Chapter 1
What is Materialism? History and Concepts

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Abstract Despite the central presence of materialism in the history of philosophy, there is no universal consensus on the meaning of the word "matter" nor of the doctrine of philosophical materialism. Dictionaries of philosophy often identify this philosophy with its most reductionist and even eliminative versions, in line with Robert Boyle's seventeenth century coinage of the term. But when we take the concept back in time to Greek philosophers and forward onto our own times, we recognize more inclusive forms of materialism as well as complex interplays with non-materialist thought about the place of matter in reality, including Christian philosophy and German idealism. We define philosophical materialism in its most general way both positively (the identification of reality with matter understood as changeability and plurality) and negatively (the negation of disembodied living beings and hypostatized ideas). This inclusive approach to philosophical materialism offers a new light to illuminate a critical history of the concept of matter and materialism from Ancient Greece to the present that is also attentive to scientific developments. By following the most important connections and discontinuities among theoretical frameworks on the idea of matter, we present a general thread that offers a rich and plural, but highly cohesive, field of investigation. Finally, we propose building on rich non-reductionist materialist philosophies, such as Mario

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Bunge's systemic materialism and Gustavo Bueno's discontinuous materialism, to elaborate powerful theoretical alternatives to both physicalism and spiritualism.

In this chapter we aim at critically and constructively outlining the evolution of philosophical materialism in the Western tradition. This enables us to propose what we consider to be a broader concept of materialism than the one that is today often employed, and thus to provide a rigorous historical framework to the discussion of the subsequent chapters. Along its more than 25 centuries of evolution, philosophical materialism has remained in close contact with critical thinking, natural philosophy and science. Despite the frequent attempts of ideological kidnapping of the term "materialism" by physicalism or downwards reductionism, our main thesis in this essay is that a great variety of versions of this worldview have populated the history of ideas.

We define philosophical materialism in general in a dual but complementary way: positively, materialism names the branch of philosophical worldviews that identify being (the "ὄντος" of ontology) with matter, understood in its broadest sense as changeability and plurality (*partes extra partes*). Negatively, materialism denies the existence of disembodied living beings and hypostatized ideas and concepts. This leads us to identify some points common to all materialistic philosophies, such as: (1) there is an impersonal stuff of which the world, included living beings, is made of; (2) living beings, included human beings, are material complex entities determined by natural laws or regularities; (3) complex ideas and other conceptual artifacts cannot exist without the activity of some advanced living beings; and (4) nothing comes from nothing.

This general framework encompasses a multitude of distinct views and approaches. Because the concept of matter is an ontological notion supported on changing scientific theories, our journey begins in Miletus and takes us to the present through a wide variety of scientific and ontological stances. Along the way, the rivals of materialism–spiritualism and idealism–have also wore many masks. And yet, when it comes to accounts of the place of matter in reality, we move away from simplistic binary thinking and identify partial but important convergences between some varieties of philosophical materialism and some varieties of spiritualist and idealist philosophies, from Plato to Aquinas to Hegel. It is important to clarify from the onset, thus, that our approach is historical as much as it is philosophical. This means that not all scholars would agree with all of our historical reconstructions. Moreover, in this essay we have chosen to spend more time in arguments and interpretations usually absent from common accounts of materialism.

Both things (our own philosophical approach and the need to be selective) are especially evident when it comes to the sections devoted to twentieth century philosophical materialism. Drawing from our historical account, the goal of this section is to mobilize the distinction between exclusive and inclusive materialism in order to introduce two little-known approaches to philosophical materialism. The history of philosophical materialism is thus an essential component of a broader search for philosophical tools that enable critical thinking in the twenty-first century grounded both on the rich and complex philosophical tradition and on scientific knowledge.

1.1 The Naturalist Revolution

Miletus and the Origin of a New Worldview

There is an undeniable variety in the interpretations of Presocratic metaphysics. While ontotheological interpretations have been very influential (see for instance Jaeger 2003[1947] and Copleston 1993[1955]), in this essay we put forward a materialist understanding of a good part of early Greek metaphysics. It is true that the first Western philosophers often included God and the divine in their systems. And also that they at times accepted immortal spirits. Moreover, ancient *physis* (φύσις) encompasses much more than what we currently understand to be physical matter. Nonetheless, unlike traditional mythological theologies, the Presocratics built metaphysical systems where impersonal causes (i.e. explanations that do not involve intention or purpose) became the canon for rational explanations. Within this general approach, some of these thinkers developed materialist theologies in which the notions of God and the divine had a very different meaning from the one held by traditional mythological thinking.

It is not a coincidence that the first philosophers were also among the first truly scientific geometers. While geometrical practices and rules were around for centuries, the notion of demonstrative proof proceeding deductively from immanent entities and rules provided a model for rational explanation (Netz 1999; for other than Greek traditions, see Chemla 2012). The Presocratics applied this impersonal/non-anthropocentric model to the whole of reality. It is because of this totalization that we say, despite the word's anachronism, that they built the first metaphysical systems (Bueno 1974). Our approach, far from being groundbreaking, was founded by Aristotle himself (2016). He explicitly contended (*Metaphysics*, 983 b, 5–10) that the first philosophers believed that the only principles of all things were those of a material nature. Although our understanding of matter differs in very important aspects from Aristotle's one, we do believe that the Aristotelian thesis is worthy of attention.

The city of Miletus (located in Asia Minor, on the eastern shore of Aegean Sea) stood in the early years of the sixth century BC among the many colonies of Greeks belonging to the Ionian tribe. With three harbors and a strategic position, commerce between colonies and with the whole known-world made Miletus into an extremely prosperous city where peoples of different worldviews and religions traded, discussed, and studied. The first prose books were written in Miletus, where the wealth of merchants allowed the luxury of a high multi-cultural education to many citizens.

It was here that Western philosophy and a prototype of what we now call *science* were born. Six centuries before the Christian era, some Ionians offered the first geometrical proofs of long-known operations and results. In a world of competing religions and worldviews, being able to demonstrate something with the force of necessity must have looked like a safe haven. This equipped them to think about the nature of things and the origin of the world favoring immanent explanations

and without resorting to magical or mythological elements.[1] More specifically, they moved away from the anthropomorphism and zoomorphism that, until that moment, had tended to monopolize the explanations of the world and the human being in the Western tradition.

It used to be common to interpret this transition as the birth of reason. Nestle (1975[1940]) famously referred to it as the progress "from *mythos* to *logos*". But this is a false dichotomy: there is logos in the myths. Scientific evidence coming from psychology, cultural anthropology, and sociology has established that traditional religious myths are rational in the sense of providing explanations of worldly experiences and phenomena in terms of anthropomorphic and zoomorphic analogies. Rather than inventing rationality, the Ionians performed something equally extraordinary: they inaugurated a way of reasoning that searched for impersonal mechanisms to explain the world and its transformations (even when they did not do away with personal myths altogether).[2]

Thales is credited to be both the first person to offer a geometrical proof or theorem and to attempt at providing a fully non-mythological explanation of the world. Attributions of precedence are always tricky, and very little is actually known about the extent of Thales' real contribution. He apparently left no writings and not even classical Greeks agreed on the exact outlooks of his thought. Thales is said to have maintained that water was a generating substance from which everything else arose. Today, this claim seems arbitrary, but Thales must had observed that the so-called four natural states of matter could be explained by water and its transformations, from the solid state (ice) and the liquid, to gases and plasma (fire, believing that oil was made of water). No anthropomorphic or magical mechanism was involved in such transformations. Instead, an immanent element of the world served as first principle from which to deduce the rest. Whatever the actual contours of Thales' metaphysics were, what is sure is that he had good pupils and must have been tolerant with their criticisms, a basic feature of the rational enterprise, since his disciple Anaximander offered a different account of the world.

Following Thales metaphysical approach, Anaximander nonetheless departed from his teacher's confidence that the vastness of the empirical universe stem from such a common element as water. Anaximander suggested instead the existence of a special basic stuff that he called "the boundless" or the *apeiron* (ἀρχή). This regression to an intangible substance beyond the appearances meant a significant

[1] Some of these philosophers, as we are going to see, used the language of traditional myth to talk about abstract philosophical conceptions; that is, they used that language as a set of rhetorical devices, along with giving traditional concepts (such as "cosmos") a new philosophical meaning. Only a minority of them still held literal beliefs in traditional mythological elements (such as reincarnation). For that reason, although the new way of thinking that they created emerged from a specific sociocultural context (rather than appearing *ex nihilo*), it had enough new and revolutionary features to be considered and classified apart.

[2] Although Hesiod started his *Theogony* with an impersonal chaos (a prefiguration of later metaphysical notions), he also offered anthropomorphic explanations for the rest of natural phenomena.

step in the critical methods of science and philosophy. The basic points of Anaximander's view are: (1) there is an impersonal source or substratum from which everything arises, the *arche* (ἀρχή); (2) the world arising from *arche* obeys regular and lawful patterns; (3) what arises from *arche* is a number of substances, such as fire, air, earth, water; (4) these substances are later naturally arranged in a stable configuration that forms the cosmos (κόσμος), i.e., an ordered world; and (5) all living things emerge from these substances, evolving from simple to complex organisms (see Graham 2010; Kirk et al. 1983; McKirahan 1994, and Kahn 1994 for fragments and doxography; Graham 2006 and Long 1999 for interpretation and extensive discussions).

One important conclusion that follows Anaximander's ideas is that the morphologies of the cosmos cannot be neither eternal nor arising *ex nihilo*, an idea that still has a big influence in modern cosmology. The world is the result of a particular organization of the original stuff. It is likely that he coined the word "cosmos" in a philosophical sense. And it is not by coincidence that Anaximander is also thought to have produced the first Greek world map. This was part of his understanding of the cosmos as an ordered whole.

The theory of a generating impersonal substance proposed by Anaximander would be essential for the Milesian worldview. While the *apeiron* was obviously far from empirical, it was entirely *materialistic*, in the sense that the world was formed by, *and only by*, concrete substances governed by impersonal causes without place for supernatural phenomena. These substances can only change according to regular patterns, "out of necessity" (Kahn 1994; McKirahan 1994). This idea implies the powerful scientific and philosophical idea of the world's rational lawfulness. Changes are ordered in two ways: generation (and destruction) and motion (and change). This, along with the fact that things only exist for a determinate time span, gives raise to motion and change. The germ of the conservation laws of nature can be seen here. Of course, his theory had little predictive power and was thus impossible to test. And yet, his impersonal metaphysics was clearly distinct from mythology. To underline the difference from verse-written myths, Anaximander presented his view in prose.

Perhaps, Anaximander's most daring proposal was that there is one, and just one world, and that whatever happens in the world obeys cyclical patterns. There is no magic. If there are gods, they are part of the world as well; as such, they would be submitted to matter's lawful mechanisms. Things appear by evolution and not spontaneously. For instance, men evolved from different species of animals, and the world itself evolved impersonally from the *apeiron*. The *apeiron* is a source of the world but it is not present in it; its existence is inferred. Most of these features are shared by modern materialistic worldviews.

Anaximander's cosmological picture was as original as his ontology. Thales seems to have said that the Earth rests on the water; Anaximander rejected the need for support, explaining that the earth is stationary and at the center of the universe. The equidistance to any point explained that would not fall: there is no more reason to go in one direction than into another. This was the first known use of the principle of sufficient reason in the Western tradition. The stars, the sun, the

moon, and the planets were openings or holes that showed the fire that was beyond the skies. Anaximander's universe is discussed in detail by Kahn (1994).

Anaximenes (b. 585 BC, d. 528 BC) was Anaximander's younger friend–perhaps also his student. Following the Milesian tradition he criticized and tried to improve the theories of his mentor. He postulated that the generating substance was air, instead of the rather mysterious *apeiron*. The great advance made by Anaximenes was to describe a specific mechanism (i.e. a process or a series or processes) that would operate in order to produce the transformation of the various substances. This mechanism was based on the compression and rarefaction of air, and the other elements. When air is compressed, according to Anaximenes, it is transformed into water. The compression of water, in turn, results in the generation of earth, etc. This was an attempt to provide an immanent explanation of worldly phenomena built solely upon perceivable elements of the world itself. Anaximenes was also a proto-meteorologist, providing tentative (and mechanistic) explanations of phenomena such as the rain, the rainbow, and the lightening (see Graham 2013).

Generating Substance Ontology

Despite their differences, Milesian thinkers shared both a methodology and an ontological view. Contrary to a widespread opinion (e.g. Barnes 1982; Kirk et al. 1983), they were not radical *substance monists*: they accepted the existence of several substances. That there are diverse types of material substances is an important feature of some materialistic systems (e.g., Bueno 1972). But not all these substances were on equal foot. One type of matter might precede the rest, becoming the generating substance of the full set. In their attempt to account for reality as a whole, Milesian metaphysicians distinguished one such particular substance as responsible for generating the rest (Graham 2006). We call this ontological view the "generating substance ontology". We can present this theory as a system of axioms (Graham 2006):

- There is a primary generating substance.
- The generating substance gives rise, through appropriate mechanisms, to derived substances or elements.
- When the generating substance changes, it ceases to exist.
- In turn, derived substances can rebuild the primordial substance.

If we adopt some current formal notation, we can express this set of statements as:

1. The world is composed by a collection of basic substances $S = S_1, \ldots, S_n$.
   Def. S_i = basic substance.
2. $\exists S_g \in S$ / before a time t_0, S_g was the only substance in existence.
   Def. S_g = generating substance.
3. $\forall S_i \in S \; \exists \; T$ / S_i is generated from S_g by the transformation T.
4. $\exists M / M$ is a material mechanism that enforces T.
5. The world exists in accordance to regular (i.e. legal) transformations of S_g and the derived substances.

This theory presents remarkable resemblance in structure with contemporary materialist theories. Namely: (1) Whatever exists is formed by, and only by, material substances on one or more types; (2) All phenomena are explainable by lawful mechanisms without place for supernatural events; (3) Human beings play no role in the general functioning of the world: the world is indifferent to human will; (4) Although the world is a material system, it is not alive, and hence has no personal attributes.

Heraclitus

Heraclitus was born in Ephesus, also in the Ionian coast, before the turn of the Sixth and Fifth centuries BC. He is famously associated with the maxima *Pantha rei*, "everything flows", a formula actually given by Plato, and likely due to Cratylus. But it accurately highlights the contrast between Heraclitus and the Milesian theory of the generating substance. Only a few fragments of his writings have survived. The image of the world that emerges from them is one of diverse substances in everlasting change without a generating or original one (Graham 2010). It has been argued that fire played a similar role to Milesian water or air, or at least hold some kind of prominence over the rest. It is more likely, however, that he used it just as an example of something that can obtain stability by changing. Heraclitus, then, drew on the Milesian tradition and departed from it. But then again, criticism was part of the Milesian approach to knowledge. The conjectural character of knowledge would be later emphasized by Xenophanes, who was deeply concerned with epistemological issues.

Everything changes but change itself. As such, Heraclitus' fire could be seen as a powerful metaphor of the essence of reality. As noted by Graham (2010): "Heraclitus does indeed believe in flux, probably of elemental changes, but unlike Cratylus he sees the flux as compatible with, or even the cause of, the stability of higher structures." (for a discussion from the point of view of contemporary physics see Romero 2013). Heraclitus' ontological views, like Buddha's in the Eastern tradition, seem to be those of a forerunner of process philosophy. For him, change is the most essential feature in the world. Change is basic and legal (i.e. due to λογοσ). Local change is necessary for global stability. The basic substances of the world are constantly undergoing transformation from one another. An important implication is that if change is legal then the world is not a chaos (χὰος); it is, as Anaximander has contended before, a cosmos (κόσμος).

There is another important aspect of Heraclitus' metaphysics. He showed a concern for the role or place of humans in the universe. In this aspect he can be considered a precursor of later Presocratics, such as Democritus and the Socratic and Hellenistic traditions. Heraclitus' interests ranged from ontology to the nature of truth. As such, he appears to be the first Western philosopher with an almost complete philosophical system. Can we think of him as a materialist-oriented philosopher? There are good reasons to do so. Although emphasizing the role of change and deeding it as basic (and hence not requiring further elucidation in terms of mechanisms), Heraclitus did not deny the material nature of the world. He did not

deny, in particular, the existence of substances as some modern *trope* theorists would do (e.g. D.C. Williams). In a way he can be construed as a precursor of dynamicists.

True, Heraclitus wrote about a mysterious God and His divine laws (τοῦ θείου). But this God is not the anthropomorphic God of traditional mythological thinking. Heraclitus clearly stated that "this world, the same of all, no god nor man did create, but it ever was and is and will be: everliving fire, kindling in measures and being quenched in measures." (Kahn 1994). Heraclitus' "God" seems to be a poetic way of referring to the universal *logos*, i.e., the main impersonal principle of reality, in which change and opposition is the source of everything. Things occur the way they do because of this *logos*/God, not because of the intervention of some all-powerful anthropomorphic consciousness. As the basic ontological principle that structures reality, the "divine" is manifest in every phenomena of the world. Heraclitus contended this view in a set of enigmatic quotes such as: "God is day night, winter summer, war peace, satiety and hunger", and "the *logos* is unwilling and willing to be called by the name of Zeus." Heraclitus' God has the paradoxical nature of fire. Heraclitus also talked about War, the wise, the One, and the thunderbolt to refer to this impersonal principle that organizes all things. In Heraclitus' metaphysics, the traditional supreme god of Greek religions is replaced by this impersonal principle. It seems very reasonable to assume that Heraclitus often used traditional religious terminology because he was aware of the fact that such metaphysical principle was taking the place of the traditional gods as the controlling element in the universe.[3] Like the idea that "everything is full of gods" that Aristotle attributed to Thales, Heraclitus seemed to continue exploring the principles of what we could call a materialist theology, in which the words "God" and the "divine" had little resemblance with their former mythological meanings, supported on literalist anthropomorphism.

Heraclitus affirmed the invalidity of human projections of values to the universe in this way: "to God all things are fair and good and just, but people hold some things wrong and some right." Since Heraclitus' God is not an anthropomorphic entity, this just seems a poetic way of stating that reality, in general, is complete and perfect as it is, an idea that will inspire the Stoics as well as Hegel.

As for Heraclitus' epistemology, Plato held that for Heraclitus knowledge is made impossible by the flux of sensible objects. But the Platonic view seems a distortion of Heraclitus' actual view that "the things of which there is sight, hearing, experience, I prefer." (B55). And, among the human senses, and like for Aristotle later, Heraclitus contended that "the eyes are more accurate witnesses than the ears" (B101a). That is, Heraclitus did not despise empirical knowledge, another (although not exclusive) key feature of materialist worldviews.

[3] According to some scholars, such as Jennifer Peck, Heraclitus' notions of *logos* and God, although very similar, should not be identified, since Heraclitus' *logos* is the pattern present in all things, whereas God refers to the principle of unity of opposites. It is undeniable that Heraclitus' fragments are obscure, and often difficult to interpret; but what seems clear is that for him, the notions of God and *logos*, if not identical, are very similar and refer to the universal impersonal mechanism and structure of reality.

Xenophanes

Xenophanes is an important reference for critiques of traditional religion: according to him, the gods have human characteristics, included human vices and weaknesses. Let us pay attention to these fragments:

> Homer and Hesiod have attributed to the gods all sorts of things that are matters of reproach and censure among men: theft, adultery, and mutual deception (B11) [. . .]. Mortals suppose that gods are born, wear their own clothes and have a voice and body (B14) [. . .] Ethiopians say that their gods are snub-nosed and black; Thracians that theirs are blue-eyed and red-haired (B16) (Lesher 1992)

Xenophanes' conclusion, millennia before Ludwig Feuerbach (1804–1872), is that religion' gods are anthropomorphic creations. Xenophanes' critiques of traditional mythological thinking meant to strip natural phenomena of all vestiges of religious or magical significance. This can be seen in his proto-scientific theories, such as that stars come into being from burning clouds, or that the moon is made of compressed cloud. Nevertheless, Xenophanes also talked about a metaphysical God without traditional mythological characteristics, opening the way for later more sophisticated metaphysical theologies such as Aristotle's.

