René Descartes (1596 – 1650)

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René Descartes was a French philosopher, mathematician, and writer who spent most of his adult life in the Dutch Republic. He has been dubbed the 'Father of Modern Philosophy', and much subsequent Western philosophy is a response to his writings, which are studied closely to this day. In particular, his Meditations on First Philosophy continues to be a standard text at most university philosophy departments. Descartes' influence in mathematics is equally apparent; the Cartesian coordinate system - allowing algebraic equations to be expressed as geometric shapes in a two-dimensional coordinate system - was named after him. He is credited as

the father of analytical geometry, the bridge between algebra and geometry, crucial to the discovery of infinitesimal calculus and analysis. Descartes was also one of the key figures in the Scientific Revolution.

Descartes frequently sets his views apart from those of his predecessors. In the opening section of the Passions of the Soul, a treatise on the Early Modern version of what are now commonly called emotions, Descartes goes so far as to assert that he will write on this topic "as if no one had written on these matters before". Many elements of his philosophy have precedents in late Aristotelianism, the revived Stoicism of the 16th century, or in earlier philosophers like St. Augustine. In his natural philosophy, he differs from the schools on two major points: First, he rejects the analysis of corporeal substance into matter and form; second, he rejects any appeal to ends -divine or natural- in explaining natural phenomena. In his theology, he insists on the absolute freedom of God's act of creation.

Descartes was a major figure in 17th-century continental rationalism, later advocated by Baruch Spinoza and Gottfried Leibniz, and opposed by the empiricist school of thought consisting of Hobbes, Locke, Berkeley, Jean-Jacques Rousseau, and Hume. Leibniz, Spinoza and Descartes were all well versed in mathematics as well as philosophy, and Descartes and Leibniz contributed greatly to science as well.

He is perhaps best known for the philosophical statement "Cogito ergo sum" (French: Je pense, donc je suis; English: I think, therefore I am), found in part IV of Discourse on the Method (1637 - written in French but with inclusion of "Cogito ergo sum") and ß7 of part I of Principles of Philosophy (1644 - written in Latin).

Biography:
Graduation registry for Descartes at the Collège Royal Henry-Le-Grand, La Flèche, 1616

Descartes was born in La Haye en Touraine (now Descartes), Indre-et-Loire, France. When he was one year old, his mother Jeanne Brochard died. His father Joachim was a member in the provincial parliament. At the age of eight, he entered the Jesuit Collège Royal Henry-Le-Grand at La Flèche. After graduation in December 1616, he studied at the University of Poitiers, earning a Baccalauréat and Licence in law, in accordance with his father's wishes that he should become a lawyer.

"I entirely abandoned the study of letters. Resolving to seek no knowledge other than that of which could be found in myself or else in the great book of the world, I spent the rest of my youth traveling, visiting courts and armies, mixing with people of diverse temperaments and ranks, gathering various experiences, testing myself in the situations which fortune offered me, and at all times reflecting upon whatever came my way so as to derive some profit from it." (Descartes, Discourse on the Method).

In 1618, Descartes was engaged in the army of Maurice of Nassau in the Dutch Republic, but as a truce had been established between Holland and Spain, Descartes used his spare time to study mathematics. In this way he became acquainted with Isaac Beeckman, principal of Dordrecht school. Beeckman had proposed a difficult mathematical problem, and to his astonishment, it was the young Descartes who found the solution. Both believed that it was necessary to create a method that thoroughly linked mathematics and physics. While in the service of the Duke Maximilian of Bavaria, Descartes was present at the Battle of the White Mountain outside Prague, in November 1620.

On the night of 10 -11 November 1619, while stationed in Neuburg an der Donau, Germany, Descartes experienced a series of three powerful dreams or visions that he later claimed profoundly influenced his life. He

concluded from these visions that the pursuit of science would prove to be, for him, the pursuit of true wisdom and a central part of his life's work. Descartes also saw very clearly that all truths were linked with one another, so that finding a fundamental truth and proceeding with logic would open the way to all science. This basic truth, Descartes found quite soon: his famous "I think".

