Presentation to Pinner Philosophy Group

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Gottfried Wilhelm Leibniz

Gottfried Wilhelm Leibniz (1646 – 1716) Philosopher, Mathematician, Polymath

"Leibniz dedicated his life to uncovering the rational order and harmony of the universe. Through mathematics, philosophy, and science, he sought to unify knowledge and use reason to understand, guide, and improve the world.

In the Best of all Possible Worlds,

could this be the Worst of all Possible Budgets?

Leibniz's Worlds

The World he grew up in

The World of his activities in Science and Philosophy

The World of his imagination, grounded in God and universal harmony

Leibniz is often called the **quintessential polymath**, arguably greatest in his time

- **1. Mathematics**

Co-invented **calculus** independently of Newton, introducing the notation (dx, ∫) still used today.

Developed **binary numbers**, laying groundwork for modern computing.

Pioneered **combinatorics** and early **symbolic logic** ideas (predecessor to Boolean algebra).

- **2. Philosophy**

Developed **Monadology**, a metaphysical system explaining the universe in terms of simple substances (monads).

Advocated **pre-established harmony**: the universe is perfectly coordinated.

Worked on **optimism**: the world is the best possible world consistent with God's wisdom.

- **3. Physics & Engineering**

Designed **calculating machines** (mechanical calculators for arithmetic).

Contributed to **hydrodynamics**, the study of fluids in motion.

Engaged with optics, mechanics, and other experimental sciences of his day.

- **4. Law, Diplomacy, and Politics**

Worked as a **diplomat** for various German princes and courts.

Wrote on **jurisprudence** and natural law.

Negotiated treaties and acted as a scientific adviser to rulers.

- **5. Linguistics and Logic**

Proposed the **characteristica universalis**, a universal symbolic language for reasoning.

Early work on **formal logic** and the notion of a **calculus ratiocinator** (mechanical reasoning).

Note of Sources

Only a handful were published in his lifetime — most of his ideas appear in letters, drafts, and short pieces.

Major works published during lifetime

- ***Nova Methodus pro Maximis et Minimis*** (1684) – calculus
- ***De Arte Combinatoria*** (1666) - logical ideas
- ***Theodicy*** (1710) - God and "best of all possible worlds"

Major works published posthumously

Monadology (1714; published 1720s)

- Leibniz's view of structure of universe, harmonised by God

Discourse on Metaphysics (1686 manuscript; published 1846)

- Early view on substance and motion, and God's role within the Universe

Why Leibniz Is Difficult to Read: Disparate Sources

- **Published very little in a systematic way.**
  Most major metaphysical works were *not* published in his lifetime.

- **Writing is scattered across thousands of letters, drafts and memos**
  He was a diplomat, mathematician, librarian, and court advisor — so ideas appear in letters to princes, scientists, and theologians.

- **He constantly revised ideas**, sometimes holding multiple versions at once (e.g., different accounts of monads, substance, pre-established harmony).

- **There is no single "Leibniz system" in one book**, unlike Descartes' *Meditations* or Spinoza's *Ethics*.

- **Many texts survived only in manuscript form**, edited and published much later (18th–20th centuries), often from incomplete notes.

- **Scholars rely heavily on modern critical editions**, especially the ongoing *Akademie-Ausgabe* (series begun 1923).

- **Result**: reading and understanding Leibniz means piecing together a system from disparate and fragmentary writings.

Political and Religious Background

- **Born 1646 in Leipzig** — shortly before the end of the **Thirty Years' War** (1618–1648).
  - Europe devastated; German states politically fragmented.
  - Religious tension between **Catholics and Protestants** still strong.
- **Holy Roman Empire** — a loose federation of small principalities.
  - Local rulers held power; diplomacy and alliance were crucial.
  - Leibniz worked as diplomat and advisor to several courts (Mainz, Hanover).
- **Religious climate:**
  - Ongoing divisions between Lutheran, Calvinist, and Catholic traditions.
  - Leibniz personally aimed to **reconcile** Christian sects through rational dialogue.
  - Saw **reason and faith** as compatible, not opposed.
- **Intellectual climate:**
  - Transitional era between **Renaissance humanism** and the **Scientific Revolution**.
  - Descartes, Spinoza, and Newton were his contemporaries.
  - Philosophy, mathematics, and theology still deeply intertwined.
- **Personal aim:**
  - To find **harmony in diversity** — in politics, religion, and the cosmos.
  - This search for order and unity shaped his whole metaphysics.

Political and Background in Leibniz's Early Years (1646–1660)

- **Post–Thirty Years' War Germany** (ended 1648 with Peace of Westphalia)

- **Holy Roman Empire fragmented** into 300+ autonomous principalities

- **Weak imperial authority**; power held by local dukes, electors, bishops

- **Rise of diplomacy**: states rely on negotiation rather than war

- **Territorial shifts**: France and Sweden gain influence in German affairs

- **Economic and social recovery** from devastation of the war

Religious Background in Leibniz's Early Years (1646–1660)

- **Westphalian settlement** 1684, confirms legal status of Lutheranism, Calvinism, Catholicism

- **Cuius regio, eius religio** upheld: ruler chooses religion of territory

- **Increased toleration**: private worship rights for minority confessions

- **Ongoing Lutheran–Calvinist tension** within Protestantism

- **Catholic–Protestant divide stabilised**, but theological disputes remain

- Intellectual climate open to **ecumenical ideas** and attempts at reconciliation

The Scientific Landscape (c. 1650–1700)

- **Philosophical Shift:** The adoption of the **Mechanistic Worldview**, which treated the universe as a vast, predictable machine governed by **mathematical laws** of matter and motion, replacing older Aristotelian ideas – the **Enlightenment**.

- **Methodology:** Science became defined by a combined approach: **Empiricism** (systematic observation and experimentation, as championed by Bacon) and the application of rigorous **mathematics** (as demonstrated by Galileo and Newton).

- **Key Institutions:** The establishment of formal scientific bodies, such as the **Royal Society of London** and the **French *Académie des Sciences***, institutionalised the practice of research, debate, and dissemination.

Major Breakthroughs

- **Physics & Astronomy: Isaac Newton's** 1687 publication of *Principia Mathematica* formalized the **Laws of Motion** and the theory of **Universal Gravitation**, providing a single, unified framework for all physical phenomena.

- **Mathematics:** The independent development of **Calculus** provided powerful new tools for analysing change, motion, and continuous functions.

- **Instrumentation:** Refinements of the **telescope** and the **microscope** (Robert Hooke and Antonie van Leeuwenhoek) opened up completely new fields of inquiry into the cosmos and the microscopic world.
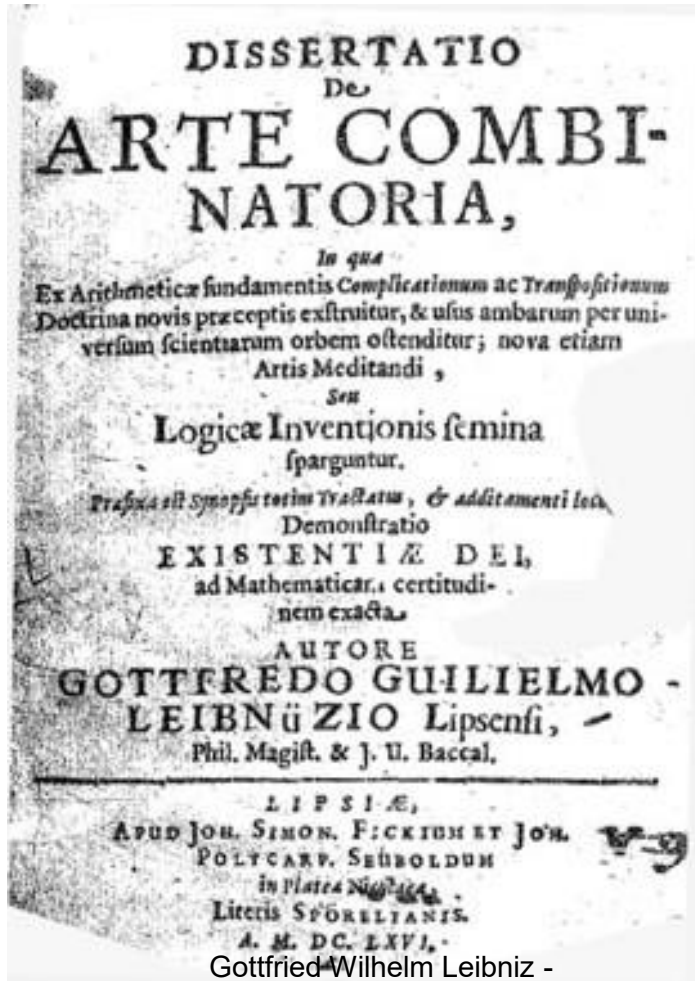
Leibniz's Life in a nutshell

- Born July 1st 1646 in Leipzig
- Father: Professor of Moral Philosophy at Leipzig University, died when GL was 6
- Brought up by his mother, who died when Leibniz was 17.

> Two things marvelously benefited me in this (things otherwise problematic, however, and often harmful to many): first, that I was nearly self-taught and, second, that I sought out what was new in each and every branch of knowledge, as soon as I came into contact with it, even though I often had not yet sufficiently grasped things commonly known. But these two things gave me this advantage; the first prevented me from filling my mind with trifles, things that ought to be forgotten, things that are accepted on the authority of teachers rather than because of arguments, and the second prevented me from resting before I probed all the way to the depths of each subject and arrived at its very principles, from which everything I extracted could be discovered by my own efforts. (AG 6)

1661-1666: Leibniz studies law at the University of Leipzig

Bachelor & Masters degrees in Philosophy and Bachelors degree in Law

Writes *Dissertation on Combinatorial Arts* in which Leibniz aims to develop a universal language of logic and mathematics based on a system of symbols – a calculus of reasoning, no less.