Parmenides

Xenophanes' main disciple, Parmenides (born at the end of the sixth century BC in Elea), deserves a crucial place both among the Presocratics and in the history of the whole Western philosophy. Parmenides put forward a radical critique of the concept of change cherished by Heraclitus. Although he used a poetic form of expression (probably influenced by Xenophanes), his was a rigorous analysis. He presented the first known philosophical deductive argument, which can be enunciated as follows:

- What is, is.
- What is not, is not.
- What is cannot come from what is not.

  Then, being cannot come to be. Being is necessary.

As a consequence, since change requires ceasing to be something and coming to be something else, change is not possible: the world we see and touch is an illusion. Through this reasoning, Parmenides introduced the idea of nothingness as absolute non-being. But he set forth such idea in order to deny its very possibility. This ontological denial of nothingness, led Parmenides to the conclusion that the universe is absolutely homogeneous, complete, immutable, necessary and eternal (Coxon 2009). As such, reality is radically different from what our senses suggest and from what we naively accept.

To be incomplete is to lack or need something that is not. Since "what-is-not", is not, incompleteness is not. Being cannot lack anything. Being is complete, and if complete, it cannot change. The world consists of nothing but pure being. Despite its undeniable resemblances with some forms of Eastern metaphysics (such as the

Vedanta), it is difficult to exaggerate the perplexity and impact that this startling line of reasoning has caused in philosophical thinking along 25 centuries.

Parmenides' position was defended by Zeno and later expanded by Melissus of Samos.[4] Parmenides' attack to the theory of a generating substance and change completely shifted the direction of philosophical speculation in the West (for a contemporary assessment and revision of Parmenides in the light of contemporary science see Romero 2012 and 2013). The world of Parmenides, being alien to change, cannot be said to be lawful in any meaningful sense. Lawfulness requires regular change, that only takes place in the illusory reality we perceive. This seems to exclude matter in any usual sense, since it is changeable by definition. If not made of matter, what are the world's building blocks? The question simply does not make sense in a Parmenidian ontology: the world is simple, so (although he imagined it as a giant and solid sphere) it cannot be made of anything. In particular it cannot be neither material nor immaterial.

Parmenides presented his philosophical theories as the revelation of a goddess, but since the essence of his metaphysics implies the denial of gods, it seems obvious that this was a rhetorical device: the gods, like everything else in the universe, are an illusion.

Later Presocractics

The reaction against Parmenides consisted in accepting some of his ontology, in particular accepting the absence of a generating substance, while negating other aspects, such as the impossibility of change. The pluralists, Anaxagoras and Empedocles, and the atomists, Leucippus and Democritus, proposed new theories of change, but mainly based on the emergence of new things from immutable components.[5]

Anaxagoras proposed that things are composed by the same things, but with varying proportions. According to this metaphysics, everything has always existed in some way. Originally, everything existed in infinitesimally small fragments of themselves. With this theory, Anaxagoras advanced a kind of primitive but extremely interesting fractal theory. Before the formation of the world, everything chaotically existed in this "fractal" impersonal mass. It seems very reasonable, therefore, to suppose that Anaxagoras' primitive mass was very influenced by Anaximander's ἄπειρον and Hesiod's χάος.

What moves Anaxagoras' metaphysics away from philosophical materialism is the role of the *Nous* (νοῦς) as a transcendental mind that orders a pre-existing set of material entities, helping to give them order. This *Nous* seems a metaphysical, rather than mythological, account of the idea of *spirit*. In any case, it is incompatible with a materialist worldview. According to Plato, Socrates was disappointed when

[4] This philosopher introduced an important critique of Parmenides' view of reality as a (Euclidean) giant sphere: since a sphere necessarily implies an outer space, reality has to be *infinite*.

[5] For a full account of the atomists, with fragments, doxography and commentaries see Taylor (1999).

Anaxogoras, after introducing the *Nous* in his metaphysics, started to give impersonal explanations of many natural phenomena, instead of using the Nous to take everything natural into account (see Bueno 1974). These impersonal mechanisms mean that there are also important convergences between Anaxagoras' worldview and a materialist approach.

For Empedocles, all things are made of combinations of four immutable elements: air, fire, water, and earth. This pluralist idea attempted to combine former ideas such as Thales', Anaximenes', Heraclitus', and Parmenides'. Empedocles' theory of the four elements was partially adopted by Plato and Aristotle, at least for pre-existing chaotic matter and the sub-lunar region respectively. Nevertheless, Empedocles' materialist approach enters in opposition with his belief in the metempsychosis or reincarnation of the souls. On the other hand, although Empedocles called "love" and "hate" to the two forces that, combining the four elements, explain change in the world, it seems that such forces are impersonal and that Empedocles' terminology is just metaphorical.

Finally, the atomists embraced indivisible substances which they called atoms (ἄτομος) moving across a void, somewhat similar to Parmenides' nothingness/non-being. Atoms themselves seem to infinitely multiply Parmenides' "being", since every atom remains unchanged and unchangeable. These infinite atoms are heterogeneously distributed throughout an also infinite space. Then, atoms combine to produce complex things, which can change by modifying their composition. The emergent things have also emergent properties (for instance, atoms are not alive, but they can form living things). Another important idea developed by the atomists is that, since there are infinite atoms in an infinite space, there is not a unique world, but an infinite number of them. Some of these important ideas would be later adopted by both the Epicureans and, although with very important modifications, a significant part of modern science (Gassendi, Boyle, Dalton). In all likelihood, Greek atomist theories were also based on empirical experiences, such as the analysis of grains of sand. Atomist doctrines were considered the archetype of materialistic theories after the so-called Scientific Revolution, despite that ancient atomists accepted the existence of the void which not all early modern atomists accepted. The Greek notion of atom as *indivisible* also limited, under some circumstances, a scientific modern understanding of real "atoms", composed of other particles.

At the end of the Presocratic period, the Ionian legacy had already shaped a new worldview. Let us enumerate some of the main elements of this anti-mythological outlook:

- Knowledge is gained through reason and experience. It is neither revealed nor based on the blind faith in an authority.
- All truth is subject to this (anti-mythological) epistemological approach.
- The value of a theory is given by its aptitude to represent the real world.
- No thought or idea is final. There is no perfect knowledge: everything is open to criticism.
- Natural phenomena obey impersonal laws. There is no place neither for magic nor for the literalist interpretation of traditional mythological thinking.

Plato

Again, it is likely that geometry, as the first instance of scientific knowledge, became a model for the Presocratic's search for impersonal lawfulness and epistemological rigor. Many of these thinkers were well versed in this science, which was in turn applied to the heavenly movements. Unlike Mesopotamic astronomy, Greek astronomy was geometrical (North 1994). The Pythagoreans took the power of mathematics to the extreme, hypostasizing the reality of geometrical beings. Together with Parmenidean denial of lawful change, they were a key in shaping Plato's philosophy, in turn essential to the formation of the later Christian worldview, with its clear differentiation of material and immaterial substances.

And yet, Plato constitutes a step beyond Presocratic metaphysics, properly introducing the philosophical method of critical and systematic appraisal of the different available worldviews and understandings of an impressive number of problems. Despite ulterior attempts at appropriation, his ontology cannot be easily reduced. Granted, there is a strong *dualistic* tendency. His unchanging *Forms* (immutable essences likely inspired in Pythagorean mathematical hypostases and Socrates' analyses of ideas), are clearly distinct from the changing material objects constituting the sensible world. Between matter and forms, however, there are also souls, that, although metaphysically closer to Forms, have enough ontological properties to be differentiated, thus breaking the original dualism. And, what's more, in Plato's metaphysics, the "Idea of Good" sits atop the ontological hierarchy of being. As such, it is more real than the Forms, and should be distinguished from them. Unlike the Idea of the Good, Forms are concrete abstract realities; or more specifically: they are (in our materialist terms) the hypostatized essence of things, regardless of their nature. In contrast, in Plato's metaphysics the soul refers to disembodied psychic activities. Both forms and souls, however, are intelligible, partless, and imperishable, thus existing eternally and independently from the material world. What happens to the objects in the world do not affect forms. They are not in space and time. Consequently, they are changeless. Epistemologically, it meant that change prevents perfect knowledge. Since the material world changes, it cannot be perfectly known. We can only have conjectural knowledge and true *belief*. Perfect knowledge is only possible of the Forms, which partake of whatever exists. But this has provided a method for philosophical thinking critical of worldly and seemingly intuitive opinions. Plato's theory of Form can also be interpreted as his attempt to find a compromise between Heraclitus and Parmenides: although it only affects to a part of reality, change is real. But its ontological and even moral status is inferior than changeless realities. Matter is worse and less real than souls and Forms.

According to several current definitions of matter (e.g. Bunge 2010; Romero 2018), we can say that Forms are *immaterial*. But it is also true that Plato's Forms can be appreciated from philosophical materialism, since it defends that philosophy deals with the analysis of ideas and their systematic relationships, which are beyond our will. This conception of ideas as abstractions submitted to objective relations is key against psychological reductionism and radical relativism. Despite

its unjustified idealist hypostases, the theory of Forms thus deserves to be considered revolutionary in the history of Western metaphysics.

Plato's concept of the soul (ψυχή) is also more complex than many of its Christian appropriators allowed for. For ancient Greeks, the soul was the essence or principle of life in a living thing. This does not necessarily imply an immaterial nature. For instance, Heraclitus seems to state that mental capacities are perturbed in the drunk because of the moistness of the soul. With important exceptions such as Anaxagoras' *Nous* and Empedocles' metempsychosis, the acceptance of the soul did not imply, for the Presocratics, the rejection of some form of materialism. The soul was what animated the body, and with the destruction of the body the soul might either disappear or move on and animate another organism. Plato, instead, tended towards dualism. For him the soul is immaterial and immortal, but with all the capacities we now call "mental": thinking, desiring, feeling, perceiving, and so on. The soul's true destiny is contemplation of the Forms. This is better achieved *after* death, when the immortal soul is free from the distractions of changing matter. While Plato in some texts defended the soul's simplicity, in others he contended that that soul has different parts, some of them even unconscious (Pérez-Jara 2014).

Plato's idea of God was also very different from the God of the so-called monotheistic religions (Kirsch 2005). Inspired by Anaxagoras and Socrates, Plato thought that the universe was created by a God (a Demiurge). This Demiurge, however, is certainly not the source of all beings. The Forms are eternal, and the Demiurge uses them to give order to a pre-existing chaotic matter. The world, however, falls short of the ideal. Not because of the Demiurge's clumsiness, but because of the raw materials at his disposal. Although the Demiurge is not omnipotent, he is benevolent: he tried to produce as much perfection as possible from the chaotic matter he found. Since the material world is not created *ex nihilo*, the Demiurge was unable to prevent evil from existing in it. Moreover, the Demiurge is not alone. After the creation out of a preexisting material he withdrew, leaving the running of the universe to lesser gods. He detached from his creation so he does not participate of its imperfections.[6] This negative view of change and matter led to Gnostic doctrines several centuries later.

Finally, another key concept of Plato's metaphysics is the idea of *symploke*, defended in *Sophist* (251e–259e). According to it, not everything is connected to everything else. As such, Plato's principle of *symploke* works as a preliminary form of the ontological thesis that reality is composed of a complex interplay of continuities and discontinuities (Bueno 1972; Bunge 2009[1959]). Plato's ontological and epistemological principle of discontinuity has a special significance for philosophical materialism and its critiques of theological and spiritualist holisms.

[6] It is important to note that Plato talked about the Demiurge using the explicit language of myth. Since in several *Dialogues* Plato used other myths as allegorical teachings rather than literalist dogmas, it is also possible that his myth of the Demiurge has a non-literalist anthropomorphic reading. But while in other Platonic myths the allegorical reading is clear, in his myth of the Demiurge it is not. For that reason, it is more than likely that Plato, as Anaxagoras and Socrates before, held a real belief in some kind of personal mind that gave form to the world.

Aristotle

Aristotle's philosophy can also be interpreted as a pluralistic one. Aristotle was Plato's most successful pupil in the critical philosophical tradition. He deviated significantly from many of his master's views, starting with the notion of the soul. For Aristotle, the soul is just what makes an organism to be alive. And, rather than hypostatized entities as in Plato's metaphysics, Aristotle's Forms are a part of the universe's substances. Ideas are generated by human beings' processes of epistemological abstraction, and Forms cannot exist by themselves, but always united to matter. The ontological symbiosis between matter and form is one of the main features of Aristotle's ontological theory. In the nineteenth century, this approach became known as *hylomorphism* (or *hylemorphism*): every concrete substance is composed of matter and form. Aristotle's only exceptions to hylomorphism are prime matter and God(s). Prime matter is pure potentiality, as such, is not a factual reality, but an abstraction of the stuff of what every substance is made of. God, in turn, is pure actuality without matter. Since Aristotle's God is not composed of matter, he/it is not a substance. Aristotle's God is not a mythological God: it is an immutable entity that does have neither created the world nor know it: it is absolute reflexivity, thought of thoughts (νοήσεως νόησις).[7]

Aristotle is also well known for advancing key ideas in cosmology, physics and living beings. Some of them dominated Western views of the universe until the seventeenth century AC. With regard to cosmology, Presocratic views were clearly influential in shaping Aristotle's great synthesis. The main points of this cosmology are:

- The universe is eternal, finite, and spherical.
- The heavens are composed of a fifth element: 'ether'.
- The Earth is the center of the universe.
- There is no central role for man in the machinery of the universe.
- Natural motion in the sub-lunar sphere is rectilinear. In the higher spheres, motion is circular.
- Everything on Earth is made up of four elements (earth, fire, water, air).
- The 4 elements are affected by properties (dryness, coldness, humidity, heat).
- Substances are composed of form and matter.
- Change involves the change of form and the permanence of substance.
- There are four types of causes: material, formal, efficient, and final.
- All the possible kinds of things that can be the subject or the predicate of a proposition can be analyzed by some key categories such as: substance, quantity, quality, relation, place, time, situation, condition, action, and passion.

This last point has often been interpreted as a linguistic one. There are, however, good reasons to think of at least some of these categories as having ontological

[7] Aristotle also considered the existence of lesser "gods" who, along with the main God, move the planets, but they do so in a completely impersonal and blind way.

significance (Haaparanta and Koskinen 2012). Aristotle's thesis that "being is said in many ways" thus extended and fortified Plato's pluralistic principle of discontinuity.

The Hellenistic Period

East-West interaction brought about by Alexander The Great's campaigns and subsequent exchanges changed the focus of philosophical thinking from ontological to ethical problems. In the so-called Hellenistic Period, extended roughly from 350 BC to 200 AC, several new philosophical schools appeared and those already in existence underwent an important shift in their topics of research and speculation. This was, of course, a matter of degree. Before that time, philosophers had also been interested in ethical and anthropological issues, just as Hellenistic thinkers did not reject metaphysical and epistemological speculation. But now the major concern of most of these new philosophical schools was to answer the question: "what is the right way to live?". Aside of important Eastern influences, their views were also strongly modeled by those of their Greek predecessors. For instance, Epicureans, adopted an atomist and clearly materialistic point of view while the Stoics adapted and to certain extent naturalized Anaxagoras' notion of *nous*, developing an original materialist theology also heavily influenced by Heraclitus' *logos*/God, in which God is material and matter is divine. Epicurus reformulated Democritus doctrine introducing several innovations (see, e.g. Marx 1975[1841]). In both Epicurean and Stoic philosophies ontological views as well as their application to the explanation of natural phenomena played an important role as the funding blocks of their respective ethical systems. Both systems in their own way aimed, through knowledge of the external world as well as of our inner nature, at freeing us from fear and anxiety. In several ways, the Epicurean system, as well as the Stoic and Cyrenaic ones, replaced religion and the necessity of an ethics based on divine whim by a naturalistic system based on knowledge of nature. For Epicurus, gods may exist, but they are material, that is, composed of atoms. Through this thesis, Epicurus developed another kind of materialist theology that denied supernatural phenomena and religious activity.[8] The human soul is also composed of particular aggregates of atoms, and when they are dismantled, the soul fades away. Given our constitutive finitude and mortality, the wise person knows how to live in order to achieve a state of tranquility and avoid pain and fear as much as possible given the world's conditions.

Pyrrhonism also pursued the ethical goal of *ataraxia* (ἀταραξία) or "imperturbability", but they thought that true knowledge was impossible to achieve. As such, Pyrrhonics recommended a suspension of judgement about matters of belief. Classic schools such as Peripateticism (based on the teachings of Aristotle) and Platonism underwent significant transformations in this period. The former aspired through knowledge to virtuous actions, which, they considered, result in happiness. What

[8] Although Epicurus considered Greek mythology's gods as human fictions, he recommended his disciples to visit Greek temples and contemplate the serenity of the gods' statues. Such activity could have psychological and ethical benefits.

actions are virtuous we can know from our study of nature and trying to evaluate which is the mean path between extremes. The Platonists moved towards skepticism, but maintaining that, although we cannot aspire to certainty, we can at least approach the truth through degrees of truth–likeness, and hence degrees of belief, which allow one to act.

A full account of all these schools (and others of the period) is impossible here. The interested reader is referred to the classical works by Long (1974) and Long and Sedley (1987). It is enough to emphasize that materialistic worldviews were abundantly available in the time and, after the first century AD, in clear competition with Christians and Gnostics. When Christianity resulted triumphant after the third century, the Hellenistic schools were obliterated. The Christian worldview, strongly influenced by Neoplatonism and Eastern religions with their strong spiritualist doctrines, was dominant for the following fourteen centuries. The next section turns to analyzing the complex panorama of Christian understanding of matter and its place in the world.

1.2 The Creationist Turn

Christian views on matter during the Roman Empire and the so-called Middle Ages constitute one of the thickest jungles one could venture into. The reason is simple: from the onset, multiple and conflicting Christian worldviews coexisted, often accusing each other of the most terrible heresies (Freeman 2011; Papandrea 2016). Even after the official view of the Catholic Church was imposed in the late Roman Empire, the fight within Christianity continued for legitimacy and the monopoly of truth (MacMullen 1984). From emperor Constantine on (and exacerbated under Theodosius I), Catholic persecutions against "idolatry" and "satanism" almost eradicated every non Jewish or Christian religious cult, dubbed as "Paganism" (Jonathan 2005). Once Paganism was practically annihilated, inner Christian fights carried on, sometimes violently. In these confrontations, every new winner transformed the meanings of orthodoxy and heresy, as it had happened since the birth of Christian movements (Bauer 1971). These disputes concerned the nature of Jesus Christ or the Salvation, but also understandings of matter.

In this section, we suggest some Ariadne's threads that might guide us through this labyrinthine plurality, which is often downplayed or even ignored by both Christian apologists and anti-religious thinkers. The main hypothesis that we follow in this section is that, despite the diversity of Christian theologies, it is possible to find some key binary oppositions to understand Christian ideas about matter: (1) the majority of Christian views combined *mythological* perspectives about matter and human being with *metaphysical* ideas from Greek and Roman philosophy, a theoretical tension that has lasted until now; (2) they kept a dual (sometimes even schizophrenic) understanding of matter as both *good* (since it has been created by God) and *evil* (since it is the opposite of the spirit and is tainted by the Devil); (3) they often followed the Platonic and Neoplatonic (and later Aristotelian) views of

matter as a passive and negative reality, as opposed to active and positive *forms*; (4) against the prevalent Greek view of matter as *necessary and uncreated*, the majority of Christian worldviews introduced the idea of matter as a *contingent reality created ex nihilo* by an all-powerful God. Let us elaborate further on each of these dichotomies.