In 1622 he returned to France, and during the next few years spent time in Paris and other parts of Europe. It was during a stay in Paris that he composed his first essay on method: Regulae ad Directionem Ingenii (Rules for the Direction of the Mind). He arrived in La Haye in 1623, selling all of his property to invest in bonds, which provided a comfortable income for the rest of his life. Descartes was present at the siege of La Rochelle by Cardinal Richelieu in 1627.

He returned to the Dutch Republic in 1628, where he lived until September 1649. In April 1629 he joined the University of Franeker, living at the Sjaerdemaslot, and the next year, under the name "Poitevin", he enrolled at the Leiden University to study mathematics with Jacob Golius and astronomy with Martin Hortensius. In October 1630 he had a falling-out with Beeckman, whom he accused of plagiarizing some of his ideas. In Amsterdam, he had a relationship with a servant girl, Helena Jans van der Strom, with whom he had a daughter, Francine, who was born in 1635 in Deventer, at which time Descartes taught at the Utrecht University. Francine Descartes died in 1640 in Amersfoort, from Scarlet Fever.

While in the Netherlands he changed his address frequently, living among other places in Dordrecht (1628), Franeker (1629), Amsterdam (1629 -30), Leiden (1630), Amsterdam (1630 -32), Deventer (1632 -34), Amsterdam (1634 -35), Utrecht (1635 -36), Leiden (1636), Egmond (1636 -38), Santpoort (1638 -1640), Leiden (1640 -41), Endegeest (a castle near Oegstgeest) (1641 -43), and finally for an extended time in Egmond-Binnen (1643 -49).

Despite these frequent moves he wrote all his major work during his 20-plus years in the Netherlands, where he managed to revolutionize mathematics and philosophy. In 1633, Galileo was condemned by the Roman Catholic Church, and Descartes abandoned plans to publish Treatise on the World, his work of the previous four years. Nevertheless, in 1637 he published part of this work in three essays: Les Météores (The Meteors), La Dioptrique (Dioptrics) and La Géométrie (Geometry), preceded by an introduction, his famous Discours de la Métode (Discourse on the Method). In it Descartes lays out four rules of thought, meant to ensure that our knowledge rests upon a firm foundation.

Descartes continued to publish works concerning both mathematics and philosophy for the rest of his life. In 1641 he published a metaphysics work, Meditationes de Prima Philosophia (Meditations on First Philosophy), written in Latin and thus addressed to the learned. It was followed, in 1644, by Principia Philosophiae (Principles of Philosophy), a kind of synthesis of the Meditations and the Discourse. In 1643, Cartesian philosophy was condemned at the University of Utrecht, and Descartes began his long correspondence with Princess Elisabeth of Bohemia, devoted mainly to moral and psychological subjects. Connected with this correspondence, in 1649 he published Les Passions de l',me (Passions of the Soul), that he dedicated to the Princess. In 1647, he was awarded a pension by the King of France. Descartes was interviewed by Frans Burman at Egmond-Binnen in 1648.

A French translation of Principia Philosophiae, prepared by Abbot Claude Picot, was published in 1647. This edition Descartes dedicated to Princess Elisabeth of Bohemia. In the preface Descartes praised true philosophy as a means to attain wisdom. He identifies four ordinary sources to reach wisdom, and finally says that there is a

fifth, better and more secure, consisting in the search for first causes.

René Descartes died on 11 February 1650 in Stockholm, Sweden, where he had been invited as a tutor for Queen Christina of Sweden. The cause of death was said to be pneumonia; accustomed to working in bed until noon, he may have suffered damage to his health from Christina's demands for early morning study (the lack of sleep could have severely compromised his immune system). Descartes stayed at the French ambassador Pierre Chanut.

In 1663, the Pope placed his works on the Index of Prohibited Books.

As a Roman Catholic in a Protestant nation, he was interred in a graveyard used mainly for unbaptized infants in Adolf Fredriks kyrka in Stockholm. Later, his remains were taken to France and buried in the Abbey of Saint-Germain-des-Prés in Paris. Although the National Convention in 1792 had planned to transfer his remains to the Panthéon, they are, two centuries later, still resting between two other graves - those of the scholarly monks Jean Mabillon and Bernard de Montfaucon - in a chapel of the abbey. His memorial, erected in the 18th century, remains in the Swedish church.

