A Century of Science Publishing
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Chapter 1
The Birth of Scientific Publishing — Descartes in the Netherlands

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René Descartes (1596–1650) occupies an eminent place at a crucial moment in the history of thought. He played a decisive role when the medieval scholastic tradition was supplanted by the modern scientific mind. His personal contribution to the attainments of science was perhaps modest (most of his theories were soon outdated). But he incarnated a new attitude of the mind towards the world; he formulated a new method; he furnished the essential bases for the future development of knowledge.

His books, which were all written in the Netherlands, are examples of the spectacular birth of scientific publications. However, by a noteworthy paradox, they were directed against the cult of the Book. Descartes, like Galileo, relied on observation, on direct experience, aided by reasoning, at a time when intellectual authority was incarnated by the canonical books, those of Aristotle. The Cartesian moment in the history of thought is marked by a refusal of opinions conveyed by ancient books. It was the moment of the true re-foundation of thought, independent of bookish culture. An anecdote illustrates it well. A gentleman went to visit Descartes at Egmond, in Holland, where the philosopher resided from 1644, and asked him for the books of physics that he used. Descartes declared that he would willingly show them to him: he took his visitor in a courtyard, behind his dwelling, and showed the body of a calf that he was about to dissect.

Official intellectual authority, in the 17th century, continued to belong to the university. But new intellectual centres were formed outside the universities. The latter had played a brilliant role in different cities of Europe from the 13th century onwards. They were international foyers from which ideas were exported. In the 16th century, these universities started to decline. In the 17th century, dynamic thought began to blossom in private circles. During the second half of the century, scientific research flourished both in the Academies (L'Académie des sciences, in France, dates from 1658) and in the periodical press (for example the *Journal des*

Sciences, in 1664, in Paris, and the *Acta eruditorum*, founded by Leibnitz, in 1682, in Leipzig). During Descartes' lifetime, in the first half of the 17th century, new ideas were searching for a means of expression. The years 1620-1650 were of an extraordinary effervescence. They witnessed the appearance of the great works of Bacon, of Galileo and of Descartes, but also, in the philosophy of law and political philosophy, those of Grotius and of Hobbes...

Contemporary with the birth of the publication of scientific books, in which the Netherlands played a major role, there was an intense circulation of ideas by letters that the scientists exchanged among themselves. It is known that Descartes devoted several hours a day and an entire day each week to his correspondence. Those letters that have been kept and handed down to us represent about half his writings. If he spent so much time and lavished so much care on them, it proves that he knew well that they would be shown, transmitted and commented. Father Mersenne (1588-1648), who resided in the Convent of the Annonciade in Paris from 1619 onwards, occupied a central position in this epistolary circulation. Himself author of several large works against atheism and scepticism (in 1623, 1624 and 1625), author of works on music and on acoustics (in 1636 and 1637), translator of Galileo (*the Mechanics* in 1644), he was also a very active correspondent with Constantin Huyghens, Isaak Beeckman, Gassendi, Fermat, Roberval, Pascal, and many others. Questions and replies from different scientists transited through him. He was a sort of catalyst of the intellectual life in Europe of his time. His role could be compared to the present role of the Chief Editor of a scientific journal, extraordinarily active and read by the best minds of the moment. Descartes, who voluntarily lived far from Paris, kept up a considerable correspondence with Mersenne and was thus in indirect communication with the readers, admirers and adversaries of his works.

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Descartes spent more than half of his adult life in the Netherlands. His first visit was during his youth when he spent fifteen months there. When he went back, during his adulthood, he had not as yet published anything and had not even started his researches, as he himself explained, on the foundation of any philosophy more certain than what was taught currently at that time. During the twenty years that he was to spend in this country he was to construct all his work. Why did he chose to live there? Chance and accident cannot explain such a long stay, especially for a man who was so keen to lead a life governed by the precepts of reason. Why were the Netherlands so convenient for him? Apart from the motives that he mentioned himself, one wonders if there was not some secret affinity that linked Cartesian thought and the Netherlands in the first half of the seventeenth century.

