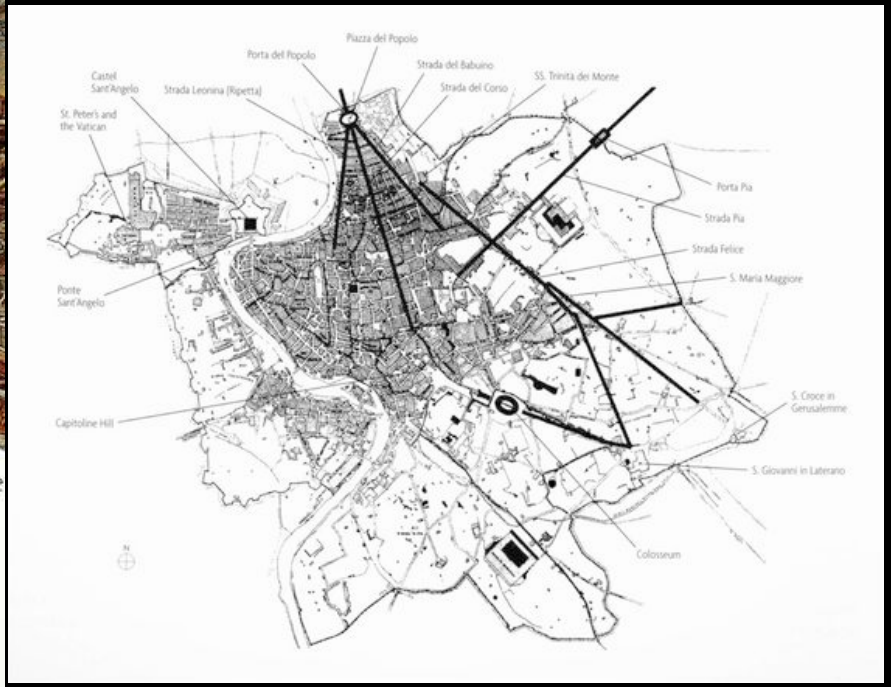
E. Insurance Office.
F. Goldsmiths'.
G. Guildhall.
H. St. Paul's.

I. Doctors' Commons.
K. Wood Market.
L. Custom House.
M. Piazzas.

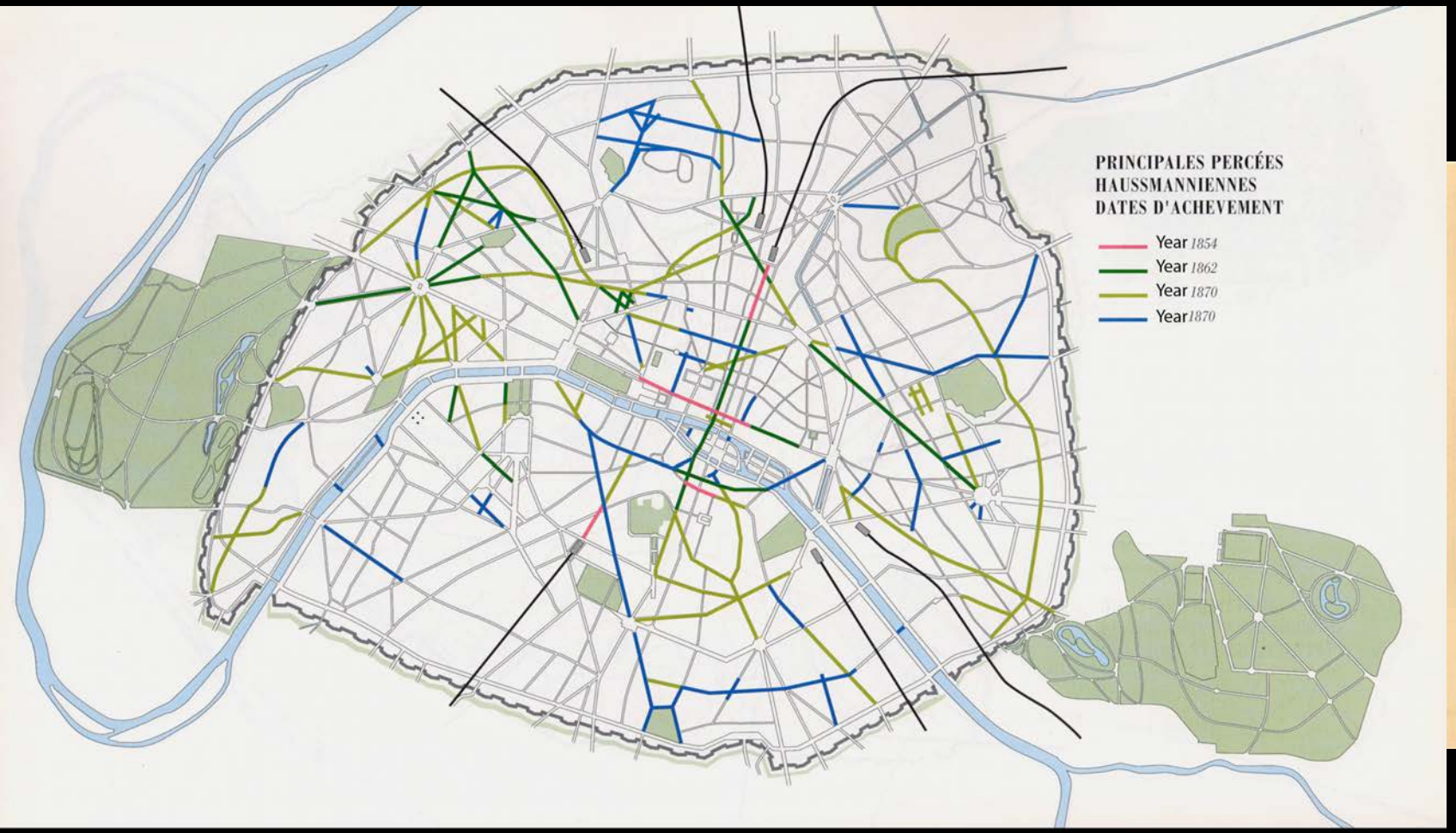
N. Market.
† Churches.
‡ Continuation of London Wall.