- **1673**: visits London, and attends meetings at the Royal Society, founded just 13 years before.
- **1675**: Leibniz develops his calculus independently of Isaac Newton – develops into a dispute between Leibniz and Newton over the priority of the invention of calculus.
- **1672-1676**: Leibniz travels to Paris to present his Egypt plan, but there, he did not pursue it.
- Studies Mathematics with Christian Huygens, and meets with Spinoza.
- **1676**: Leibniz accepted a position as court councillor and librarian to Duke Johann Friedrich at Hanover – spends rest of his life, (another 40 years) here.
- He also unofficially gave technical advice on the draining of silver mines in the Hartz mountains.
- Pursues grand plans to reconcile different religious groups.
- 1679: Duke dies. His successors, Ernst August and his son Georg Ludwig (to become George I of England), were not interested in Leibniz's religious ambitions, but instead were interested in furthering the family's (Guelf) standing and to promote the Hanover from a junior duchy to a major player in the Holy Roman Empire.

- Undertakes a major genealogical research project for the Guelf family, to establish the Guelf family claims to the higher echelons of aristocratic society such that they could claim to be included in the rarified electors (nine of them) who elected the Holy Roman Emperor himself.

- **1686**: Writes *Discourse on Metaphysics,* explores key concepts such as monads, the Principle of Sufficient Reason, the harmony of pre-established order, and the idea of the best of all possible worlds.

- **1686**: Leibniz published his work on the calculus

- **1700**: played a significant role in the founding of the Berlin Academy. Leibniz was instrumental in drafting the statutes and regulations for the institution, and served as its first president until his death in 1716.

- **~1700 onwards**: 'priority dispute' bubbles up, over who, Leibniz or Newton, was the first to 'discover' the branch of mathematics known as the calculus.

- **1710**: writes*Theodicy: Essays on the Goodness of God, the Freedom of Man, and the Origin of Evil:*

- Problem of evil and attempts to reconcile the existence of evil with the belief in a benevolent and omnipotent God. The term "theodicy" itself refers to the justification of God's goodness and omnipotence despite the existence of evil in the world.

- **1715**: Leibniz engages in correspondence with Samuel Clarke, an English Anglican priest and philosopher, known for his defence of Newtonian science and natural theology.

- The *Leibniz-Clarke Correspondence* records their debate on the nature of space, time, and the existence of God.

- **1716**: Leibniz dies on November 14 in Hanover, at the age of 70. His death was attributed to gout, a chronic inflammatory condition that had plagued him for many years.

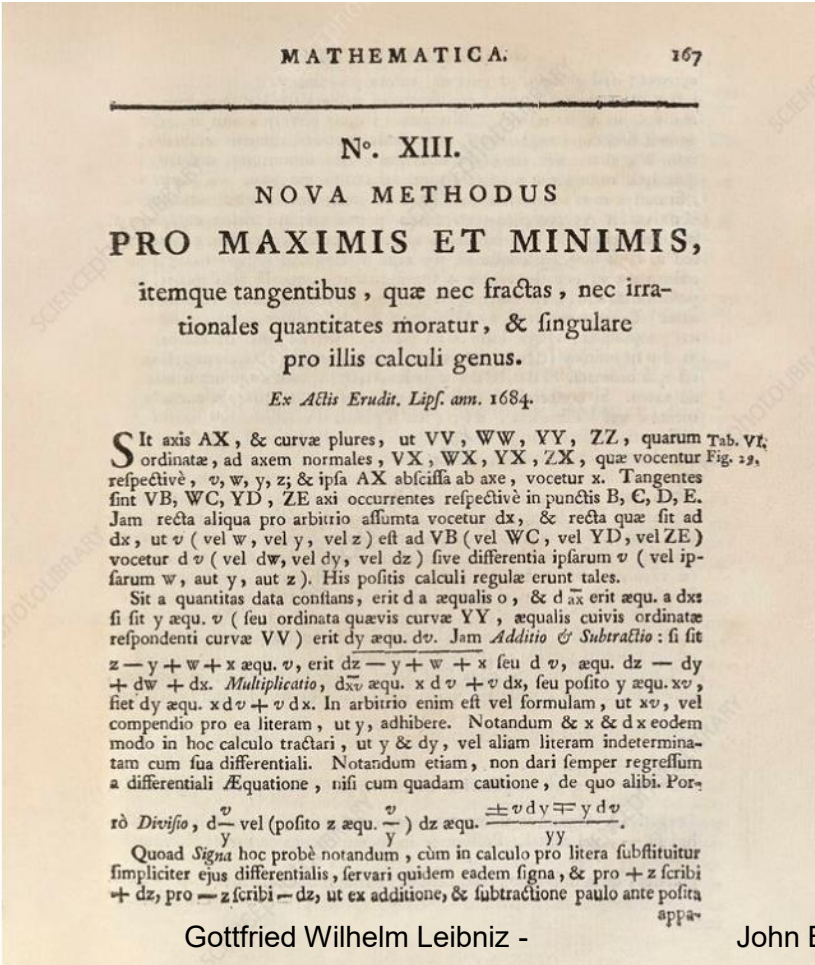20 mark coin 1966, 250th anniversary of death

Neustädter Hof- und Stadtkirche St. Johannis,Hanover

Leibniz's Contributions Beyond Philosophy

Mathematics

Invention of the calculus, in a paper *Nova Methodus pro Maximis et Minimis* ("A New Method for Maxima and Minima") in 1684.
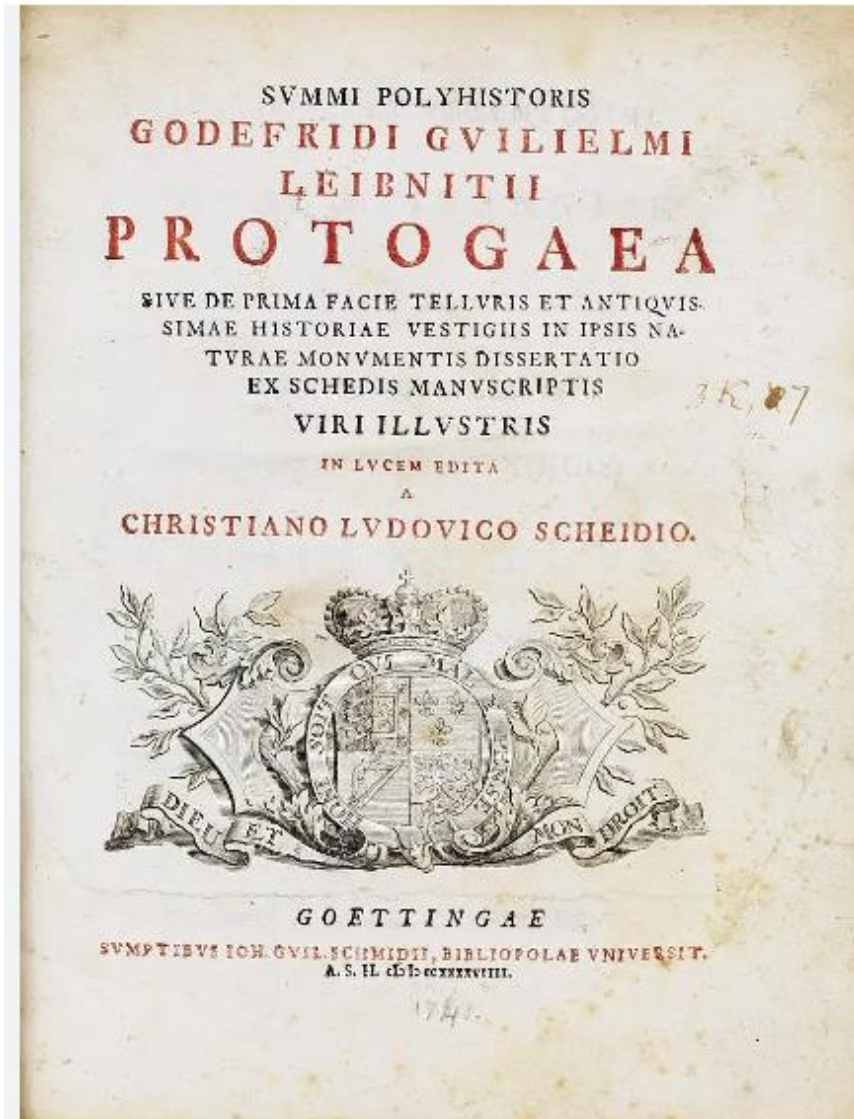

Gottfried Wilhelm Leibniz -   John Belling   November 26th 2025   17

Newton-Leibniz Calculus priority dispute

- Newton published his work on the calculus in 1687, whilst Leibniz published in 1684, 3 years before Newton.

- However, both had demonstrably been working on the topic for many years – Newton for example had written a paper in 1666, circulated to some colleagues, but not actually published. Nonetheless, publication dates are usually paramount in deciding priority of discovery, so on this basis, Leibniz should be declared the discoverer.

- British mathematicians sprang to the defence of Newton – John Wallis intimated that Leibniz had learned the calculus from Newton, a claim now known to be false.

- The Royal Society, 1n 1712, wrote a report to purporting to settle the matter in favour of Newton, accusing Leibniz (who was a member of the Royal Society) of concealing his knowledge of Newton's work. This was not surprising as the President of the Royal Society at the time was no other than Newton himself!

- In turn Leibniz accused Newton of stealing his own work, and in making errors into the bargain.

- The dispute went on well after Leibniz's death in 1716, full of accusations and counteraccusations.

- **Current consensus:** Both mathematicians are recognised as independent inventors of calculus, each with their own valuable contributions. The focus has shifted from "who invented it first?" to appreciating the unique strengths of each approach.

Geology:

Protogaea: Leibniz proposed the Protogaea theory, one of the first comprehensive theories of Earth's history.

He suggested that the Earth formed from a molten mass and gradually cooled and solidified over time, shaping the continents and oceans.

