

## Gottfried Wilhelm Leibniz (1646 – 1716)



Gottfried Wilhelm Leibniz (1646–1716) was a German philosopher, mathematician, and polymath who made significant contributions to various fields. He developed a system of differential and integral calculus independently of Isaac Newton, and the dispute over priority led to the famous calculus priority dispute. Leibniz also made advances in logic and metaphysics, proposing the idea of monads as fundamental units of reality. His work extended to diplomacy, where he served as a diplomat, and he sought to unify European nations. Leibniz's wide-ranging interests included philosophy, mathematics, law, theology, and linguistics, leaving behind a legacy that influenced diverse areas of knowledge.

Leibniz was baptised into the Lutheran faith, but later in life, as he delved deeper into philosophy and theology, his views became more ecumenical. He engaged in dialogues with prominent Catholic figures and expressed admiration for both Catholic and Protestant traditions.

### Leibnitz's Life in a nutshell

July 1, 1646: Gottfried Wilhelm Leibniz is born in Leipzig, Saxony (now in Germany). Leibniz father was a professor of moral philosophy at Leipzig University, died when Leibniz was just 6 years old. He and his sister were brought up by their mother, the daughter of a prominent lawyer (who died when Leibniz was 17) in a house full of books. Left alone to study, Leibniz developed a wider outlook than the strict Lutheranism within Leipzig might allow. He would refer to himself as an auto-didact.

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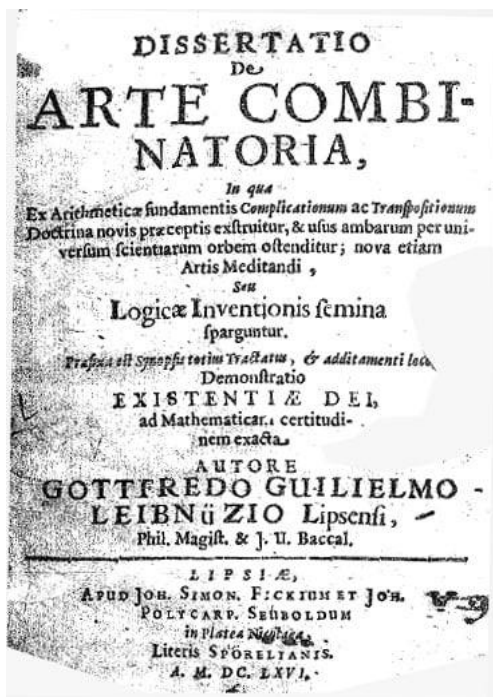
**1652-1660**: Leibniz receives his early education at the Nicolai School in Leipzig.

**1661-1666**: Leibniz studies law at the University of Leipzig while also pursuing independent studies in philosophy and mathematics.

Gained Bachelor & Masters degrees in Philosophy and Bachelors degree in Law – his bachelor's dissertation *Metaphysical Disputation on the Principles of Individuation* (1663).

Also 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. Front page shown left, and diagram showing how the 'four elements' relate to each other is shown below.

**1666**: enrolls at Altdorf University and one month later obtained doctorate in Law *summa cum laude*, and was immediately offered a law professorship. Leibniz (amazing to us perhaps) turned this down – he had higher intellectual ambitions! His training in Law was not wasted, for example in a major work *Essays in Theodicy*, Leibniz acts as defence council for God against charges of injustice.





Quelle: Deutsche Fotothek

**1672-1676:** Leibniz works for the Elector of Mainz, Johann Philipp von Schönborn, as an assistant and librarian.

Louis XIV was pursuing an expansionist foreign policy, with Germany and Holland in his sights. Leibniz sought to divert French aggression – in his *Consilium Aegyptiacum*, he proposes that the French should attack non-Christian Egypt. Leibniz's desire for peace clearly did not extend beyond European boundaries!

**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. He meets influential intellectuals and establishes correspondence with many European scholars. Studies Mathematics with Christian Huygens, and meets with Spinoza. This was a time when Leibniz was able to absorb much of current philosophical ideas and advance his knowledge of science and mathematics.

**1676:** As the Elector of Mainz had died, Leibniz felt he needed a change of focus, so Leibniz accepted a position as court councillor and librarian to Duke Johann Friedrich at Hanover. He also unofficially gave technical advice on the draining of silver mines in the Hartz mountains. Leibniz spends the rest of his life, (another 40 years) here. The Duke was sympathetic to Leibniz's grand plans to reconcile different religious groups, but perhaps unfortunately for Leibniz, died in 1679. The Duke's 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.