Mathematical legacy:

One of Descartes' most enduring legacies was his development of Cartesian or analytic geometry, which uses algebra to describe geometry. He "invented the convention of representing unknowns in equations by x, y, and z, and knowns by a, b, and c". He also "pioneered the standard notation" that uses superscripts to show the powers or exponents, for example the 4 used in x4 to indicate squaring of squaring. Descartes' work provided the basis for the calculus developed by Newton and Leibniz, who applied infinitesimal calculus to the tangent line problem, thus permitting the evolution of that branch of modern mathematics.

Descartes' rule of signs is also a commonly used method to determine the number of positive and negative roots of a polynomial.

Descartes discovered an early form of the law of conservation of mechanical momentum (a measure of the motion of an object). He outlined his views on the universe in his Principles of Philosophy.

Descartes also made contributions to the field of optics. He showed by using geometric construction and the law of refraction (also known as Descartes's law or more commonly Snell's law, who discovered it 16 years earlier) that the angular radius of a rainbow is 42 degrees (i.e., the angle subtended at the eye by the edge of the rainbow and the ray passing from the sun through the rainbow's centre is 42°). He also independently discovered the law of reflection, and his essay on optics was the first published mention of this law.

Writings:

1618. Compendium Musicae. A treatise on music theory and the aesthetics of music written for Descartes's early collaborator, Isaac Beeckman.

1626–1628. Regulae ad directionem ingenii (Rules for the Direction of the Mind). Incomplete. First published posthumously in 1684. The best critical edition, which includes an early Dutch translation, is edited by Giovanni Crapulli (The Hague: Martinus Nijhoff, 1966).

1630–1633. Le Monde (The World) and L'Homme (Man). Descartes's first systematic presentation of his natural philosophy. Man was published posthumously in Latin translation in 1662; and The World posthumously in 1664.

1637. Discours de la méthode (Discourse on the Method). An introduction to the Essais, which include the Dioptrique, the Météores and the Géométrie.

1637. La Géométrie (Geometry). Descartes's major work in mathematics. There is an English translation by Michael Mahoney (New York: Dover, 1979).

1641. Meditationes de prima philosophia (Meditations on First Philosophy), also known as Metaphysical Meditations. In Latin; a French translation, probably done without Descartes's supervision, was published in 1647. Includes six Objections and Replies. A second edition, published the following year, included an additional objection and reply, and a Letter to Dinet.

1644. Principia philosophiae (Principles of Philosophy), a Latin textbook at first intended by Descartes to replace the Aristotelian textbooks then used in universities. A French translation, Principes de philosophie by Claude Picot, under the supervision of Descartes, appeared in 1647 with a letter-preface to Princess Elisabeth of Bohemia.

1647. Notae in programma (Comments on a Certain Broadsheet). A reply to Descartes's one-time disciple Henricus Regius.

1647. The Description of the Human Body. Published posthumously.

1648. Responsiones Renati Des Cartes... (Conversation with Burman). Notes on a Q&A session between Descartes and Frans Burman on 16 April 1648. Rediscovered in 1895 and published for the first time in 1896. An annotated bilingual edition (Latin with French translation), edited by Jean-Marie Beyssade, was published in 1981 (Paris: PUF).

1649. Les passions de l'âme (Passions of the Soul). Dedicated to Princess Elisabeth of the Palatinate.

1656. Musicae Compendium (Instruction in Music). Posth. Publ.: Johannes Janssonius jun., Amsterdam

1657. Correspondance. Published by Descartes's literary executor Claude Clerselier. The third edition, in 1667, was the most complete; Clerselier omitted, however, much of the material pertaining to mathematics.

In January 2010, a previously unknown letter from Descartes, dated 27 May 1641, was found by the Dutch philosopher Erik-Jan Bos when browsing through Google. Bos found the letter mentioned in a summary of autographs kept by Haverford College in Haverford, Pennsylvania. The College was unaware that the letter had never been published. This was the third letter by Descartes found in the last 25 years.