While some aspects of *Protogaea* were later proven inaccurate, it laid the groundwork for modern geology

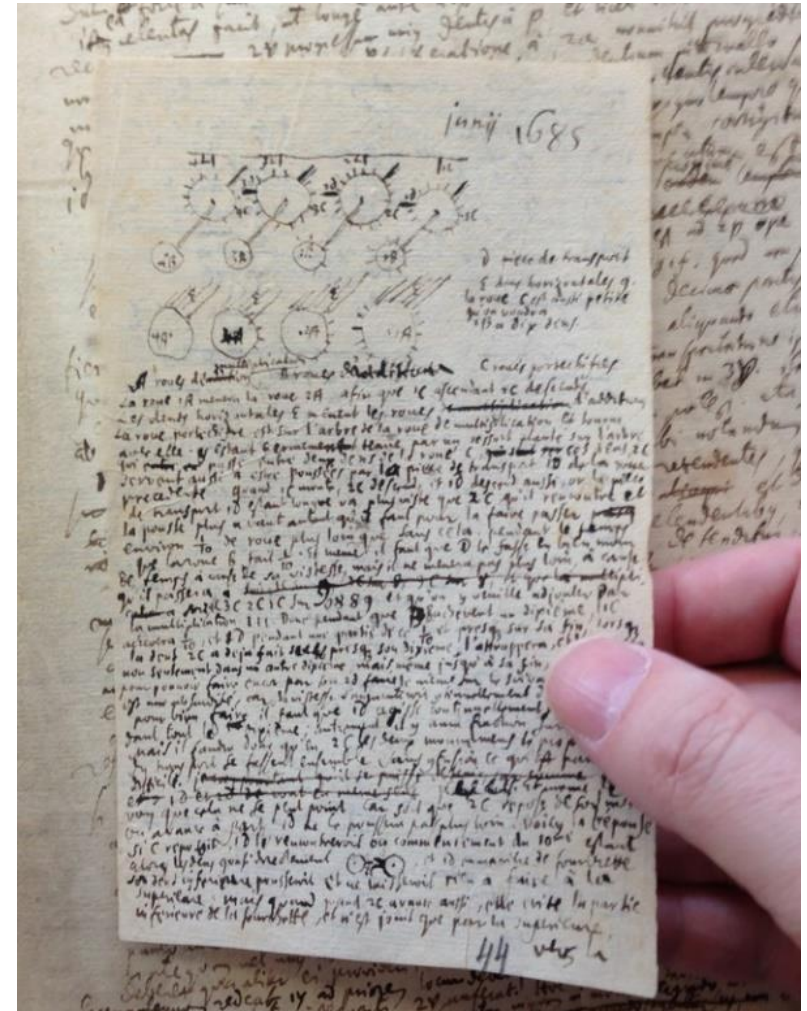Written around 1691, it remained unpublished in his lifetime.

- <u>Palaeontology</u>: He was an early proponent of palaeontology, recognizing the significance of fossils as evidence of past life forms and Earth's geological history.

- <u>Windmills</u>: He contributed to the design and development of windmills, increasing their efficiency and paving the way for their wider adoption as a renewable energy source.

- <u>Hydraulics</u>: Leibniz made significant contributions to the field of hydraulics, studying fluid flow and designing pumps and water-lifting devices.

- <u>Mechanics</u>: Leibniz laid the foundation for analytical mechanics with his principle of least action, stating that the path taken by a moving object minimizes a certain quantity called "action." This principle has proven invaluable in understanding classical and quantum mechanics.

- <u>Dynamics:</u> He contributed to the development of dynamics, particularly through his concept of *vis viva*, which is the precursor to the modern concept of kinetic energy.

- <u>Optics:</u> Leibniz made significant contributions to the field of optics, including developing a new lens design for telescopes and proposing wave theory of light, which challenged the prevailing particle theory at the time.
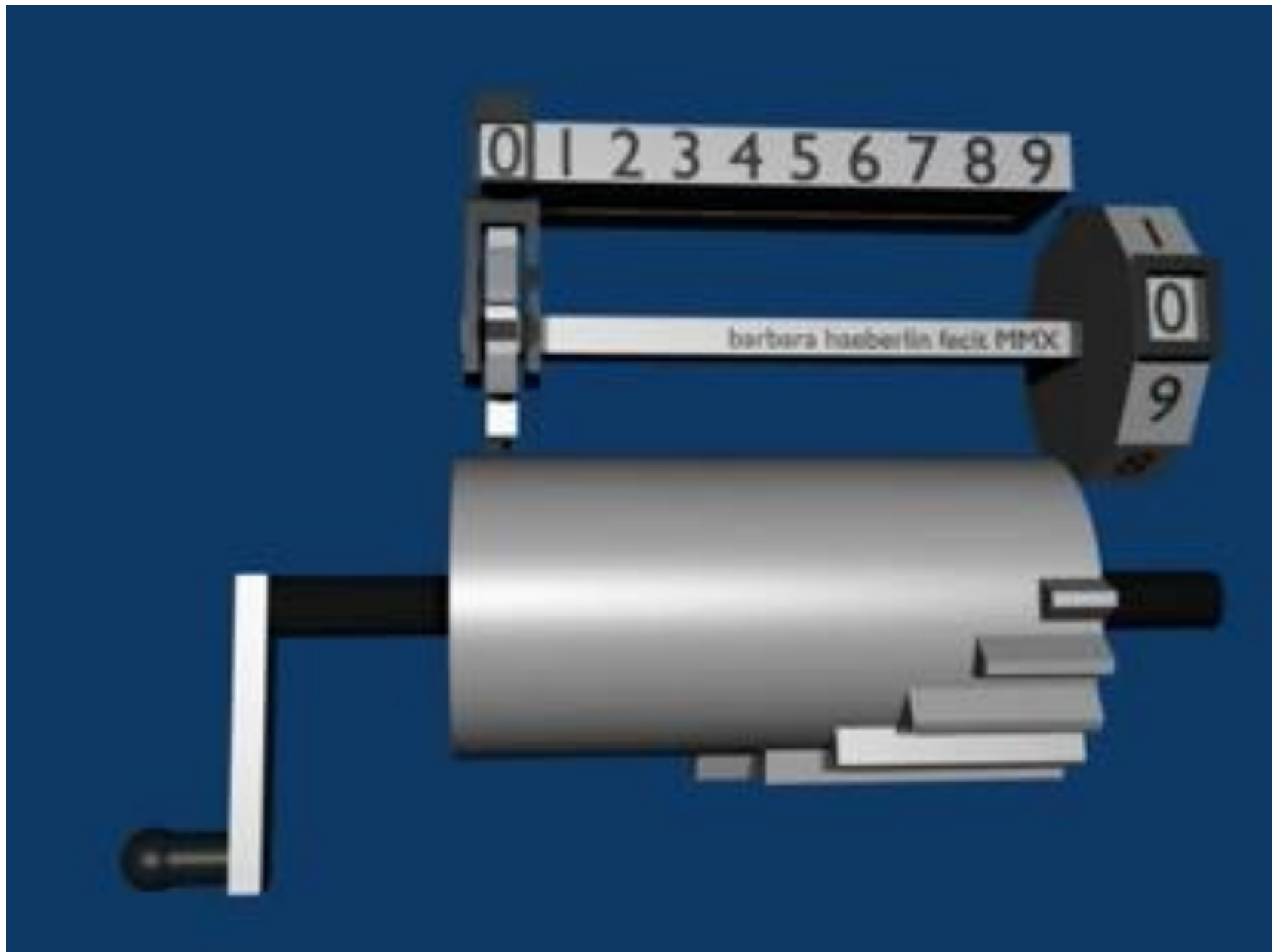
Calculators: Leibniz is credited with inventing the stepped reckoner, a mechanical calculator that could perform addition, subtraction, multiplication, and division.

This invention marked a significant advancement in computational technology.

1673: wooden model demonstrated to Royal Society

1694: completed brass model

Calculators down the ages,
including the Leibniz inspired Brunsviga (top left)

The Encyclopaedia

Johan Heinrich Alsted (1588 – 1638): 7 volume encyclopaedia – entire universe of knowledge

Leibniz grand idea – extend Alsted's work – 'demonstrative' encyclopedia – identify principles and methods by which the Arts and Sciences had developed in the past - guide the future cross-disciplinary, development of the Arts and Sciences.

Belief in the unity and systematicity of all knowledge - fundamental truths were shared by all disciplines - advances in one field would guide advances in other disciplines.

What a breathtaking, overarching, conception!!

"It does not make much difference how you divide the sciences, for they are a continuous body, like the ocean".

In my view, wisdom is nothing other than the science of happiness, and true learning, considered as a preparation for wisdom, is the habit of a soul most plentifully supplied with the knowledge of how to live well and happily. ... From this it follows that it is in the interest of the happiness of humankind that there be brought together a certain *encyclopaedia* or orderly collection of truths, sufficient (as far as possible) for the deduction of all useful things. And this will be like a public treasury to which could be added all remarkable [subsequent] discoveries and observations. But since [this encyclopaedia] will be of the most massive bulk, especially regarding matters of civil and natural history, in the meantime a certain *Scientia Generalis* is needed containing the first principles of reason and experience. (A VI, 4, 137–8)

1700: persuaded Friedrich III of Brandenburg to establish a Society of Sciences in Berlin, with Leibniz as first president.

1710: the Society published its first 'Miscellanea' – 60 papers, on literary matters, physical sciences, medical advances, mathematics and engineering.

Leibniz himself contributed one fifth of the papers himself, topics including fossils, aurora borealis, his work on calculus, an essay of the origin of peoples with respect to a study of languages, and his work on calculating machines.

Challenges: financial support, printing not equipped to handle the large amounts of information, Leibniz's other endeavours limited his time on the project.