(1) The Structural Tension Between Mythology and Philosophy in the Christian Understanding of Matter

Mythological worldviews and philosophical worldviews should never be understood in simplistic binary terms; both perspectives always have convergences, and in many occasions their borders are blurry. For instance, Hesiod's idea of chaos has a metaphysical side and Plato's, Epicurus's, Lucretius's or Hobbes's God(s) are not only mythological. In order to make the opposition between mythological thinking and philosophical thinking as clear cut as possible, we will reduce here mythological thinking to the *literalist interpretation* of anthropomorphic and zoomorphic metaphors and allegories. As such, when some myths can be interpreted in more abstract/allegorical terms, we will not consider them "mythological". Up to what point many of the Bible's myths were written as allegories that, only with the passage of time became interpreted in literalist terms as their specific political contexts of origin faded, is a fascinating debate that obviously exceeds the limitations of this chapter (but see for instance Day 2002, 2015). But that the original meaning of many Biblical stories was obscured or totally distorted by later interpretations should not lead us to downplay those later interpretations: they were the ones with more historical and cultural relevance.

To complicate matters further, often Biblical stories were interpreted in allegorical terms different from the metaphors of origin. Because of his familiarity with the Hellenistic literature, Origen of Alexandria (AD 184–253) is perhaps the best example of a Christian theologian seeking allegorical interpretations of Biblical myths (Coakley and Sterk 2004). Nevertheless, he lacked sufficient historical and sociological background to reconstruct their original metaphorical meanings. Additionally, Origen was far from embracing total allegorism, for he held literalist beliefs in the real personal character of God and the Devil as well as of angels and demons. As for Biblical literalism, Tertullian (AD 155–220) is a paradigmatic example of an author who pleaded for a literalist reading of Biblical myths (Dunn 2004). On the other hand, St. Augustine (AD 354–430) sought a theological middle ground between allegorism and literalism (MacCulloch 2010).

This structural tension between literalism and allegorism in the Christian world was reflected on three main positions: (a) *fideism*, according to which only Faith matters, and non-literalist interpretation of the Bible and the Revelation should be consider as the work of the Devil; (b) *allegorism*, according to which the myths present in the Bible and other sources of Revelation should always be considered as stories founded on poetic metaphors; (c) *ratio–fideism*, or the middle ground between the previous positions, according to which some myths should be interpreted in allegorical terms, whereas others (such as the personal nature of

God, the resurrection of Christ, or the immortality of the soul) should be read in literalist terms. After many heated debates, this latter option became the prevalent in the Catholic tradition. Total allegorism became synonym of atheism, whereas fideism, before Luther, was cornered, being held only by minority Christian communities. This compromise between philosophical thinking and literalist–mythological thinking forced the conciliation of philosophical Greek views on matter with Jewish and early Christian (but also Greek and Zoroastrian) mythological views on supernatural spirits, miracles, and prophecies. But not all Greek philosophy qualified. Presocratic, Stoic and Epicurean understandings of φύσις did not mix well with a literalist reading of the core Christian dogmas, and thus were rejected as heresy.[9] And Aristotelian philosophy was largely forgotten for many centuries until their Arab rescue. Understandingly, then, Platonism and Neo-Platonism dominated the philosophical side of Christian approaches to matter.

These approaches started to form slowly, as allegorical readings were only tolerated as long as they did not threat the authority of Christian communities (Freeman 2011). If Christianity spread first over the Roman Empire's lower classes, wealthier (and therefore more educated) citizens were also fast to adopt it. Among them were Stoic and Neoplatonic philosophers. St. Justin Martyr (AD 100–165) is a perfect example of an intellectual with philosophical background in Stoicism, Aristotelian, Pythagorean, and Platonic who converted to Christianity. Thinkers like him navigated an unstable equilibrium between the literalism necessary to belong to a specific Christian community and the allegorism imposed by their own philosophical formation (Freeman 2011).

St. Paul and most Fathers of the Church knew that, if Christian communities were to attract the masses, they had to respect the literalist interpretation of Biblical myths. The price to pay was high: the literalist interpretation of myths concerning anthropomorphic divinities, angels, demons, miracles and prophecies was difficult, if not outright impossible, to conciliate with a non-dogmatic and rigorous understanding of the material world. This debate is still alive in our times in current debates between Christian and non-Christian scientists and philosophers about evolution, the history of the universe, and the destiny of humankind (Bueno 2007).

(2) The Dual Understanding of Matter as Good and Evil

Another important paradoxical understanding on matter in Christianity was related to the very ontological and moral nature of matter itself: is it good or bad? On the one hand, matter has an unquestionable good side because it has been created by the true God. As the beginning of the Book of Genesis informs us, God was indeed satisfied with the His Creation of the material world. True, this was before the "original sin" tainted the Creation (Nebe 2002). But the fact that the Old Testament's God

[9] The case of the relationships between Stoicism and Christianity is very interesting. Several Stoic ideas related to ethics and politics were accepted and transformed by some Christian thinkers, at the same time that they rejected Stoic metaphysics.

constantly rewards his loyal followers with material belongings must also be a sign that matter is to some extent holy.

Matter's positive valuation was also emphasized by three main dogma, namely: (a) The Incarnation, according to which God Himself voluntarily decided to incarnate in a human being: Jesus Christ as Holy Savior of humankind. God could have decided to act as a pure spirit or use one of his angels;[10] instead, the Second Person of the Trinity willingly *became flesh*, revaluing matter in the process; (b) The Eucharist: miraculously, God himself becomes materially present in bread and wine during the Holy Communion; (c) The Resurrection of the Dead: contradictions and ambiguities notwithstanding (Freeman 2011), the official Catholic view on the afterlife included the immortality of both soul and body. Our resurrected bodies, though, will not suffer the devilish corruption of our earthly bodies. They will be heavenly bodies, able of the prodigious capacities that St. Paul promised us. But *bodies*, all in all. Furthermore, by postulating that our resurrected glorious bodies can take the place of another body and can be at several places simultaneously, the Dogma of the Resurrection of the Dead broke with the traditional identification of matter with impenetrability and locality. And this was explicit in the rich theology of St. Thomas Aquinas's revolving about the glorious bodies, a fascinating mixture of metaphysics and mythology (Aquinas 1948 S. Th., III, q.57, IV; Bueno 1990b: 70). On the other hand, matter appeared as the source of evil, corruption, and sin. Christian Gnostics went the farthest in demonizing matter. According to them, the material universe is not the creation of God but of an evil Demiurge, sometimes known as Yaldabaoth. As such, matter is the source of evil and corruption (Brakke 2012). Although less radical than the Gnostics, Neoplatonic Christians also were generally inclined to condemn matter. According to Plotinus and several of his disciplines, there is nothing ontologically below matter (Wallis 1995). Matter is just the most degraded form of being. As such, matter could be poetically understood as when light is closer to the darkness. Which in metaphysical terms means that, for Neoplatonism, matter is close to nothingness (Slaveva-Griffin and Remes 2017).

Negative connotations of matter were not exclusive to Gnosticism and Neoplatonism. St. Paul's and his disciplines' writings achieved wide recognition among Christian communities (Freeman 2011). In Pauline theology, "flesh" is the main source of sin, in opposition to the spirit, the source of good and justice.[11] As distinct to the spiritual world, material reality is tainted by sin, corruption, and imperfection. This binary understanding of matter as opposed to the spirit is also present in Plato and other traditions. But, within the Western tradition, it reached its utmost

[10] This is Docetism's theological doctrine, according to which the body of Jesus was an illusion. But, despite its partial influence in other Christian communities, Docetism was soon perceived as a dangerous heresy by more powerful and popular forms of Christianity: see Wahlde (2015), Freeman (2011), and Papandrea (2016).

[11] Through these binary oppositions between the sins generated by matter, and the virtues generated by the spirit, St. Paul did not seem no notice the theological contradiction that it was not matter, but the pure spirit of Satan who introduced evil in reality, before the creation of matter.

radical versions in Christian thought.[12] John the Baptist, Jesus, the twelve apostles, and St. Paul engaged in different ascetic practices based on the binary opposition between matter and the spirit. Late Antiquity's Christian theologians such as St. Ignatius (AD 35–108), Origen, St. Jerome (AD 347–420), St. John Chrysostom (AD 349–407), and St. Augustine also endorsed ascetic practices, supporting them on interpretations of Biblical texts. Most, however, were not radical ascetics. Christian asceticism reached its peak during the decadence of the Roman Empire with the movement of the Desert Fathers and Mothers (Chryssavgis 2008). Interpreting the empire's political, economic, and sociocultural crisis as unequivocal signs of the futility of the material life and the imminence of the Judgment Day's coming, St. Anthony the Great (AD ?-356) moved to the desert in AD 270–271. His main goal was to renounce to the material world tainted by the Devil, consecrating himself to the spiritual world blessed by God. St. Anthony the Great's extravagant practices became a sort of trend. By the time St. Anthony the Great died in AD 356, thousands of monks, hermits, and random ascetics abandoned everything to live in the desert. Depriving themselves of food, comfortable shelter, sex, and personal hygiene, as well as self-inflicting pain and voluntary suffering, they wanted to remove themselves as far as possible from the material temptations that corrupt the spirit, moving it away from God (Robinson and Rodrigues 2014). Paradoxically, this counter-cultural movement became so popular that St. Anthony's biographer, Athanasius of Alexandria (AD 296–373), wrote that "the desert had become a city." (Chryssavgis 2008).

The radical spiritual movement of the Desert Fathers and Mothers, with major figures such as St. Mary of Egypt (AD 344–421) and St. Simeon Stylites (AD 390–459), had a major influence on the theoretical and practical development of Christianity (Johnston 2013; Weidemann 2013; Peeters et al. 2011; Chryssavgis 2008). Although this radical anti-materialism eventually faded away, Christian asceticism and its ideological justifications did not. Centuries after the Fall of the Western Roman Empire, in the twelfth century, the religious text *De Miseria Condicionis Humane*, written by cardinal Lotario dei Segni, later Pope Innocent III (1977), elaborated on the misery and corruption of material existence.

Most branches of Christianity did not so radically condemn matter and accepted it as a creation of the true God. But even then, Christian thinkers emphasized the metaphysical gap between God and the world. Some authors ignored this dual understanding of matter as holy and as profane. Christian pantheistic theologians such as David of Dinant (1160–1217) and Giordano Bruno (1548–1600) went as far as identifying God with the material reality. As a consequence, of course, they were punished as heretics. But, even within the official Catholic orthodoxy, it was possible to defend a middle ground between glorifying and demonizing matter. The best example is St. Thomas Aquinas (1225–1274), whose crucial importance in

[12] Even though Plato drew from the Orphic despise of matter, he did not plea for asceticism and mortification of the flesh. On the contrary, Plato encouraged good nutrition, bodily aesthetics, and sports.

Christian theology lasts until the present day. But there are other less spectacular examples. The theology of Raymond of Sabunde (1385–1436) contemplated both "the book of Nature" and the Bible as Divine revelations (Díaz Díaz 2003). As such, the material world reveals God's perfection and goodness.

Jewish and Islamic theologies, which were also under the aegis of Greek philosophy, faced a similar conundrum of a dual consideration of matter. Within Jewish creationism, Solomon ben Yehuda ibn Gabirol, more popularly known as Avicebron (1021–1070), asserted the ontological dignity of matter with his thesis of the *materia universalis*. According to it, everything created by God, including the soul and intellect, is composed of matter and form (Avicebron 2014). According to this metaphysics, matter is not passive. Rather the contrary, matter is the active.

On the other hand, some schools of Islamic theology identified matter with the evil and the profane. In the *Al-Isq* and the *Al-Nachat*, written by the Neoplatonic Avicenna (980–1037) matter is that from "which all evil proceeds" and it is comparable (in doubtful poetic terms) to a "vile, dishonored, and ugly woman." (Gutas 2014). Only by receiving *ad extrinseco* the forms given by God (the *dator formarum*) can matter recover some ontological dignity (Bueno 1990a,b). Important to also note is that, for Avicenna, forms do not change in themselves. But the substratum, matter, can change by suppression of form. Activity comes from internal forms called "natures". Avicenna also added a new form to the classical forms of Aristotle, the *forma corporeitatis*, or bodily form. Matter always have some form of corporeity. This, with time, became the common meaning of the word "form". It was not until the nineteenth century that matter without corporeity was first postulated and then found experimentally (the electromagnetic field).

(3) Matter as Negativity and Passivity

This Greek-inspired opposition between matter and form went hand in hand with the relation between passivity and activity. This was already so in Plato and Aristotle. But not for the Presocratics, the Stoics, and the Epicureans. Both Presocratics' φύσις and Stoics' naturalist God, along with Epicureans' atoms, are unquestionable active and positive realities. Christian theology, however, overwhelmingly ignored these views in favor of an understanding of matter as negative and passive and of form as positive and active.

The interesting paradox is that mythological influences took many Christians to believe that matter is as an active source of sin and corruption (Freeman 2011). The contradiction between the philosophically-inspired doctrine of matter as passive and the mythologically-inspired view of matter as active led to innovative results in Platonic Christian thinkers such as St. Augustine. His mythological theology emphasized the active reality of evil while his metaphysics presented evil as a *privation* of good. Although with degrees, everything created by God is actively good. The passive formlessness of matter is not an absolute negativity, for matter has the positive capacity to receive God's forms (Gilson 1960; Bourke 2019). Similar metaphysical imbroglios about the negative/passive and positive/active character of

matter can be found in later Christian thinkers heavily influenced by Aristotle, such as St. Albertus Magnus (1200–1280) and, above all, St. Thomas Aquinas.

One of the most important Islamic philosopher of all times, Ibn Rochd (1126–1198), maintained that there are forms intrinsic to matter itself (and hence subordinated to it). This implies, contrary to traditional Platonic, Aristotelian, and Neoplatonic views, that matter, the substratum, is accesible to knowledge and deserves investigations. This idea will be very influential in late Scholastic philosophy, as we will see in the next section.

(4) Matter: From Uncreated and Necessary to Created and Contingent

The idea of *creatio ex nihilo* is a very late concept in Judaism and even in Christianity. It does not explicitly feature neither in the Old nor the New Testaments (Young 1991; May 2004; Blenkinsopp 2011). Antiquity's demiurges did not create out of nothing: they gave shape and order to a preexisting chaotic matter (May 2004). In the Bible's creation myth, God is the order–giver (Day 2015). Contrarily, the idea of *creatio ex nihilo* implies the idea of nothingness as the absolute non-being. And it is very difficult to keep track on the idea of absolute nothingness before Parmenides, or, more generally, Greek metaphysics (Young 1991). During the first four centuries AD, Christian theologians held heated theological discussions with contemporary rivals about the nature of God and the material world. Among those opponents, Gnostics played a key role in making Pauline Christians to develop, influenced by Greek metaphysics, the idea of *creatio ex nihilo* (May 2004).

Creationism was an original idea. Although Greek thinkers knew it, they abhorred it for contradictory (Bueno 1974). But even Christian creationism was severely nuanced by its own Greek roots. Again, Neoplatonist Christian theologians were confronted by this contradiction most directly. In St Augustine's *De diversis quaestionibus*, God created the world using the ideas existing in His divine intellect as paradigms (Gilson 1960). The implication is that, in truth, there is nothing really new in the Creation: only "matter" as the passive receptacle that God creates to incarnate the ideas/forms. The world, with all its stars, mountains, empires, rivers, animals, and individuals was contained in God's mind for all eternity: God "actualizes" in matter what exists eternally in his divine intellect. Christian creationism becomes here a crypto-neophobic metaphysics, for there is nothing really new that has not existed in the divine mind eternally.[13] The contradiction is inescapable. In order to avoid materialism and naturalism, Christian creationism falls down into a circular reasoning (Pérez-Jara 2014). Even the Christian nominalist

[13] Here, we use the concept of "neophobia" in Bunge's critical sense, i.e as the metaphysical approach that denies ontological novelty in reality: "The most popular idea about novelty is that whatever appears to be new actually existed previously in a latent form: that all things and all facts are 'pregnant' with whatever may arise from them. An early example of such neophobia is the conception of causes as containing their effects, as expressed by the scholastic formula 'There is nothing in the effect that had not been in the cause'." (Bunge 2010, p. 87).

version of the Creation begs the question, for God also had in his intellect the infinite individual things that He actualized in the Creation.

To complicate this picture further, not all Greeks thinkers thought of matter as absolutely necessary; there was also room for contingency and freedom. Regarding the cosmos, the specific morphologies of matter are neither necessary nor eternal: for Hesiod, our current cosmos derives from *chaos*; for Anaximander, from *apeiron*; for Anaximenes, from *magma*; and for Plato, from a previous chaotic matter. Only Aristotle postulated the eternity of the cosmos' supralunary morphologies (Jaeger 2003[1936]). Regarding the human sphere, necessity is not absolute either. Take Aristotle's criticisms of the Megarians' fatalism (see Aristotle 2016, 3 T). Or the late Greek Tragedy of Euripides, in which human freedom is much more prevalent than in Aeschylus' and Sophocles' works (Loraux 2002; Critchley 2019). These ambiguities and richness reproduced in Christian theology. Freedom and contingency are subject to God's omniscience, providence, and omnipotence. But fatalism is politically and morally futile. The contradiction between freedom and the Christian God reached its climax in Luther's *De servo arbitrio*, and shortly after during the polemic between Dominicans and the Jesuits that gave rise to the *Congregatio de Auxiliis* (Bueno 1996).

These four binaries (mythical/philosophical, good/evil, active/passive, necessary/contingent) were not the only ones given texture and complexity to the Christian ontology. But they have served here as the main threads to find our way through the labyrinthine jungle of Christian metaphysics. With the exception of Gnosticism and pantheism, Christian views on matter always saw matter as a product created by God. As such, matter was thought as a reality planned, created, and ordered by a divine spirit. General Christian understanding on matter in creationist terms meant that Christian ontologies of matter were eminently teleological, postulating final causes in every corner of nature, along with a monism of order.[14] Since the divine spirit was thought as infinite and omnipresent, penetrating into every material domain, this view implied a sort of *hubris* or hemorrhage of the psyche radically antagonistic with a materialist understanding of the universe (Pérez-Jara 2014). To understand matter meant, at least in part, to understand God's plans.[15] Therefore, as long as many of the divine plans are a mystery to us, matter will not be epistemologically transparent to us. For many centuries, Christian ontology of matter clearly determined Christian epistemology of matter in a radical spiritualist way which would then live on in non-theological philosophies. With very few exceptions, until the end of the Middle Ages, the majority of Christian thinkers downplayed empirical investigation on matter. A paradigmatic example of this tendency was represented by St. Augustine and his in "*interiore homine habitat veritas*" (Gilson 1960; Bourke 2019). Christian epistemologies of matter

[14] According to which everything is connected with everything else through God (Bueno 1972).

[15] Aquinas even defended that matter could be eternal, despite been created by God. Only by Revelation do we know that the material universe had a beginning in time: see Aquinas (1948) and Gilson (1960).

took the lead in late medieval times, with Robert Grosseteste (1175–1253), St. Thomas Aquinas, Roger Bacon (1214–1292), and Raymond of Sabunde (1385–1436) much more open to empirical research and, therefore, closer to materialism (Crombie 1953).

With very few exceptions, Christian spiritualist creationism dug a huge metaphysical gap between God and His material Creation: if God is unchangeable, eternal, and incorruptible, matter is mutable, created, and corruptible; if God is simple and invisible, matter is plural and visible; if God is the source of all goods and virtues, matter (often) the source of evil and sin. The difference between the Creator and the Creation reached its peak with apophatic or negative theology, defining God by what He *is not* and taking the material world as the negative reference (Carabine 2015). Such abyssal difference between God and the world implied, in the limit, the denial of God's mythological attributes. As such, negative theology's *Deus Absconditus* could be considered as a theological open door to escape from literalist anthropomorfism. Nevertheless, rather than a simplistic division between positive and negative theology, it was common to find them combined to different proportions in most medieval theologies.[16] There are unquestionable (although often neglected) elements of negative theology in both St. Augustine's (Geest 2011) and St. Thomas Aquinas' thought (Rocca 2008; O'Rourke 2016). But it is true that the negative approach is much more prevalent in the theology of Pseudo-Dionysius the Areopagite, who understood God in terms of "divine silence, darkness, and unknowing" (Dionysius the Areopagite. 2004; Rorem 1993). Augustinian and Thomistic theology, on the contrary, never abandoned the Biblical analogical anthropomorphism. This was understandably favored by Christian religious authorities, who preferred to give their blessings to theologies that, despite their "negative theological" elements, also underlined God's literal anthropomorfic character.[17] Only by emphasizing God's personal character, able to bestow unthinkable rewards to the Church's followers, or horrific punishments to whoever broke the Church's rules, could Christian authorities maintain their political and sociocultural control over vast masses of people.