Descartes went there for the first time in 1618. He was twenty-two years old. He had studied at the Jesuit College of la Flèche, an experience summed up in the *Discours de la Méthode*, followed by a year of Law in Poitiers. In that year 1618, his father bought an office of Counsellor to the Parliament of Rennes for Pierre Descartes, René's elder brother. He doubtless intended his second son to follow a career in the legal profession. But Descartes felt the urge to travel. What better means to escape from the sedentary life than to choose a career in the army. The Netherlands offered, at that time, the best training in the military profession. They were not, however, at war, the Twelve Years' Truce having been signed with Spain in 1609. But the prestige of Maurits of Nassau continued to exercise its attraction and two French regiments remained in the service of the States. It is thus plausible that Descartes, joining the troops of Maurits of Nassau, followed the normal destiny of a younger son of a good family in becoming a soldier in an army already legendary. One cannot, however, say that he precipitated himself towards an opportunity of military glory. He could not ignore that the Truce had been signed nine years earlier. It was thus a garrison life that awaited Descartes.

Mere volunteer in a reserve army, Descartes received no pay. He was free to leave when he wanted. No obligation was imposed on him. He was idle. The key event of this stay at Breda was his meeting with Isaac Beeckman. The latter was thirty at that time. Not only was he a physician but he was also curious about mathematics, and physics. He had been to France on September 6, 1618, to be awarded his degree of Doctor of Medicine at the University of Caen. It is from his diary that we know that his first meeting with Descartes took place on November 10, 1618. He became, for Descartes, like an elder brother, a study companion for the young Frenchman isolated among military men. A common cast of mind incited them to study mathematics in view of their application to physics. Beeckman's diary includes the account of their discussions on falling bodies, on hydrostatics, on algebra. Descartes said that he was indebted to his friend for having escaped from the torpor that threatened him. On December 31, 1618, he gave Beeckman, as a New Year's gift, his first text, the *Compendium musicae* (Summary of Music), a mathematical theory of consonances. He gave it to him as a souvenir of their friendship, asking him never to show it to anybody, refusing that the world at large should judge a work "composed rapidly, only for you, amidst the ignorance of soldiers, by an idle man, submitted to a type of life completely different from his thoughts". From January 2, 1619, Beeckman was no longer at Breda — he was more often resident at Middelburg. Descartes wrote letters to his friend, letters that the latter duly transcribed into his diary: we thus learn that Descartes spent his time studying painting, military architecture and, above all, Dutch. "You will soon see

that I have made progress in your language, for I plan to be in Middelburg, God willing, for the coming Spring".

The letters to Beeckman should also give us some idea as to why Descartes decided to leave the Netherlands so soon. On April 29, 1619, in fact, fifteen months after his arrival at Breda, he left Amsterdam for Denmark, by ship, whence he intended to go to Germany. But his intentions remain obscure. He said that he wanted to take part in the war that was being prepared in Germany, while organising a long detour and not giving up his scientific work. He seemed impatient to intervene in the battles of which he had been deprived by the Truce of Twelve Years. He was tired of the inactivity of Breda. At the same time he showed himself by no means in a hurry: "If I stop anywhere, which I hope, I promise you to undertake immediately the writing of my Mechanics and of my Geometry and to extol you as the inspirer and the spiritual father of my studies". His reason for leaving the Netherlands was perhaps simply that which had brought him there: the desire to travel, or the intention to study in the 'great book of the world', as he was to state later in the *Discours de la méthode*: "in deciding to search for no other science than that which could be found within myself, or rather in the great book of the world, I spent the rest of my youth in travelling, in seeing courts and armies, associating with people of diverse humours and conditions, collecting different experiences, proving myself in the encounters that fortune proposed me, and everywhere reflecting upon the things that presented themselves, so that I could benefit somewhat from them".

Descartes thus went to Germany. We know that he was in Frankfurt on September 9, 1619, for the coronation of Ferdinand II as Holy Roman Emperor, that he then spent the winter in solitary meditation, closed up in a room, probably in the region of Ulm. It was there that he said he discovered "the bases of an admirable science". He noted the date of this revelation: November 10, 1619. It is very likely that the admirable discovery, mentioned in his notes as a miraculous illumination, was that of the possible unity of sciences following a general mathematical method. It was the flowering of ideas that had ripened on contact with Beeckman.