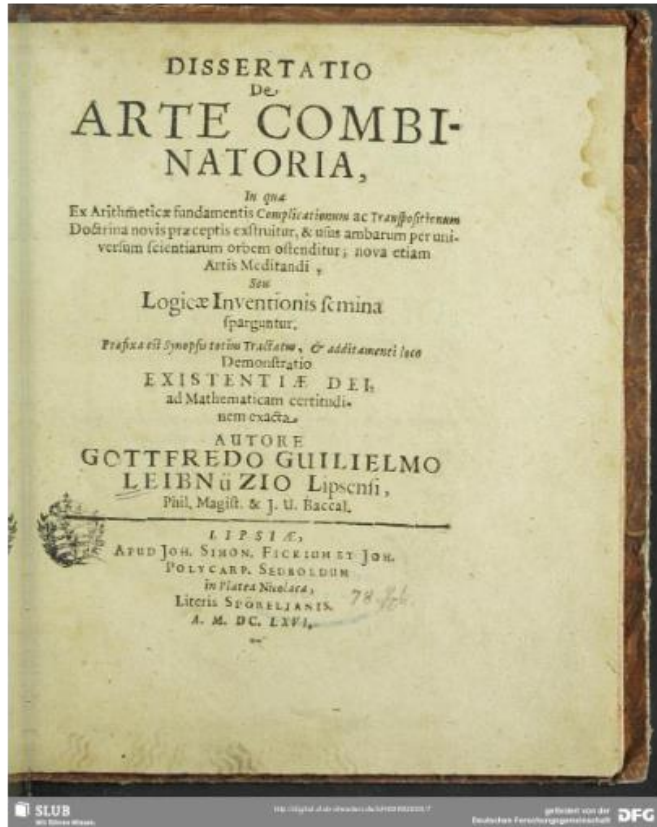Later influences: inspired subsequent encyclopaedists, notably Denis Diderot and Jean le Rond d'Alembert - the groundbraking 18th C. ***Encyclopédie.***

Significant contribution to the Enlightenment.

While Leibniz's dream of a universal encyclopaedia remained ultimately unfulfilled, His ideas remain relevant and inspiring in an era increasingly reliant on efficient and accessible information management.

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Characteristica Universalis : universal set of signs

- Concept first developed in his *De Arte Combinatoria* 1666.
- Formal, symbolic, language capable of expressing all concepts and propositions in a clear, unambiguous, and logically consistent manner.
- Revolutionise human thought, resolve disputes through logical calculation rather than altercation.

"If controversies were to arise, there would be no more need of disputation between two philosophers than between two accountants. It would suffice to take their pencils, sit down to their slates, and say to each other: Let us calculate."

Quelle: Deutsche Fotothek

- **Example: A legal dispute about inheritance**
- Two rules exist in a legal code:
- **Rule A:** "If a person dies without children, their estate goes to their siblings."
- **Rule B:** "If a person dies leaving a spouse, the spouse inherits the estate."
- Now imagine someone dies, leaving **no children, but a spouse and siblings**. Who inherits?

- Leibniz might have written something like:
  - Rule A: *If no-children + siblings* → *heirs = siblings*
  - Rule B: *If spouse* → *heirs = spouse*
- Case: *no-children + siblings + spouse*
- From substitution: heirs = siblings ∧ heirs = spouse
- **Contradiction!**

Representation of concepts using prime numbers

Let: animal = 2; conscious = 3; rational = 5; mortal = 7; instinctive = 11; roots = 13

"Let us calculate!" ("Calculemus!")

- Represent complex concepts:

Man = 2 × 3 × 5 × 7 = 210 → Animal, Conscious, Rational, Mortal

Dog = 2 × 3 × 7 × 11 = 462 → Animal, Conscious, Mortal, Instinctive

Plant = 13 × 7 = 91 → Roots, Mortal

- Analysis:

The **gcd** of Man and Dog is 42 → shared features: Animal × Conscious × Mortal

Man and Plant: gcd(210, 91) = 7 → shared feature: Mortal

Dog and Plant: gcd(462, 91) = 7 → shared feature: Mortal

210 ÷ 462 is not an integer → *Man* is **not** a kind of *Dog*.

462 ÷ 210 is not an integer → *Dog* is **not** a kind of *Man*.

210 ÷5 = 420 (integer) → Man is rational

462 ÷ 5 is not an integer → Dog is not rational

• Unsurprisingly, Leibniz did not get very far with this project, but he did anticipate the structure if not the machinery of modern logic, as espoused by Boole, Frege and others.

• Laid foundations for computer Science.

• Leibniz anticipated computer languages by his development of binary numbers (see left)

CORE TRIAD of Philosophical Principles

1. The Principle of Identity/
   Non Contradiction

1. The Principle of Sufficient Reason

2. The Principle of Continuity

Principle of Identity/Non Contradiction

Founded on ideas from Aristotle

Identity: A is A :

"Every thing is identical with itself." or symbolically: $A = A$.

Non-Contradiction: A cannot be not-A

"It is impossible for the same attribute to both belong and not belong to the same subject at the same time and in the same respect."
or symbolically: $\neg(A \wedge \neg A)$.

If P is "it is raining at the Methodist Church at 1pm today" and

Not-P is "it is NOT raining at the Methodist Church at 1pm today".

"Clearly", P and not-P cannot both be true – it is either raining or it is not raining. This could be argued against – HOW??

"Primary truths are those which assert the same thing of itself (identical propositions), such as 'A is A,' or which deny the opposite, such as 'A is not not-A.' These are the principles of identity and of contradiction, which once understood are taken for granted. And all other truths are reduced to them by using definitions; that is, they are proved by analysis, when a truth is shown to be identical by resolving it into simpler ideas and truths until it reaches those that are primary."

Necessary Truth or Truth of Reason

Cannot be otherwise, opposite involves contradiction.

E.g. "A triangle has three sides"   -   "2 + 3 = 5"

True in all possible worlds — no matter what reality looks like, these truths hold.

The first principle, Identity: A is A, seems trivial, even tautological.

For Leibniz, underpins his notion of a grand logical structure.

Reduction to Identity

E.g. 2 + 3 = 5

(1 + 1) + (1 + 1 + 1) = (1 + 1 + 1 + 1 + 1)

(1 + 1 + 1 + 1 + 1) = (1 + 1 + 1 + 1 + 1)

Leibniz holds that any necessary truth can be reduced in a finite number of steps to an identity of the form A=A. Not so trivial!

Note that the opposite is a contradiction:

If 2 + 3 ≠ 5, then the whole edifice of arithmetic collapses in a heap!

Contingent Truth or Truth of Fact:

These are truths that **could have been otherwise**

Their **opposites do not involve contradiction**, even if they happen not to be the case.

E.g.: "I am talking about Leibniz" - "The sun rose this morning"

A contingent truth cannot be reduced to an identity A=A in a finite number of steps.

Leibniz gives the example of the statement "Caesar crossed the Rubicon".

He introduces the idea of a **complete concept**, where the predicate is contained within the subject. That is, the complete history of Caesar is contained within the subject.

Proposition: Caesar crossed the Rubicon.

For Leibniz, every truth can be expressed as: Subject contains Predicate

Step 1 — Subject–predicate structure
  The complete concept of Caesar includes the property "crossed the Rubicon at
   time T."

This already shifts us away from the surface grammatical form to **conceptual containment**.

Step 2 — Situating the predicate

To unpack "crossed the Rubicon," we identify **factual conditions** that are conceptually part of this predicate:

- There was a river called the Rubicon.

- Caesar was physically present there.

- He moved from one bank to the other.

- This happened in 49 BCE.

So: Crossed the Rubicon $\equiv River\ exists + Caesar\ present + movement\ event + $ time T.
Each of these conditions itself contains more content.

- **Step 3 — Causal and personal factors**
- Why was Caesar there?
- He was commanding legions in northern Italy.
- He made a political decision to invade.
- He defied the Senate's order to disband his army.
- His troops were loyal to him.

Each layer reveals **further content** contained in the concept of Caesar as a particular individual: Leibniz's view is radical here:

To fully analyse "Caesar crossed the Rubicon" is to **unpack the entire history of the universe** in which that event is inscribed.

That is why: *Infinite analysis is required*.

Only **God's intellect**, which grasps the complete concept of Caesar in one act, can "jump to the end" — the identity:
$$Caesar = \text{the Caesar} - who - crossed - the - \text{Rubicon.}$$

For us, that identity is approached asymptotically.

A proof of the existence of God (!)

Only things which do not imply contradiction (i.e. are possible) can be thought of or conceived.

I can think the words "square circle", but cannot conceive of a figure that is both square and circular at the same time. Leibniz says that this is not just because we have a limited intellect – <u>even God could not do this</u>.

For Leibniz, possible things which exist only in the mind (e.g. a second large moon in orbit around the Earth) do have a mental reality. Such a thing requires the mind to think of it, hence it has existence.

I can think of <u>necessary truths</u>, e.g. the only even prime number (2).
This is true even if I don't think about it. It is true if no one thinks about it.

Yet as we have seen, this fact requires a mind in order to ground its existence.

Therefore, there has to be a **superior mind** that is always thinking that the only even prime is 2, and other necessary truths

This mind must be the mind of GOD ! QED.

It is also true that in God is the source not only of existences but also of essences, insofar as they are real, or of what there is of real in possibility. This is because the Understanding of God is the realm of eternal truths, or of the ideas on which they depend, and because without him there would be nothing real in the possibilities—not only nothing existent, but also nothing possible. For if there is some reality in essences or possibilities, or indeed in eternal truths, this reality must be founded on something existent and actual; and consequently on the existence of the Necessary Being in whom essence includes existence, or in whom it is sufficient to be possible in order to be actual. (GP VI, 614)

God's infinite intellect embraces the ideas of all possible things, and God organises these into worlds in which they are possible <u>together.</u> E.g. it is possible that England did win the World Cup in 1966, and it is possible that England did not win the World Cup in 1966. There is not a contradiction in either of the statements taken by themselves, but there is a contradiction taken together – we say they are not <u>compossible</u> in any given world. Therefore, God could create a world where England did win, or one where England did not win.
God is able to create a multiplicity of worlds where the constituents are all compossible.

Identity of Indiscernibles (Leibniz's Law)

Leibniz first principle: A=A; but what makes objects the same or different?