1.3 Return to *Physis*

As we have seen in the previous section, during the early Middle Ages (approximately from 500 to 1000 AD) the dominant worldview was based on Neoplatonic sources, mainly Augustine, Pseudo-Dionysius the Areopagite, Boethius, and few

[16] Sharing similar theological problems and concerns, these combination between negative and positive theologies also took place in medieval Judaism and Islam: see Kars (2019) and Fagenblat (2017), respectively.

[17] The recovery of God's anthropomorphic attributes was achieved through cataphatic theology, which sought to understand God in positive terms, emphasizing the divine attributes that we can find through the Revelation.

other Latin writers. Between 1000 and 1200 AD, approximately, the surviving texts of Aristotle and other Greek and Islamic thinkers were translated to Latin and reintroduced in the West. This resulted, along with the raise of the universities and the increasing demand on technical expertise in the growing cities, in a vigorous revival of learning in the West. Paris, Bologna, Oxford, and other universities became centers of intellectual activity, vivid discussion, and research. A new movement emerged aiming at blending Christian theology and Aristotelian philosophy. At the beginning of the so-called high Middle Ages (1200–1400), this movement had succeed thanks to the efforts of Albert the Great, Thomas Aquinas, and many others.

As soon as the main texts of Aristotle started to circulate, Robert Grosseteste (1168–1253), first chancellor of Oxford University, wrote several important commentaries on various books of Aristotle where he emphasized, among other things, the methodological aspects of the inquiring of nature and the importance of mathematical thought. He tried to harmonize Aristotelian empiricism with Platonic mathematical approach. Doing this, he offered one of the first explorations of the basic elements of what later would be called the "scientific method" (see Grant 2001; Lindberg 2007). Grosseteste was the first scholastic who understood the double path for scientific thought: generalize from particular observations to a universal laws, and then the reverse path: deduce from universal laws the forecast of particular situations. In addition to that, he stated that these two paths should be verified—or invalidated—through experiments. Grosseteste placed great emphasis on mathematics as a means of understanding nature and its research method contained the essential basis of the future experimental science.

The program of Grosseteste was continued and expanded by Roger Bacon (1220–1292). Bacon was one of the first to lecture on Aristotle natural philosophy in Paris, around 1245. He gave a special attention to the importance of experimentation with the aim of increasing the number of known facts about the world. He described the method of the natural philosopher as a repeated cycle of observation, hypothesis, experimentation, and then the need for independent verification. Bacon recorded how he conducted his experiments by giving precise details so that others could reproduce the experiments and test the results—that possibility of independent verification is a fundamental part of the method of the contemporary scientist.

Oxford scholars adopted the concept of matter given by Aristotle, i.e. hylomorphism, which conceives cosmic beings (*ousia*) as compounds of matter and form. Actually, the use of Latin word *materia*, to design Greek word ὕλη (*hyle*), "wood" or also "that out of which", was introduced by the Scholastics. It derives from the root *ma*—"to make". Thus *materia* having a common root with *mater*, "mother", seems to be adequate word to render the original Greek term. Then, through the high Middle Ages, the term *materia*, matter, corresponded to the correlative of *form*: that which receives form. *Prima materia*, pure matter, correspondingly, cannot exist. Whatever is, is in one form or another.

Because of their Neoplatonism, inherited from a large tradition coming back to Augustine, the Franciscan scholars regarded that all activity source of being was in the forms, and matter was merely inert and passive (an understanding that we have explored in the previous section). The reversal of this Platonic and Neoplatonic

position would prove to be of the greatest importance for the reemergence of materialism after the Scientific Revolution. Roger Beacon, in particular, conceived matter as having its own *essence*, and hence being in principle *active* independently of form. The critiques of the traditional understanding of matter as passivity and negativity implied a criticism not only of Platonism and Neplatonism but also of some Aristotle's tenets. The concept of motion of Aristotle became soon under attack.

The first to seriously questioning of the Aristotelian ideas about natural motion was made by the sixth-century Alexandrian Neoplatonist John Philoponus (490–570), who objected the suggestion made by Aristotle that when a projectile is launched, the medium imparts a force that sustains the projectile against natural motion (vertical, in the sub-lunar region). The medium receives the force from the thrower. Philoponus claimed that, actually, the medium serves as *resistance* to the movement, not a cause. If the projectile continues its motion against the natural movement is because it has an *impetus* (a kind of driving form), that is acquired by the projectile and remains until the medium dissipates it. These ideas were developed by John Buridan (1295–1358), who used the term "impetus" to refer the internal impressed motive force of a body. His ideas were influential in Galileos' treatment of kinematics during the seventeenth century. Buridan went so far as to claim that the impetus, which are corrupted by the resistance of the air, can be measure by the velocity of the projectile and the quantity of matter in it. However, it must be emphasized that Buridan, contrarily to Galileo centuries later, still was working within the Aristotelian paradigm, since he conceived his impetus as *causes* of motion, and not as the modern concept of *inertia*.

Why did it take more than two centuries since these first criticisms to Aristotelian physics to finally dropping the Ancient worldview? The answer is complex, as any answer to any question in the history of ideas. Negatively, a prominent reason seems to be the advent of the Black Death. It was the largest pandemic ever, it whipped out half of the population of Europe, and destroyed the material basis on which the revival of the learning in the West grounded. Positively, the reasons why this change did eventually occur might be linked to an equal disruption in the material conditions of philosophical and scientific work: the discovery of a new world.

1.4 A New World

Enlightened interpretations of the early modern period as the dawn of reason were well alive throughout the twentieth century, even if at times they took the negative overtones of Max (Weber's 1946[1918]) thesis of the "disenchantment of the world". These interpretations picture the Middle Ages as a dark period of ignorance and superstition brought to an end by Renaissance humanism and its drive towards naturalization. We have seen already how this interpretation misses the late Medieval rise of empiricism and the timid recovery of Ancient materialism. The second part of the enlightened story also misses a key development: the blossoming

of theological and spiritual explanations of natural phenomena in the early modern period. True, the fall of Constantinople in 1453 meant an unprecedented migration of Eastern wisdom to Europe. This included translations of Ancient philosophy which, added to those facilitated by the circulation brought about by the Crusades, helped triggering the humanist inquiries of Pomponazzi (1462–1525), Machiavelli (1469–1527) and others for whom the supernatural had little place in human and natural history. But we should not forget that in the world of early modernist thinkers coexisted human powers with magical and demonic prodigies, witchcraft artifices, and a myriad of theological portents and miracles (Daston 1991; Clark 1997; Vermeir 2011).

Rather than an abstract philosophical impulse towards naturalization, it was a political context of competition between incipient empires and nation states and an economic one of rising markets what came to transform and question the ancient wisdom transmitted in universities. Regarding notions of matter, artisans busy in their workshops bending, dying, heating and smashing stressed its many potentialities (Smith 2004). While rather an unusual figure, Paracelsus (1493–1541) serves as a yardstick of his contemporaries' complex conception of nature. Educated in Basel, Vienna and Ferrara, his studies of theology and medicine included the latest Pythagorean and Neo-Platonist additions to the Renaissance corpus. An avid traveler in Europe, he combined the practice of medicine and alchemy with a growing theoretical corpus which moved fluidly between natural philosophy and magic. His materialist interpretation of hermetic monism payed close attention to how natural elements interacted with one another, but also postulated a pantheistic universal continuum connecting all beings (Weeks 1997). In the sixteenth and seventeenth centuries, alchemy and "chymistry" (a practical and theoretical precedent to modern chemistry) constructed a theological frame for an experimental practice which combined and transformed natural elements in ways that opened up the possibilities of matter (Newman 2006).

The importance of this chemical atomism for conceptions of matter in the next two centuries cannot be overemphasized. The reason is not its scientific accuracy, since Dalton's atomic theory of the nineteenth century was nothing like sixteenth and seventeenth century versions (it relied on the complete reorganization of the elements conducted by Lavoisier and others at the end of the eighteenth century). The significance of the theory of corpuscularism put forward by alchemists (and later adopted by mechanical philosophers) lied in its opposition to the Aristotelian distinction between matter and form. In Aristotle's hylomorphism, form was imposed onto passive and uniform matter. Albertus Magnus and Thomas Aquinas endeavored to Christianized Aristotelian hylomorphism in the search for a metaphysical foundation for the otherwise mythological Catholic doctrine of transubstantiation. In the Eucharistic miracle, Aquinas argued, the bread and wine became prime matter, pure potentiality, while their form was (by God's will at the consecration) the very body and blood of Christ. God is here a *Dator Formarum* of a prime passive matter. Alchemical elements, on the contrary, were imbued with form (with activity, virtues and sympathies). In the context of Reformation, when the Church championed a literalist reading of transubstantiation, atomism posed a

challenge to Thomist interpretations (Newman 2006). Even the Jesuits had to turn their natural philosophy upside down to face this experimentally raised criticism (Feingold 2003). Francisco Suárez (1548–1617), the great Christian metaphysician of his time, came to deny in his *Disputationes Metaphysicae* (1597) the possibility of a prime matter completely separated from form–he did admit the possibility of form completely separated from matter, and he called it spiritual substance (Bueno 1990a).

Far from a lineal progression towards materialism, numerous steps back and meanders shaped the modern materialist philosophies before they crystalized in the seventeenth and eighteenth centuries. A turning point was 1492. While Columbus did not realize the enormity of its finding, short after his voyage European cosmographers working for the Spanish crown recognized the discovery of a new world (Portuondo 2009). As the American continent was defined, enlarged and redefined along the sixteenth century through cartography and conquest, a plethora of new entities completely reshaped the map of knowledge. The first victim of the new continent was the Ancient Ptolemaic world map. Already under question by Portuguese voyages south of the Equator, the Magallenes-Elcano 1519–1522 voyage of circumnavigation was explicitly perceived as the destruction of the Greek known-world, of the Christian medieval maps, and of the learned disputes at universities over whether the four Aristotelian elements formed four distinct spheres or whether they were completely mixed in the sublunar world (Camprubí 2009). The road to Copernican heliocentrism (and thus to the new physics of Galileo Galilei, 1564–1642) was beginning to open.

As Charles V adopted the motto "plus ultra" to signify his empire's going beyond the old world, José de Acosta and others utilized the vernacular to declare that their knowledge made the Ancient obsolete (Insua 2018). Geographical discoveries and specially the voyage of circumnavigation were perceived as examples of the new power of science and boosted confidence in the possibilities of "discovery" Bueno 1989; Grafton 1992; Wooton 2015. Trigonometry, the theory of the sphere and astronomical navigation contributed to the emergence of an age of global empire and knowledge in which rulers were quick to recognize the political import of maps, building techniques and learned schools. This imperial contest, moreover, was at the heart of the religious reformation movements which resulted in the creation of protestant and national churches in northern Europe. It also triggered a global commerce in which companies and state officials needed to develop complex bureaucratic structures spanning entire continents.

Other areas of knowledge were no less shaken by navigational voyages than spherical geography. With little exaggeration, historians have spoken of the "discovery of mankind" (Abulafia 2008). Ethnography was sketched as a discipline as new peoples unimagined by the biblical teachings of the Church were recognized as humans and their languages and costumes studied and recorded (Padgen 1982; Davies 2016). The heated Salamanca disputes around the theoretical and practical consideration of the newly encountered peoples were among the landmarks of the second scholasticism, including figures like Suárez who sought to adapt Christian metaphysics to the findings of the era. This philosophical movement devoted great

efforts to counter the reformists theses and redefine the relationships between political and religious power. In the process, they took theology to its utmost refinement, but also made evident the internal contradictions of the spiritual metaphysics of the free soul and the infinite creator, as with the late sixteenth century free will controversies between Dominicans and Jesuits (Hevia Echeverría 2007).

Natural history and medicine also entered into uncharted territories. The works of Fernández de Oviedo and other royal botanists pictorially recorded the thousands of new botanic species found in the new world, putting into perspective the *materia medica* written before then (Barrera-Osorio 2007). From El Escorial to the Ashmolean Museum in Oxford, cabinets of curiosities spread throughout Europe, containing all kinds of wonders and effectively shifting the focus of natural philosophy from the universal to the particular (Daston and Park 1998: 135–172; Grafton 2000).

The experimental overcoming of the Ancients was formalized institutionally first in the Portuguese Casa da India and then in the Spanish Casa de Contratación and, explicitly modeled after the latter by the likes of Francis Bacon (1561–1626), the Royal Society (Pimentel 2001; Cañizares-Esguerra 2006). Bacon, famous for theorizing the experimental turn that others were putting into practice, captured his times' interest in rare and singular phenomena in his "tables and arrangement of instances" of "natures" (in the plural) to capture the plurality of bodies and virtues accessible only by bodily operations (Klein 2008). Like in the explorers' *relaciones geográficas* (the thousands of official reports of the findings from remote lands), the world was a pluralistic wealth of entities waiting to be untapped by unimpeded natural philosophers whose task was to push nature to its very limits (Ashworth 1990; Pardo J. 2002). The breaking of the old world required the constitution of a new one. While of course historical transformations are never so abrupt, finding the building blocks of this new world was the self-invested role of the great scientific and philosophical systems of the seventeenth and eighteenth centuries.

1.5 Materialism Crystallized

At the dawn of the seventeenth century, occult causes and spirits, demons and miracles were relegated to the margins of theology and natural philosophy. The retreat of animism (or popular spiritualism) from the philosophical debate was not the result of turning to Reason with a capital R. It was largely the outcome of the political vulnerability of the Roman Church and protestant communities, which had to measure their forces against imperial and city–state armies. In that context of upheaval, a natural order governed by universal laws regained political import (Daston 1991). Religious tolerance, where it existed, was an unintended consequence of the extreme religiosity of the reformation and counterreformation movements and of the relative political weakness of the different churches. This helps explain the rise of the political theories of father Juan de Mariana (1536–1624) or Thomas Hobbes (1588–1679), the latter explicitly grounded in a materialist

interpretation of Galileo's new physics. By the mid of the century, explanations of movement could no longer invoke action at a distance nor antipathies or sympathies; they were expected to refer to mechanistic explanations of physical contact among bodies (Meli 2006) or at least occult attributes as in the case of Newtonian gravity (Henry 2008).

Hobbes's philosophy deserves a special place in any history of materialism. And yet, his materialism had peculiarities that puzzled both readers and censors. Hobbes combined philosophical materialism with Christian belief by holding that God is corporeal. He challenged readers of the Bible to find a passage that says that God is incorporeal. He even declared Hell and Heaven to be real and corporeal. These theses, which have puzzled scholars to this day, may well indicate that Hobbes was in truth a crypto-atheist who put forward contradictory speculations on God and the Bible to avoid censorship. But perhaps we should take it more seriously. Let us not forget the important tradition of theological materialisms, from Thales, Heraclitus, the Stoics, Epicurus and Lucretius to Spinoza.

For Hobbes, to be real is to be corporeal. And to be corporeal means to have dimensions and quantity and move, i.e. to be is to become in a spatial and quantitative way. Within this general framework, Hobbes's ontology of matter defends that matter is made of a spatial and moving continuous stuff. Different densities of matter correspond to different composition of materials. Mathematics, and specifically geometry, is the result of an abstract idealization of matter's properties. Without geometry, we would be unable to understand the nature of matter. Matter's movements are legally determined by objective causality: there is no room therefore for real magic and miracles. It is clear that Hobbes was pushing the mechanical science of its time to its ontological limits.

While physicists often get the credit for the rise of mechanic philosophy, it was physicians who started to think seriously about mechanical reductions of the soul. Vesalius (1514–1564), imperial doctor with Charles V and Philipp II, did much to restitute the value of anatomy, autopsies and a mechanical vision of the body with his *De humani corporis fabrica* (1543). In 1554, the physician Gómez Pereira (1500–1567) argued that animal organisms functioned like machines (Gómez Pereira 2000). He did so partly as a response to a recent debate initiated in Italy by Pomponazzi's *De Immortalitate Animae* (García Valverde and Maxwell-Stuart 2019, p. 22–55), and through the following *reductio ab absurdum*. Despite Aristotle, it is impossible to separate sensation and intellect and to restrict the former to humans, because if sensation is to serve volition it needs to be accompanied by some sort of intellectual judgment that enables animals to distinguish between those perceived objects that they want for food, shelter or mating from those perceived objects that they need to avoid or run from (as we mention below, Schopenhauer embraced this first part of the argument). But recognizing intellectual abilities to the brutes would tantamount to acknowledging they have something very akin to a spiritual soul, and this is absurd and irreligious. The only solution Gómez Pereira could think of was denying animals had sensations and will and assuming their movements were the result of physiological resorts like those of a clock or a magnet (Pereira 2019[1554]).

Gómez Pereira's solution resembles the sharp distinction introduced some decades later by Descartes (1596–1650) between material things (*res extensa*) and thinking spirits or souls (*res cogitans*). Descartes was also familiar with the physiology of the animal and the human body, as with the machines and automata that proliferated in the early modern period. While both authors sought to preserve the immaterial immortality of the Christian soul, their physiological mechanics paved the way for the physical materialisms of the eighteenth century. Nonetheless, between the two thinkers important scientific developments had greatly changed understandings of matter and its powers. What physicists added to the early physician's mechanics was mathematization. We should avoid exaggerating the role of mathematical sciences in the rise of materialism. Kepler applied conic theory to retool the orbits of planetary movement. And Galileo sought to find abstract mathematical relations between the phenomena he observed and experimented with. But while Galileo's scientific mechanism was intended as a rebuttal of Aristotelian physics, it did not intend to pose an ontological alternative to the world of final causes which characterized Aristotelian philosophy. The second, more ambitious, project was what Descartes attempted to do with the mechanical philosophy, first put forward in his 1644 *Principia Philosophiae*.

Descartes's Paradox: From Radical Theological Spiritualism to Crypto-Mechanistic Materialism?

In 1641 Descartes published the *Meditationes de Prima Philosophia*. This work would become the basis of modern philosophical spiritualism. The "systematic doubt", with clear if unacknowledged precedents in Saint Augustine, led Descartes to question everything except the act of doubting itself. This demonstrated, he famously concluded, the indubitable existence of the ego cogito. The world we see and touch, the people with love or hate, could be illusions. The thinking mind cannot. This argument became the solid rock on which modern philosophical spiritualism was built. The human mind that emerges from this argument is a sort of disembodied reasoning engine without emotion and motivation–a reductionistic which seventeenth century "computationalism" would take as a precedent to its arguments that mental processes are just computations. At this point in Descartes's philosophy, the thinking mind does not occupy any space within the body.

Descartes's spiritualist argument, moreover, was explicitly theological. While a malicious demon could be creating the illusion of the external world, it could not conceal from us the fact that our thinking exists. Accepting the ontological argument, the thinking mind demonstrates the existing of God as the most perfect entity that can be thought. But it is through faith that we know of God's goodness, which then allows us to infer that the external world we think in our thoughts does actually exist beyond illusions. The soul and God take ontological and epistemological precedent over matter.

This most perfect argument for theological spiritualism, however, contained the dangerous seeds of philosophical materialism. Descartes's idea that the existence of the external world is, as a last resort, supported on faith strongly influenced later

philosophers, from Malebranche to Kant and Gramsci. But it also introduced a split between spiritualism and theism. God's omnipotence would even alter mathematical truths, but it could not lie to us about the fact that we and our thoughts exist. God was no longer necessary to proclaim the reign of the spirit. This believe in the autonomous existence of human spirits would later become central to both radical empiricism and German idealism. But it would also be used by philosophical materialist who, as we show below for authors like d'Holbach, pointed to the contradictions of Christian ontotheology (Bueno 1972).

