Circumstances of Composition

The project began when Descartes took an interest in meteorology in 1629. This interest was stimulated by reports of spectacular perhelia (false suns) in Rome. Descartes then generalized his meteorological investigations so as to “explain all natural phenomena, that is, the whole of physics.” Moreover, he thought he could give his explanations in a way that they would “satisfy everyone, and others will not be able to deny them” (Letter to Mersenne, November 13, 1629). Thirteen months later, he wrote to Mersenne that he wanted “to find a basis on which to give a true account without doing violence to anyone’s imagination or shocking received opinion.”

Descartes had promised Mersenne that he would complete it in three years. He stated that he would rather investigate the world than write about it, and that he was writing only to head off criticism. “I swear that if I had not already told people that I planned to do so, with the result that they would say that I had not been able to carry out my plan, I would never undertake the task” (Letter to Mersenne, April 15, 1630). This project he referred to as World. He notes that his work had been held up for six months, during which he investigated “the nature of colors and light.” The work appears to consist of several connected pieces, including one posthumously published as The World, or Treatise on Light. (This is what is entitled The World in our text.) He refers to another sub-project, the Optics, which “will contain what amounts to a complete physics” and “will be more or less an abstract of [The World].” The letter contains a remarkable, false, prediction: after the publication of The World, “I do not think I will ever bring myself to have anything else printed, at least in my lifetime. I am too much in love with the fable of my World to give it up if God lets me live long enough to finish it; but I cannot answer for the future” (Letter to Mersenne, November 25, 1630).

Three years later, he writes again to Mersenne. He was preparing to send a copy of the book to Mersenne, when he came upon the news that “Galileo had been convicted and fined.” He says that this so astonished him “that I almost decided to burn all my papers or at least to let no one see them.” The reason is that the crime of Galileo—the assertion that the earth moves—“is so closely interwoven in every part of my treatise that I could not remove it without rendering the whole work defective.” Descartes asserts that he does not want to publish anything that the Catholic Church disapproves of. Still, he will honor his promise to send a copy to Mersenne—in a year “so that I can revise and polish it.” He concludes the letter by saying that the verdict of the Cardinals of the Inquisition has not been endorsed by the Pope or any church council, “So in time my World may yet see the light of day.”

The standard view of the matter is that Descartes feared the consequences of publication. For example, the article on Descartes’s life and works in the Stanford Encyclopedia of Philosophy (by Kurt Smith) states, “In a letter to Mersenne, dated November 1633, Descartes expresses his fear that were he to publish The World, the same fate that befell Galileo would befall him. And, this is something that he understandably wanted to avoid.” The quotations above suggest a different reading, that is, that
Descartes recognized that the new opposition of elements of the Catholic Church might dash his plans to convince everybody of the truth of his views. Descartes notes in the letter cited in the encyclopedia article that “if my views cannot be approved of without controversy, I have no desire ever to publish them.”

In the summer of 1635, he notes that “the time is not ripe” for the publication of *The World*.

By 1637, he writes to Huygens that he has “laid aside all work on my *World*, so that I shall not be tempted to put the finishing touches to it.” In March of 1638, he writes to Huygens that his views found favor with a Jesuit, which he hoped would spread to the whole society. “But for all that, I cannot yet see any hope that I shall be able to give my *World* to the world in the near future.” Again to Huygens in 1639, he states that he will be guided by circumstances as to whether to publish the book. He has not sworn not to publish it during his lifetime, nor has he sworn to have it published after his death. He writes, “We leave fruit on the tree long enough for it to ripen, though we are well aware that wind and hail and other hazards may spoil it in the mean time. Similarly, I think that my *World* is the sort of fruit that cannot be picked too late, and should be left to ripen on the tree.” He did not go to the trouble of writing it without intending to publish it, and so “I would not fail to publish it if there should ever be some advantage to me.”

The final mention of the book in the correspondence is in a letter to Huygens of January, 1642. Descartes has received the *Seventh Objections* to the *Meditations* by Bourdin, and is preparing a devastating reply to them. “Perhaps these scholastic wars will result in my *World* being brought into the world. It would be out already, I think, were it not that I want to teach it to speak Latin first. I shall call it *Summa Philosophiae* to make it more welcome to the scholastics, who are now persecuting it and trying to smother it before its birth. The [Calvinist] ministers [in the Netherlands] are as hostile as the Jesuits.”