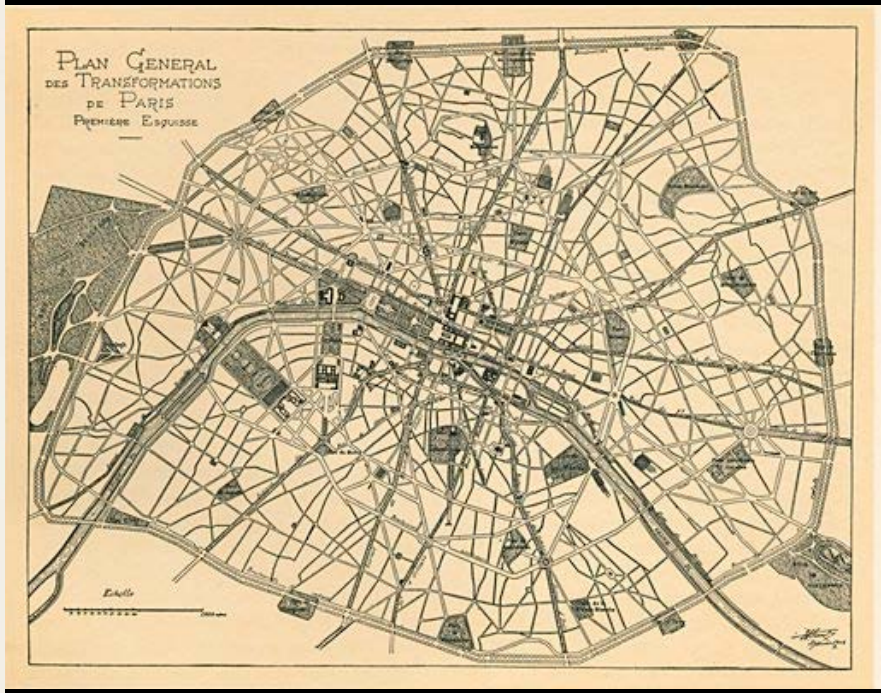
Baroque
and
Neo-Baroque City Plans





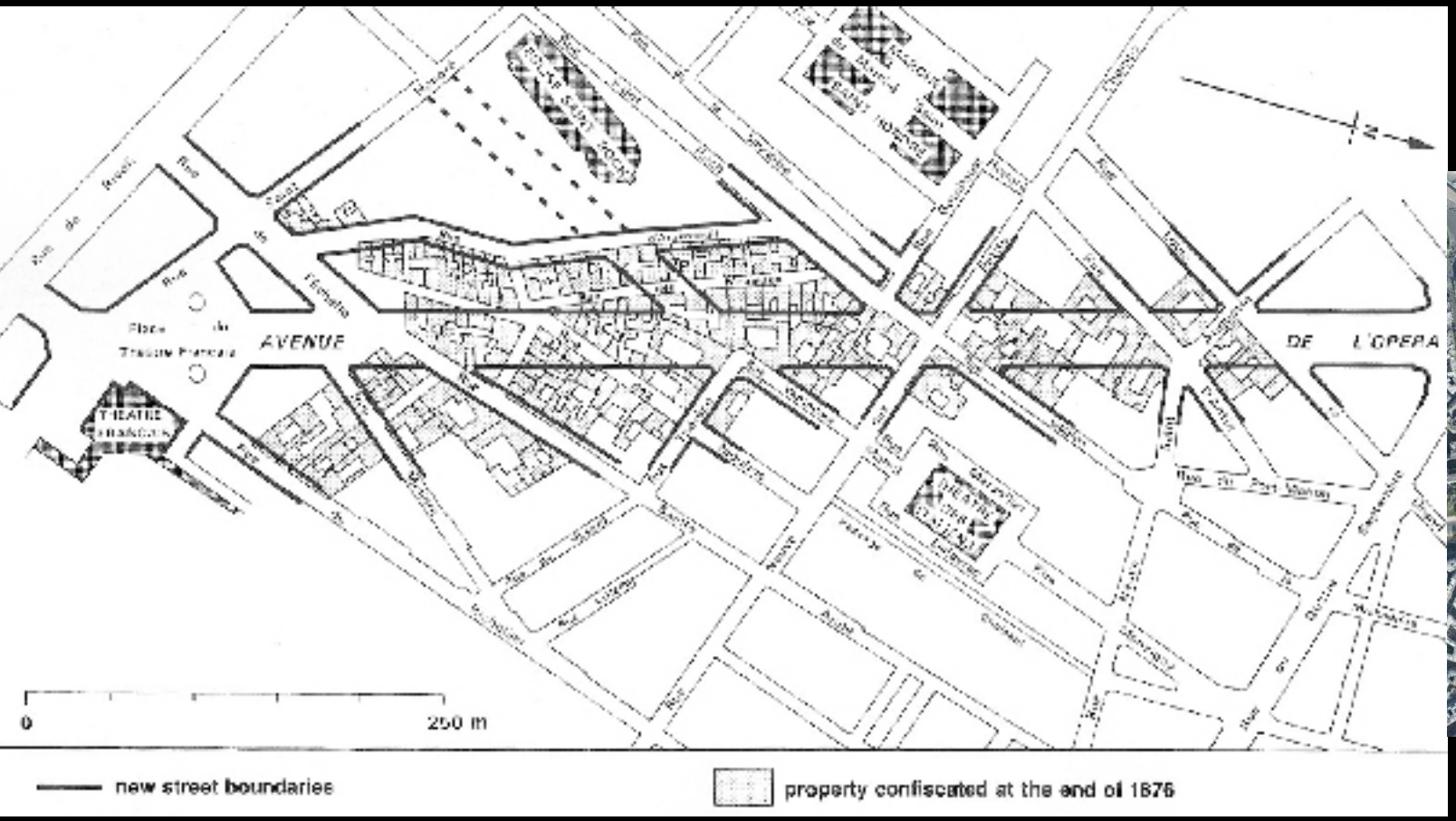
Pope Sixtus V, Plan for Rome, Italy, c. 1590





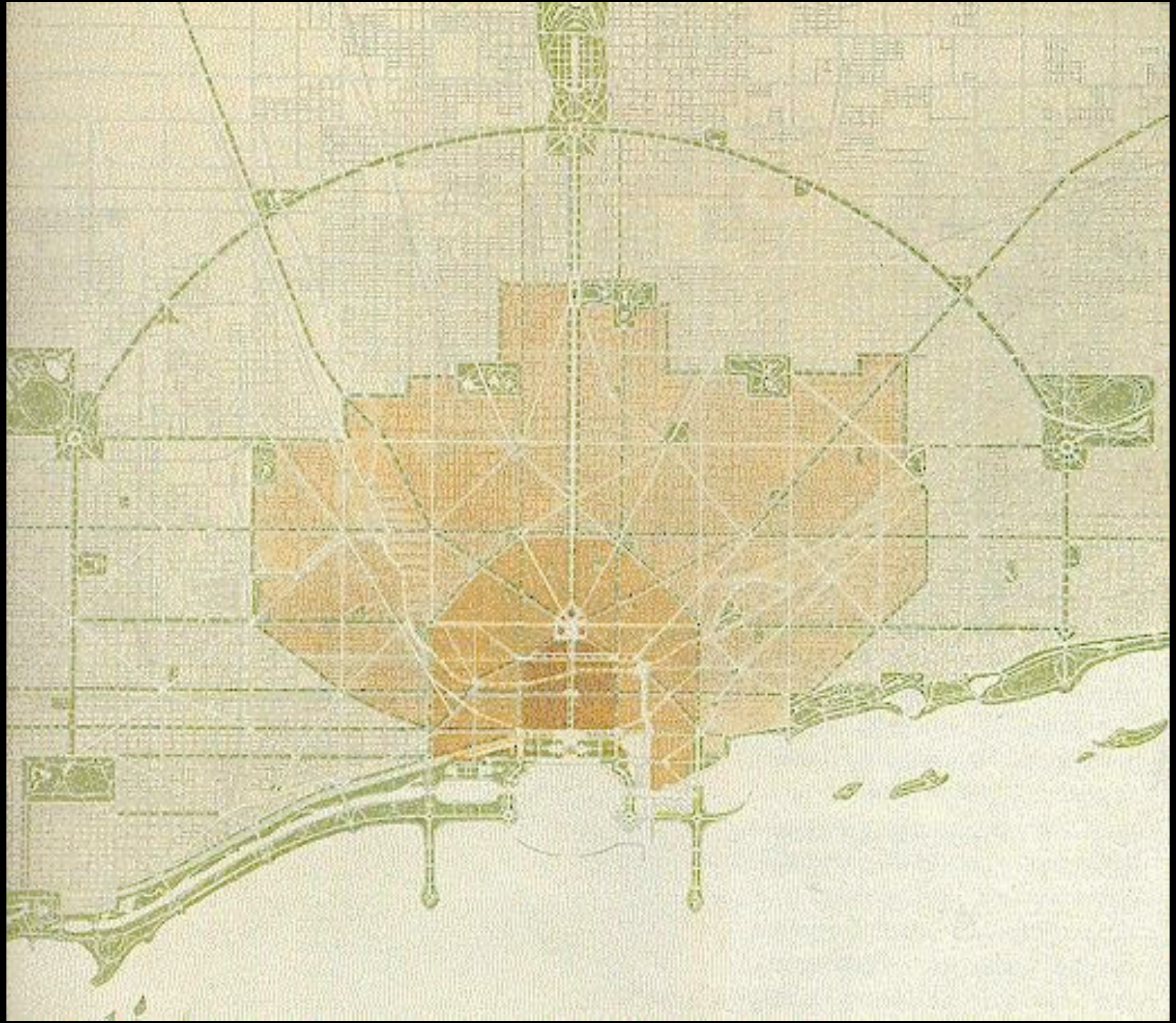
Paris - Streets and Avenues cut by Haussmann, 1854 -1879