Leibniz perhaps reluctantly undertook a major genealogical research project, 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.

Leibniz went overboard on this project, constructing a history of the Guelf family from the beginnings of time (as was reckoned then) – giving him excuses to travel extensively (1687 – 1699) for research purposes, but taking every opportunity to meet up with philosophers and scientists at every port of call.

**1686:** Leibniz writes one of his most famous philosophical work, *Discourse on Metaphysics*. This philosophical work serves as an introduction to Leibniz's metaphysical system and 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**. The *Discourse on Metaphysics* is an important early work that lays the groundwork for many of the philosophical ideas that Leibniz would later develop in more detail.

**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:** Gottfried Wilhelm Leibniz's *Theodicy: Essays on the Goodness of God, the Freedom of Man, and the Origin of Evil* is a philosophical work written in 1710. In this work, Leibniz addresses the 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.

**1714:** Leibniz's writes *Monadology*, shortly before his death. It is one of Leibniz's most famous and concise expressions of his metaphysical system. The "Monadology" consists of 90 brief paragraphs, or monads, each presenting a specific aspect of Leibniz's philosophy.

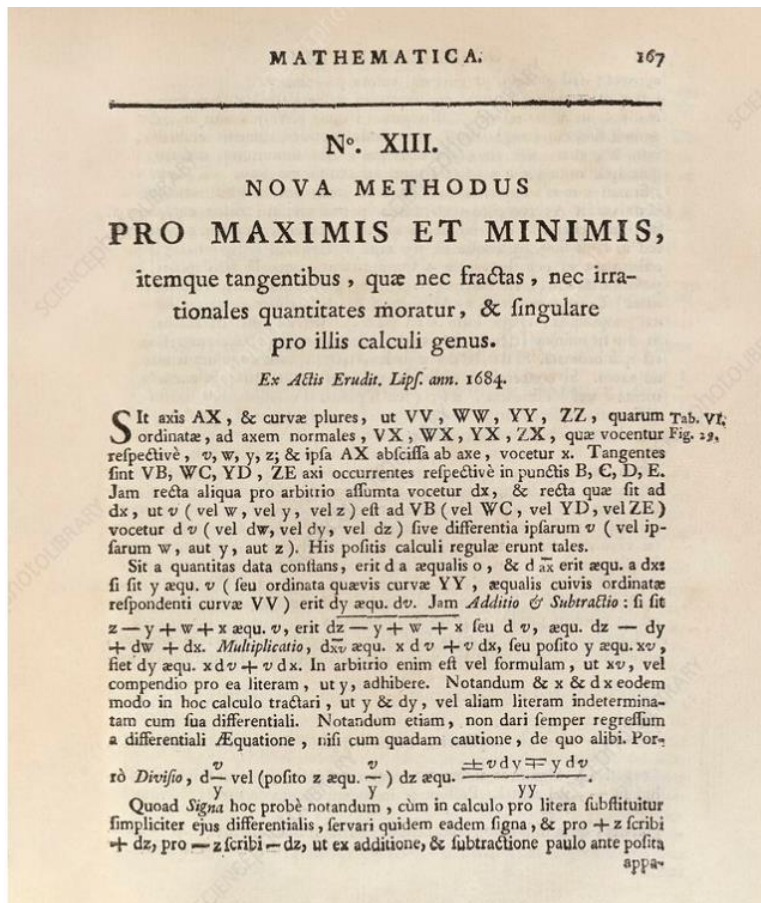
**1715:** Leibniz engages in correspondence with Samuel Clarke, an English Anglican priest and philosopher, known for his defence of Newtonian science and natural theology - he often served as a spokesperson for Isaac Newton in philosophical and theological debates. The *Leibniz-Clarke Correspondence* 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.

Posthumous: Leibniz's ideas continue to influence various fields, including philosophy, mathematics, and computer science.

## Gottfried Wilhelm Leibniz's Contributions Beyond Philosophy:

While Leibniz is primarily known for his groundbreaking work in mathematics and philosophy, his intellectual curiosity extended far beyond these fields. He made significant contributions to physics, geology, and engineering, leaving a lasting impact on various scientific disciplines.



### Mathematics

Leibniz made many contributions to mathematics, but his most famous was the invention of the calculus, in a paper *Nova Methodus pro Maximis et Minimis* ("A New Method for Maxima and Minima") in 1684.

### Newton-Leibniz dispute

Newton published his work on the calculus in 1693, whilst Leibniz published in 1684, 9 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, in 1712, wrote a report 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.