Even more important for us are the developments of Descartes's thoughts on matter, in particular the distinction between primary and secondary properties and the mechanistic view of matter. The idea that the senses conceal from us the true nature of reality had been present in the Western tradition since the times of Greek presocratic philosophers. It became central for some early modern scientists, particularly Galileo. Physics, as natural philosophy, could reveal the primary properties of things. Following Galileo without quoting him, Descartes contended that our senses deliver only superficial and distorted appearances. But, unlike Kant, who would later radicalize Galileo's and Descartes's idea by stating that the knowledge of things in themselves is impossible, Descartes went after real things and their primary (or mind-independent) properties. The secondary properties of the things we perceive would later be known as qualia. For spiritualism, qualia reside in a supernatural soul; for materialism, in the activity of the nervous system. But in both cases the universe appears as colorless, soundless, insipid, and inodorous. The distinction between primary and secondary properties would be challenged by both phenomenalists and physicalists alike. Phenomenalists, like Hume and Berkeley, argued that there are no reasons to believe in the existence of primary properties. Physicalists, in turn, became unable to account for secondary properties (a problem still open today, as later sections of this chapter discuss).

For Descartes, the distinction between primary and secondary qualities opened the very possibility of the mechanical worldview. Together with other scientists and philosophers of his time, he moved away from the Aristotelian physics and ontology of matter. Physics was now the science of matter in motion. His *Le Monde* (1664 [1633]: 7–10) starts with the discussion of the difference between our sensations and the things that produce them. The primary properties of material things could be reduced to figures et mouvements, i.e., to mechanical entities and processes. Descartes had first divided reality into three main domains: God, as an infinite spirit, the finite human spirit (res cogitans), and matter (res extensa). In later periods of his life, res extensa seemed to displace the key roles Descartes had earlier assigned to the spirity.

This shift is even more evident in Descartes posthumous treatises on man and world (*Traité du Monde* and *Traité de l'Homme*). These works accounted for everything in the world by mechanistic causes. This included the highest functions of the human body as well as miracles. There was little room for the human soul understood in supernatural terms. Thus, in his *Treatise on Man*, Descartes wrote: "I should like you to consider that these functions [including passion, memory, and imagination] follow from the mere arrangement of the machine's organs every

bit as naturally as the movements of a clock or other automaton follow from the arrangement of its counter-weights and wheels." Whereas the *Meditationes* defended a spaceless *res cogitans*, Descartes later works physically located it in the pineal gland. The strong spiritualist rhetoric of his early *Meditationes de Prima Philosophia* was therefore totally abandoned. Fearing the power of the Church, Descartes did not dare to publish his treatises while alive, and they have been usually overlooked by the usual histories of philosophy (they were translated into English only three centuries later). Nevertheless, after his death, these posthumous works enabled mechanistic readings of his more famous works, revealing the true rich of his *Principia Philosophiae*.

He had there proposed a metaphysics in which all movement occurred by physical contact in a microscopic plenum and according to three laws justified on the grounds of God's immutable nature. Despite Descartes's attempt at mathematical formulations, his mechanistic philosophy was built on metaphysical and theological grounds (and through analogies to actual machines) very different from the mathematical physics of Galileo's mechanics (Meli 2006, p. 135–144). The same is true for Gassendi's (1592–1655) mechanical philosophy, which unlike Descartes's plenum recovered the Ancient theory of atoms and void (a possibility reinforced by Torricelli's experiments with the vacuum). But mechanistic reductionism would prove to be extremely successful in modern natural sciences (although, as discussed later, nineteenth century field physics and thermodynamics would show mechanics is only one chapter of physics). Moreover, if had opened the way to deist visions of God as the maker of a material mechanism whose functioning did not depend on His providence but on immutable and deterministic laws. This was only a step away from materialist atheism.

The Power of Matter

Alongside mechanism, the study of matter and its properties also continued in the great systems of natural philosophy, which nevertheless were often theologically framed and explicitly anti-materialists. A case in point is the experimentalist Robert Boyle (1627–1691), who popularized two terms that he was careful enough to separate: "corpurcularism" and "materialism" (a term coined only some years before Boyle used it and helped spreading it). His defense of the former was part of his attack on the latter, and it is no coincidence that the materialist Hobbes was among Boyle's greatest antagonists (Shapin and Schaffer 1985). Boyle's alchemical program set out to demonstrate that matter was passive and brute without a natural order which depended entirely on God's will.

Newton (1643–1727) is also a good example of the anti-materialism which often framed scientific mechanism. While he successfully completed, systematized, and universalized the new mechanical physics inaugurated by Galileo, it is well known that theology occupied a great deal of his energies (Westfall 1983). Moreover, inasmuch as active matter might have been an important unacknowledged "hypothesis" behind the action at a distance seemingly required by the universal law of gravitation, God would have played an important role in the philosophical

framing of the mechanics of the *Philosophiæ Naturalis Principia Mathematica*'s mechanics (Westfall 1983, 646). Finally, while Leibniz (1646–1716) opposed Boyle's corpuscularism and Newton's views on space and time, he shared their dismissal of materialism in favor of a theological and spiritual ontology of self–sufficient but interconnected *monads*, conceived as centers of pure activity, a sort of middle way between mechanism and teleology in which God acquired the problematic status of a monad of monads; see Bueno (1981).

Spinoza (1632–1677) was a different story. His philosophy can be (and has been) interpreted both as pantheistic or as materialistic and atheistic, because the God that he equates to nature has none of the personal attributes of the God of ontotheology. Spinoza's "God, or nature" is infinite, absolute, necessary, and indivisible, but it has no personal or anthropomorphic characteristics. It is the very eternal necessity of the world to be. This can be better understood in light of Spinoza's attack on the Cartesian thesis that spiritual life is independent from organic life. The entire edifice of Spinoza's philosophy was based on the negation of spiritualism, even if it used schemes coming for Cartesian philosophy such as substance and causality.

But Spinoza's philosophy also avoided reducing the whole of reality to mechanically moving corpuscles. Reality or nature (the infinite necessary and indivisible "substance") works in Spinoza in different modalities, including extension and thought which are irreducible to one another but refer to the same nature (Peña 1974). If this is the case, then Spinoza would have been among the first and most sophisticated examples (although not one without problems and contradictions) of a non-reductionist and non-monist materialism of the kind that would later flourish in the very different context of the twentieth century (see below). His political philosophy was no less impious than his ontology, and his *Tractatus Theologico–Politicus* (1670) confronted the providentialist supernaturalism with which most Christian and Jewish thinkers approached human and natural history.

Spinoza was certainly read as an atheist by many enemies and followers alike. The latter group became relevant when, early in the eighteenth century, non-theological interpretations of Newtonian mechanics proliferated both in England (with John Toland, 1670–1722) and in France (with Voltaire, 1694–1778). The latter utilized Newton's physics and John Locke's empiricism to construe scholastics as an strawman of religious fanaticism and announce a new era of lights. Libertine clandestine literature, which had been flourishing since the seventeenth century in works like the anonymous *Theophrastus Redivivus* and *Traité des Trois Imposteurs*, deepened the mistrust of Christian spiritualism (Jacob 2019). Most French enlightened thinkers adopted a deist philosophy which removed most mythological attributes of God while preserving his personal nature as an architect and creator of the universe (Pascal famously dismissed this as the "philosophers' God"). But others openly embraced materialist worldviews without a place for God and the supernatural soul.

The Difficulties of Empiricism to Account for Modern Science

It is still common to associate the rise of modern empiricism with the development of modern science. The personal and intellectual relationship between John Locke (1632–1704) and Newton has often been invoked as proof (Ansey 2017). Newton published his *Principia* in 1687, and Locke was quick to review it in praise. Locke's monumental *An Essay Concerning Human Understanding* appeared only two years later, and it included some adaptations to Newton' *Principia*. However, the impact of Newton's *Principia* on Locke's empiricist philosophy was actually very limited (Rogers 1978). In the very general level of rhetoric, empiricist philosophers did indeed posit empirical observation and experimentation as the means to know the world. But in the more granulated level of epistemology, the incompatibilities between the two show the difficulties empiricism faces in trying to account for modern science.

In short, Newton's *Principia* analyzed some of the laws of motion that Locke's empiricism deemed unknowable. Locke embraced an atomistic and mechanistic ontology of matter. He also defended the distinction between primary and secondary qualities. In the list of primary qualities, he included size, shape, motion, number, and solidity. That is, he rejected the Cartesian definition of material body as simply extended, arguing that bodies are both extended and impenetrable/solid. This was his tribute to Boyle's atomism. But all this was hardly compatible with an empiricist epistemology that held that our only source of knowledge is either directly sensation or reflection upon sensation. This led Locke to devise his own theory of matter and of our knowledge of it.

Moving away from Descarte's innate ideas, Locke defended that we are born as blank slates. Thanks to the process of empirical knowledge, we can have simple or indefinable ideas (such as our notion of blue) and complex ideas (such as our idea of a country). The empiricist theory of association opposed others available at the time. The neuroanatomical work of Doctor Thomas Willis (1621–1675), for instance, identified mental activity with brain processes. In contrast, Locke held that although our ideas of secondary qualities are caused by primary qualities, that mechanism is mainly unknown. After all, how the size, figure and motion of particles could cause any sensation in us? And, what's even more puzzling: what is what underlies beyond primary qualities? Although Locke had rejected much of Aristotelian ontology, he still held that qualities are always qualities of something. And that "something" behind our knowledge of matter is called "substance" in Locke's metaphysics. Locke thus postulated subject-independent substances and causal processes, but he declared them unknowable.

Locke's empiricism inspired the development of much of modern psychology, often opposed to empirical studies of the brain, and of later empiricism, particularly that of David Hume (1711–1776) and George Berkeley (1685–1753). Despite contemporary advances in the physical and other sciences, Hume deepened Locke's divide between knowledge and reality. His philosophy was at odds with the very existence of matter. Taking the empiricist premise to its most radical conclusion, Hume saw no reasons whatsoever to believe in the existence of independent

substances that are the cause of the phenomena we perceive. Subject-independent substances and causal processes might exist, sure, but they might as well be just the products of human imagination. A rose, for instance, is the bundle of its properties (size, color, smell...). We do not have any good reasons to hold that behind such bundle of qualities there is a substance that supports them. As Bunge (2006) has noted, Hume denied the epistemological possibility of knowing anything other than subjective phenomena "at a time when physicists and chemists were studying non-phenomenal facts such as planetary orbits, imperceptible gases, and invisible chemical reactions. It is not that Hume was unaware of these novelties: He rejected them explicitly because they contradicted phenomenalism."

Hume's phenomenalism led him very close to subjective idealism, in which we do not have any reasons to hold the belief in the existence of absolute realities and causality beyond human appearances. Therefore, Hume reduced matter to secondary qualities, approaching subject-independent qualities with strong skepticism. Hume's critiques of the principle of induction also contributed to his rejection of universal natural laws. As it has been pointed out many times, Hume was obviously right in holding that the leap from "some" to "all" is logically invalid. Nevertheless, he went too far in denying the subject-independent objectivity of connections, from structures to causality.

The rejection of objective causality and structural processes in matter led Hume to a God-less contingentism. The picture of an almost phantasmagorical world whose only stability is given by human finite, precarious and imperfect psychology was a bad companion as a philosophical presupposition of natural, social, and biosocial sciences, let alone of philosophical materialism. Nevertheless, and paradoxically, Hume's "immaterialism" can also been seen as a significant episode for the history of materialism through his critiques of the notion of substance. Buddhism has defended for millennia the enigmatic idea (for a Western mindset) that emptiness or nothingness fills reality. But the Buddhist nothingness is not the absolute privative nothingness of Abrahamic creationist ontotheology; rather, it points out at the insubstantiality of things as something dynamic and real. Things do not have any substantiality because everything is dependent and impermanent (in contrast with the dependence and permanence attributes of traditional substances). Hume held a very similar idea through his "bundle theory": like in Buddhism, everything, from stars and mountains to our "ego", is an impermanent and dependent aggregate of changing properties or qualities (see also Borges 1989[1952] for his poetic "new refutation of time"). The essence of being is becoming: an idea already held from Lao Tse, Heraclitus and early modern materialist philosophers. But Hume went beyond through his thesis that everything (and therefore matter) is composed of transient aggregates. That means that we cannot hypostatize anything in reality (including properties), an idea key for some versions of materialism, such as current discontinuous materialism and some versions of systemic materialism (see Pérez-Jara's chapter in this volume).

Berkeley's subjective idealism took empiricism to its last consequences. A bishop, Berkeley explicitly rejected the existence of matter and argued that everything in the universe is a set of temporally discontinuous appearances created

by God: things only exist beyond human perception inasmuch as God perceives them. But the divine perception has little to do with human epistemological apparatus, so cosmic entities, as we understand them, cease to exist when there are no finite souls perceiving them. Berkeley's epistemology was considered too radical by the majority of Christian scientists and philosophers. Our point here is that Hume's attacks on Christianity should not conceal that the incompatibilities of Hume's philosophy with modern science and materialism are comparable to those of Berkeley's philosophy. British empiricism was incompatible with much of physics, chemistry, biology and psychology. For Hobbes, the substance behind the mind is unknowable; for Hume, in all likelihood the brain is just a bundle of empirical qualities, just as any other object we perceive; for Berkeley, the brain is an idealistic appearance that only exist when we observe it. British empiricism played a propagandistically important role in emphasizing the importance of empirical knowledge and the rejection of innate ideas. But its large idealistic shadow opposed understandings of matter in terms of objective causal and structural legality.

Materialists Out of the Closet

Drawing on Hobbes' explicit but peculiar materialism, as well as from Descartes's and Spinoza's crypto-materialisms and from further scientific developments, thinkers like La Mettrie (1709–1751), Claude Adrien Helvétius (1715–1771), and Paul-Henri Thiry, the Baron d'Holbach (1723–1789) advanced strong materialistic agendas in the eighteenth century. These authors took to full consequence Hippocrates's and Galen's idea that the brain is the mental organ to proclaim the inexistence of the soul understood in supernatural terms. Their works were widely read despite being banned and, in the case of Helvétius's *De l'Esprit*, even burned publicly. Their materialism prefigured the monism of the nineteenth century materialists, aiming to explain all phenomena through "matter and motion".

La Mettrie explicitly rejected the existence of God and the truth of Christian dogma. Inspired by Descartes's posthumous treatises, La Mettrie followed a mechanistic view of matter rich in technological analogies on how human bodily physiology governs intellectual thoughts, feelings, and passions. The way such a machine would work occupied many of the scientists and philosophers trying to put up materialistic systems of the world in the centuries to come. This strategy was very different from d'Holbach's. One of the most active encyclopedists, d'Holbach drew more clearly from the chemical views of matter as active and divided into elements. In his key works *Système de la Nature* (1770) and *Système Social* (1773), he offered a full philosophical system, in which there was no place for supernatural or non-material beings. D'Holbach acknowledged that different types of matter had very different properties, arguing for instance that humans are made of a sort of thinking matter. This allowed him, moreover, to follow Spinoza's ethics by proposing and atheistic self-interest in preserving one's own life and that of (at least some) others (Thomson 2014). Not surprisingly, his works were banned in France.

D'Holbach's significance lies precisely in this merging of materialism with systemism. Departing from the individualist materialisms of the Epicureans, Lucre-

tious, and Hobbes, but also from Spinoza's holistic cryptomaterialism, d'Holbach held that material things form systems. These go from microsystems (like the organs of the human body), to the megasystem of nature or the world. This idea of system is crucial in the history of philosophy. It poses a middle ground between the excesses of individualism/atomism and those of holism: a system has, among other dimensions, components (overlooked by holism) and a structure (overlooked by atomism). Nevertheless, and despite these precautions, d'Holbach did hold a holistic notion of causality very similar to Spinoza's. Everything is connected with everything else causally from eternity. Thus, reality's main dimensions are materiality, systemicity, and causal determinism–a view that would have important followers among nineteenth century scientists and philosophers of disciplines as diverse as physics, biology, sociology, and history.

D'Holbach philosophical atheism is also worth noting. While d'Holbach is amply recognized as an atheist by both friends and foes, an aspect of his atheism has not received sufficient attention. According to his *Système de la Nature*, the very idea of God is a pseudo-idea, a "patchwork" composed of contradictory attributes: immutability is incompatible with the divine will and providence, infinity is only compatible with pantheism, and so on. The Abrahamic ontotheological God is thus ontologically impossible. This is a step further from the existential atheism that contends that God is a possible being but does not exist. We could call this structural atheism in contrast with the postulatory atheism of so many atheist philosophers, from Nietzsche to the so-called "New Atheists", such as Sam Harris, Richard Dawkins, Daniel Dennett, and Christopher Hitchens.

Importantly for this chapter, one of the earliest mentions in English of the phrase "philosophical materialism" occurred in 1808 in an encyclopedic article about La Mettrie which appears to seek reconciliation: "philosophical materialism is not necessarily connected with irreligion or the disbelief of a future state" (Aikin et al. 1808: p. 70). Around the same time "*matérialisme philosophique*" appeared in French in a translation from the German *Geschichte der neuern Philosophie* (1800–1804), written by Jean-Gottlieb Buhle. It was also used in reference to La Mettrie's project of naturalization of the soul (Buhle 1816, p: 225).

That materialism was now recognized as philosophical may have to do with the recognition of its metaphysical stances beyond the scientific discussion, a separation we already saw in an incipient form when discussing seventeenth century mechanistic worldview. Some of the great philosophical systems of the nineteenth century would still consider science and metaphysics as part of the same project (particularly for the Germans, "*Wissenschaft*" was an encompassing enough concept). But as the eighteenth century was coming to an end and the number and complexity of scientific disciplines were multiplying, natural philosophy was beginning to break apart into two distinct endeavors: science and philosophy. The professionalization of the scientist as distinct from the philosopher was certified by Whewell's coinage of the word in English (even if the crystallization of science, philosophy, and religion as distinct enterprises was not complete until the late nineteenth century; Harrison 2015). While recognized as a different endeavor, philosophy still needed to be very attentive to the results that scientists were obtaining in their voyages, workshops,

and laboratories. The next two sections deal respectively with the philosophy and the sciences of the long nineteenth century, in which both the notion of matter and philosophical materialism underwent unexpected transformations.

1.6 From Modern Idealism to Karl Marx's and Engels' Dialectical Materialism

The institutionalization of modern philosophy was not about returning to Greek and Roman philosophy. Our thesis here is clear: without Christian metaphysics, modern philosophy would not exist. This is most evident for idealism. Christian ontotheology had taken the hypostatization of psychological life to proportions without precedent, at least in the Western world. The weakening of the Ancient Regime opened the way to attacks on Christian metaphysics and the rise of philosophical materialism. But thinkers moving away from medieval philosophy were transforming ontotheology, rather than ignoring or completely rejecting it. Christian theological ideas were secularized. Take for instance David Hume (2000[1739]) who, like Buddha had done millennia earlier, denied the substantiality of the ego and criticized the belief in miracles, clearly contradicting traditional Christian anthropology and theology. But the opposition was at times more apparent than effective. By rethinking causal connections in subjective terms, for instance, Hume was secularizing Christian doctrines of causality, such as the ones held by occasionalism. The same goes for the links between Hume's contingentism and that of the theologies of Duns Scotus, Occam, Luther, and Descartes (Pérez-Jara 2014).

Modern idealism in general, and German idealism specifically, emerged as one of the most important products of a historical process of secularization. The medieval understanding of God as *dator formarum* of the world became Kant's transcendental consciousness, Fichte's pure Ego, Schelling's Absolute, Hegel's absolute spirit, and Schopenhauer's Intellect. The idealist philosophies of these five thinkers, after all, represent softer versions of the hypostatization of the psyche exercised by Christian metaphysics (still very present in early modern thinkers such as Descartes, Malebranche, Berkeley, and Leibniz).[18] This section explores their views of nature as well as their lasting influences.