Baron Eugène Haussmann, Prefect of the Seine, under Napoleon III, 1853-1857

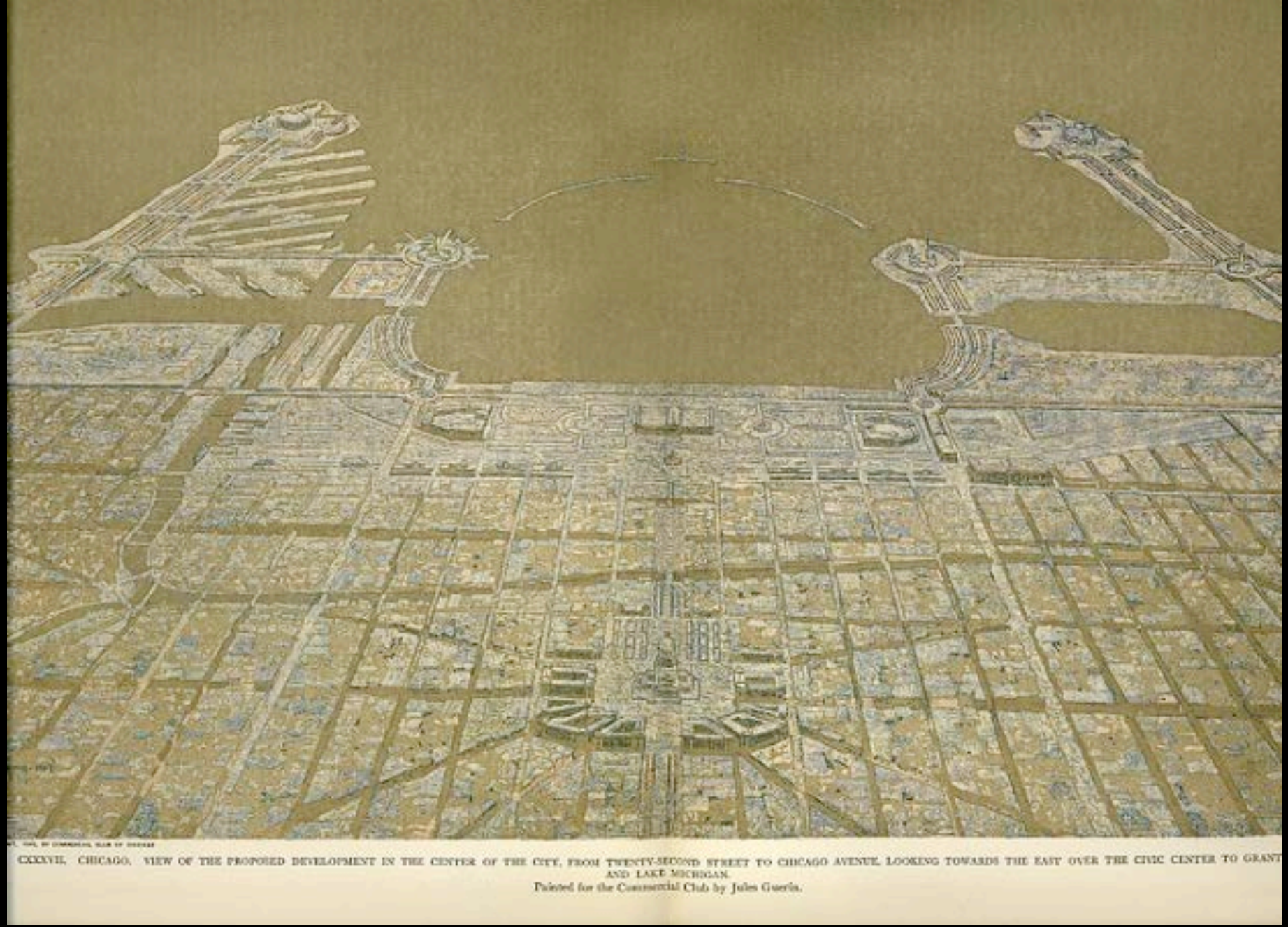


Property erased to make way for Avenue de l’Opera

An aerial view of Paris showing the boulevards radiating from the Arc De Triomphe



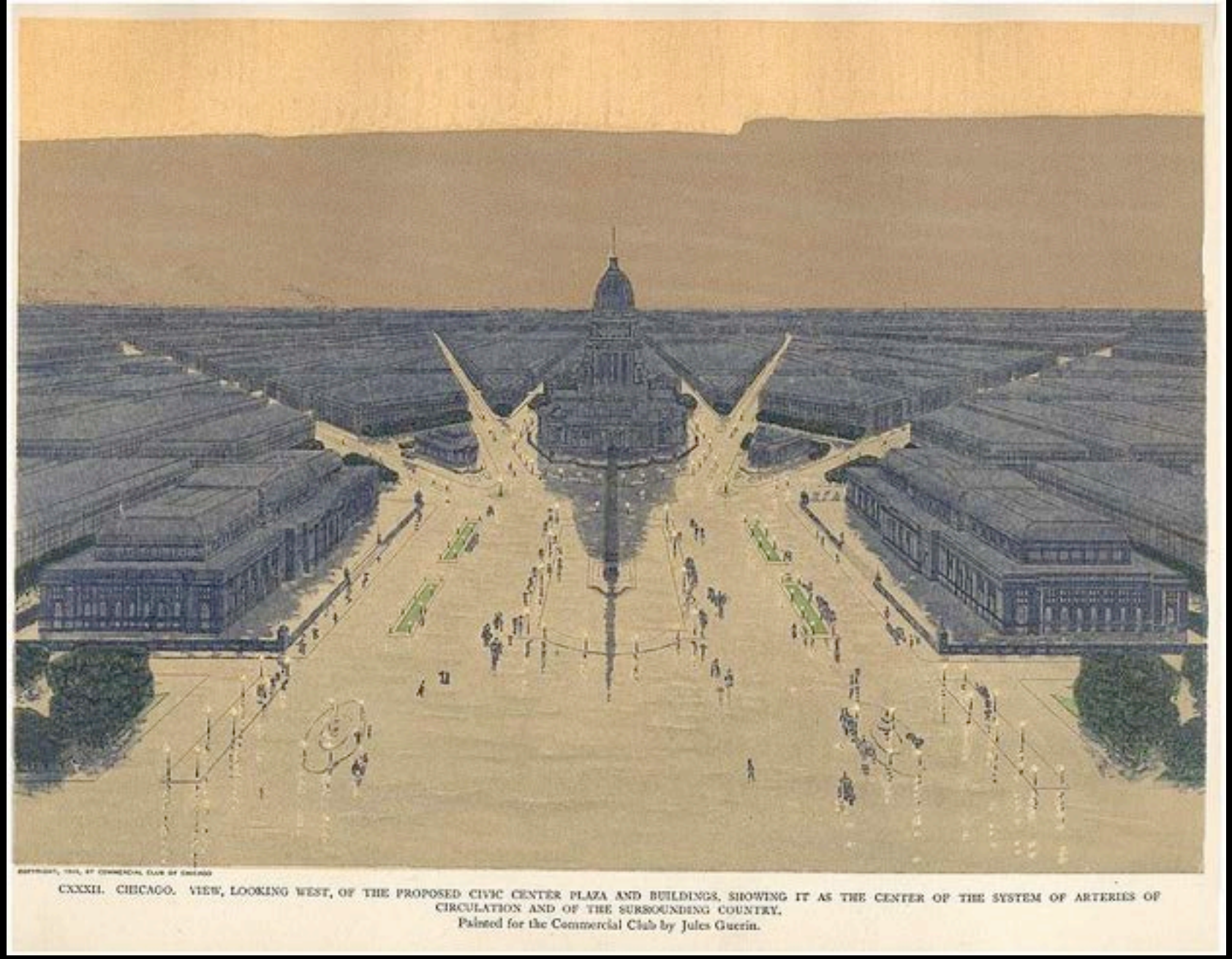
Daniel Burnham, Plan for Chicago, 1909



CXXXVII. CHICAGO. VIEW OF THE PROPOSED DEVELOPMENT IN THE CENTER OF THE CITY, FROM TWENTY-SECOND STREET TO CHICAGO AVENUE, LOOKING TOWARDS THE EAST OVER THE CIVIC CENTER TO GRANT AND LAKE MICHIGAN.
Painted for the Commercial Club by Jules Guerin.