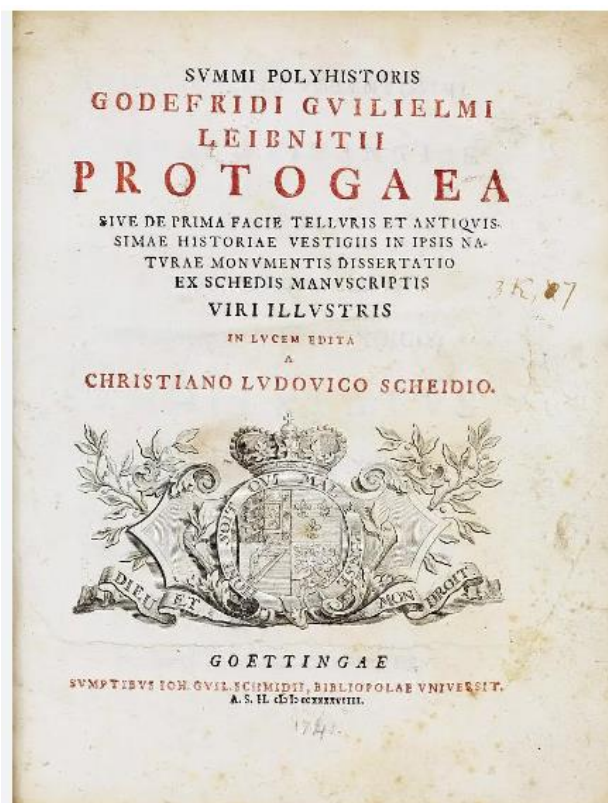
**Current consensus:** Both mathematicians are recognised as independent inventors of calculus, each with their own valuable contributions. The focus has shifted from "who invented it first?" to appreciating the unique strengths of each approach.

### **Physics:**

**Mechanics:** 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.

**Dynamics:** 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.

**Optics:** 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.



### **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.

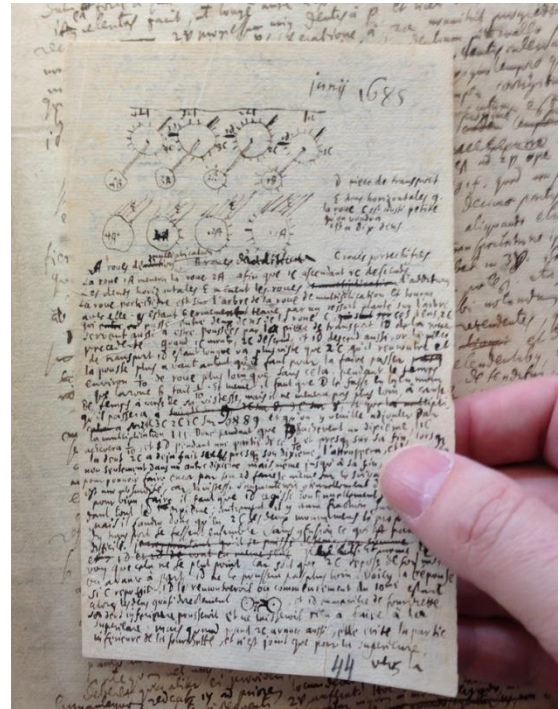
**Palaeontology:** He was an early proponent of palaeontology, recognizing the significance of fossils as evidence of past life forms and Earth's geological history.

### **Engineering:**

**Windmills:** 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.

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

**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.



Leibniz's versatile genius and insatiable curiosity allowed him to make significant contributions in diverse fields. His work in physics, geology, and engineering helped lay the foundation for future scientific advancements and continues to inspire researchers today.

## Rationalists

The term "rationalists" refers to a group of philosophers who emphasised the role of reason and logical analysis in understanding the world and acquiring knowledge. Rationalism is a philosophical position that asserts that reason is the primary source of knowledge and that it is through rational thought and deduction that one can gain insights into reality. This is in contrast to empiricism, which emphasizes the role of sensory experience and observation in acquiring knowledge.

Three prominent rationalist philosophers from the 17th and 18th centuries are often discussed in Western philosophy:

**René Descartes (1596-1650):** Descartes was a French philosopher, mathematician, and scientist. He is famous for the statement "Cogito, ergo sum" (I think, therefore I am), which reflects his emphasis on the certainty of self-awareness and the foundational role of reason in knowledge.