The following years, Descartes continued his travels wandering "here and there in the world, trying to be a spectator rather than an actor". He went to Italy and found the heat in Rome unbearable. Then he stayed in Poitou, in Brittany and, for a longer period of time, in Paris. He associated himself with a group of scholars who were gathered round Father Mersenne. He worked on his research on optics. His reputation as a mathematician grew. He was famous for his method and for the perspectives that it opened in favour of a study of Physics renewed by

Mathematics. His conceptions intrigued. One could guess their importance, from the assurance with which he refuted the ancient ideas and the pseudo-innovators. But he still had not published anything. His friends urged him to do so. They considered him as the champion of a new philosophy, capable of combining Christian truth and scientific discoveries. The old scholasticism, in fact, was incompatible with the science that was being developed. This new science was thus considered as a possible encouragement of atheism. The time had come for Descartes to establish his system clearly and to articulate together his metaphysics and his physics. In 1628, he had his back to the wall. He had to put his ideas into form so as to present them to the public. He looked for the most convenient place to work in peace. With full knowledge of the facts, because he had already stayed there, he chose the Netherlands. He was to stay there twenty years.

The first person that he wanted to see when he landed in Holland, arriving probably from Calais, was Beeckman. They met at Dordrecht on October 8, 1628. Beeckman's journal recounts their conversation, during which Descartes related his progress: he had already elaborated an algebra applied to geometry, and this analytical geometry was in the process of constituting the instrument of all human knowledge. The esteem between the two men seemed mutual.

Descartes certainly had other conversations with Beeckman in the following weeks. We know, however, that in April 1629 he enrolled as a student at the University of Franeker. The region of Friesland offered him the retreat that he was looking for, for a peaceful and studious life, as well as the advantages of an intellectual centre. A high school, "Hoogeschool", had been founded in Franeker in 1585. Descartes was able to attend the courses of Adrian Metius, who was the author of an *Arithmeticae et Geometricae Pratica*. He lodged opposite the University, in the Castle of the Sjaerdema, a great catholic Friesian family.

But, as from October, 1629, Descartes installed himself in Amsterdam. At the request of doctor Wassenaer and of Henricus Renerius, with whom he had been in contact, he examined the phenomenon of parhelions (mock suns, comparable to haloes); he interested himself in the rainbow, then in all the phenomena which he was to describe in his work on Meteors. His correspondence with Mersenne shows that he unceasingly widened the field of his investigations. From Optics he passed on to Acoustics, Ballistics, Anatomy. The title of the work that he then was preparing bears witness to his scientific ambition: it was to be *Le Monde* (The World), no less.

From 1629 to 1635 Descartes lived in Amsterdam. His stay was nonetheless interruped several times. On June 27, 1630, he enrolled at the University of Leiden and the *Album studiosorum* mentioned his residence in that town. He wanted to

follow the courses of the mathematician Jacob Golius, in company with the astronomer Martin Hortensius and of Renerius. He also lived in Deventer, in 1632 and 1633. His friend Renerius was professor of philosophy there, at the "Illustere School"; and it was there that Descartes, far from the outside world, hoped to finish his treatise *Le Monde*. But he always came back to Amsterdam.

It was during his stay at Leiden that the unpleasant episode of his quarrel with Beeckman took place. Father Mersenne came to visit Descartes. He was already in correspondence with Beeckman, who asserted that he had been the early master of Descartes. When they met, Beeckman showed Mersenne his Journal and claimed the merit of the discoveries that Descartes considered as his own. Descartes, informed of this by Mersenne, gave vent to his anger in imprecations against his former friend and wrote him wounding letters. The violence of the rupture was in proportion to the intimacy that they had known.

At Deventer, while he completed the writing of the Physics (the treatise of *Le Monde*), Descartes learned that the Inquisitor in Florence had just seized the recent work by Galileo, *Dialogues on the Two Principal Systems of the world, that of Ptolemy and that of Copernicus*. (Dialogo intorno le due massimi sistemi del Mondo, Tolemaico e Copernicano). The thesis that had been condemned, that of the movement of earth round the sun, occupied an essential place in Descartes' own system; it could not be omitted. However, Descartes refused to publish a work "where there would be the least word that might be disapproved of by the Church". He therefore shelved his manuscript. Was it a gesture of prudence? He was however in no danger of being troubled. He was living in a protestant country, and the Dutch were then considering offering a refuge to Galileo, whose *Dialogo* was to be published, in latin, by the Elzevier brothers in 1635.