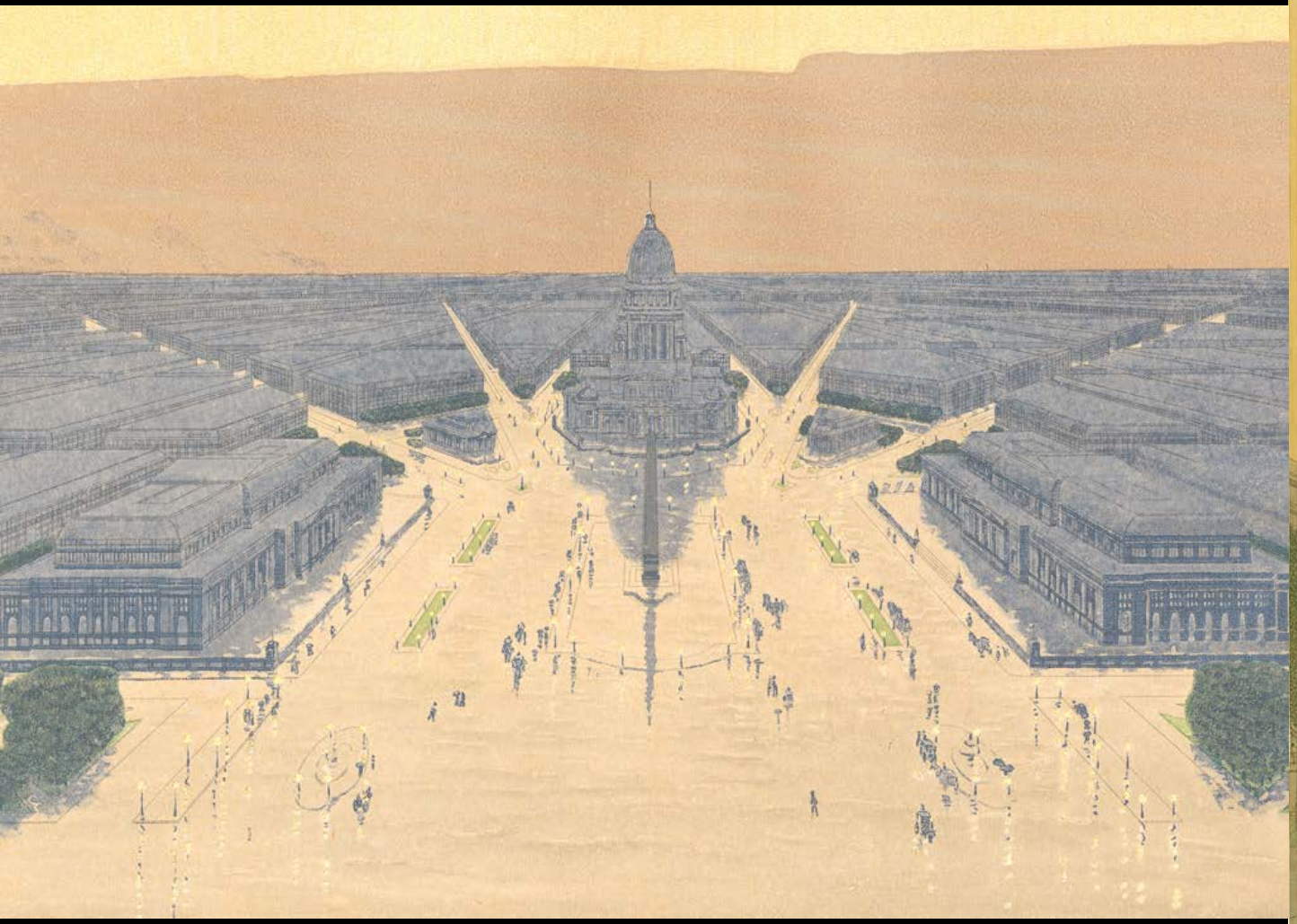
Centralized Chicago, painted by Jules Guerin, conceptualized by Daniel Burnham, 1909