**Baruch Spinoza (1632-1677):** Spinoza was a Dutch philosopher of Portuguese Sephardic Jewish descent. He developed a comprehensive and systematic philosophy that rejected Cartesian dualism and emphasised a monistic view of reality. His work "Ethics" is a key text in rationalist philosophy.

and **Leibniz.**

These philosophers were united in their rejection of pure empiricism and shared a conviction in the power of reason to uncover universal truths about the world. Their ideas played a crucial role in the development of modern philosophy and had a lasting impact on subsequent philosophical thought.



## Characteristica Universalis : universal set of signs

The *Characteristica Universalis*, also known as the universal characteristic or universal language, was a concept first developed in his *De Arte Combinatoria* (On the Combinatorial Art, 1666): it was envisioned as a formal, symbolic, language capable of expressing all concepts and propositions in a clear, unambiguous, and logically consistent manner. Leibniz believed that such a language could revolutionize human thought and communication, enabling the resolution of disputes through logical calculation rather than through argument or debate.

Leibniz's idea was that concepts which we think about cannot easily be represented in a natural language, but could advantageously be represented by symbols in this universal language.

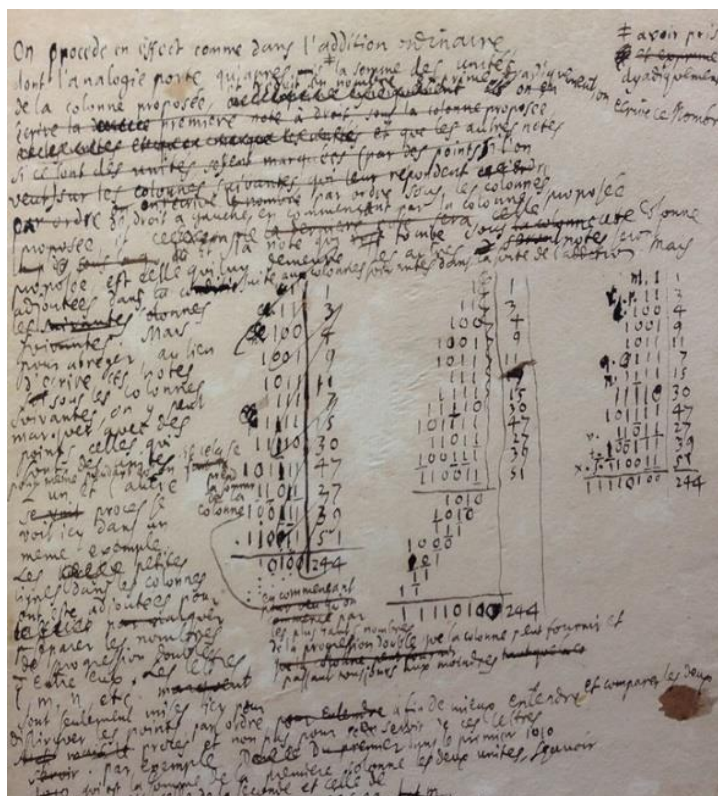
The *Characteristica Universalis* was inspired by several sources, including:

**Mathematics:** Leibniz's own work in mathematics, particularly his development of calculus, led him to believe that logic could be formalised and manipulated in a similar way.

**Natural languages:** Leibniz was familiar with languages, such as Latin and Chinese, and saw their limitations in terms of precision and expressiveness.

**Philosophy:** Leibniz's philosophical ideas, such as his theory of monads (to be discussed later) and his commitment to rationalism, informed his belief in the possibility of a universal language that could reflect the underlying structure of reality.

The *Characteristica Universalis* would have consisted of a set of primitive symbols, representing simple concepts, and a set of rules for combining these symbols into complex expressions. These expressions would then be able to represent any proposition, argument, or logical reasoning, regardless of its subject matter, much like algebra serves as a method for representing mathematical relationships. The language would be designed to be completely unambiguous and precise, so that any given proposition could have only one possible interpretation. Leibniz believed that such a language would facilitate communication and understanding between people from different cultures and disciplines.



Leibniz never fully developed the *Characteristica Universalis*, and it remains an unrealised concept. However, its influence on subsequent thought has been profound. The idea of a formal language for logic inspired the development of symbolic logic in the 19th century, which in turn laid the foundation for modern computer science. Additionally, Leibniz's vision of a language that could eliminate misunderstandings and facilitate rational discourse continues to resonate with philosophers and linguists today.

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

## **The Encyclopaedia**

The history of encyclopaedias stretches back millennia – before Leibniz was born, in 1630, the most comprehensive encyclopaedia to date had been published by Johann Heinrich Alsted (1588-1638), a substantial 7 volume work which tackled the challenge of organizing the entire universe of knowledge. Employing a complex system based on logic and interconnectedness, Alsted strove to present a comprehensive picture of the world, encompassing theology, philosophy, mathematics, natural history, and more.