The <u>Identity of Indiscernibles</u> asserts that if two things are truly distinct, there must be some way to differentiate between them; otherwise, they would be the same thing. Formally, it can be expressed as:

$$\forall x \forall y \ (x \neq y \quad \leftrightarrow \quad \exists P \ (P(x) \neq P(y)))$$ or equivalently as:

$$\forall x \forall y \ (x=y \quad \leftrightarrow \quad \forall P \ (P(x) = P(y)))$$

where:

- $\forall$ (universal quantifier) means "for all",

- $\exists$ (existential quantifier) means "there exists a",

- $\rightarrow$ means "implies".

- $P(x)$ is a property of object x,y.

In simpler terms, this principle states that no two distinct entities (x,y) can be exactly alike in every respect. There must be at least one property (P) that differs between them.

E.g. if two footballs are distinct, there must be at least one property that differs between them – perhaps colour, weight.

The logic relations above are (to me) satisfyingly beautiful, but I think Leibniz would have been pleased to see what his work on universal languages might lead to – a formal symbolic language to express truth propositions.

- first order logic – Gottlob Frege (1879)

- Early computer languages with strong logic functionality – Prolog, Lisp

- Modern computer languages - Python

And how about another form of universal language – emojis …

These emojis might express how you feel about my talk?!

😄 🤣 🥰 🤭 🤔 😒 🙄 😴 🤧 😵‍💫 😵‍💫 💫 🙁 😮 😦 😫 😠

 Would Leibniz approve?

Principle of Sufficient Reason (SR)

"No fact could be found to be true and existing, and no proposition to be true, unless there is a sufficient reason".

No unexplainable facts – our inability to explain something doesn't mean that an explanation doesn't exist.

All facts are a result of an infinite chain of reasons – no wonder we can't understand!

You might think that this chain of reasoning is tantamount to a causal chain, asserting that nothing happens without a cause. This would be the view of Spinoza, but Leibniz has other ideas, as we shall see when we come to discuss **monads**.

The universe, with its intricate laws and vast complexity, cannot exist by mere chance. There must be a sufficient reason for its existence.

God is the reason: according to Leibniz, God, as the ultimate and necessary being, provides the explanation for the universe's existence. His infinite power, wisdom, and goodness necessitate the creation of a world.

Even our individual choices and moral actions must have underlying reasons, even if they appear spontaneous or influenced by external factors.

The Principle of Sufficient Reason is employed in the chain of reasoning stemming from a contingent truth.

As an example, reconsider the chain of reasoning stemming from the statement "Caesar crossed the Rubicon".

Discussion

- Identity: If two objects have the same properties, they are the same object

    Any counter-examples – e.g. electrons ?

- Sufficient reason – Newtonian world, laws of physics provide SR

    What about the quantum world probabilistic outcomes subvert SR

- God created one world out of an infinite number of possibilities, the best of all possible worlds.

    What about the Many World theory ("think of the *Sliding Doors* film)

    Or the Multiverse

Five Visions of Reality

Philosopher	Basic Reality	God's Role	Mind–Matter Relation
Descartes	Two substances	Guarantees knowledge	Dualism
Spinoza	One substance (God/Nature)	Immanent cause	Monism
Leibniz	Infinite monads	Creates harmony	No causal interaction
Locke	Mind + matter	Creator, indirect link	Representational dualism
Berkeley	Minds & ideas	Continuous perceiver	Idealism

Principle of Continuity

Leibniz introduced idea of infinitesimals - < finite amount,   but > 0

- **All change is continuous**, made up of these infinitely small steps: "In nature, there are no leaps, but only continuous transitions."

- If a body changes speed from V1 to V2, it must pass through every speed between them: cannot instant "jump" from one speed to another - rejection of mechanical philosophy of Descartes.

- Rejects atomism – collision between 2 rigid atoms implies a sudden infinite change in force upon impact, violating continuity principle.

- Perceptions change continuously, never in sudden jumps

- Consciousness is a **continuum** of perceptions, many of which are so small (*petites perceptions*) we are unaware of them - bridge gap between unconscious states (sleep) and fully conscious states. The mind never makes a sudden leap from nothingness to full thought.

- Physical & Divine order: Continuity is a metaphysical requirement for an orderly and rational world created by God.

Substance

We move from the logical structure of the principle of Identity (based on abstract properties) to ask - what are the objects themselves that exist and have these properties?
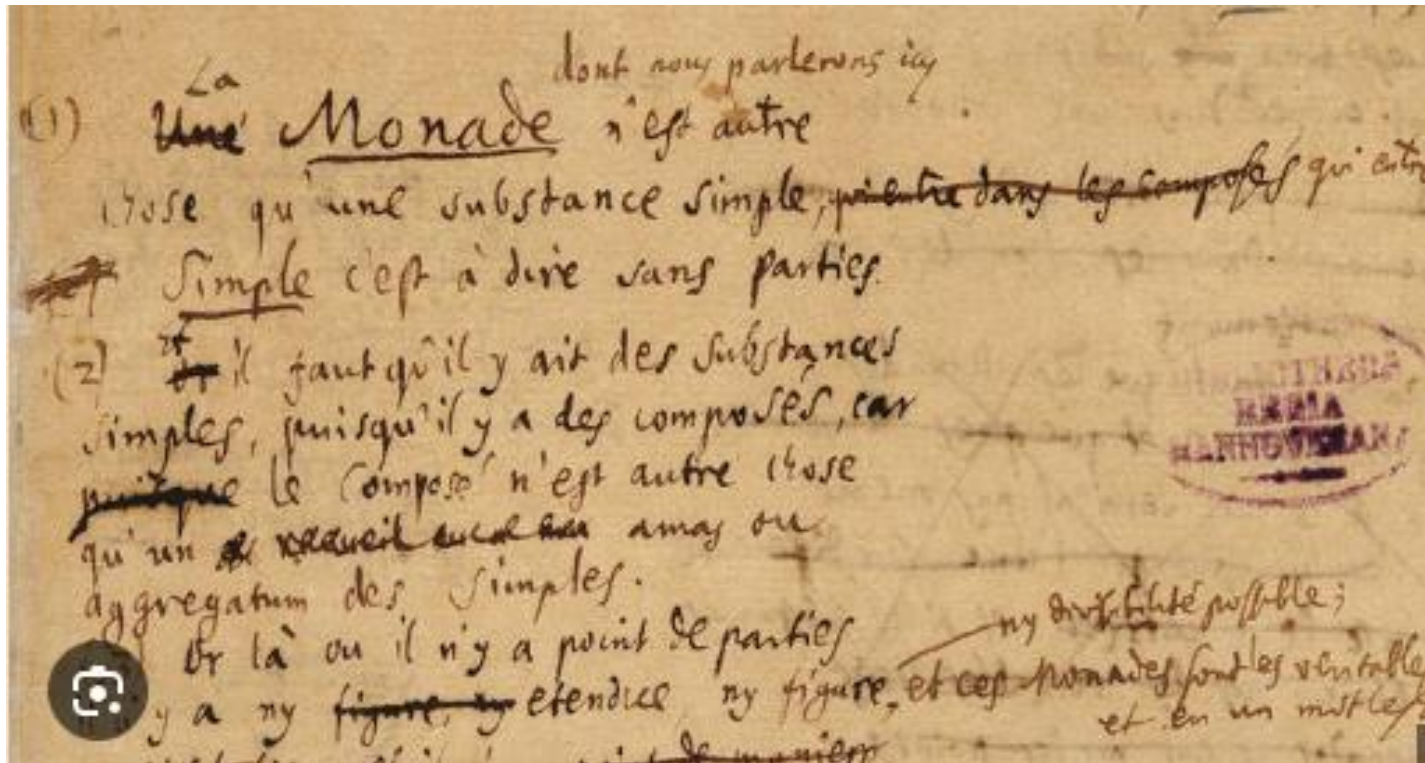
This is the question of substance

Before Leibniz

- **Aristotle**: substance = something that exists independently (e.g., a horse, a person). Qualities or 'accidents' are non-substances

- **Descartes**: two basic substances — mind (thinking) and matter (extended).

- **Spinoza**: only **one** substance (God or Nature); everything else is a mode of it.

- Leibniz wanted to avoid both extremes —

  - fragmentation of Descartes

  - monism of Spinoza.

- He proposed instead that reality consists of countless *simple substances* — the famous **monads**

The Monadology (1714)

In the *Monadology (1714)*, Leibniz offers a systematic account of reality grounded in monads—simple, immaterial centres of perception whose coordinated activity produces the order of the world.

§1 *« La Monade, dont nous parlerons ici, n'est autre chose qu'une substance simple, qui entre dans les composés; simple, c'est-à-dire sans parties. »*

First 10 paragraphs (of 90) of the Monadology

§1 *"The Monad, of which we shall here speak, is nothing but a simple substance, which enters into compounds; simple, that is to say, without parts."*

§2 *"And there must be simple substances, because there are compounds; for the compound is nothing but a collection or aggregatum of simples."*

§3 *"Now where there are no parts, there can be neither extension, nor form, nor divisibility. These Monads are the true atoms of nature; in a word, the elements of things."*

§4 *"No dissolution of these elements need be feared, and there is no conceivable way in which a simple substance can perish naturally."*

§5 *"For the same reason there is no conceivable way in which a simple substance can begin naturally, since it cannot be formed by the aggregation of parts."*

§6 *"Thus it may be said that Monads can only begin or end by creation or annihilation; while that which is composite begins or ends by the aggregation or dispersion of its parts."*

§7 *"There is also no way of explaining how a Monad can be altered in its inner being, or how any internal change can be brought about in it, by any other created thing."*

§8 *"It is impossible for one created Monad to influence another internally, and all that can happen to a Monad must be caused by God alone."*

§9 *"Every Monad is different from every other. For in nature there are never two beings which are perfectly alike and in which it is impossible to find any difference that is internal or based on an intrinsic denomination."*

§10 *"I also take for granted that every created Monad is subject to change, and that this change is continual in each."*

Infinite divisibility

Take any object, divide into two halves, repeatedly;

After a finite number of steps, it will have a left half and a right half

After a finite number of steps, it will have a left half and a right half so can be further subdivided.