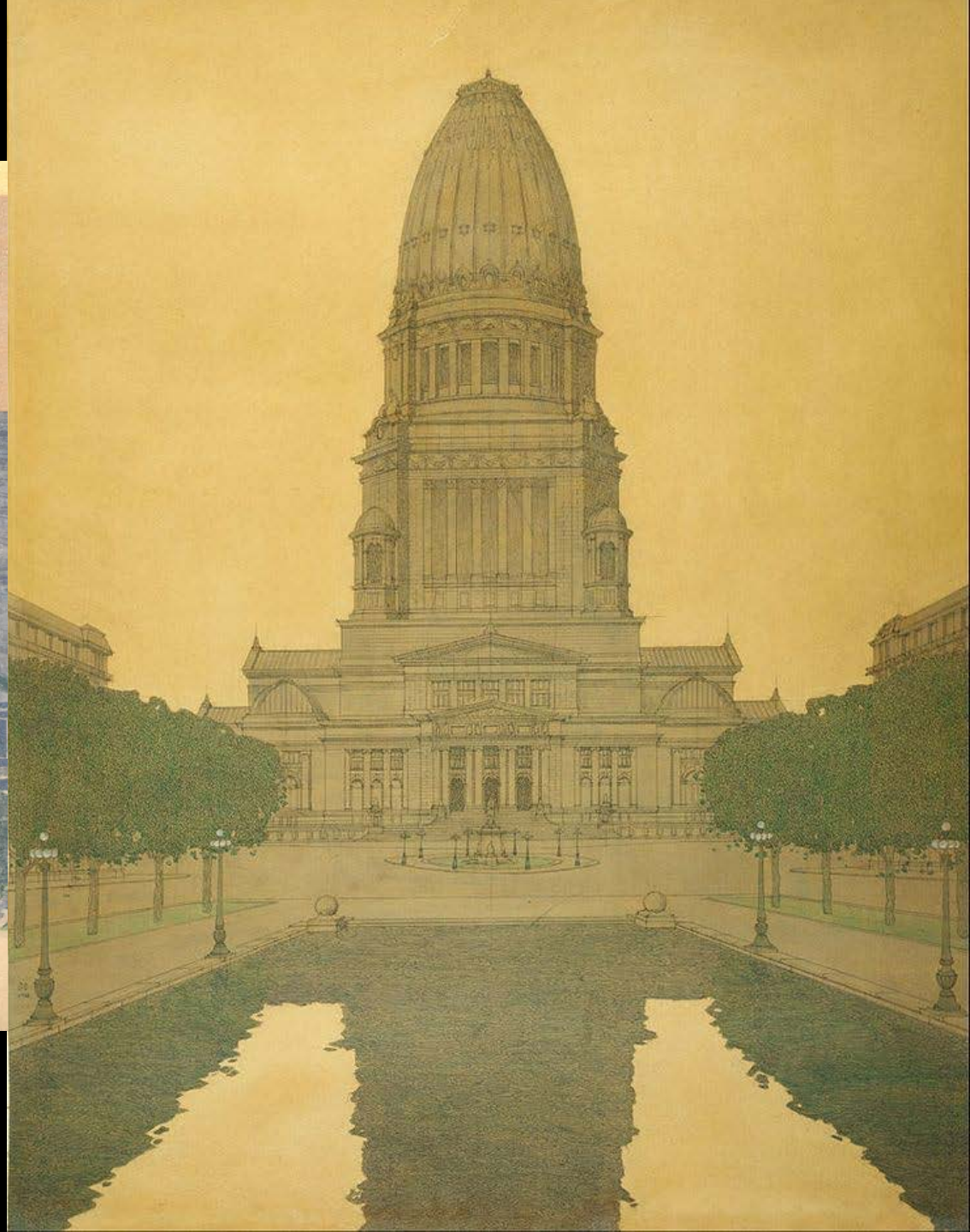
1909



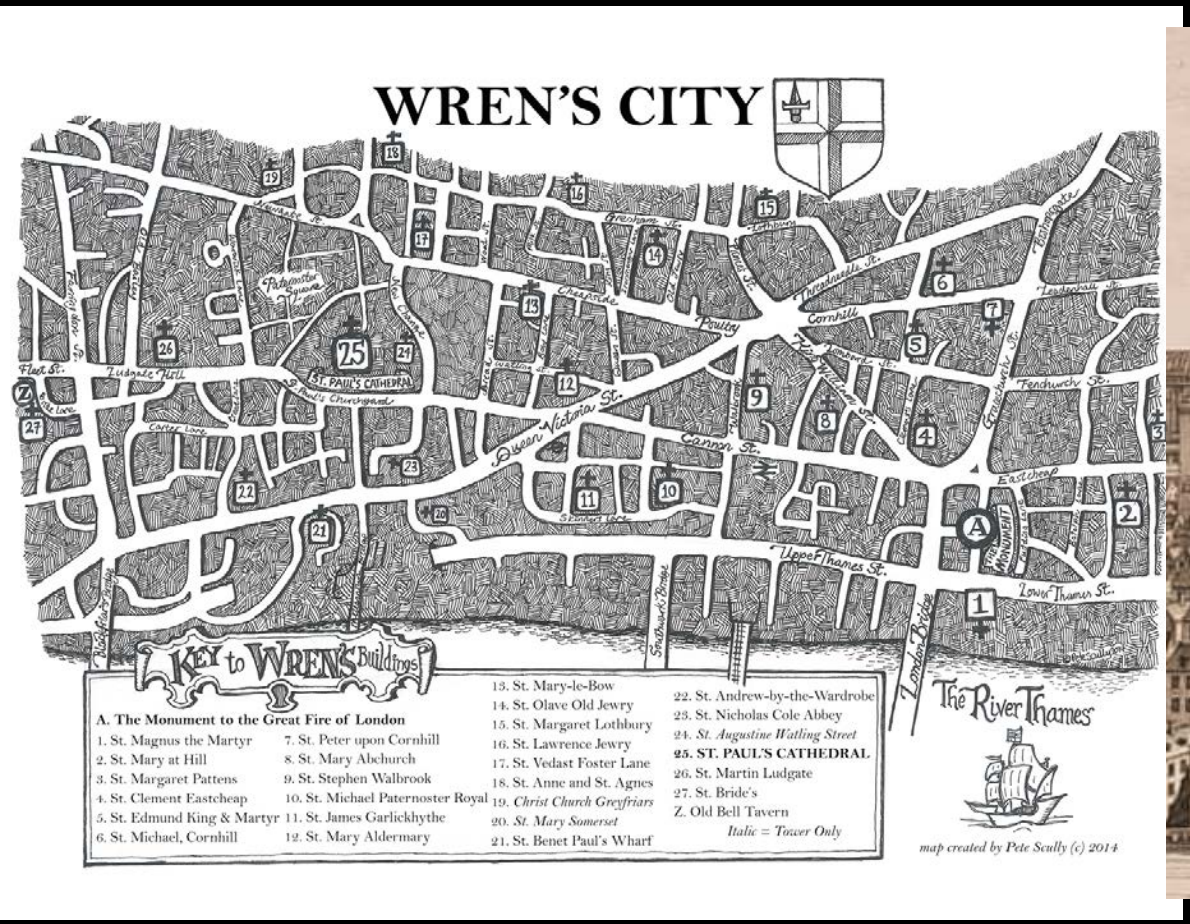
CXXXII. CHICAGO. VIEW, LOOKING WEST, OF THE PROPOSED CIVIC CENTER PLAZA AND BUILDINGS, SHOWING IT AS THE CENTER OF THE SYSTEM OF ARTERIES OF CIRCULATION AND OF THE SURROUNDING COUNTRY.
Painted for the Commercial Club by Jules Guerin.

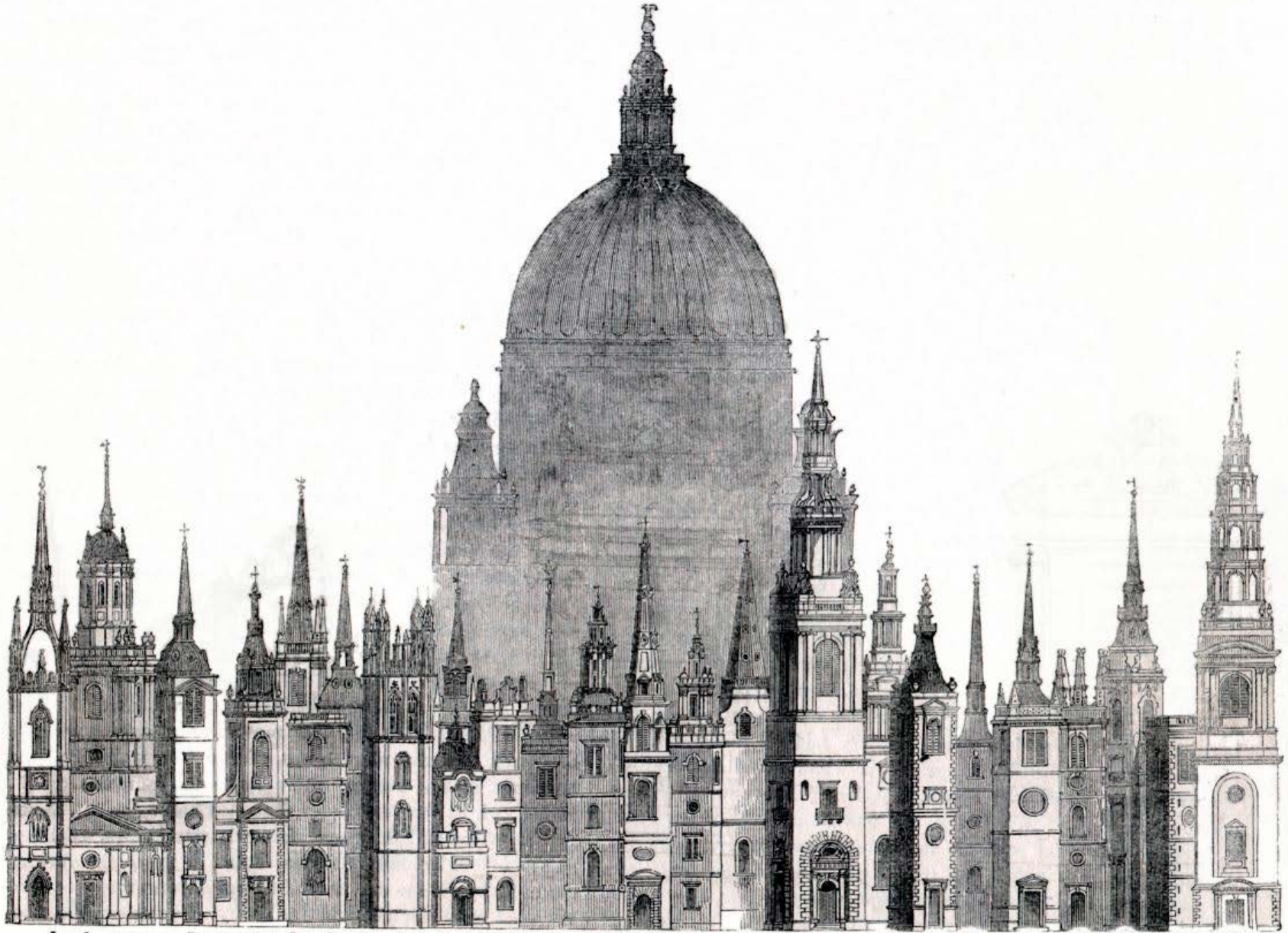
Civic Center and Plaza, painted by Jules Guerin, conceptualized by Daniel Burnham, 1909





LONDON c. 1666





2029.—A Parallel of some of the principal Towers and Steeples built by Sir Christopher Wren.

1, St. Dunstan in the East. 2, St. Magnus. 3, St. Benet, Gracechurch-street. 4, St. Edmund the King, Lombard-street. 5, St. Margaret Pattens. 6, Allhallows the Great. 7, St. Mary Abchurch. 8, St. Michael, Cornhill. 9, St. Lawrence, Jewry. 10, St. Benet Fink. 11, St. Bartholomew. 12, St. Michael, Queenhithe. 13, St. Michael Royal. 14, St. Antholin, Watling-street. 15, St. Stephen, Walbrook. 16, St. Swithen, Cannon-street. 17, St. Mary-le-Bow. 18, Christ Church, Newgate-street. 19, St. Nicholas, Cole Abbey. 20, St. Mildred, Bread-street. 21, St. Augustin, Watling-street. 22, St. Mary Somerset. 23, St. Martin, Ludgate. 24, St. Andrew by the Wardrobe, 25, St. Bride, Fleet-street.

The scale is expressed by St. Paul's in the background.

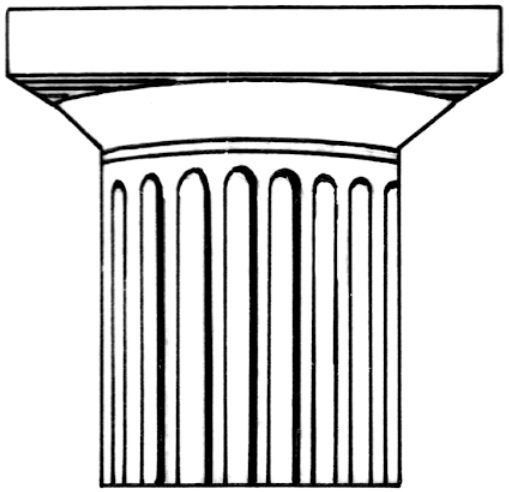
Eighty-eight parish churches were burned during the Great Fire of London in 1666. The office of Christopher Wren rebuilt 51 parish churches and St. Paul's Cathedral. Many of these churches were demolished as the population of the City of London declined in the 19th century and more were destroyed or damaged during the Blitz.