Leibniz's initial ideas were to extend and update Alsted's encyclopaedia. His grand, crazily ambitious, plan was to create a 'demonstrative' encyclopaedia, which would not just present knowledge à la Britannica, but would identify principles and methods by which the Arts and Sciences had developed in the past, with a view that these principles and methods could guide the future cross-disciplinary, development of the Arts and Sciences. This grand vision was grounded in the belief in the unity and systematicity of all knowledge, in which fundamental truths were shared by all disciplines, and where 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".*

The purpose of the exercise was practical, rather than theoretical, *"for the benefit of public happiness"*.

### **I shall read quote Q 020**

Leibniz was under no illusion that a project of this magnitude would require a support structure, and to this end, he persuaded Friedrich III of Brandenburg to establish a Society of Sciences in Berlin in 1700, with Leibniz as the first president. In 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.

As in much of his work, Leibniz's ambitious plans were not matched by comparably significant outcomes, but his perseverance throughout his life was not in doubt.

### **Challenges and Unfinished Legacy:**

Despite his enthusiasm and considerable efforts, Leibniz faced several obstacles:

Lack of funding and resources: Securing financial support for such a massive undertaking proved difficult.

Technological limitations: Printing and communication technologies in the 17th century were not equipped to handle the vast amount of information envisaged for the encyclopaedia.

Divergent interests and workload: Leibniz's own prolific work in other fields, including mathematics, philosophy, and diplomacy, limited the time and energy he could devote to the encyclopaedia.

While he never saw his full vision realised, Leibniz's pioneering work on the encyclopaedia project had a significant impact:

Influence on later encyclopaedists: His ideas and methods inspired subsequent figures like Denis Diderot and Jean le Rond d'Alembert, who built upon his foundation in creating the groundbreaking Encyclopédie in the 18th century.

Contribution to knowledge organization: His focus on logical classification and information retrieval laid the groundwork for modern systems of library science and information management.

Legacy of intellectual ambition: Leibniz's tireless pursuit of a comprehensive encyclopaedia embodies the Enlightenment spirit of knowledge dissemination and intellectual progress, continuing to inspire today's efforts to organize and share information on a global scale.

So, while Leibniz's dream of a universal encyclopaedia remained ultimately unfulfilled, his contributions laid the groundwork for future generations of information organization and democratization of knowledge. His ideas remain relevant and inspiring in an era increasingly reliant on efficient and accessible information management.

## **Fundamental Principles**

Leibniz variously invoked a number of fundamental philosophical principles, two of which are discussed here.

**1. Identity/contradiction.** If a proposition is true, then its negation is false and vice versa.

The first fundamental philosophical principle is the Principal of Non-Contradiction which says that is P is a proposition, the P and not-P cannot both be true at the same time.

If P is "it is raining at Harrow Leisure Centre at 2pm today" and

Not-P is "it is NOT raining at Harrow Leisure Centre at 2pm 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??

P is "my age on 19/02/2024 at 2pm is an even integer" and not-P is "my age on 19/02/2024 at 2pm is NOT an even integer".

Can't so easily wriggle out of this one.

This is equivalent to the Principle of Identity:

*Primary truths are those which assert the same [thing] of itself, or deny the opposite of its opposite. As A is A, or A is not not-A. If it is true that A is B, it is false that A is not B, or that A is not-B. Also: every thing is what it is. Each thing is like itself, or equal to itself. Nothing is greater or less than itself—and others of this sort which, though they may have their own grades of priority, can all be included under the name of 'identities'.*

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 nonetheless, I 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 – even God could not do this.

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 necessary truths, e.g. the only even prime number (2). This fact 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. But the fact is true even if there were no humans at all to think this. Therefore, there has to be a superior mind that is always thinking that the only even prime is 2. This mind is the mind of GOD! QED.

**I shall read quote Q 030**

God's infinite intellect embraces the ideas of all possible things, and God organises these into worlds in which they are possible together. 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 compossible 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.

**Group discussion** – Leibniz's possible worlds versus the modern many-world theory – and the Multiverse.

Leibniz's principles of the "Identity of Indiscernibles" and the "Indiscernibility of Identicals" are closely related but express distinct ideas. Let's clarify each principle:

### **Identity of Indiscernibles (Leibniz's Law)**

The Identity of Indiscernibles 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:

$$\forall x \forall y (x \neq y \rightarrow \exists P (P(x) \neq P(y)))$$

where  $\forall$  means "for all",  $\exists$  means "there exists a", and  $\rightarrow$  means "implies".