Continue the subdivision ad infinitum. Leibniz asserts that you end up with a substance of <u>zero dimensions</u>, must be <u>immaterial</u>.

Leibniz calls this a simple substance, or a MONAD, and asserts that monads form the basic building blocks of the universe

Leibniz wants to avoid positing a finite sized 'particle 'as the basic unit, because we can then say- "this particle is finite, so it has size, so what is it made of? - it can't therefore be basic".

Monads, as zero sized, immaterial; substances, have no parts, otherwise they could still be further divided.

3. Now where there are no parts, there can be neither extension nor form [figure] nor divisibility. These Monads are the real atoms of nature and, in a word, the elements of things.

What are Monads

Simple substances: simple because indivisible and Immaterial

Unique: no two monads are alike

Windowless: nothing in or out – no interaction between monads

Perception: each monad reflects universe from its own point of view

Appetition: monads move from one perceptual state to another according to an internal drive or desire, conforming to the Principle of Sufficient Reason.

Hierarchy

- Bare monads: unconscious perceptions – inanimate matter
- Soul monads: conscious perception – animal kingdom
- Rational monads: clear perceptions, self-awareness, reasoning
- Supreme monad: God - possesses all perceptions simultaneously

Pre-established harmony: most startling property!

- Because monads do not interact, God has synchronised development
- from the beginning.
- Divine orchestration – ensures world appears coherent.
- Entire history of the universe is programmed into each monad – from its point of view

What is an object (body)?

Bodies result from the aggregation of monads that are organised in a way that gives rise to the **appearance** of a larger, extended entity with physical properties.

Bodies exist only in **phenomenal space** — the space of appearances.

A body is not spatially built from monads. Rather, a body corresponds to an infinity of monads whose perceptions harmonise.
The boundaries we see (e.g. the shape of the object) belong to appearance, not to monads. The monads "of" the object are simply those whose perceptions together express that phenomenon.

Because monads have no size, they cannot be created or destroyed as one might a material object. Leibniz asserts that they can only be created and destroyed 'supernaturally', which for Leibniz, means GOD.
When God created the universe, he created monads.

Resonance with modern physics – just as we do not know how the Big Bang occurred (because the 'laws' of physics as we know them today did not apply at time T = 0), we cannot know how the monads were created - this is forever beyond the purview of mere humans. Monads operate under different rules to the physical universe we know

More on Monads

Monads, because of their zero-sized, immaterial; nature, cannot affect each other – they form closed systems. Nothing can enter or emerge from a monad. Leibniz uses the term 'windowless':

> 7. Further, there is no way of explaining how a Monad can be altered in quality or internally changed by any other created thing; since it is impossible to change the place of anything in it or to conceive in it any internal motion which could be produced, directed, increased or diminished therein, although all this is possible in the case of compounds, in which there are changes among the parts. The Monads have no windows, through which anything could come in or go out. Accidents cannot separate themselves from substances nor go about outside of them, as the 'sensible species' of the Scholastics used to do. Thus neither substance nor accident can come into a Monad from outside.

The possibility of monads affecting each other (inter-monadic causation) is rejected, not just because monads have no parts and no dimensions, but on objections to causality generally.

More on Monads – Qualities

So, if each monad cannot enter into causal relationships, has no parts, and remains independent, how are they differentiated?

Leibniz now deploys his 'Leibniz Law' which we have already met, the Identity of Discernibles – "if two things are truly distinct, there must be some way to differentiate between them; otherwise, they would be the same thing".

So, it looks like the universe just contains one monad.

This was Spinoza's view - he believed in the existence of only one substance, which he referred to as "God" or "Nature." This single substance is infinite, eternal, and encompasses everything in the universe, including both material and mental aspects. So, in Spinoza's view, there is only one monad, which is the entirety of existence itself.

Leibniz wriggles out of his own logical maze by positing that a monad has **qualities**: each monad has a set of qualities that define a unique state that it is in. The qualities are not parts – if this were so, you could further subdivide a monad, but we know that a monad is indivisible. No two monads have the same set of qualities at any one time.

More on Monads – Perception & Appetition

Leibniz wriggles out of his own logical maze by positing that a monad has **qualities**: each monad has a set of qualities that define a unique state that it is in. The qualities are not parts – if this were so, you could further subdivide a monad, but we know that a monad is indivisible. No two monads have the same set of qualities at any one time.
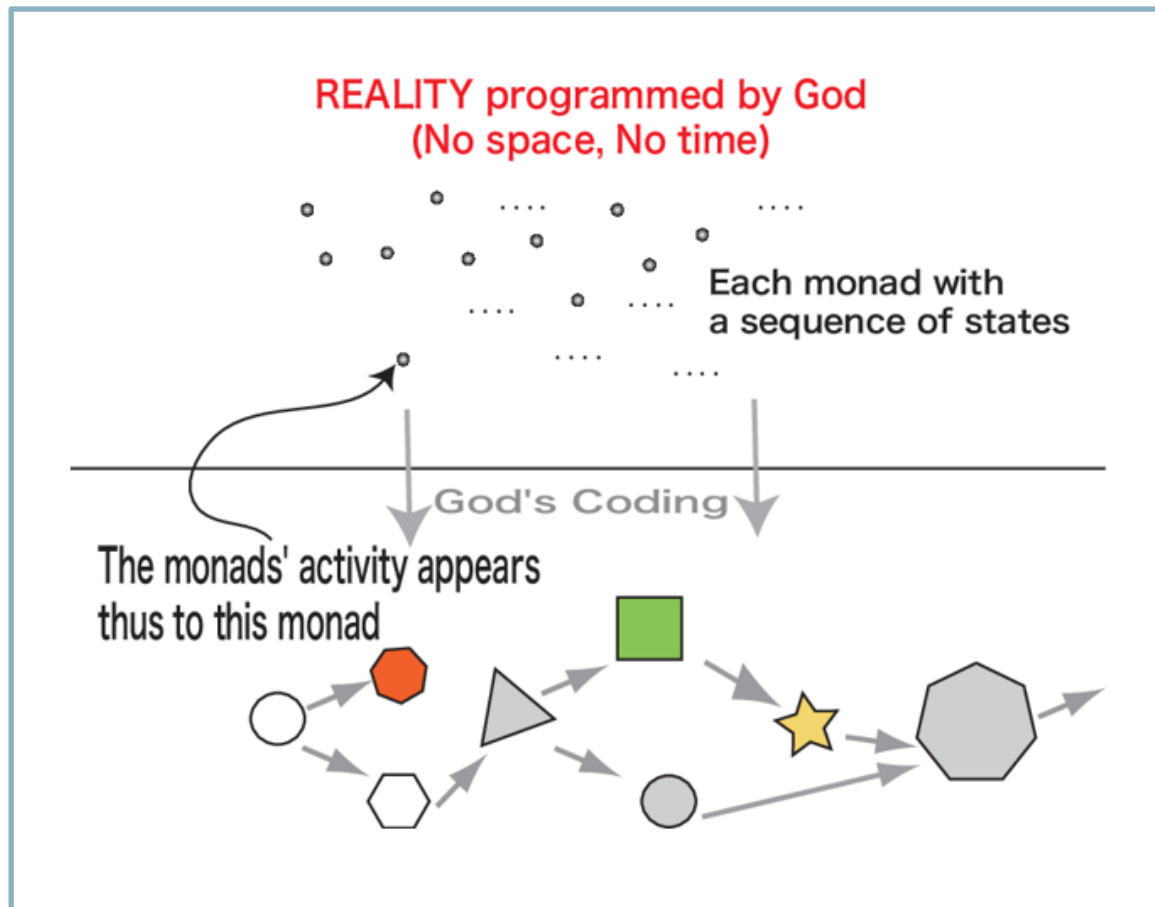
Qualities are **perception** and **appetition**.

Perception: Each monad perceives the world around itself from its own perspective - each monad holds a sequence of perceptions from its creation (by God) until the end of time.
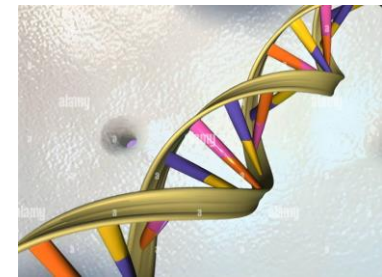
Appetition: the monad's internal tendency, striving, or impulse that **drives it from one perception state to the next**. No causal force from outside.

AS there is no causal connection between states, Leibniz asserts that the monad must contain a 'script' of states that run from start to finish, divinely orchestrated, to mimic causal interaction. The script is inserted into the monad when God creates it.

So, the behaviour of the monad is fixed throughout time at the moment of its creation by God. A startling conclusion!

REALITY programmed by God
(No space, No time)

Each monad with a sequence of states

God's Coding

The monads' activity appears thus to this monad

Crick & Watson 1953 paper "Structure of DNA"

God's coding for the development of life.

More on Monads – types

Now Leibniz associates the partless monad with perceptions to the mind. This is clever, in the sense that the mind is supposedly indivisible - can you divide a mind into left and right halves?

Hierarchy of monads

- **Bare monads**: unconscious, faint, perceptions – inanimate matter.

- **Soul monads**: conscious perception – animal kingdom.

- **Rational monads**: clear perceptions, self-awareness, reasoning, abstract thoughts, i.e. **a mind .**– humans and angels

- **Supreme monad**: God - possesses all perceptions simultaneously.