Christopher Wren and Robert Hooke, The Monument to the Great Fire of London, 1671-77

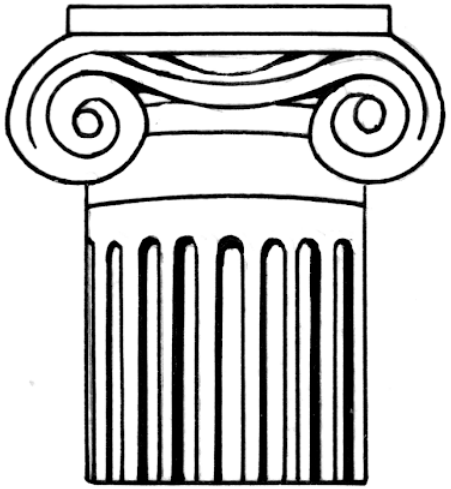
The Monument comprises a fluted Doric column built of Portland stone topped with a gilded urn of fire.

Its height marks its distance from the site of the shop of Thomas Farriner (or Farynor), the king's baker, where the Great Fire began.

The top of the Monument is reached by a narrow winding staircase of 311 steps. A mesh cage was added in the mid-19th century at the top to prevent people jumping off, after six people had committed suicide from the structure between 1788 and 1842.



DORIC



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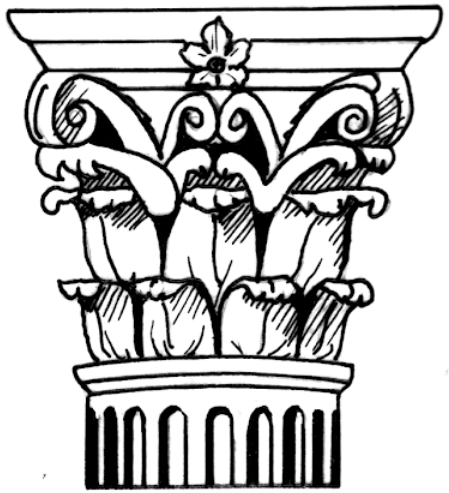
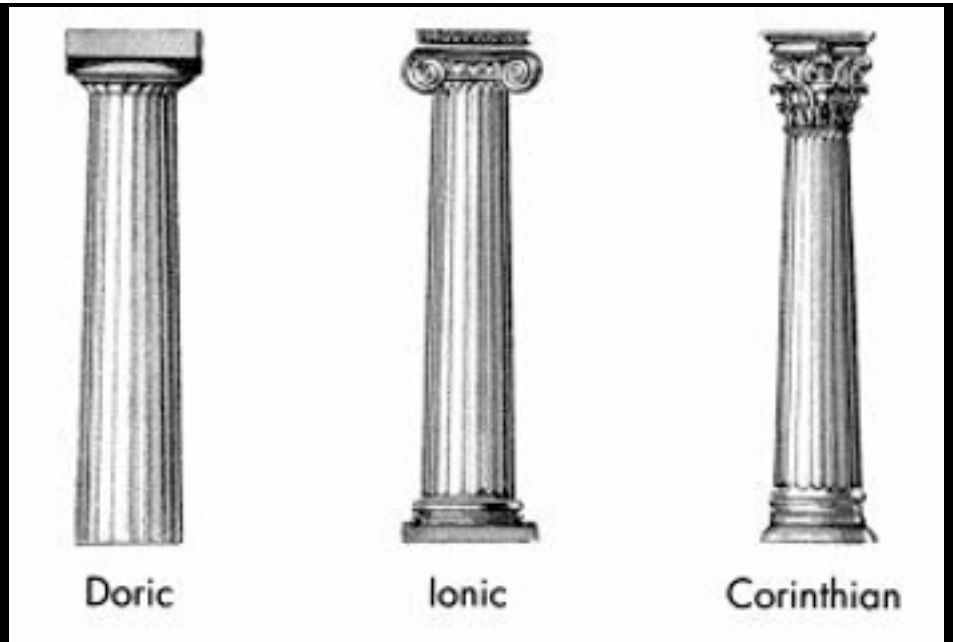
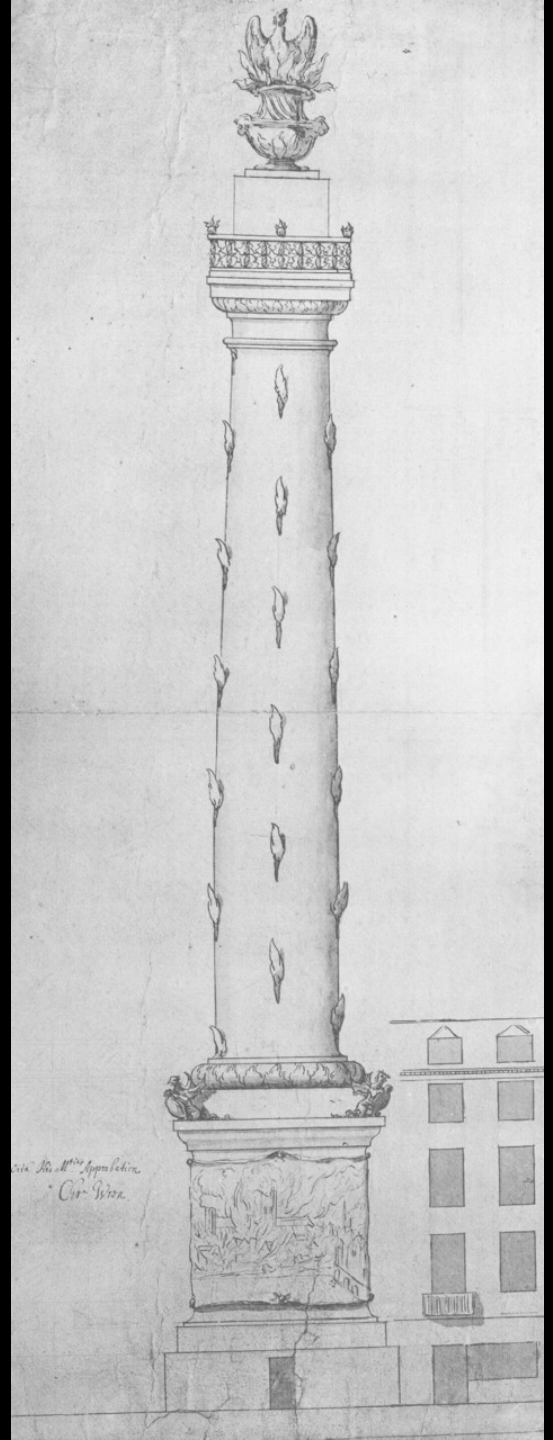
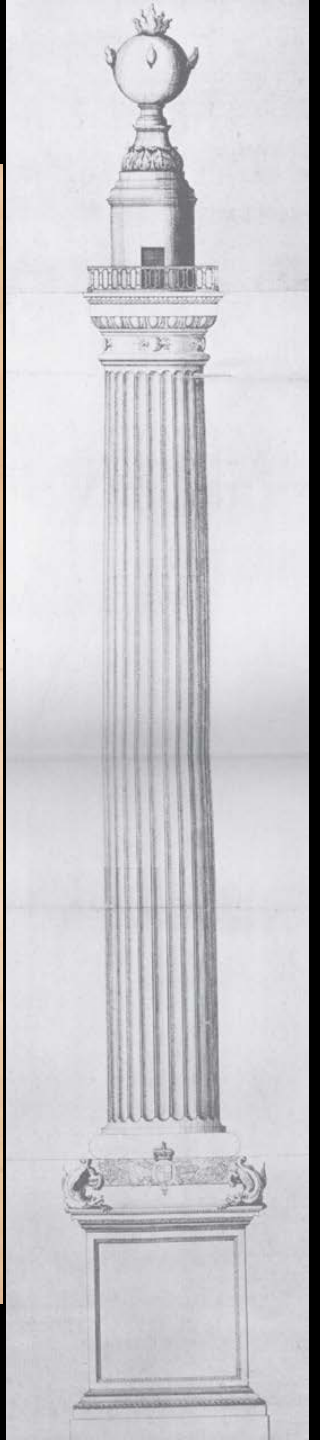
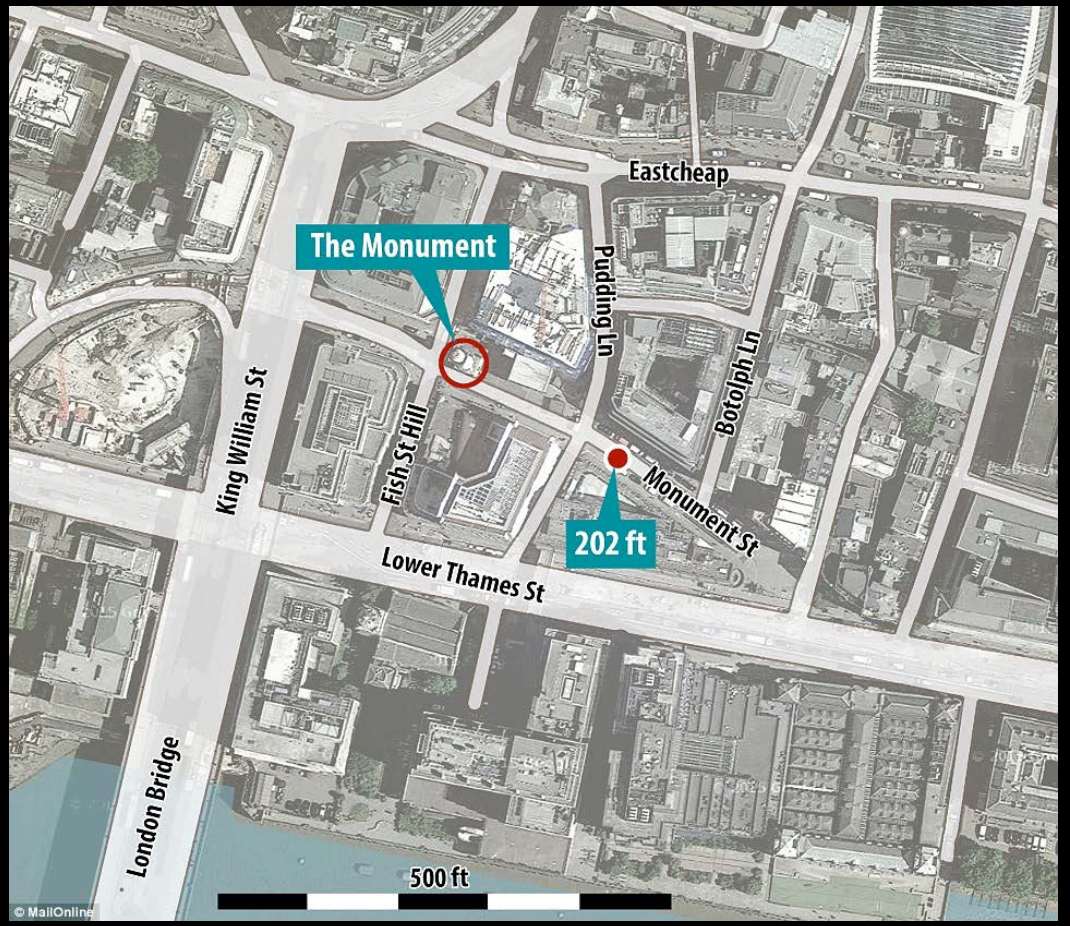