Using the terminology of speculative realism, we consider modern idealist systems of metaphysics to be "correlationist philosophies" (Harman 2009, 2011; Bryant 2014). That is: philosophies according to which everything we can talk or think about only makes sense in a correlation with a subject. In this gen-

[18] Hume's (and, later, Stuart Mill's) psychologism is different in that it can be considered an even softer version of this hypostatization of the psyche. Both authors downplay the organic and operational side of human existence, along with reducing abstract concepts, ideas and relations to psychological processes. But the independence of the mind respect of the nervous system is not held; it just suggested as a possibility.

eral classification, weak correlationists postulate the existence of an unknowable absolute reality that exists outside the correlation: that would be Kant's and Schopenhauer's positions. On the other hand, strong correlationists would deny such absolute independent reality from human subjectivity: it would be Fichte's position. Schelling's and Hegel's stances deserve more nuances, as we will see. Let us now begin by exploring Kant's "transcendental idealism".

Kant's Transcendental Idealism

Kant (1724–1804) famously credited Hume for waking him up from his "dogmatic dream" of taking metaphysical knowledge of God, the world, and the human soul for granted. Reading of Hume convinced Kant that there is a significant hiatus between human experience and reality as it is in itself. But then, he asked, what is the difference between absolute reality and the phenomena we experience? And, what are the main epistemological structures and processes that allow human experience and knowledge?

Kant spent many years developing his theory of knowledge and science, which he presented in the two editions of his *Critique of Pure Reason* (1781, 1787). He offered "transcendental idealism" as some kind of middle ground between naive realism (that Hume had debunked) and Descartes's, Hume's, and Berkeley's forms of radical skepticism or idealism. Kant's transcendental idealism searched for the conditions of possibility of human knowledge in general. Such conditions of possibility were not to be found in empirical subjects, which are already part of the world of human experience. Rather, they were transcendental/pure/a priori. Kant followed here Descartes' spiritualist *ego cogito* to postulate a "transcendental consciousness" which epistemologically constitutes the world of human experience.

Kant's epistemology had an immediate ontological aspect. Concerning matter, it considered its dual ideal and empirical character in two main ways. "Transcendental Aesthetic" studies how transcendental consciousness puts space and time as a priori intuitions that make experience possible. Fused elements of both the Leibnizian "relationalist" and the Newtonian "absolutist" conceptions of space and time with his transcendental idealism removed matter's spatio–temporal properties from reality itself. "Transcendental Analytic", in turn, studies how the transcendental consciousness puts twelve categories as pure concepts of the understanding (*Verstand*).[19] These categories work with the empirical data provided by the spatio–temporal experience (Kant 2008[1787]), but also they do not pertain to the "thing–in–itself" (*das Ding an sich*).

Thus, Kant's transcendental consciousness does not create the world of phenomena *ex nihilo* (Heidegger 1997[1929]). In a similar way as Plato's Demiurge,

[19] Kant's pure categories of the understanding are: unity, plurality, and totality for the concept of quantity; reality, negation, and limitation, for the concept of quality; inherence and subsistence, cause and effect, and community for the concept of relation; and possibility–impossibility, existence–nonexistence, and necessity and contingency, for the concept of mode (see Kant 2008[1787]; Heidegger 1997[1929]; and Strawson 2018).

the transcendental consciousness "works" with a previous unknown reality, the mysterious thing–in–itself, or *noumenon*. This absolute reality is previous to human epistemological distortions. The difference between human knowledge and absolute reality was a key issue in modern Empiricism. But while Locke contended that substance and causality were attributes of an absolute reality, Kant attributed them to the transcendental consciousness, the realm of phenomena. And while Hume embraced radical skepticism, Kant declared the absolute existence of the *noumenon*. We will see in the sections dedicated to German Idealism how Kant's position regarding noumenon's existence and even causal powers is contradictory. While in several key passages from Kant's *magnum opus* it seems clear that the noumenon is identified with the absolute reality behind the world of phenomena, there are, on the other hand, other no-less important passages in which Kant is explicit in that the noumenon is simply a concept that is the logical counterpart of the phenomenon, and that since categories have real application only on the latter, it makes no sense to attribute existence and causal powers to the noumenon / thing in itself. This continues being a controversial issue for Kant scholars. Here, our position is that the only way to solve this problem is either declaring Kant's concept of noumenon as contradictory (which is the way chosen by German idealists) or postulating that maybe the concepts of "existence" and "causality" can be applied to the noumenon in an analogical, but not literal, sense. In any case, both options contradict the Kantian notion of noumenon as the absolutely unknown. For our purposes, it is important to stress that Kant explicitly affirmed that matter does not exist without the omnipresent transcendental consciousness. As such, his philosophy cannot be considered materialist. In our view, these are among the main Kantian ontological and epistemological ideas incompatible with philosophical materialism:

1. For Kant, there are no space, time, causality, etc., without the transcendental consciousness, and therefore without humans. This means that absolute reality is a-spatial, a-temporal, a-causal, and so on. On the other hand, the Kantian "transcendental deduction" of space, time, and the understanding's categories is a witty spiritualist fiction.
2. The Kantian transcendental consciousness, even if not a psychological ego, is a disembodied psychological and logical activity. Obviously, this implies the hypostatization of human psychological and logical processes. But, from a materialist point of view, these processes cannot exist without physical, chemical, biological, and sociocultural entities.
3. Equally fictional for a materialist philosophy is Kant's epistemological foundations of mathematics and empirical sciences (mainly Newtonian physics, since Kant paid much less attention to either chemistry or biology). These foundations are again transcendental and limited to phenomena and not to things in themselves.
4. Kant's totally non-historical and non-sociocultural explanations of the origin of the ideas of God, world, and soul cannot be accepted either for any materialist philosophy supported on scientific knowledge.

5. Kant contended the ontological possibility of ontotheology's disembodied and immutable God through his thesis on the *intellectus archetypus*, capable of knowing the thing in itself. Considered such imaginary "*nous*" contradictory, the concept of thing in itself as "*noumenon*" would fade away.
6. Kant's spiritualism is reflected on his dualism between nature and freedom. The late Kant nuanced this dualism in the *Critique of Judgment* (1790), contending that nature produces self-determining organisms capable, like humans, of disinterested aesthetic pleasure (Kant 2007[1790]). But despite these nuances, the dualism nature vs freedom never disappeared in the Kantian system, since it was supported on the key epistemological and ontological dualism between phenomena and the *noumenon*.
7. Kant's thesis on the impossibility of metaphysical knowledge about absolute reality is not only antithetical to philosophical materialism; it is also contradictory within Kantian philosophy, as Kantian thinkers such as Karl Leonhard Reinhold (1757–1823), Salomon Maimon (1753–1800), Jakob Sigismund Beck (1761–1840), and Gottlob Ernst Schulze (1761–1833) pointed out: the thing in itself can only be thought through some of the understanding's categories, which should work exclusively for the world of phenomena.

Despite the above-mentioned incompatibilities with philosophical materialism in general, there are also important convergences between Kant's transcendental idealism and a materialist outlook. Let us point out some of them:

1. Kant criticized subjective idealism and argued for an "empirical realism" (Kant 2008[1787]). In Kant's philosophy, individual consciousness is not what constitutes phenomena, but a transcendental consciousness that is behind *both* material phenomena and empirical subjectivity. While transcendental idealism is non compatible with philosophical materialism, its critiques of subjective idealism are valuable.
2. In the world of phenomena made possible by the transcendental consciousness there is no room for supernatural events. Kant's philosophical denial of miracles, revelations, and prophecies brought him serious problems. If the *Critique of Pure Reason* had implicitly denied supernatural phenomena (for they are not allowed by the understanding's transcendental categories), in his book *Religion within the Boundaries of Mere Reason* (1793), Kant explicitly expelled supernatural phenomena from his interpretation of Christianity (Kant 1998[1793]). Kant's antisupernaturalist theses were perceived as too radical and dangerous. As a consequence, the book met royal censorship. Kant's attempts to skip censorship ended up in a royal order that required Kant never to publish or even speak publicly about religion (Pasternack 2013).
3. Although Kant maintained the ontological possibility of disembodied spirits (the divine and angelical "*intellectus archetypus*" able to know "the thing in it self"), he also held that human individuality is necessarily linked to space, time, and corporeality against radical animism and spiritualism.

4. Kant did not only criticize traditional metaphysical proofs of the ontotheological God; he also explicitly held that this God is a "transcendental illusion", i.e., just a mere idea product of reason when it works without empirical material.[20]

Fichte's (Inter)Subjective Idealism

Kant influenced important German philosophers such as the above mentioned Reinhold, Salomon Maimon, Sigismund Beck, and Schulze. Nevertheless, the most important immediate successor of Kant was Johann Gottlieb Fichte (1762–1814). For thinkers such as Arthur Schopenhauer, Bertrand Russell, and Karl Popper, post-Kantian German idealism is mainly a philosophical fraud. According to Russell, for instance, Fichte carried "subjectivism to a point which seems almost to involve a kind of insanity"[21] (Russell (1972[1945]). The insanity of Fichte's philosophy meant for Russell that the German philosopher should only be considered important as the "theoretical founder of German nationalism", but not as a pure philosopher.[22] Naturally, if Russell's opinion were right, the significance of Fichte's philosophy for philosophical materialism would be null.

Against this radical opinion, we contend that, despite its undeniable philosophical mistakes, Fichte's philosophy is much more than "insanity". Russell did not even seem to notice that the fact that Fichte strongly believed in supra-subjective realities such as the German nation, to which mortal and finite individuals submitted to, shows that Fichte's idealism was far from solipsism. As we will see, it sometimes even approached materialism in some important aspects.

The basics of Fichte's epistemology and ontology can be found in his book *Foundations of the Science of Knowledge* (1794/1795).[23] In his epistemology, Fichte identified *Wissenschaft* (usually translated as "science") with the highest form of knowledge. But rather than a science in its current sense, Fichte's *Wissenschaft* is a pure metaphysical system. Within this general system, empirical sciences would be minor disciplines subordinated to the highest science: metaphysics. As such, Fichte was not particularly interested in those minor empirical sciences, which, of course, moves him away from a materialist approach. Despite that, Fichte did not use any anti-scientific rhetoric: his main enemy was "dogmatism", identified with the worldview that holds that the ego is a derivative reality that comes

[20] It is well-known that Kant (2015[1788]) introduced this God again in the *Critique of Practical Reason* as a postulate for moral action. But this does not contradict that, from an epistemological point of view, Kant held that the Christian God was just an idea.

[21] Russell (1972[1945]), p. 718.

[22] Russell (1972[1945]), p. 718. Russell also contended that "Modern philosophy begins with Descartes, whose fundamental certainty is the existence of himself and his thoughts, from which the external world is to be inferred. This was only the first stage in a development, through Berkeley and Kant, to Fichte, for whom everything is only an emanation of the ego. This was insanity, and, from this extreme, philosophy has been attempting, ever since, to escape into the world of everyday common sense." Russell (1972[1945]), p. XXI.

[23] Fichte's *Wissenschaftslehre* was later reworked by Fichte in various versions. The most well-known version of the work was published in 1804, but other versions appeared posthumously.

from an absolute impersonal reality. Fichte explicitly identified "dogmatism" with "materialism". Against materialism, Fichte, following Kant's terminology, proposed critical philosophy as the main antidote.

In building his philosophical system, Fichte followed Kant in starting by an analysis of how human experience works. In every experience, Fichte thought, there is an objective side and a subjective side. The objective or material side is linked to necessity, whereas the subjective side is linked to freedom. This binary between necessity (matter) and freedom (the subject) was largely based on Kant's philosophy. When we abstract the objective side, we have the Kantian "thing in itself", whereas when we abstract the subjective side, we have a pure (disembodied) intelligence. For Fichte, absolute reality lies either in the objective side (the Kantian thing in itself) or in the subjective side (the pure Ego).[24] The first option is "dogmatism", which, if coherent (Fichte held) always leads to "materialism". The second, "criticism", which Fichte identified with his own idealism, thus denying the Kantian *noumenon*.

At the end of the day, Fichte declared, the kind of philosophy people choose depends on the kind of person they are. Those willing to believe in the existence of freedom, will choose criticism; those trapped by fatalist ideas, will choose dogmatism. By opting for idealism, Fichte followed the ontotheological tradition that identifies the *ipsum esse* with the *ipsum intelligere*. But, unlike Christian ontotheology, Fichte's pure Ego is not an immutable entity or a substance of any kind, but, on the contrary, a pure constituent activity (*Tathandlung*).[25] As such, Fichte's pure Ego is only a "substance" in its etymological sense: the pure Ego, like Kant's transcendental consciousness, is what *sub-stare* both the phenomena and the empirical egos (Fichte 2009[1868]).

Fichte was explicit in stating that empirical egos are not what constitute the world of phenomena. For that reason, identifying Fichte's idealism with an insane solipsistic metaphysics is just a bad caricature. Empirical egos have a beginning and an end; they come and go: what remains is the activity of the pure Ego operating through the millions of empirical egos. Fichte dubbed "non-Ego" (*Nicht-Ich*) to the material reality constituted by the pure Ego's activity. As such, Fichte's view of matter remains prisoner of the traditional identification of matter with negativity and passivity. Within this traditional general conception of matter as negativity, one of Fichte's original ideas was to also conceive matter as a set of obstacles to be overcome by subjects. Without confronting such material obstacles, Fichte contended, self-consciousness would be impossible.

Since for Fichte, Kant's "thing in itself" was a redoubt of dogmatism, matter/non-Ego does not exist whatsoever without the pure Ego's activity. For Fichte, like for

[24] That is, for Fichte, absolute reality cannot be (as Schelling will defend later) *both* subjective and objective.

[25] The concept of *Tathandlung* reminds of Husserl's *Leistung*. But Husserl's transcendental idealism did not deny the Kantian "thing in it self" as Fichte did; it just placed it between brackets: see Pérez-Jara 2014.

Leibniz and Berkeley before, there are only spirits in reality: what we call "material" is just a set of phenomena constituted by the pure Ego's disembodied activity. Gustavo Bueno correctly referred to this radical metaphysical position as "exclusive spiritualism" (Bueno 2019).

Fichte's idealism was immanent in that *nothing* falls outside the pure Ego. In the *First Introduction of The Science of Knowledge*, Fichte went as far as considering Berkeley's material idealism as a form of (inconsistent) materialism, since it postulated God's extra-subjective reality (Fichte 1982[1794]). From our perspective, Fichte's pure Ego was, like Kant's transcendental consciousness, a new secularized version of the Christian ontotheological God. But it was also a departure from that God. Fichte's "God" is not the personal creator of medieval metaphysics. To begin with, Fichte's idealism was an (inter)subjective idealism. Similarly to Edmund Husserl in the twentieth century, Fichte's intersubjective idealism defended that there is no "I" without "you". This situates Fichte among those who opened the door to the study of human nature and society supported on intersubjectivity, a milestone for the materialist understanding of human sciences. In his *Foundations of Natural Right* (1797), Fichte attacked the solipsism of Christian, Jewish and Islamic metaphysics, which explicitly conceived the possibility of absolutely individual and isolated egos and, in particular, of God's absolute Ego (Fichte 2000[1797]). Because the ego always implies interactions with both the non-Ego (matter) and a plurality of egos, the ontotheological God is not ontologically possible for Fichte. Before the creation of angels and the world, God's absolute ego does not have either "objective" obstacles to overcome nor other egos to interact with. The conclusion for Fichte (2009[1868]) is obvious: the traditional Christian God cannot be an "ego". Furthermore, for Fichte an immutable Ego is also a square circle. Fichte's identification of *being* with *becoming*, and the subsequent denial of the ontological possibility of the Christian God, is an important point of convergence with philosophical materialism.

Another convergence with materialism is Fichte's early denial of supernatural phenomena. Fichte's first published work was the *Attempt at a Critique of All Revelation* (2010[1792]).[26] In that same vein, in 1798 he responded to Friedrich Karl Forberg's essay "Development of the Concept of Religion" with the publication "*Ueber den Grund unsers Glaubens an eine göttliche Weltregierung*", usually translated as "On the Ground of Our Belief in a Divine World–Governance" (Bowman 2016). Ficthe's secularized and rationalist metaphysics led to accusations of atheism and a heated dispute with, among others, Friedrich Heinrich Jacobi (1743–1819). In an open letter to Jacobi (1799) argued that philosophy needed a *salto mortale* or leap of faith in order to not fall into the intellectual and practice vices of atheistic materialism. Let to itself, philosophical reason, and Fichte's idealism in particular, led to *nihilism* regarding the true God and the material world. Fichte's protestations of God's ontological reality were not enough, since

[26] This book was published thanks to Kant's support. As such, it was briefly mistaken by the public to be a fourth Kantian Critique. This confusion granted Fichte a considerable philosophical fame.

his secularized God was not that of Christian ontotheology, and thus suspicious in the sociologically Lutheran society of his times.

Schelling's Objective Idealism

Hegel's towering figure has eclipsed Schelling's key role in the "objective side" of German idealism. Ignored for many decades, the few philosophers who mentioned him downplayed his significance. Take, for instance, the few words that Russell devoted to Schelling in his bulky *A History of Western Philosophy*:

> [Ficthe's] immediate successor Schelling (1775–1854) was more amiable, but not less subjective. He was closely associated with the German romantics; philosophically, though famous in his day, he is not important. The important development from Kant's philosophy was that of Hegel.[27]

Schelling's metaphysics is largely seen as a mere precedent and introduction to Hegel's more complete system. And his philosophy of nature dismissed as prematurely outdated. True, the development of experimental natural science in the nineteenth century had a destructive impact on the credibility of many of Schelling's scientific speculations about the nature of magnetism, gravity, or electricity. But, it is our contention that this does not totally invalidate Schelling's metaphysics, which deserves to be considered as an important episode of the history of philosophy in general, and of philosophical materialism specifically.

The challenge to the analyst of Schelling's philosophy lies in the complexity (often obscurity) of his theories as well as in its development through time in several distinct stages. But there is a logic to this development. First, Schelling moved away from Fichte's subjective idealism towards a subject-independent conception of nature. Schelling rejected Fichte's idea that matter, once eliminated Kant's *noumenon*, is just a non-Ego put by the pure Ego (Bruno 2020).

If the pure Ego is identified with absolute reality, how is it possible to imagine something outside and defined in purely negative terms with respects to the Ego? On the other hand, how can a purely objective nature give rise to subjectivity and therefore to the realm of spirit? If matter and spirit are absolutely antagonistic realities, how can they relate to each other to allow knowledge and experience? To answer those questions, Schelling drew on Spinoza. Between 1785 and 1789, the so-called pantheism controversy (*Pantheismusstreit*) confronted the ani-Spinozian Jacobi with Spinoza's defender Moses Mendelssohn. The controversy helped spreading pantheism among many German thinkers. One of them, Gotthold Ephraim Lessing (1729–1781) played a key role in the revival of Spinoza's philosophy (Josephson-Storm 2017; Goetschel 2004). And thus entered Spinoza's metaphysics into the idealism of Schelling and Hegel, and with it, although more indirectly, the Stoics materialist theology.

Schelling's holistic reading of Spinoza's metaphysics (which had been repudiated by Fichte as "dogmatism"), identified God with the whole, which he called

[27] Russell (1972[1945]), p. 718.

"the Absolute". In the *Naturphilosophie* and the *Identitätsphilosophie*, Schelling attempted to overcome Kant's and Fichte's dualism through a metaphysical identification of matter with spirit: both the subjective and the objective are moments that fade away in the Absolute's metaphysical indifference and identity. Matter (objective, necessary) seems to oppose spirit (subjective, free); but in the metaphysical abyss of the Absolute, they are identical. From this perspective, knowledge appears as a form of reflexivity.