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.

### **Indiscernibility of Identicals**

The Indiscernibility of Identicals, often expressed as "if two things are identical, then they are indiscernible in all respects," can be stated formally as

$$\forall x \forall y (x=y \rightarrow \forall P (P(x) \equiv P(y)))$$

The corollary – if two objects are identical in all respects, they are the same object.

Leibniz then distinguished two types of truths – truth of reason and truth of fact.

Truths of reason are necessary, and their opposite is impossible. E.g. the only even prime is 2.

Truths of fact are not necessary. Their opposite is false, but not contradictory.

It may be true that I am driving to my daughter, but it would not be contradictory or logically impossible. In another possible world, I am not driving to my daughter, I am playing the piano.

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.

And how about another form of universal language – emojis ...



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

## 2. Principle of 'Sufficient Reason'

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

For Leibniz, there are no unexplainable facts, no matter how inexplicable things may appear to us. Our inability to explain something doesn't mean that an explanation doesn't exist.

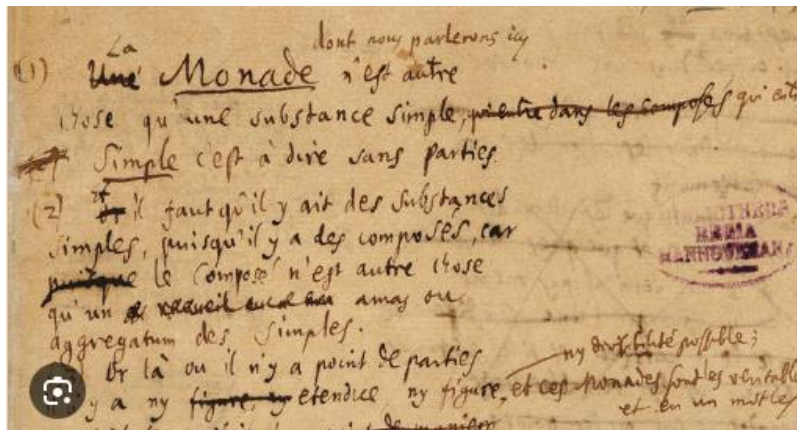
All facts are a result of an infinite chain of reasons – no wonder we can't understand!

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 as 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.

## Substance and Monads



Leibniz conceived this term **Monad** for substance relatively late in life (**The Monadology**, 1714). He makes the startling argument that everything is made up of monads.

But first we must consider what Leibniz means by 'substance'.

According to Leibniz, substances are basic, indivisible entities that constitute the fundamental building blocks of the universe.

Leibniz imagines taking any object, say a pen, and progressively dividing this object into two pieces.

Continue repeating this 100 times. You will have lots of small pieces of pen, but each piece can still be divided, as it still occupies space, however small. So carry on dividing. According to Leibniz, if you stop, you still have pen pieces, which occupy space, so are still divisible. What happens if you carry on ad infinitum. If you end up with an object which has size and shape, then it must have a left half and a right half, so you can divide again. Leibniz posits that you end up with a substance of zero dimensions, which therefore must be immaterial. If Leibniz calls this a simple substance, or a MONAD. Leibniz asserts that monads form the basic building blocks of the universe. This seems a wacky idea!

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.

Bodies are compound substances that result from the aggregation or arrangement of monads. While monads are indivisible, bodies are extended and divisible. Bodies are composed of a multitude of monads that are organised in a way that gives rise to the appearance of a larger, extended entity with physical properties.

DISCUSSION: reactions on monads as being the basic building blocks of the universe - can an immaterial monad form mind and matter?

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 (the best of all possible worlds), he created monads.

This has a resonance with modern physics – just as we appear not to 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.

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.

Consider plunging a hot iron bar into water. The traditional Scholastic view is that the heat in the metal would be transferred to the water – quite reasonable.

But Leibniz quibbles that when the heat is transferred from A (the hot iron) to B (the water), there must be a moment, no matter how small, where the particular heat (the 'right here and now' instantiation of the heat) would be in limbo, between the origin A and destination B.

Leibniz therefore rejects a causal explanation for the transfer of heat, because he would argue that in this moment of limbo, there is heat without anything being hot.

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.

And here is Leibniz's astonishing claim – one of the qualities is **perception**. Each monad perceives the world around itself from its own perspective, in fact each monad holds a sequence of perceptions from its creation (by God) until the end of time.