In April 1635, Descartes was in Utrecht, close to Renerius, who was there as professor at the "Illustere School" where he taught the Cartesian theses. The philosopher lived in a pavilion that opened on to the Maliebaan, outside the fortified walls. It was there that he wrote the Dioptrics, one of the three essays (with the Meteors and the Geometry), which were intended to follow the *Discours de la Méthode*, as applications of his method. It was probably there that he wrote the *Discours de la Méthode* itself. In the Spring of 1636, he went to Leiden where he was to stay for a year to oversee the printing of his book. This printing, in fact, necessitated particular care because of the woodcuts (by Frans Schooten the Younger) illustrating the three essays. The work was to be published by the Elzevier brothers. But Descartes doubtless judged the financial conditions unacceptable and he looked for another publisher. He thought of having his book published in France. But what kept him back was the fact that the preparation of the wood blocks had

to be effectuated in his presence; it was thus more convenient to call upon a publisher established in Holland. We know that he wanted "the whole text to be printed with very fine characters and on very fine paper" and that at least two hundred copies should be kept for his personal use for he "desired to distibute some of them to a quantity of people". In 1637 the *Discours de la méthode* was published by Jean Maire at Leiden, without mentioning the name of the author.

Descartes took advantage of his stay in Leiden to attend the anatomy courses of Professor Van Valckenburg. He did not live in isolation. He frequented Constantin Huygens, Counsellor of the Stathouder, who had been his friend for several years and with whom he kept up assiduous conversations and correspondence. He knew and respected Pieter Corneliszoon Hooft. However, tranquillity remained his main concern. As soon as his presence at Leiden was no longer necessary, he retired to Egmond-Binnen, in the region of Alkmaar, then to Santpoort, near Haarlem.

This period was, at first happy. He had his daughter Fransintge brought to him as well as the discreet Helena Jans, mother of the child. His letters are imbued with serenity and are often cheerful. He reckoned on developing his medical research: the lengthening of human life seemed to be the goal of all science. He only received the visits that he desired: for example those of two catholic priests of Haarlem, Bannius and Blomaert, or those of his disciples, Renerius and Regius. Renerius died in 1639. He had practised the method of Descartes without, for all that, adopting the metaphysics. On the contrary, Regius, also a professor at the "Illustere School" of Utrecht, declared himself more completely faithful to Cartesian philosophy. Descartes certainly expected the University of Utrecht (the "Illustere School" had become University in 1636) to be a favourable ground for the propagation of his doctrine, thinking that it would come up against less resistance there than at the old Sorbonne. Nonetheless, it was there that the most violent hostility was expressed: that of Gisbert Voet (Voetius), a Calvinist minister and professor of theology. Voetius undertook to bar the route for the new doctrine which was threatening to invade the University. This violent conflict affected Descartes profoundly. He considered himself slandered, unjustly accused of atheism. He witnessed the disappearance of the possibility of a diffusion of his ideas in a milieu that he had thought, for a moment, to be the most receptive. He had written the *Discours de la méthode* in French, because he hoped to reach a wider public than that which could read in Latin. In 1640, on the contrary, he wrote his *Metaphysical Meditations* (Meditationes de prima philosophia...) in Latin: it was a question, this time, of convincing the world of scientists. He was to prepare, shortly afterwards, the *Principles of Philosophy* (Principia philosophiae) by dividing his treatise into

articles to make it easier to use in teaching. But the learned theologians of whom he was mainly thinking did not appear in the least disposed to listen to him.

The *Metaphysical Meditations*, followed by objections collected by Mersenne from different theologians and philosophers to whom he had shown the manuscript, followed also by the replies from the author, were published in August, 1641, in Paris, by Michel Soly. A second edition was published, in May 1642, by Louis Elzevier, in Amsterdam, "more correct than that of Paris" according to Descartes, who had supervised the printing himself. As for the *Principles of Philosophy* (Principia philosophae), they appeared in 1644, as a first edition, printed by Louis Elzevier, in Amsterdam. While he was working on these two major works, Descartes lived in Leiden, then nearby at Oegstgeest, from March 1641 to April 1643, in the little castle of Endegeest which he had rented thanks to an inheritance from his father. The proximity to Leiden allowed Descartes to keep up frequent relations with the university professors. His philosophy found defenders there: Heydanus and Bannius. But there, as well as in Utrecht, he was also to meet determined opposition.

In 1643, Descartes left this ideal residence of Endegeest for a short stay at Egmond-op-den-Hoef. Then he travelled in France for four months in 1644, his first visit after fifteen years in the Netherlands. On his return, he settled in a country house at Egmond-Binnen, where he lived until his final departure from the Netherlands in September 1649.