Schelling's "God" is the Absolute's development through time. In a similar way as Fichte's Ego and, later, Hegel's Spirit, Schelling's God develops historically through the evolution of human subjectivity. But, unlike Fichte, the development of Schelling's God stems from unconscious nature. The Absolute progressively knows itself through the biological and later historical development of humans. From matter to light, organisms, and human individuals, nature develops in a progressive way towards self-awareness. The idea of unconsciousness, key to Schelling's system, was later developed by Schopenhauer and Karl Robert Eduard von Hartmann (1842–1906).

That Schelling's God *emerges* from matter does not make matter ontologically superior to the spirit. For Schelling, necessity/impersonal matter is temporarily previous to freedom/spirit (Bruno 2020). But, (onto)logically, freedom/spirit is previous to necessity/matter. This metaphysical paradox had a strong presence in Hegel, as we show below. To be more precise, in Schelling's metaphysics, the spiritual side of nature exists since ever, but it does so in an *asleep* or *unconscious* form. As such, consciousness emerges from nature because it is always virtually included in it. For our purposes, this means that matter, though existing without individual actual egos (unlike in Berkeley and Fichte) is a form of spirit. For Schelling, one of nature's key features is *productivity*. This, of course, is a very important ontological departure from the traditional views of matter as negativity and passivity. This productivity is mainly reflected on God's progressive awakening through universal physical, chemical, biological, and human historical development.

Schelling anti-materialism also shows in his views (of Parmenidean flavor) of finite entities as appearances, as well as the identity between the object and the subject. In *Philosophy and Religion* (1804), Schelling explicitly stated that only the Absolute is truly real (Schelling 2009[1804]). As such, the multiple finite entities that surround us can only be understood in terms of the incomprehensible Absolute's "fallenness" into finite things. Such metaphysical fallenness looks like Schelling's secularized appropriation of traditional Christian creationism.

Multiplicity and individuality hold little ontological weight in Schelling's philosophy. The spirit is non-individual. Schelling considered Descartes' individual *cogito* to be a philosophical mistake. The individuality of thinking fades away in the Absolute: it is God/the totality/the Absolute what things and knows itself through us. But human conscious thinking is unable to fully grasp the Absolute's featureless reality, in which the dualism between the objective and the subjective totally fades away. Thus, philosophy cannot positively represent the Absolute. For that reason, the Absolute's self awareness is better grasped by some forms of art that blur the

difference between the objective and the subjective, between necessity and freedom, exteriority and interiority.

By postulating that individual egos emerge from an impersonal matter, Schelling was closer to materialism than previous Christian spiritualists and Fichte. Nevertheless, Schelling's main metaphysical mistake was to contend that the spirit (i.e., the psyche) was, somehow, already present in impersonal matter, even if in an asleep or unconscious way. This position could be considered as a form of "positive emergence" (Bueno 1993) according to which what emerges is not really new but contained in the existing reality. Although in an obscure way, nature was always "pregnant" of consciousness and spirit. This neophobic metaphysics also permeates Hegel's system.

Schelling's God is constantly revealing Himself. In this process of Revelation, mythologies are a progress towards God's self-awareness. God mainly becomes aware of Himself through humans speculating historically on the nature and essence of the divine (Schelling 2012[1842]). Like the history of politics, philosophy, and art, the history of mythologies is not for Schelling a homogeneous and straight progress. Sometimes, there are temporary recoils on the road to universal progress.

Since for Schelling God is not a personal transcendent creator, and the essence of spirit is freedom, Schelling arrived to the conclusion that the world does not have a causal explanation for its own existence. Otherwise, we would fall into the realm of causality/necessity denied by the spirit's freedom. This metaphysical position was particularly explicit in Schelling's philosophical stage of *Positivphilosophie*.[28] Schelling also called "metaphysical Empiricism" to this positive philosophy. He opposed it to the "negative philosophy" which studies the *essence* of something without paying attention to the radical and shocking actuality of its very existence, that is, without paying attention to *reality's primordial facticity* (see Pérez-Jara's chapter in this volume). According to Schelling, Hegel's metaphysics represents a form of negative philosophy. For Schelling, the human awareness of the groundless and unconditional character of the Absolute exposes our radical finitude and mortality. The "exuberance of being" provokes a deep feeling of awe or respect in us. Despite being usually downplayed, when not totally ignored by many manuals of history of philosophy, it is easy to see the influence of many of Schelling's ideas in the so-called existentialist philosophy, from Søren Kierkegaard to Martin Heidegger.

To sum up: Schelling's development of the idea of unconsciousness, his critiques of the dualist idea of knowledge as a form of simple representation, the thesis of matter as a condition of possibility for the emergence and evolution of individual egos, along with the denial, for contradictory, of several of the traditional characteristics of the Christian God, make Schelling's philosophy to be something worthy of consideration for the history of philosophical materialism.

[28] Important to note is that Schelling's lectures on positive philosophy were attended by personalities such as Engels, Bakunin, Kierkegaard, and Humboldt.

Hegel's Absolute Idealism

From Schopenhauer, Popper, to a vast majority of analytic philosophers, Hegel has attracted the wrath of many thinkers. Someone like Russell at least granted that he was worth of a deep philosophical analysis (unlike Fichte and Schelling). Russell (1972[1945]) even conceded that "Hegel saved himself by means of the influence of Spinoza". Again, we believe Hegel did more than that. Hegel proposed his metaphysics as a synthesis between Fichte's subjective idealism and Schelling's objective idealism. From the first he accepted some key notions: (1) the importance of inter-subjectivity: there is no "I" without "you"; as such, the ontological figure of the ego structurally implies a plurality of egos; (2) Kant's thing in itself is contradictory: it is postulated as totally different from the a priori categories put by the transcendental ego, at the same time that is thought through some of these categories (such as substance and causality); (3) egos develop ontologically through overcoming obstacles; Fichte's obstacles put by the pure Ego's will become Hegel's processes of overcoming dialectical contradictions. From Schelling, Hegel adopted the following ideas: (1) things in themselves and human representations cannot be absolutely different, as Kant postulated: human knowledge has to be a side of absolute reality; (2) God cannot be the creationist personal unchangeable divinity of medieval Christian metaphysics; rather, also following Spinoza, God has to be everything that exists; there cannot be anything outside the Absolute; (3) unlike Spinoza, but like Schelling, God is not a given reality: it develops through time. Hegel followed Schelling's metaphysical thesis according to which the physical, chemical, and organic stages of the universal evolution through which God starts to know Himself are unconscious. Consciousness and self-consciousness are, therefore, evolutionary products; (4) Schelling's influence also led Hegel to consider matter as a condition of possibility for the evolution of consciousness. In Hegel's system, matter is reality "in itself", in contrast to consciousness, that, temporarily evolving from matter, would be reality "for itself". Hegel, obsessed with dialectical triads, considered both moments as thesis and antithesis, synthesizing them in reality "in and for itself", which he called the "absolute idea".

Hegel, following Schelling, considered matter as "alienated spirit": if spirit is interiority, matter is exteriority, if spirit is simplicity, matter is plurality, if spirit is freedom, matter is necessity. Hegel considered matter to be a degraded form of spirit, closer to the *non-ens* of Platonic and Neoplatonic metaphysics (1972[1945]). Nevertheless, Hegel also held in his *Encyclopedia of the Philosophical Sciences* that, since matter is a form of spirit, we can admire in it "God's wisdom". Nature should be considered as a "living whole" (2015[1817], §251). Nevertheless, Hegel emphasized at the same time that the most humble or contingent state of human psyche is a better element to understand God (2015[1817], §248).

Like Schelling, for Hegel matter/nature is chronologically previous to consciousness and egos (represented by the spirit), but (onto)logically, the spirit is previous to matter. Starting from the Kantian dualism between nature and freedom, but overcoming it, Hegel postulated, in a similar way as Schelling, that matter is an alienated or unconscious form of spirit that progressively starts to be more aware of

its own existence and possibilities: Hegel's God is the Absolute thinking about itself through human historical, cultural, and political developments.

Since matter is a form of spirit, Hegel's metaphysics is, together with Fichte, a form of exclusive spiritualism. But, like the rest of the idealists, Hegel's holistic metaphysics has no place for supernaturalism: it denies the immortality of the individual soul, miracles, prophecies, and demonic possessions. As such, for Hegel, there are no human psychologies without bodies, even if bodies are considered as a devalued form of (unconscious) spirit. And, although matter is a form of degraded spirit, its spiritual nature means that "everything real is rational and everything rational is real." (Hegel 1991[1820]). An unknowable reality totally beyond the spiritual categories of reason (like radical theology's *Deus Absconditus*, Kant's thing in itself, or even Schelling's Absolute) is just a fiction for Hegel's immanentist metaphysics; an immanentism that moved away, therefore, from Spinoza's transcendentalism, according to which the *res cogitans* would only be one among God/nature's infinite attributes. On the other hand, Hegel (1977[1807]) also moved away from Schelling's "Absolute" for being "the night in which all cows are black.". That is, for being a featureless (and therefore empty) identity.

Although according to Russell (1972[1945]), for Hegel "ultimate reality is timeless", the truth is that Hegel's "logic" does not analyze immutable Platonic entities outside the world, or God's mind "before the Creation". On the contrary, it studies the common ontological structures present in the philosophy of nature and the philosophy of spirit. Hegel (2015a[1817], §258) contended that time is an abstraction of *becoming* (in a similar way as space is an abstraction of exteriority). The Absolute, rather than "temporal", should be considered *eternal* (Hegel 2015a[1817], §258). But becoming is not a Parmanidean fiction: for Hegel, like for Fichte, being means becoming. And what becomes is the Absolute, this time thought as the totality of things. Hegel's holistic metaphysics made him to famously defend in his *Phenomenology of Spirit* that "the true is the whole". As such, nothing partial is ever completely true (Hegel 1977[1807]).

Although Hegel's holistic metaphysics often downplays the role of individuals in the ontological processes through which God knows Himself, it does not deny the importance of ontological individuality. Rather, Hegel's *Science of Logic* criticized ontological continuism: quantity–quality ontological leaps, along with ontological phenomena such as death, show that there are structural ontological discontinuities in reality. This brings Hegel closer to inclusive materialism's critiques of absolute monism (see later sections in this chapter) than to the pure indifference or identity of Schelling's Absolute, which denied the *real* existence of finite entities (Hegel 2015b[1816]).

As we have emphasized, both for Schelling and Hegel, there is nothing outside the Absolute. Therefore, the Absolute cannot think about anything but itself. In a way, this reflexivity recalls to Aristotle's God (νοήσεως νόησις, "thought of thought"). But, unlike Aristotle's God, Hegel's God is everything that exists, which is in constant evolution. Behind Hegel's often obscure dialectics, we can find a metaphysics that, in opposition to medieval ontotheology, emphasized the dynamic character of reality, the crucial importance of intersubjectivity, the nonexistence

of supernatural phenomena, and other important valuable ideas for philosophical materialism.

Schopenhauer's Materialist Idealism

Arthur Schopenhauer (1788–1860) is the most important idealist philosopher to have despised idealist philosophy, at least that of his rivals Fichte, Schelling, and Hegel. He would rather pair himself with Kant. And yet, many of his ideas can be traced back to his opponents, including Schelling's unconsciousness and the theory of the objectification of God in nature. But Schopenhauer did not recognized those debts and explained his project as the redefinition of Kant's transcendental consciousness, his a priori categories and forms, along with the "thing in itself". Schopenhauer also explicitly drew on Eastern philosophies, mainly on Hinduism and Buddhism, which played an important role not only in his ethics and anthropology, but also in his metaphysics.

Against the spiritualism defended by Descartes, Kant or Fichte, Schopenhauer grounded the true roots of the transcendental consciousness on the *human brain*, rather than on a disembodied spiritual activity. In yet another twist to Kant's philosophy consisted, he reduced the twelve a priori categories of the understanding to only one, the principle of sufficient reason as it had been formulated by Christian Wolff (1679–1754). Against the Parmenidean, Platonic, and Aristotelian spiritualist duality between sensibility and understanding, Schopenhauer (2018[1859]) fused both: a pure sensibility is impossible, every sensible intuition implies the principle of sufficient reason. For that reason, Schopenhauer defended that animals, although intellectually inferior to human beings, are not only capable of suffering and willing: they also manage a basic version of the principle of sufficient reason, without which they would die. Against the radical spiritualist thesis held by thinkers such as Gómez Pereira (1500–1567), Descartes (1596–1650), and Malebranche (1638–1715) according to which animals are machines without emotions and thinking (Pereira 2019[1554]), Schopenhauer defended that the animal and human psyche is a system of biological devices prepared for the survival in hostile and complex environments.

Despite these unquestionable materialist elements in Schopenhauer's metaphysics, he embraced idealist positions. His rejection of naive realism led him to declare, following Kant's Transcendental Aesthetics, the ideal nature of physical matter. This means that Schopenhauer's metaphysics conserves Kant's division of reality into two realms: Kant's phenomena became, in Schopenhauer's metaphysics, the world as representation (*Vorstellung*), whereas the thing in itself/*noumenon* became the Will (*Wille*). Despite being the mother of countless misunderstandings, Schopenhauer's "Will" is the most important concept in his metaphysics. Schopenhauer identified absolute reality with an impersonal force that manifests or objectifies itself in everything that exists, from the most basic physical and chemical processes, to the most advanced biological and sociocultural processes present in human beings. Thus, behind physical phenomena such as gravitation or magnetism, a basic manifestation of the Will underlies. The Will is the active principle of the

World. Schopenhauer's Will achieves its highest degree of expression in humans' desires and dissatisfaction.

Following Kant, Schopenhauer postulated that neither space, time, nor causality are characteristics of the absolute reality. Logically, this implies that Schopenhauer's Will (i.e., the absolute force that constitutes reality) is, like the Christian ontotheological God, immutable, simple, and without any cause or reason for its own existence. But, unlike the traditional Christian God, the Will is a purely non-creator impersonal entity. If Schelling held that the Absolute is an *Abgrund* (abyss), Schopenhauer contended that the Will is *Grundloss* (without reason). Both ideas will greatly influence Heidegger's ontology.

If for Kant the experience of human freedom connected us to the thing in itself, for Schopenhauer, the identification between our bodily movements and our acts of will opens the way to the identification between the Kantian thing–in–itself and the World as Will. The identity between our will and our bodily movements makes us to realize, according to Schopenhauer, that we, beyond phenomena, are internally composed of Will. We are then in a position to extend this discovery, although in different degrees, to every corner of the material world, which in this light appears as an objectification of the Will (2014[1859]; 2018[1859]).

Infinite Will is beyond any possible understanding, since there is no cognition without space, time, and causality. This does not mean that Schopenhauer considers metaphysical knowledge impossible; Schopenhauer criticizes Kant's very narrow limits for metaphysics. According to Schopenhauer, Kant's antinomies in the *Critique of Pure Reason* are totally factious: we can philosophically demonstrate that the World is not a transcendental illusion, but an eternal and spatially infinite reality non-created by any providential God (Schopenhauer 2017[1851]). We cannot, Schopenhauer claimed, conceive the non-eternity of matter. Schopenhauer (2016[1851]) even poetically identified the World with Vishnu, the supreme divinity of many forms of Hinduism.

Against Schopenhauer's materialist side, there are important thinkers, such as Russell (1972[1945]), who have emphasized that Schopenhauer "believed in spiritualism and magic." Despite it is true that in *Parerga and Paralipomena* (1851) Schopenhauer contended the truth of many phenomena traditionally linked to spiritualism and magic, he gave them a completely non-spiritualist explanation: unlike Kant, Schopenhauer (2016[1851]; 2017[1851]) held that the Will's "omnipotence" can break the spatio–temporal causality of the World as representation. After several misunderstandings provoked by the first edition of his magnum opus *The World as Will and Representation* (1819, 1859),[29] Schopenhauer's *Parerga and Paralipomena* and other writing emphasized that the Will was not a literal psychic force. To talk about "Will" was just a metaphor that pointed out at a completely impersonal force.

[29] *The World as Will and Representation*'s first edition was published in late 1818, with the date 1819 on the title–page. In 1844, a second edition appeared. This edition was divided into two volumes: the first one was an edited version of the 1818 edition, while the second volume was a collection of commentaries about the ideas expounded in the first volume. In 1859, at the end of Schopenhauer's life, a third expanded edition was published.

The psyche is a collection of means, generated by the brain, to achieve the Will's blind "goals": reproduction, nutrition, rest and so on as manifestation of the will to persevere in existence (Schopenhauer 2014[1859]). He named it "will" because of the analogies between this blind force and animal and human volition. Without recognizing Schelling's influence, Schopenhauer argued that the unconscious drive of the Will structured reality, from physical and chemical processes to more advanced realities such as human sexuality.[30]

Schopenhauer explicitly placed the aprioristic Kantian categories of the intellect (now reduced only to causality) in the human and animal brain.[31] For that reason, Gustavo Bueno, inspired by Paul Janet, talked about Schopenhauer's "idealist materialism" (1972: 166; 2019). This oxymoron is dissolved once we pay attention to the main inconsistency of Schopenhauer's philosophy, namely the attempt of explaining the a priori forms of cognition of space, time, and causality in terms of brain processes (Schopenhauer 2014[1859], 2018[1859]). But the brain is already a spatial, temporal, and causal reality! How can we explain the ideal character of matter through the brain if it is already material? The only possible way to break this vicious circle in which Schopenhauer fell into is to abandon Kant's transcendental idealism without neither returning to naive realism nor following the radical spiritualism defended by German idealism. This is precisely the way followed by the inclusive materialism that we defend in this chapter. We know that we cannot hypostatize the organoleptic morphologies of the world we perceive because they greatly depend on our organs, nervous systems, and sociocultural environment.[32] The organoleptic world emerges from the ontological encounter between a independent material reality and highly evolved biological processes (processes socioculturally and historically shaped in the case of humans). Neither that independent material reality is Kant's thing in it self, nor the biological, historical and sociocultural processes that shape human perception and understanding of the world is Kant's Transcendental Ego.

Finally, the abandonment of Kant's Transcendental Aesthetic and Transcendental Analytic also implies to overcome Schopenhauer's most anti-materialist idea, namely the immutable and absolutely simple character of absolute reality.

The Materialist Controversy in Germany

By the 1840s idealism was in decline in Germany. This was in part a consequence of the tremendous success of the sciences. Observation, experiment, and mathematics

[30] Schopenhauer's metaphysics of sexuality brilliantly anticipates many hypotheses of evolutionary biology: see Pérez-Jara (2011).

[31] Schopenhauer agreed with Schulze's critique of Kant's contradictory use of causality. For Schopenhauer, the thing in it self (i.e., the Will) is not the cause of our sensations. Rather, our sensations are a (non-causal) manifestation of the Will.

[32] Here, we use the concept of organoleptic in its usual meaning of relative to our sensory experiences, so the "organoleptic world" is the set of phenomena, from the taste of wine to the colors of the sky, filtered through our sense organs.

replaced dialectics as a paradigm of rationality. Not only physics and chemistry were achieving major triumphs but also the scientific methods were applied (or attempted to be) to biology, psychology, and historical analysis.

On significant occasions, these developments went hand in hand with a critique of religion. David Strauss and Bruno Bauer championed the critique of positive religion in two famous books of biblical studies. They showed that some religious beliefs rationalized by the Hegelian dialectics were no more than mythical impostures or poetical expressions of human wishes (Bauer 1841; Strauss 1835). By the same epoch, Helmholtz's enunciation of the principle of the conservation of energy made suspicious the very idea of a divine creation. The rising authority of modern science contributed to spread the idea that only matter exists. Many physicists used and transformed concepts and techniques from idealism while attacking its central tennets (Wise 2018), and others coordinated knew knowledge, for instance of thermodynamics, with the old prophecies of evangelical religions (Smith and Wise 1989). But the scientific bang gave new wings to new varieties of materialism.