**The Building Blocks of Nature**

*The World* represents a radical departure from the physics of Aristotle. Aside from the motion of the earth, it described the material making up the physical universe in a modern way. For Aristotle, there are qualitative principles of change, such as heat and cold, wetness and dryness. Aristotle had postulated four elements on that basis: earth is cold and dry, water is cold and wet, air is hot and wet, and fire is hot and dry (*On Generation and Corruption*, Book II). Descartes holds that all matter has the same character; the difference between the three “elements” he describes is only in size. (Chapter 5)

Moreover, Descartes attempted to reduce heat to the rapid motion of particles of fire. Fire itself is nothing more than very small particles moving very rapidly. This view is based on an extrapolation from the fact that one can see some small particles moving in fire.

Descartes notes that some people (obviously he has the Aristotelians in mind) would say that there is more to fire, i.e., “the form of fire, the quality of heat.” This he dismisses for two reasons. First, such things do not bring about the motion we observe in fire. Secondly, the motion of particles in fire is
sufficient by itself to explain the changes brought about by fire.

He notes that something has to get the process started. There must be some “power” which is responsible for the separation of the fine particles making up the fire itself from the coarse particles making up what is burning (say, a log). This motion is best explained by appeal to some other motion. “It is not possible to conceive how one body could move another except through its own movement.” This is a fundamental principle of mechanistic explanation.

One thing that Descartes had to account for was the upward motion of fire. Aristotle had explained this by claiming that fire (like all the elements) has a natural tendency to move to its “natural place” (Physics, Book IV, Chapter 1, On the Heavens, Book IV, Chapter 3). The natural place of fire is above the air, so since all fires observed through the seventeenth century took place below the air, all fires have risen. Descartes’s explanation is that there is less overall resistance in the upward path than there is in the downward or sideways path. Thus, the particles above the fire must be more movable, in some way, than those in other directions. One must ask how Descartes could demonstrate this. It seems that he only postulates it to make the upward motion of fire compatible with his general theory of matter.

Like Aristotle (Physics, Book IV, Chapters 6-9), Descartes believed that there is no empty space or void. He attributed belief in the void to a faulty inference from sense-perception: if we perceive nothing in a place, then there is nothing in that place (The World, Chapter 4). Although he argued vigorously against the existence of the void, he notes that his arguments do not prove that a void does not exist. “My treatise would, I fear, become too long if I undertook to explain the matter at length . . .” (The World, Chapter 4).

One important point in the explanation of the motion of fire is that Descartes strictly separates the cause of motion from the cause of the direction of motion. “The power to move and the power that determines in what direction the motion must take place are completely different things, and can exist one without the other” (The World, Chapter 2). In the Optics (Discourse 2), Descartes attributed this “power that determines in what direction the motion must take place” to the medium in which the motion occurs. His paradigm case of this is reflection and refraction of light (which he also takes to be particulate in nature). Some objects turn the light back at a right angle, while others let light pass through. Different media refract light at different angles. The separation of the power to move and the power that determines direction would lead to problems for Descartes’s mature physics in the Principles of Philosophy.

Another difference between Descartes and Aristotle has to do with our perception of heat, light, and other things that are explained by Descartes in terms of the motion of small particles. For Aristotle, we perceive them just as they are (On the Soul, Book II, Chapter 5ff). For Descartes (as well as for Galileo and the ancient atomists), what we perceive is not the motion of small particles. In Chapter 1, Descartes advances four reasons to think the two are different. One such reason is that we do not detect the moving particles themselves. Another is that some of our sensations, such as tickles and pains, do not represent anything resembling them in objects we touch.

In Chapter 3, Descartes claims, based on observations, that particles are always moving. He uses this
to account for the difference between hard matter and fluid matter. In the former case, the moving particles are at rest relative to one another (they move together) and so are hard to separate. In the latter case, they are moving with respect to one another and thus are easy to separate. More generally, the properties of matter are to be accounted for entirely by the motions of their small parts.

Chapter 5 develops an account of the small particles that make up all material things. The key explanatory properties of these particles are “motion, size, shape and arrangement.” He postulates three kinds of particles, which he treats as elements. The smaller they are, the faster they move. This scheme will be developed more fully in other works on physics.

The Fable

The last chapters reprinted in our text concern the “fable” with which Descartes declared he was in love. He describes an imaginary world, far out in space, which begins in chaos and ends in order. He attributes the order of the world to the operations of laws of nature, which govern all the behavior of the bodies making up the world, with no supernatural intervention. The world can be imagined, and so God could create it. (Note that Descartes stated that his meditations of God and himself were the source of his discovery of how the physical world works.)

A key feature of the world is that it consists of bodies of multiple sizes and shapes. Thus, the world at its beginning is not what Aristotle called “prime matter,” matter without any form whatsoever. Descartes notes that prime matter lacks quantity and extension, while the bodies in the world have them. Since the world is imaginary, he is free to populate it with whatever he chooses. He defines “extension” here as the property of matter of occupying space, and extension is not an “accident” of matter, as with Aristotle, but “its true form and essence.” This is a metaphysical position Descartes held throughout his later writings.