More on Monads – worlds within worlds

From the Monadology:

66. Whence it appears that in the smallest particle of matter there is a world of creatures, living beings, animals, entelechies, souls.
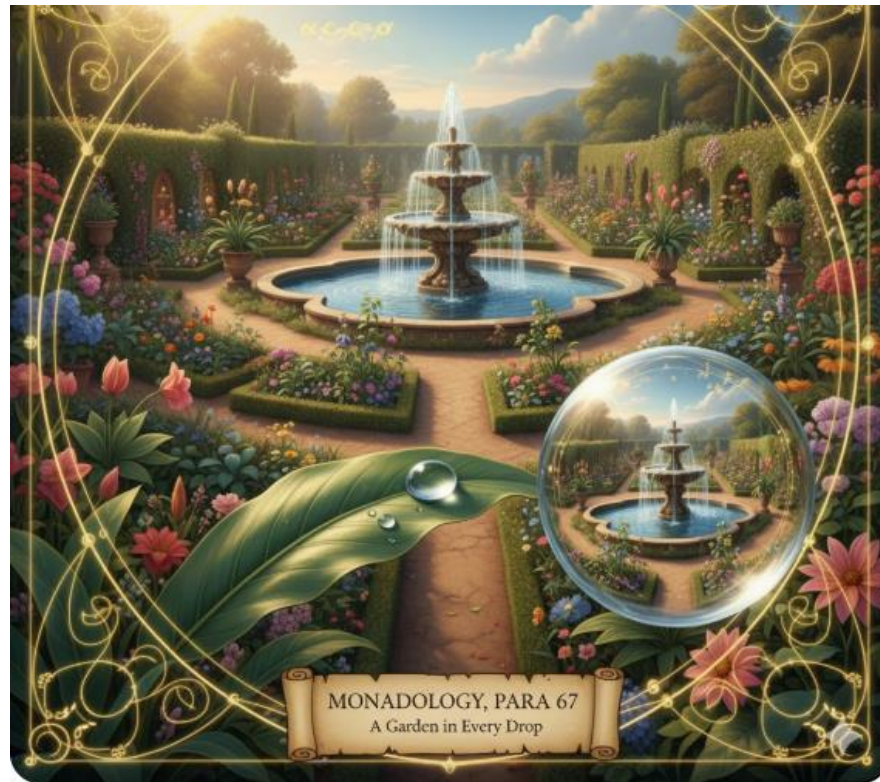
67. Each portion of matter may be conceived as like a garden full of plants and like a pond full of fishes. But each branch of every plant, each member of every animal, each drop of its liquid parts is also some such garden or pond.

68. And though the earth and the air which are between the plants of the garden, or the water which is between the fish of the pond, be neither plant nor fish; yet they also contain plants and fishes, but mostly so minute as to be imperceptible to us.

The idea of living things within living things (worlds within worlds) may stem from the invention of the microscope, probably best attributed to Antoni Van Leeuwenhoek and Robert Hooke in the 1660s.

More on Monads – worlds within worlds

So, Leibniz's view of a body is an unending unfolding of ever simpler 'creatures', each with their own monad. We can continue delving down indefinitely, finding 'creatures' at every level, each containing a unique set of perceptions, which somehow reflects its position in the infinite layers of monads.

MONADOLOGY, PARA 67
A Garden in Every Drop

Discussion – this is a breathtaking view of matter. It is reminiscent of fractals, Mandelbrot set.

The Illusion of Interaction and Sight

What Happens (The Appearance)	What Actually Happens (The Reality)
I see the table. (Cause & Effect)	My monad's internal state (the perception of a table) is developing in perfect synchronization with the arrangement of the table's monads.
I knock the table. (Physical Interaction)	My body monads act according to their program, and the table's monads simultaneously enter a state of disorganization, according to their program. There is no causal push.

More on Monads – Pre-existing Harmony

Each monad runs through its script of perceptions, but what keeps the scripts synchronised?

This is achieved by Leibniz's concept of **Pre-existing Harmony**.

God's creation of the monads was so perfect that all monads are perfectly synchronised for all time.

So is God needed after the creation event?

God's role is not just as a "starter," but as the **necessary being** who keeps the monads in existence. Without God's continuous power, the whole created universe would fall back into nothingness.

The Principle of Sufficient Reason: Everything that exists must have a reason for its existence. For the monads, that ultimate reason lies in a necessary being—God.

So what is reality?

An object has no physical existence

Conscious monads perceive the object phenomenally from its own point of view, synchronised by pre-existing harmony

Consider: persons in group observing a tree: each perceives the tree from their point of view

Why have tree monads? - looks like a solipsist viewpoint

Because God has a complete concept of the tree, and in His perfection, he creates the tree monads, operating in perfect harmony with all other monads perceiving the tree.

God's creation is not dependent on perception.

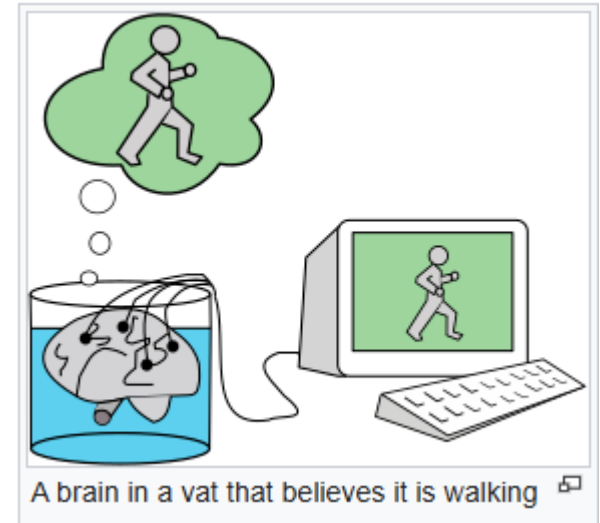Relate this to explain what is going on in this room right now!

Other "realities" ?

Brain in a Vat

- Your brain is detached from your body,
- Kept alive in a vat of nutrients,
- Fed electrical signals identical to those you'd receive from the real world.

Experience is an illusory world!

Not unlike monads.

A brain in a vat that believes it is walking

The Matrix

If consciousness is a form of integrated information, and the universe itself is fundamentally informational (as some interpretations of quantum physics and digital physics suggest), then:

> Yes — avatars in an advanced simulation could genuinely become conscious.
> And by the same reasoning, *we ourselves might be such avatars* — conscious informational beings within a cosmic computation.

<u>Monadology – some further discussion points, if not already covered</u>

- Your total life history, according to Leibniz

- Your car's total life history, according to Leibniz

- Does God get bored, after creating the universe?

- Are we arrogant, impertinent, in ascribing actions to God, saying what he can and can't do?

Innateness-1

Rationalist stance - **ideas** and **truths** are not derived from sense experience but are present in the mind from birth, though often in a **potential** or **dispositional** state.

Leibniz disagreed with the radical innatism of:
Descartes - ideas are fully formed
Locke - the mind is a *tabula rasa* or blank slate

Potentiality: Innate truths are like **seeds** or **veins** within the mind - **virtually** or **potentially** present, and external experience <u>merely serves</u> to **activate** them, so they transition from potentiality to **actuality.**

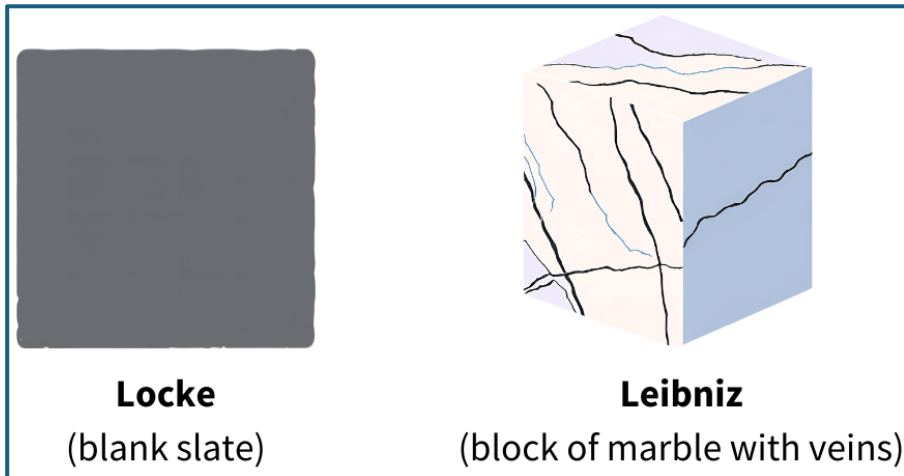Go to the next slide for Leibniz's famous quote ⟶

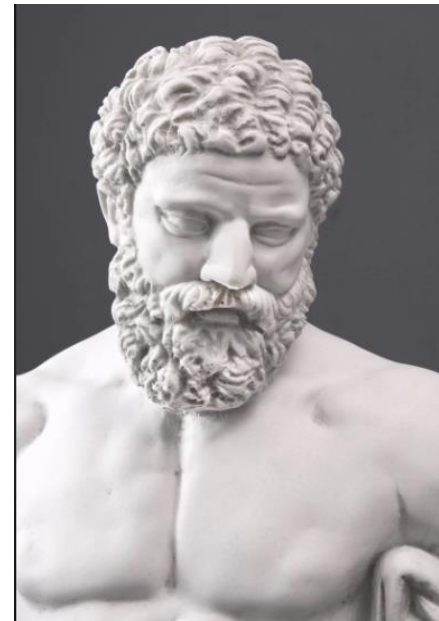**Caveat**: we read this, with Leibniz's monadic thesis in mind.
Your rational monad evolves according to God's script, governed by pre-existing harmony, so whatever is inscribed upon the mind at any one time, including birth, is pre-determined – it could not be any other way.
"Experience" is not some externally acting input, (monads have no windows), but is itself embedded in the monadic script.

Innateness-2

Locke
(blank slate)

Leibniz
(block of marble with veins)

philosophyalevel.com

ar.inspiredpencil.com

I have made use of the analogy of a block of **veined marble**, rather than a wholly uniform block of marble or a blank slate, that is, what is called a **tabula rasa** in philosophy.