CORINTHIAN

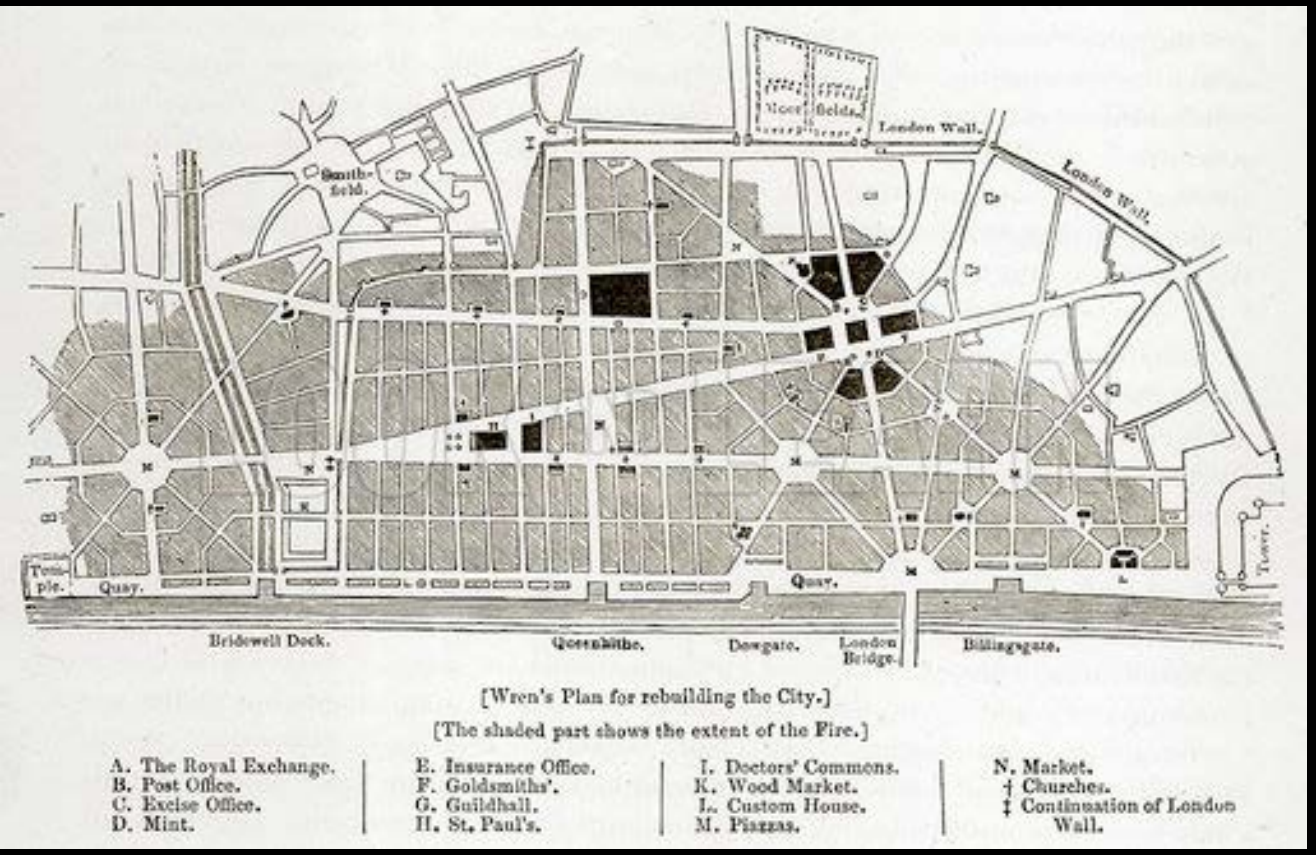







The Monument
Eastcheap
Pudding Ln
Botolph Ln
King William St
Fish St Hill
Monument St
202 ft
Lower Thames St
London Bridge
500 ft
© MailOnline

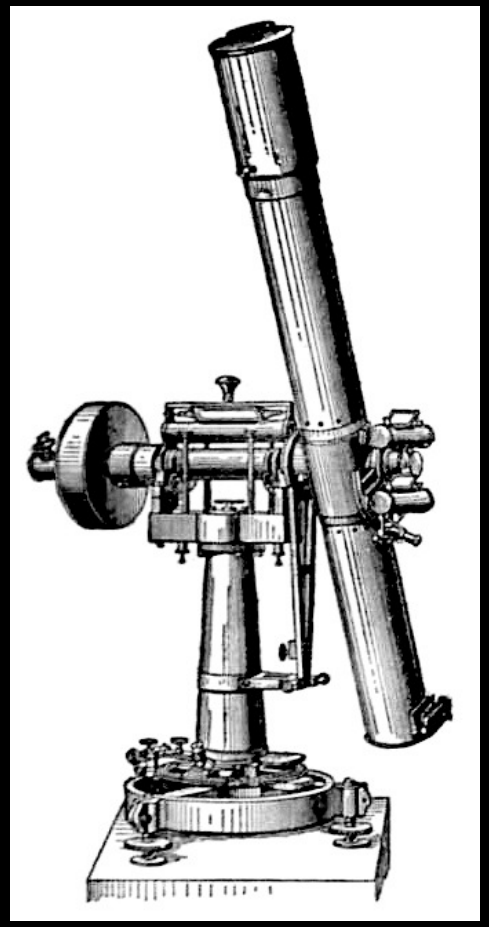
Its 202ft (61m) being the distance from its base to the bakery in Pudding Lane where the fire started…



[Wren's Plan for rebuilding the City.]