A key property Descartes builds into his world is that God preserves it in the same way in which God created it. He appeals to “preservation” because he can then say that God is not actively involved in bringing about change in the world. The reason God would preserve the world as created is that God himself is immutable (unchangeable) and always acts in the same way.

Laws of Motion

Given this premise, Descartes is able to account for change, which is explained on the basis of motion. He regards motion and rest as real properties of bodies, unlike the scholastics, who regard rest as simply a lack (“privation”) of motion. The preservation of the world as created is then made the basis of the laws of motion. Descartes enunciates a law of inertia, according to which bodies continue in the same state with respect to size, shape, motion, and rest, except when changed by collision with other bodies. This departs from the common view, according to which only size and shape are preserved unless the body is affected. Aristotle had held that in the case of motion that is not self-initiated, there must be something in contact with the body which is responsible for the body’s continuing to move (Physics, Book VII). It was very difficult for Aristotelian physicists to explain what keeps heavy bodies that are projected upward moving after they lose contact with the body that projected them (my
hand, for example, if I throw a ball upward). Of course, Descartes must explain why the thrown body comes to the halt. This is due to the resistance of the air (one hears the whizzing sound as a golf ball goes by). But this explanation is not complete, as Descartes must explain how it is that the motion of a body is changed by contact with another body.

So he formulates a second law: that an equal amount of motion is lost by a pushing body and given to the body pushed. When a projectile collides with particles of air, the body loses as much motion as the air it pushes forward gains.

Descartes considers an alternative explanation of change of motion, which seems at first glance to be plausible. The claim is that loss of motion of a body varies with the degree of resistance of the body with which the body collides. We might think of resistance in terms of the hardness of the body: a softer body yields more than does a harder one. In that case, a body colliding with a softer body should lose less motion than a body colliding with a harder one. But this is contradicted by experience. Indeed, collision with a hard body often results in rebound, in which little motion at all is lost. Descartes can explain this observation on the grounds that the important thing is how much the resistance is overcome. In the rebound case, the body which is hit may not move much, in which case the striking body loses little motion as well, bouncing off in the other direction. In the case of a soft body being struck, the body changes shape, and hence its parts are moving, and the resistance is overcome.

In commenting on the first two laws, Descartes says that he would build them into his imaginary world even if they contradicted observation, simply because the reason for them (God’s immutability) is so powerful. “For what more firm and solid foundation could one find for establishing a truth, even if one wished to choose it at will, than the very firmness and immutability which is in God?”

While the first two laws concern the existence of motion, the third law concerns its direction, which we have seen Descartes regarded as a separate issue. This law to be based on the same foundation, as the first two: the immutability of God. Bodies have a tendency to move in a straight line, although in most cases their actual path is different. This law agrees with experience, as when a stone leaves a sling. Descartes gives a rather strained justification of this law in terms of the relative simplicity of rectilinear (straight-line) motion versus circular motion. We may pass this over with no loss.

Descartes concludes the chapter by saying that the only further laws needed to explain how the world will move from chaos to order are those “which follow inevitably from the eternal truths on which mathematicians have usually based their most certain and most evident demonstrations.” These rules would have a priori demonstrations, and would apply to any world at all. (This foreshadows a similar distinction in Leibniz between rules governing all worlds and rules local to a world.) Descartes finally notes that he will not be demonstrating everything, but will leave the reader to fill in details of the fable.

The Body of Man

We will not go into much detail regarding the “Treatise on Man,” which appears to have been intended
as a component of *World*.

Descartes uses the technique of fable once again, this time describing a hypothetical man. This man would be composed of body and soul, “as we are.” The plan was to describe the body, the soul, and the relation between them. This plan is not completed in the extant essay.

The body of the hypothetical man is conceived as a machine. Much of the account concerns the way in which this machine functions internally. A central part of the account is the activity of the “animal spirits,” which function like the fluids in a hydraulic machine. The animal spirits are “a certain very fine wind, or rather a very lively and pure flame,” which is produced in the heart. Descartes seems to have had in mind water-powered machines he had viewed in an exhibition in the Netherlands. He also did a number of anatomical experiments. No Aristotelian “sensitive soul” or “vegetative soul” is needed in this mechanical account of the functions of the body.

One of the key processes Descartes tries to account for is the production of images in the brain, which he calls “ideas.” These images are literally figures traced on the pineal gland and are what the rational soul turns to when it imagines an object or perceives it by the senses.