Consider the monad moving through its sequence of states – we know that Leibniz will not admit a causal connection between one state and its successor, so 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.**

As I say, this is startling.

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?), but the perceptions are manifold, and the perceptions of the mind run through sequences from birth to death.

So, Leibniz can liken a monad to the mind. Humans and other animals have minds, which are monads. However, he distinguished between monads based on their level of perception and development, forming a hierarchical structure. Here's a breakdown:

#### Levels of Monads:

1. Bare Monads: These are the simplest and least developed monads, often associated with inanimate objects like rocks or simple plants. They have very faint and confused perceptions, likened to being in a daze or deep sleep. They lack distinct consciousness or memory.
2. Sensitive Monads: These monads possess a higher level of perception, allowing them to experience distinct entities and enjoy conscious representations. Animals are typically categorised as having sensitive monads. They can react to their surroundings and have basic desires or appetites.
3. Rational Monads: These are the highest level, characterised by the ability for higher-order thoughts and self-reflection. This includes humans and potentially angels. Rational monads can not only perceive and react but also understand abstract concepts, reason, and make conscious choices.

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.

Again amazingly, Leibniz makes the following claims (left):

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

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.

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

Can we be clearer about what constitutes matter? I asked ChatGPT:

Leibniz's concept of how matter emerges from monads can be understood through his theory of perception and the principle of pre-established harmony.

According to Leibniz, each monad represents the entire universe from its unique perspective. These representations or perceptions of the universe are not passive observations but active expressions of the internal nature of each monad. Monads perceive the universe in a way that reflects their internal states, which Leibniz describes as a combination of perceptions and appetitions (drives or tendencies).

When multiple monads perceive the universe, their perceptions are coordinated in such a way that they form a harmonious whole. This coordination is achieved through Leibniz's principle of pre-established harmony, which posits that each monad, being created by God, is programmed or pre-established to perfectly coincide with every other monad without direct interaction. This means that despite their lack of causal interaction, the perceptions of all monads are perfectly synchronised.

From this perspective, matter emerges as the result of the coordinated perceptions of monads. The diversity and complexity of the physical world, including the appearance of material substances and their interactions, are explained by the multitude of perspectives provided by individual monads. Matter, then, is not something separate from monads but rather a manifestation of their perceptions and the harmony that exists among them.

In summary, matter emerges from monads through the coordinated perceptions of these non-material entities, guided by the principle of pre-established harmony in Leibniz's metaphysical system.

The answer refers to **pre-established harmony**. This is another astonishing concept.

We have said that each monad has a script of a sequence of perceptions, all created by God. Recall that monads have no communication with other monads, so how are the sequences of perceptions coordinated.

Leibniz likens the problem to clocks ticking away. Suppose all the clocks, all independent, are started at certain time  $t=0$  all set to the same time. Then what time will the clocks be saying at time  $t = 1$  week,  $t = 1$  year,  $t = 1$  millennium,  $t =$  billion years. You would think that the time on the clocks would have deviated much after so much time. But suppose you observe that, incredibly, the clocks are still agreeing exactly – what might you conclude.? Perhaps that God has ensured that the clocks tick in perfect harmony - God made the clocks so perfectly that they will agree for  $t=0$  to  $t= \infty$ .

Similarly, for Leibniz, the scripts in all the monads move from one state to the next in perfect harmony. Given that monads do not communicate with each other (so they can't check on each other's clocks), it must be God who imposes harmony – pre-established harmony at the time of creation.

I asked ChatGPT to give an example of the pre-existing harmony operates in the real world, an example of me dropping a glass on the floor:

Leibniz's principle of pre-established harmony can indeed be applied to the scenario of a glass hitting the floor.

In Leibniz's metaphysical framework, every individual substance, or monad, operates independently according to its internal perceptions and appetitions, without directly interacting with other monads. This means that when a glass hits the floor, the sensation of the glass breaking and the sound it produces are not the result of a direct causal interaction between the glass and the floor.

Instead, Leibniz would explain this event as follows: the monad associated with the glass perceives its own internal state, which includes the glass's motion and eventual impact with the floor. Simultaneously, the monad associated with the floor perceives its own internal state, including the impact of the glass. These perceptions are perfectly synchronised due to the pre-established harmony between all monads, ensuring that the internal states of each monad correspond perfectly with the internal states of every other monad.

So, when the glass hits the floor, the sensation of the glass breaking and the sound it produces are not directly caused by the physical interaction between the glass and the floor. Instead, they arise from the coordinated perceptions of the monads associated with the glass and the floor, reflecting the pre-established harmony that governs Leibniz's metaphysical system.