He enjoyed talking to the peasants. He used his influence with Constantin Huyghens in favour of one of them who had been dragged into committing a murder. It seems that he chose his friends without considering their social rank, as one can see in his relationship with Dirk Rembrandtz, a boatman or a cobbler of the neighbourhood, and who became, with his help, a notable astronomer. If he kept up an important correspondence with Princess Elizabeth (daughter of the Elector of the Palatinate Frederick, ephemeral King of Bohemia, who had taken refuge, with his family, in the Netherlands), it was not that he was particularly fascinated by her rank of princess, but rather because of the intellectual vigour of the young lady and the acuteness of her questions. Also, doubtless because she was young and showed interest in his research, representing a generation on which he founded his hopes. She was thus an ideal disciple. This hope of exercising a durable influence was precious at a time when his differences with the theologians barred his way in the universities.

Descartes made a second trip to France in June 1647. When he arrived in Paris, the great question debated in scientific circles was that of the Vacuum in nature. The position of Descartes, set forth in his *Principles of Philosophy*, was that

a vacuum cannot exist. His thesis seemed to be contradicted by the experiments that Pascal had just carried out; but he did not seem to be shaken in his opinion. In Torricelli's tube, according to him, a "subtle matter" passing through the pores of the glass, replaced the air. One should not consider that Descartes felt, in Paris, in the painful situation of an ageing physicist who sees his theories surpassed. He met Pascal and planned new experiments with him. He probably also met Hobbes, and renewed his acquaintance with Gassendi. His glory was evident to all. It was moreover towards the end of his stay that he received from "the King by the intermediary of Cardinal Mazarin, without any solicitation other than that of his friends, and by letters patent of September 6, 1647, a pension of three thousand livres, in consideration of his great merits and the utility of his philosophy and of his research based on long study brought to the human race" (Adrien Baillet, his first biographer, 1691). All, in consequence, should have kept him in France. However, he was to return to Holland. The enigma of his attachment to the Netherlands is here posed in a striking way. He was honoured in Paris while in Holland he experienced, above all troubles. Why did he go back?

On his return to Egmond, Descartes spent his time studying astronomy with the help of a telescope that he had, and above all his work of dissection, for the fifth and sixth parts of his *Principles*. He replied scrupulously, as he had always done, to the written objections that he received. He allowed himself to be questioned viva voce by a young man of twenty, Frans Burman, who came to visit him on April 16, 1648, and whom he invited for dinner. Their long conversation, which lasted several hours, transcribed by the young man, bore on the main philosophical works and corresponded to what we would today call an "interview". This was not the only example of the attention given to the improvement of young people, he also followed the progress of the sons of his friend Huygens, closely enough to foresee that Christian would become an exceptional scholar.

However, the pension announced had not yet been paid and Descartes found himself requested, on behalf of the king, to travel once more to France to receive it. This third trip took place from early May to September, 1648. A badly chosen period. It was the beginning of the Fronde uprising. On August 26, 1648, barricades were built in Paris. The day after, with all possible speed, Descartes left for Holland. He was never to come back to France.

During his last year in Holland Descartes worked on the third part of his *Passions of the Soul* (Passiones Animae), the treatise on psychology undertaken in parallel with the moral reflection that occupied an essential part of his correspondence with Princess Elizabeth. It was at that moment that a fine opportunity to favour the propagation of his doctrine arose. France was busy with political trou-

bles, the Netherlands in the throes of theological disputes, whilst the Court of Sweden was perhaps in a position to welcome his ideas in all their developments. Queen Christina was trying, at that time, to attract to Stockholm scholars and artists of all nationalities. She was particularly interested in the Netherlands. Many Dutch engineers and architects were already in Sweden and numerous Swedish students attended courses in Dutch universities. One of Descartes' friends, Pierre Chanut, had been appointed chargé d'affaires of the French government to the Queen of Sweden. He understandably mentioned the philospher. Descartes was flattered by these testimonies of interest in his work, but when, in February 1649, he received an invitation to go to Sweden, he was embarrassed rather than pleased. The idea of such a long voyage worried him. The Queen wanted to have him near her so that she might familiarise herself with his philosophy. Could she not read his books, followed, if necessary by a long correspondence that he was ready to carry out? He put off action deliberately, but finally decided to go to Stockholm for a stay that he thought would last no longer than a few months. He left Egmond on September the first, 1649. In Amsterdam, having left the manuscript of the *Passiones Animae* with Louis Elzevier, he embarked for Stockholm. He was never to come back. He immediately missed the solitude of Egmond. He hated life at court and felt that he was wasting his time. The Queen was often absent from Stockholm for long periods and when she decided to converse with him about his doctrine, she asked him to come to the palace at five o'clock in the morning, three times a week, in the heart of the Scandinavian winter. Stricken with pneumonia, he died on February 11, 1650, at the age of fifty-three.