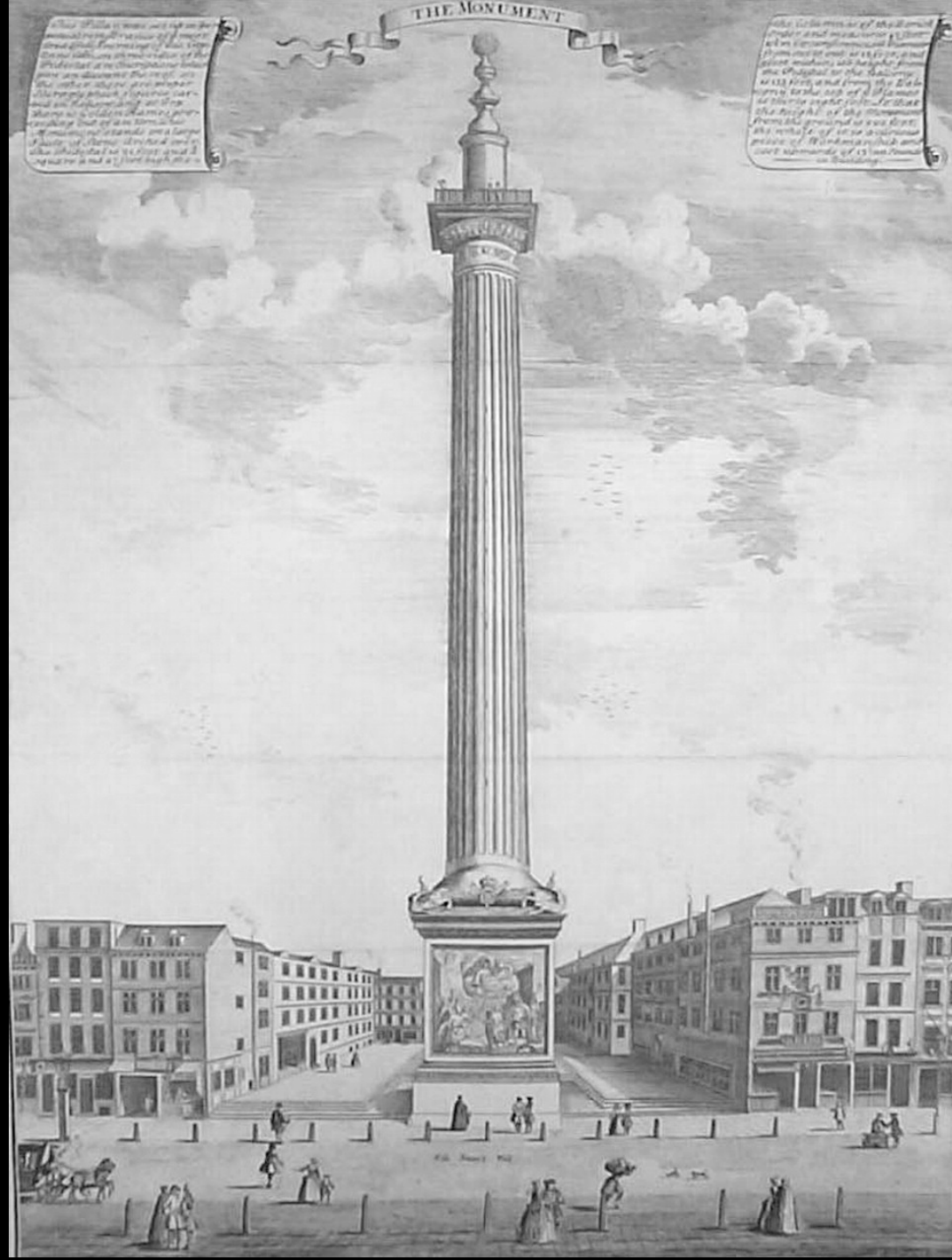
[The shaded part shows the extent of the Fire.]

A. The Royal Exchange.
B. Post Office.
C. Excise Office.
D. Mint.
E. Insurance Office.
F. Goldsmiths'.
G. Guildhall.
H. St. Paul's.
I. Doctors' Commons.
K. Wood Market.
L. Custom House.
M. Piazzas.
N. Market.
† Churches.
‡ Continuation of London Wall.



A **zenith telescope** is designed to point straight up at or near the zenith. They are used for precision measurement of star positions, to simplify telescope construction, or both.

Wren and Hooke built the monument to double-up as a scientific instrument. It has a central shaft meant for use as a zenith telescope and for use in gravity and pendulum experiments that connects to an underground laboratory for observers to work (accessible from the present-day ticket booth). Vibrations from heavy traffic on Fish Street Hill rendered the experimental conditions unsuitable.
A hinged lid in the urn covers the opening to the shaft. The steps in the shaft of the tower are all six inches high, allowing them to be used for barometric pressure studies.



THE MONUMENT

THIS MONUMENT. DESIGNED BY SIR CHRISTOPHER WREN. WAS BUILT TO COMMEMORATE THE GREAT FIRE OF LONDON 1666. WHICH BURNED FOR THREE DAYS CONSUMING MORE THAN 13,000 HOUSES AND DEVASTATING 436 ACRES OF THE CITY. THE MONUMENT IS 202FT IN HEIGHT. BEING EQUAL TO THE DISTANCE WESTWARD FROM THE BAKEHOUSE IN PUDDING LANE WHERE THE FIRE BROKE OUT. IT TOOK SIX YEARS TO CONSTRUCT 1671-1677. THE BALCONY IS REACHED BY A SPIRAL STAIRWAY OF 311 STEPS AND AFFORDS PANORAMIC VIEWS OF THE .METROPOLIS A SUPERSTRUCTURE RISES FROM THE BALCONY AND SUPPORTS A COPPER VASE OF FLAMES.
THE ALLEGORICAL SCULPTURE ON THE PEDESTAL ABOVE WAS EXECUTED BY CAIUS GABRIEL CIBBER.

TIMES OF OPENING AND CLOSING
9.30 A.M. TO 5.pm. DAILY.

CONCESSIONS £ 2-00
ADMISSION: ADULT £ 3-00 CHILD £1-00

ST. MAGNUS THE MARTYR

FISH STREET HILL. TO THE SOUTH. LEADS TO ST. MAGNUS THE MARTYR (A WREN CHURCH). ALONGSIDE WHICH. IS THE ANCIENT FOOTPATH WHICH LED TO THE FIRST LONDON BRIDGE.

Three sides of the base carry inscriptions in Latin. The one on the south side describes actions taken by King Charles II following the fire. The one on the east describes how the Monument was started and brought to perfection, and under which mayors. Inscriptions on the north side describe how the fire started, how much damage it caused, and how it was eventually extinguished. In 1681, the words "but Popish frenzy, which wrought such horrors, is not yet quenched" were added to the end of the inscription. Text on the east side originally falsely blamed Roman Catholics for the fire ("burning of this protestant city, begun and carried on by the treachery and malice of the popish faction"), which prompted Alexander Pope (himself a Catholic) to say of the area:

Where London's column, pointing at the skies,
Like a tall bully, lifts the head, and lies.
– Moral Essays, Epistle iii. line 339 (1733–1734).

SCAPEGOATING

Scapegoat: A person or group that is made to bear blame for others. According to the Old Testament, on the Day of Atonement, a priest would confess all the sins of the Israelites over the head of a goat and then drive it into the wilderness, symbolically bearing their sins away.

Wren's collaborator Robert Hooke (1635-1703) originally designed the interior as a giant telescope, with lenses at the top and bottom giving views from a small laboratory at the base. The flaming urn on top has a small trapdoor that opened to allow a view of the sky. (In fact, he – and not Wren – almost certainly designed the whole structure.) Hooke thus used the column as a zenith telescope.

A number of trap doors in the column were opened and the urn at the top was lifted (it was hinged). Lenses were then placed at various heights which permitted various astronomical observations to be carried out. Wren and Hooke were both surveyors of the city of London after the Great Fire and both member of the Royal Society and a noted experimenter. Besides Hooke's telescope, he used the Monument's 311 steps – all exactly six inches high – to measure the effects of different heights on atmospheric pressure. The experiments were soon discontinued because of the constant vibration of traffic.

The Monument ended up as what has to be London’s largest scientific instrument. Hooke and Wren designed its steps to hug the wall so there was a clear view all the way up the middle to the urn, which still conceals a pair of iron doors opening to the heavens.