A dropped glass shatters because it "knows" it has hit the ground, and not because the impact with the ground "compels" the glass to split.

So, I think this deserves some discussion!!

## **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.

Leibniz considered that space and time must be a substance (since everything is made up of substance).

But empty space has no properties, so this substance representing space 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. Therefore, absolute space is absurd as it violated the principle of sufficient reason.

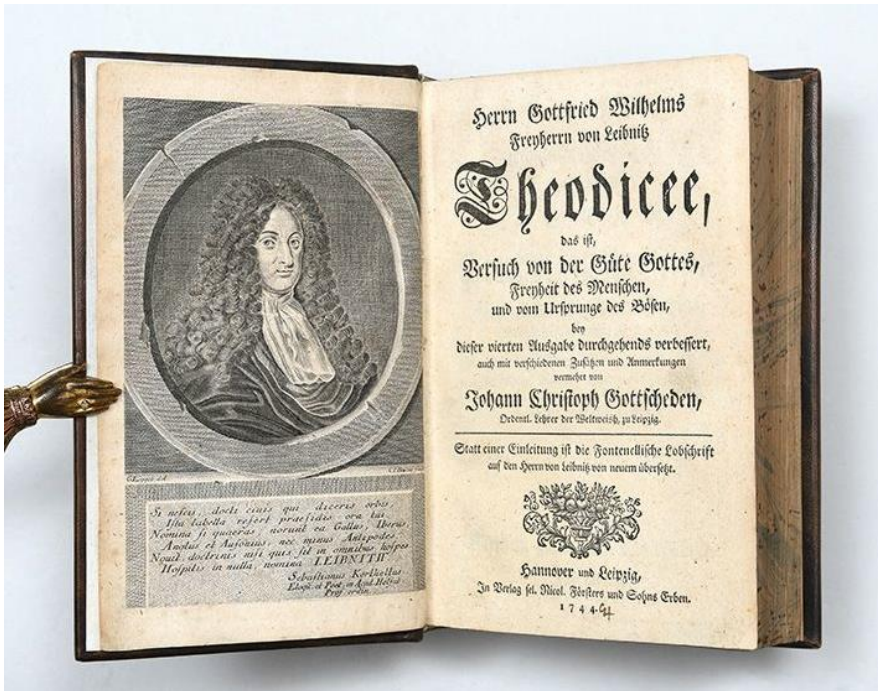
So, what is space then? Leibniz argues for a relational space – a network of relationships between the substances. If the universe didn't exist, there would no space.

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 claver theories as to why the world works as it seems to, e.g.' Newtons laws of motion.



## 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.

Here are the key arguments Leibniz uses to arrive at his "best of all possible worlds" conclusion:

### 1. Perfection of God:

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. Principle of Sufficient Reason:

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. Infinite Possibilities:

He acknowledges the existence of infinitely many possible worlds God could have created.

### 4. Choice of the Best:

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. No Better Option:

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. Reconciling Evil and God:

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.

### Additional Points:

Leibniz further argues that metaphysical evil (imperfection inherent in creation) and physical evil (natural disasters) 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 refers to the existence of imperfections or limitations inherent in created beings due to their finite nature – not due to sin. These imperfections are considered to be "metaphysical" because they stem from the inherent limitations of finite beings rather than from moral wrongdoing. One example of metaphysical evil in Leibniz's view is the limitation of human knowledge and understanding. Humans are finite beings and therefore incapable of comprehending all truths simultaneously. This limitation leads to errors, misunderstandings, and incomplete knowledge, which can result in various forms of suffering and confusion.

Physical evil, on the other hand, refers to the presence of suffering, pain, and misfortune in the world. It encompasses natural disasters, diseases, accidents, and any other forms of harm that befall sentient beings. Physical evil is often perceived as a more direct challenge to the benevolence of God, as it involves the experience of suffering and distress by living beings.

He also attributes moral evil to the freedom of human choice (free will).

#### Criticisms:

This argument faces criticism for being logically challenging to grasp and potentially minimizing the severity of real-world suffering. Some argue it doesn't adequately address the problem of evil and can appear insensitive to individual pain.

Voltaire's "Candide, or Optimism" is a 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.

**I shall read extract from beginning of Candide ... Q\_040**

## Free Will

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!

#### Leibniz's Solution:

He employs the concept of compatibilism. 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).

I personally fail to see how free will can be reconciled with the monadic determinism of Leibniz. What are your views?

**FINIS**