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Descartes always felt profoundly attached to the Netherlands, among other reasons, because this country always remained for him the place where he experienced, during his youth, the first true intellectual stimulation. It was Isaak Beeckman who was the inspirer of the studies which were to occupy him for a long time: "You alone, in truth, awoke me from my idleness". The souvenir that Descartes was to keep of their meeting can certainly explain, for a large part, the choice that he was to make in 1628 to settle in the Netherlands — the place where he was to orchestrate his work. The country where he had known friendship, the enthusiasm of his first discoveries, and the revelation of his vocation.

When Descartes, later, convinced himself that he had discovered the principles that were to make possible an extraordinary development of science, he saw in the Netherlands the most propitious place to continue his studies and to publish them. Firstly because it was there that he found liberty and security: the maintenance of public order guaranteed his daily tranquillity. At the same time this coun-

try was rich with personalities open to the new scientific spirit, to whom Descartes was able to put his ideas to the test.

The Netherlands, on the other hand, offered precious possibilities of publication. One should not go so far as to state that it was the only country where he could have his works printed. These were also publishable — and indeed were published — in Paris. The publication in the Netherlands of French works was only to become important after 1680, with the growth of anticalvinism in France and the increase in non-conformist writings. Only then were French works printed in Holland that could not be printed in France. Let us say rather that during the time of Descartes, Leiden and Amsterdam were towns where it was possible to find publishers capable of meeting the requirements of the most exacting authors (and we have seen how demanding Descartes was, concerning the quality of the paper, of the typography, of the illustrations). It was only necessary that the authors should be able to negotiate and be ready to assume the financial investment.

As for the question of the diffusion of the new ideas, the biography of Descartes carries several pieces of information. Firstly, let us repeat, the circulation of letters was, at the time, an essential means for the communication of knowledge (letters formed about half of the writings of our author). Publication in book form, however, was a moment of paramount importance in the expression of a thought, a moment on which it was important to lavish all possible care. Secondly, this transition to the printed word was not without danger, even in the Netherlands. Descartes renounced the publication of his treatise *Le Monde* after the condemnation in Florence of the *Dialogo* of Galileo, and the works that he had published brought about long discussions and troubles with the theologians of Utrecht and Leiden. Thirdly, the appearance of a book, even if it escaped controversy, was not conceived as an end in itself. Furthermore, it was necessary for the ideas it contained to reach the greatest possible number of different minds. Hence the hope that Descartes placed in possible "relays": the universities (this hope was soon disappointed), or certain young people (Princess Elizabeth, Frans Burman...), or finally, Queen Christina of Sweden. Fourthly, a clear contradiction appears, with Descartes, between the desire to see his ideas widely diffused and the desire to keep them as his property. The painful rupture with Beeckman shows clearly that Descartes was torn between the sincere desire to serve truth and a susceptibility of an author who wanted his name to remain associated with his discoveries.

Descartes, incontestably, has left his name to posterity (he has even left an adjective: "Cartesian"). However, even though he was singular, this thinker was highly representative of a whole world: that of the years 1620–1650 in Europe. This was the period when the continent was bathed in blood by the Thirty Years' War.

Paradoxically, the date of 1648, with the signature of the Treaty of Munster, is perhaps the time when Europe became conscious of herself. At the same time, in an apparently independent way, another Europe existed: that of the philosophers and scientists, who remained in close contact with each other regardless of frontiers. Mersenne, Huyghens, Torricelli, Pascal, Hobbes, Gassendi, Fermat... were all intellectually cosmopolitan, like Descartes. This Europe was in the process of conceiving a world based on the principle of causality, and no longer on the finalism of Aristotle. Nature in its immensity was not animated by secret correspondences and symbols: it was a great machinery, delivered to man, who, from then on has power over her. The world ceased to be an ensemble of signs to be deciphered according to the teaching in The Book; it became an ensemble of objects, analysable experimentally, in view of transmissible knowledge by books. The modern era was born.