For if the soul were like these blank slates, **truths would be in us as the figure of Hercules is in a block of marble, when the marble is entirely indifferent to receiving this figure or another**…

But, **if there were veins in the stone which marked out the figure of Hercules rather than other figures**, then that stone would be **more determined** thereto, and Hercules would be **innate,** in a way, in the stone, even though labor would be needed to expose the veins, and to polish them into clarity.

It is in this way that I take **ideas and truths to be innate in us**—as inclinations, dispositions, habits, or virtual potentialities, and not as actualities."

Space and Time

Newton believed that Space and Time were absolute. You can think of the universe a great container with a clock sitting on top. The container contains the universe. If you then remove the universe, the space in the container is still there, and time still goes on according to the clock outside the container.

For Leibniz, space and time is a substance (everything is made up of substance).

But empty space has no properties, so this substance will have no properties.

Leibniz says this to be absurd - even God could not create such a substance.

He advances a second argument – suppose space is absolute, then Leibniz asserts that is no sufficient reason for why the universe was created here, rather than 10 metres to the left (because no region of space is discernible from any other). So absolute space is absurd as it violated the principle of sufficient reason.

So, what is space then? Leibniz argues for a relational space – a network of relationships between the substances. If the universe didn't exist, there would no space. Analogy – family tree, relationships are real, but tree is abstract.

For Leibniz, the location of an object is not a property of independent space, but a property of the object itself. This means that an object located here is actually different from an object located there, by virtue of its different location.
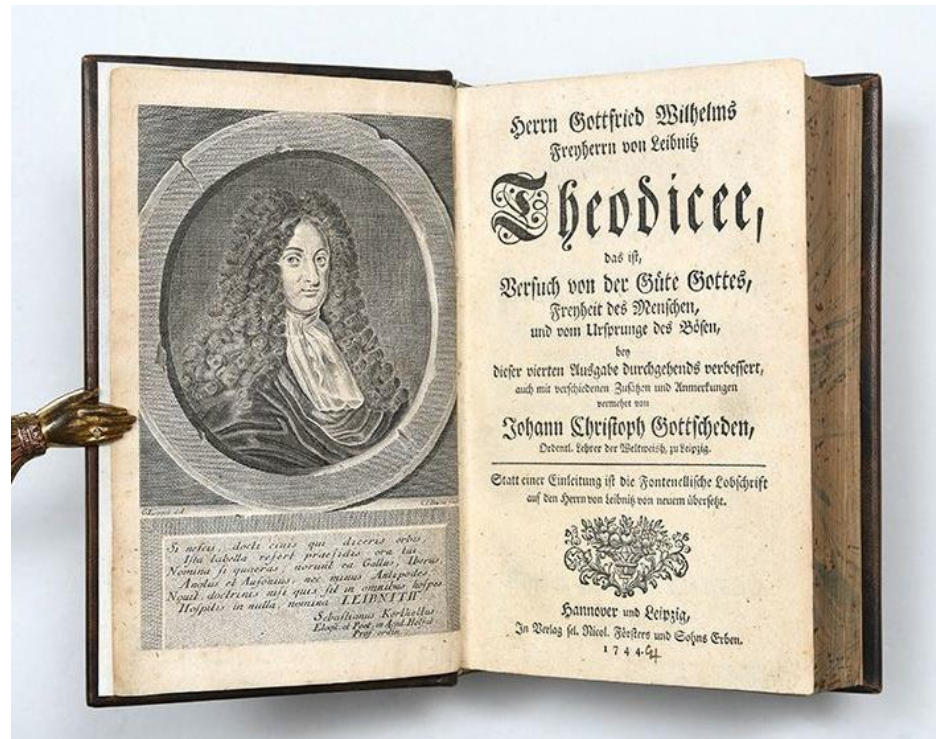
Space and Time are not real, but emerge from our perceiving the relations between substances – they are illusory. In our efforts to understand (illusory) space and time, scientist have performed many experiments and have devised clever theories as to why the world works as it seems to, e.g.' Newtons laws of motion.

The universe does not obey laws – it unfolds according to monadic scripts!

Leibniz Monadology v Modern Science

Leibniz Monadology	Modern Science
Metaphysics – but interesting parallels with modern science	Scientific theory – but interesting parallels with Monadology
Monads created by God simultaneously	Matter created by Big Bang at beginning of tome
Monads programmed with history of universe. Metaphysical determinism	Universe evolves according to laws of physics. Evolves deterministically (classical), probablistically (quantum)
Monads are immaterial and indivisible	Quantum Field Theory – particles are excitations of Field – not known if indivisible
Higher monads are a centre of consciousness Liebniz would say that all monads are panperceptive rather than panpsychic	Panpsychism – speculative – all matter, e.g. electrons, have a degree of consciousness. In aggregate, can produce human consciousness. Consciousness is emergent, not fundamental
Pre-established harmony – each monad evolves in perfect correspondence with all others. Grounded in theology.	Universe operated under universal, consistent laws – Perfect correspondence at all regions of the universe. Grounded in mathematics.
You could say that all monads are perfectly correlated	A fundamental principle in quantum physics – 'entanglement' of systems implies correlation.
Information programmed into monad – cannot be destroyed, evolves via appetition	Fundamental principle of modern physics. Information cannot be destroyed but can be transformed via the Schrödinger equation
Time and motion are phenomena – relations between appearances, i.e. relative	Time and motion are relative, depending on state of observer. Einstein's Theory of Relativity

Theodicy: 'Best of all Possible Worlds' & existence of Evil

Leibniz's *Theodicy* was published in 1710. It is an attempt to reconcile the existence of evil with the existence of an all-good and all-powerful God. The problem of evil is the question of how a perfectly good and all-powerful God could allow evil to exist in the world.

Leibniz's justification for "best of all possible worlds"

1. <u>Perfection of God</u>:
He starts with the premise that God is omniscient (all-knowing), omnipotent (all-powerful), and omnibenevolent (perfectly good). These attributes are considered essential to God's nature.

2. <u>Principle of Sufficient Reason</u>:
He employs the "Principle of Sufficient Reason," stating that everything must have a reason for its existence. This implies God would not create something without a good reason.

3. <u>Infinite Possibilities</u>:
He acknowledges the existence of infinitely many possible worlds God could have created.

4. <u>Choice of the Best</u>:
Given his omnibenevolence, God would naturally choose to create the best possible world from these infinite possibilities. He would not settle for anything less than the absolute best, as imperfection would not align with his perfect goodness.

5. <u>No Better Option</u>:
If there were a better world than the one created, God, with his perfect knowledge and power, would have chosen that instead. The fact that our world exists implies it must be the best option available.

6. <u>Reconciling Evil and God</u>:
This argument connects to Leibniz's Theodicy, aiming to reconcile the existence of evil with a benevolent God. By claiming this is the best possible world, he tries to explain that even evil might have a role in this "best" outcome, perhaps as a necessary counterpoint to greater good or as a consequence of free will.

Evil

Leibniz argues that metaphysical evil (imperfection inherent in creation), physical evil (natural disasters), and moral evil are inevitable aspects of a created world.

He posits that even these "evils" contribute to the overall greater good within the best possible world.

Metaphysical evil: existence of imperfections or limitations inherent in created beings – necessarily less perfect than God – not due to sin.

Limitations of human knowledge and understanding, incapable of comprehending all truths simultaneously
→ errors, misunderstandings, incomplete knowledge   →
suffering and confusion

Physical evil: natural disasters, diseases, accidents   →
suffering, pain, misfortune

Moral evil – since God's creatures necessarily have imperfections, they act imperfectly → sin – deficit in a creature's makeup, not ascribable to God!

Voltaire's "Candide, or Optimism"

Satirical novella first published in 1759.

It follows the adventures of a young man named Candide, who is raised in a sheltered paradise with an optimist named Pangloss who believes "all is for the best in this best of all possible worlds." – i.e. it mercilessly lampoons Leibniz's philosophy.

However, Candide soon experiences the harsh realities of the world, filled with suffering, violence, and injustice.

Extract from Voltaire's Candide (1759)

Master Pangloss taught the metaphysico-theologo-cosmolonigology. He could prove to admiration that there is no effect without a cause; and, that in this best of all possible worlds, the Baron's castle was the most magnificent of all castles, and My Lady the best of all possible baronesses.

"It is demonstrable," said he, "that things cannot be otherwise than as they are; for as all things have been created for some end, they must necessarily be created for the best end. Observe, for instance, the nose is formed for spectacles, therefore we wear spectacles. The legs are visibly designed for stockings, accordingly we wear stockings. Stones were made to be hewn and to construct castles, therefore My Lord has a magnificent castle; for the greatest baron in the province ought to be the best lodged. Swine were intended to be eaten, therefore we eat pork all the year round: and they, who assert that everything is right, do not express themselves correctly; they should say that everything is best."

Free Will - 1

Reconciling human free will with pre-established harmony is a significant challenge in Leibniz's philosophy. Here are some key points to understand his solution:

The Problem:

Pre-established harmony states that everything in the universe, including individual entities, follows a predetermined path set by God from the beginning.

This suggests a **deterministic universe where our choices seem predetermined.**

Free will, however, emphasizes our ability to make genuine choices and shape our own lives.

This appears to be a **gigantic contradiction**!

Free Will - 2

Leibniz's Solution:

He employs the concept of <u>compatibilism</u>. This view argues that free will and determinism are not necessarily incompatible. Even if our choices were ultimately predetermined, they could still be freely chosen from our perspective.

This is what Leibniz says:

"*We act freely, but God foresees our actions...We act freely because we deliberate and choose according to what we consider good...God foresees our actions because he sees all things possible, together with their reasons and connections.*" (Discourse on Metaphysics, Section 15).

This, to me, does not help much!

- A <u>compatibilist approach</u>: we can make choices freely, and God perceives this at monad creation.

- Each free choice that we make gives rise to possible world(s), as choices are contingent.

- God chooses the best of all possible worlds, which will embody one of my world/choices.

- So my choices are free, but the choice occurring in this best of all possible worlds is God's choice, not mine.

- ***Do you think this is a convincing argument?***

THE
END