A new breed of materialists, different from those of the *le siècle des Lumières*, were ready to champion the old cause and engaged in numerous disputes that went from the mid 1850s till the end of the century. The main ones were Carl Vogt (1817–95), the author of the polemic *Köhlerglaube und Wissenschaft: Eine Streitschrift gegen Hofrath Wagner in Göttingen* (Vogt 1855) and Ludwig Büchner, whose *Kraft und Stoff* was considered as "the Bible of materialism". This latter book was also published in 1855 and went through twenty-one editions and it was translated into seventeen languages (Büchner 1855). The key for such a success lays probably in the fact that the book was written without technicalities and straight to the point. Büchner aimed at the general public. He presented a wholly naturalistic worldview with no room for the Divine, miracles, or any form of transcendence. He insisted, however, that his concept of matter should not be confused with the Cartesian idea of matter as inert stuff. For Büchner, matter, endowed with force (i.e. the capability of interacting), was a center of activity. In his book he offered many examples from magnetism to chemical reactions. Matter, he argued, is self-sufficient, an eternal substance in permanent change. His doctrine, we might say, was closer to the Milesians or even Heraclitus than to Democritus or Lucretius.

Such ideas did not go unquestioned. Not only theologians but atheistic metaphysicians confronted them. Pessimist philosophers such as Julius Frauenstädt (1813–79) agreed with the materialist position, but only insofar it is applied only to the phenomenal or natural world and not beyond it. A disciple of Schopenhauer, Frauenstädt separated appearances and things-in-themselves. The realm of moral and purposefulness was the second, not the first one (Frauenstädt 1856). He accused Büchner and his fellow materialists of naive realism.

Also based on Kant's ideas was the critique presented by Friedrich Lange (1828–75) in his famous *The History of Materialism*, one of the most influential books of the second half of the nineteenth century (Lange 1866). Lange argued that the noumenal world is not an ontological realm filled with supernatural objects but a strictly normative realm containing moral and aesthetic values. These values are not things-in-themselves but our creations, which have nonetheless universal and

necessary validity. Lange's book was the first comprehensive history of materialism, and beyond its neo-Kantian criticism it had enduring value as such.

It is not possible to make justice here to the rich controversy around German materialism in the period 1850–1900. The publication of Darwin's *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* in 1859 added a new dimension to the already hot debate around materialism and the naturalist worldview. The interested reader is referred to the excellent books by Gregory (1977) and Beiser (2014) for further details and references.

From German Idealism to Marx's and Engels' Materialism

Karl Marx's and Friedrich Engels' "dialectical materialism" had an enormous practical and theoretical weight throughout twentieth century. There are thinkers who go as far as contending that, in a sense, every relevant philosopher of the last 150 years is under the shadow of Hegelian and materialist dialectics (Zizek 2013). Here, instead of either glorifying or downplaying dialectical materialism's philosophical importance, we will summarize the main strongest and weakest points of such worldview, underlying its deep connections to German idealism and its understanding of matter.

Although the influence of seventeenth, eighteenth and nineteenth centuries mechanistic materialism was key in the development of Marx's and Engels' philosophical materialism, the impact of Modern idealism cannot be downplayed. As Ludwig Feuerbach (1804–1872) had done in his own way, Karl Marx (1818–1883) and Friedrich Engels (1820–1895) took advantage of many theses of German idealism for their particular conception of philosophical materialism. Specifically, and against attempts to abandon Hegel, Marx declared himself his disciple. His project, he announced, was an "overturning" or materialist "reversal" (*Umstülpung*) of Hegelian ontology (Marx 2014[1844]). Among other writings, Marx did just that in his *Critique of Hegel's Philosophy of Right* (1844). Nevertheless, Marx's reversal of Hegel's worldview has often been misunderstood as if Hegel held that a personal and a conscious spirit was previous to the existence of matter. As we have seen, behind Hegel's Christian rhetoric, a deeply secularized metaphysics stood. Therefore, we need to interpret Marx's (and later Engels') *Umstülpung* in more rigorous terms (Bueno 2008).

Marx wrote little about metaphysical topics. As such, he relied on his philosophical companion, Engels, to found the ontological premises of his political, economic, and sociocultural philosophy. But there are significant ontological insights in Marx's philosophy. Marx's metaphysical background ranges from Greek atomism and Aristotle to the German idealists. His most relevant contribution to metaphysics might be his idea of production. Key metaphysical components of Fichte's ego (as dominating nature) and Hegel's spirit (as a creative force) survive in this concept, as Marx partly recognized when speaking of the "active side of German idealism" in his *Theses on Feuerbach* (1888): see Marx and Engels 1976[1888], and James 1980[1948]. In Marx, only through production does reality become meaningful for humans.

The idealist binary opposition between nature and spirit also survived in Marx's distinctions between nature and culture and between consciousness/subject and world/object. Marx adapted Hegel's "objective spirit" and "process of objectification" for his own worldview. Similarly, he also adopted Hegel's emphasis on "dialectical processes" pervading history and societies' structures and interactions. Marx also drew on Fichte's insistence on the intersubjective nature of the ego. Marx even appropriated Schelling's unconscious: Marxist class consciousness implies a more common situation of class unconsciousness of the processes constituting asymmetrical human societies and interactions.

Engels' ontology was more ambitious. His unfinished *Dialectics of Nature* (1883) was a significant contribution to metaphysics. Working on that book for a decade, Engels proposed a dialectical materialism supported on both a naive positivism regarding natural sciences and dialectical metaphysical laws. In a similar way as in Marx's sociocultural and historical ontology, Engels' metaphysics revolved around the Hegelian notion of contradiction and conflict as applied to the whole of reality, both physical and human. Engels' three laws of dialectics are the law of the unity and conflict of opposites; the law of the passage of quantitative changes into qualitative changes; and the law of the negation of the negation. The Hegelian influence of each of these laws is undeniable (McClendon 2004).

Take what is today perhaps the most influential of these principles, "the law of the transformation of quantity into quality and vice versa". Hegel's *Science of Logic* (1812, 1816) discussed such qualitative jumps. And, already for Hegel, they imply important ontological discontinuities and ruptures in reality, thus contradicting the extended approach to Hegel and Engels as absolute continuist philosophers. But Engels' "qualitative jumps" are a rather obscure and contradictory form of presenting emergence (Bunge 2003, 2010). By trying to understand ontic oppositions and strife through Hegelian dialectics, Engels ended up developing a rather obscure metaphysics, whose main inconsistencies arise from applying Hegelian dialectics to physical and chemical processes and from the (attempted) development of a "dialectical logic" (Bueno 1972; Bunge 2010).

For Engels, matter is a general abstraction that behaves "like the idea of fruit in respect to cherries, pears and apples." (Engels 2012[1883]). As such, what is real is not matter, but concrete material entities.[33] As we saw, Hegel, on his part, had declared matter to be a form of spirit. But recall that, chronologically, Hegel starts with stars, rocks, mountains, and rivers. From mechanic interactions to organic beings, reality evolves towards self-awareness. But Hegel thought impossible for psychological life to exist as a completely new product relative to physical, chemical, and organic matter. If such emergence is impossible, Hegel thought following Schelling, then psychic life has always to be virtually included in matter (like, we could say, a tree is virtually included in a seed). And, because before the emergence of animals (and above all, human beings) matter does neither think nor

[33] For a very interesting philosophical analysis on this topic, see: Bueno (1972), pp. 50, 52, 60, 72, 283, 288.

feel, it is clear that the "spirit" (i.e., psychological life) is included in matter from the onset in an "alienated way". For Hegel, the emergence of consciousness, therefore, is a necessary product of matter. Engels followed this Hegelian thesis. Matter, in its eternal cycle, necessarily produces the thinking spirit. Thus, if the thinking spirit disappears, it will appear again in another part of the universe (Engels 2012[1883]). Naturally, Engels' thesis implies a metaphysical anthropocentrism incompatible with a true materialist understanding of the many contingent physical, chemical, and biological processes that take "intelligent thinking" into account.

In this section we have seek to demonstrate that, paradoxically enough, German idealism displays key (if often downplayed) materialist components and that Marx's and Engels' dialectical materialism mobilizes relevant, if also often overlooked, idealist components. Dialectical materialism resulted from the transformation of seventeenth and eighteenth centuries materialist ontologies through German idealism, just as German idealism was a secularized development of Christian metaphysics.

1.7 The Scientific Bang

Independently from the new idealist and materialist philosophies, but not completely detached from them, nineteenth century sciences took notions of matter in different fields to completely new realms. Contemporarily with the Baron d'Holbach, the French chemist Antoine-Laurent de Lavoisier (1743–1794) reorganized chemical matter through a new nomenclature that clearly defined the field of modern chemistry. Thanks to this new system of terms and through precise experiments with balances, he concluded that the quantity of matter (mass) always remains the same through chemical reactions. This clear separation between matter and mass, which came to be understood as a property of the former, is of paramount importance in the history of materialism. John Dalton (1766–1844) moved Lavoisier's chemical revolution forward reintroducing the atomic theory. The main points of his theory as presented in *A New System of Chemical Philosophy* (1808–1827) were of lasting significance for materialistic understandings of matter:

- Chemical elements are made of extremely small particles called atoms.
- Atoms of a given element are identical in size, mass and other properties; atoms of different elements differ in size, mass and other properties.
- Atoms cannot be subdivided, created or destroyed (something that was proved to be wrong in the twentieth century).
- Atoms of different elements combine in simple whole-number ratios to form chemical compounds. This allowed Dalton to make sound predictions.
- In chemical reactions, atoms are combined, separated or rearranged.

The nineteenth century also saw the birth of thermodynamics and its advance at fast pace. Drawing on the work of Joseph Black and James Watt, Sadi Carnot, published his *Reflections on the Motive Power of Fire* (1824), a treatise on heat,

power, energy, and engine efficiency. The book outlined the basic energetic relations among the Carnot engine, the Carnot cycle, and motive power, marking the starting point of thermodynamics and contributing to a technological revolution which reshaped the world. The first and second laws of thermodynamics emerged simultaneously in the 1850s, primarily out of the works of William Rankine, Rudolf Clausius, and William Thomson (Lord Kelvin). All these efforts configured an image of the world that was essentially mechanistic, and certainly materialistic (see Purrington 1997 for a full account; see also Camprubí's chapter in this volume). Partly modeled in Lavoisier's law of the conservation of mass, the generalized law of the conservation of energy was formulated in the mid-nineteenth century simultaneously in Great Britain and in Germany. Hermann von Helmholtz's 1847 *Über die Erhaltung der Kraft* (On the Conservation of Force) established the principle and in 1850 William Rankine referred to it as "the law of the conservation of energy". Energy came to be considered a universal property possessed by any kind of matter in the physical world.

Another milestone of nineteenth century physics was the development of the kinetic theory of gases by Maxwell, Gibbs, and Boltzmann (Purrington 1997; Van Melsen 2004; Yourgrau et al. 1982). By first time a macroscopic theory (thermodynamics) was recovered as a limit of a microscopic theory (the atomic theory). Properties such as temperature, pressure, entropy, heat, equilibrium, and empirical numbers appearing in classical thermodynamics could now be understood as an effect of the properties of tiny particles and their own properties. Boltzmann was the champion of the battle between atomists and energeticists (including Ernst Mach and Wilhelm Ostwald, who viewed energy as a kind of fluid and even proclaimed the death of matter). The controversy was settled by Einstein, who explained Brownian motion as an effect of atomic motions in 1905 and by Jean Perrine, who experimentally demonstrated the existence of atoms in 1908. Energy was firmly established as a property of physical systems and not an entity in itself. Atoms exist, thus posthumously vindicating Boltzmann who had committed suicide just two years before Perrine's results (Broda 1983).

A fourth radical advance in the physical sciences was the electromagnetic theory and its long development along the nineteenth century. Already in the late seventeenth century various electricians postulated that electricity might be considered a kind of region of space with the potential to affect the motion of charged bodies (Cao 1997). These ideas were an *ad hoc* device to describe the motion of charges and magnets rather than the identification of a new kind of entity of independent existence. Such a bold step was taken in 1844 by Michael Faraday (1791–1867). Extending ideas of Boscovich, Faraday postulated the existence of continuous lines of forces, through which the electromagnetic actions were transmitted. These lines were real in the sense that they were affected by matter and could affect matter in return and in that energy can be present in them outside of any other body. This was the concept of *field* (Cao 1997; Hesse 2005, Romero in this book).

The physical reality of electromagnetic fields was not initially recognized because it was not obvious how such an entity could be accommodated in the dominant mechanist worldview of the time. Thompson developed a complex model

of a mechanical ether and James Clerk Maxwell developed his electromagnetic equations not as field equations but as equations describing how electromagnetic actions are propagated through Thompson's mechanical ether. It was only much later, with Hertz's demonstration that electromagnetic waves can propagate through empty space, that the concept of field finally imposed itself. Maxwell's theory was reinterpreted as a field theory by Lorentz and others. It produced a deep impression upon the young Einstein, who thought the field theory far superior to the purely mechanical interpretations. This led first to Special Relativity, with its reformulation of classical mechanics, and later to General Relativity where spacetime itself is endowed with energy and considered as a material stuff.

The actual meanders of nineteenth century physics and the complexities introduced by field theories and General Relativity in the twentieth and twenty-first centuries exceed the goals of this chapter. So do the no less important developments in biology, where Charles Darwin and others established the theory of evolution by natural selection, yielding a materialistic revolution of their own. Organisms emerged as highly organized forms of matter, not alien to universal laws comparable to those affecting all other systems in the universe. While this nineteenth century scientific bang opened up all kinds of philosophical interpretations and disputes, it also set the scenario for the varieties of the heterogeneous materialist theories that exploded in the next century.

1.8 Varieties of Materialism

We have already insisted on the variety of existent branches within the big family of philosophical materialism. This is most true for twentieth century philosophy. It is, however, useful to classify (and therefore simplify) this plurality to locate relevant differences and similarities. There are several possible criteria. For instance, some materialisms are implicit and other explicit. Implicit materialists were the philosophers who developed their worldviews before the emergence of the word materialism in the seventeenth century. But also the philosophers who held materialist stances but disliked the term. For instance, Heidegger never presented his obscure metaphysics as a materialist philosophy. And yet, he explicitly defended that absolute reality is meaningless and valueless without the phenomenological activity of human beings, who are structurally corporeal, finite, and mortal (Sheehan 2014). Even more, he explicitly rejected the spiritualist God of Christianity. Therefore, we could talk about Heidegger's "existentialist materialism" as we talk about Spinoza's or Schopenhauer's forms of materialism.

The criteria we use here, inspired by Bunge (2010), go more directly to the ontological contents, dividing materialisms into two main families: exclusive materialisms and inclusive materialisms. The first *exclude* the ontological reality of the psyche as well as of concepts or ideas, whereas inclusive materialisms include both of these kinds of realities (although always emphasizing that such realities cannot exist without physical, chemical, and biological entities and processes: see

Bueno 1972; Bunge 1977; Pérez-Jara 2014; Romero 2018). With this in mind, let us briefly overview twentieth century varieties of philosophical materialism.

Marxist Materialism

Marx's and Engels' dialectical materialism became, with significant updates, the official ontological view of the Soviet Union and several communist countries during the twentieth century. In the Soviet Union, dialectical materialism (*Diamat*) was seen as complementary to historical materialism (*Histomat*). We would not want to underestimate Diamat's obvious philosophical virtues. As Engels had already argued in his *Dialectic of Nature* against animism, pure spirits are impossible because they violate the laws of conservation of energy. Against ontotheology, it affirmed the eternity of matter and the nonexistence of the ontotheological God. Against anti-philosophy and relativism, *Diamat* offered a philosophical system trying to coordinate ontology, epistemology, philosophical anthropology, philosophy of history, political philosophy, ethics, and so on. Finally, it went beyond classical mechanistic materialism through its dynamic view of reality, supported on Hegel's process metaphysics.

That said, Diamat's philosophical difficulties were also notorious. Lenin's definition of matter as what is independent from human consciousness was directly inspired by Fichte's division between idealism/criticism and dogmatism/materialism. It thus carried the excesses of Ficthe's definition, which forced him to group Berkeley's philosophy with the "materialists" (Bueno 1972). No less fatal, *Diamat* rested on Engels' laws of dialectics, whose obscurity we reviewed in the latter section. It is false that every entity or process is the result of an "unity of opposites", as for instance quarks and leptons show. Furthermore, every "opposite" should also be composed of other opposites, *ad infinitum*. It is also false that every change in reality comes from the "contradiction" or "struggle" of such opposites. The number of physical, chemical, biological, sociocultural, and technological examples of processes that cannot be understood in terms of contradictions is simply too large to enumerate. Emphasizing struggles and contradictions is sound to confront static and harmonic views of reality. But the price to pay cannot be as high as Engels' or the Soviet laws of dialectics.

Was *Diamat* a form of inclusive or exclusive materialism? In general, Soviet philosophers followed Engels' Hegelian thesis that the "human spirit" is a necessary product of matter. Although they clearly emphasized that the latter could not exist without the former, the distinction between "physical matter" and the "human thinking spirit" is, in our view, enough to include most of them under the inclusive materialist category. Nevertheless, Engelian-Leninist analysis of the relationship between the human mind and physical matter were frail. Lenin's critiques of Joseph Dietzgen's thesis about the material nature of thought is a good example. Lenin contended that such inclusion of the psychological within the material ruined the epistemological difference between mind and matter and thus (suspiciously) dissolved the ontological divide between materialism and idealism (Lenin 2011[1909]).

Just as Lenin, Joseph Stalin (1878–1953) also made philosophical theory a part of his political practice. Stalin departed from Lenin's clear cut division between mind and matter and embraced a sort of neutral monism according to which "the mental and the material are two different forms of the same phenomenon" (Rosental and Yudin 1945). Stalin's *sui generis* neutral monism was confusing and hardly developed. Its main merit was the critique of vulgar materialism, but at the cost of not differentiating the qualitative discontinuities between physical matter, chemical matter, and biological matter's psychological processes in complex animals equipped with nervous systems. Before its peculiar Soviet version, neutral monism was a philosophy mainly advanced by Ernst Mach, William James, and Bertrand Russell. In its different versions, neutral monism postulated that physical events and mental events are expressions or dimensions of a common neutral reality –expressions whose boundaries are conventional or logical, rather than ontological. Thus, for instance, in Russell's version of neutral monism, both mind and matter are epistemologically inferred and logically constructed –which means that, without human beings, there are no mind and matter, but an unknown previous reality. Russell combined this view with a structural realism, according to which we can only know some general structural properties of that previous, subject-independent reality, but not the intrinsic qualitative properties of subject-independent events.

Stalin's downfall and subsequent *damnatio memoriae* erased his views from the *Dictionary of Soviet Marxist Philosophy*. Once again, the official doctrine became Engels' and Lenin's dualism between matter and the psyche. The psychoneural identity theory was rejected as "vulgar materialism".[34] Mario Bunge, who we classify below as an inclusive materialist, received harsh criticisms after proposing psychoneural identity in a Russian and a Hungarian journals in 1979 and 1982 respectively. As testimony of the strange alliances Soviet dualism led to, he wrote:

> Interestingly, whereas my Soviet critic was presumably a Marxism expert, my critic in the Hungarian journal of Marxist philosophy was an eminent neuroscientist, Janos Szentagothai, who also happened to be a devout Christian.[35]

The conclusion seems obvious: ontologically speaking, Soviet materialism represented a form of inclusive materialism at the price of threatening its own consistency as a materialist worldview. Diamat's epistemology was not less flawed than its ontology. Soviet philosophers too often discarded scientific and philosophical ideas arguing only that they "contradict Engels", or were written by "lackeys of the bourgeoisie" (Lenin 2011[1909]). This dogmatic approach led to the rejection and even demonization of scientific theories in the most diverse fields, including non-dialectical logic, relativity, quantum mechanics, genetics, and functionalist sociology. All of them, apparently, were considered as corrupt capitalist doctrines incompatible with a dialectical understanding of matter and of the revolution. But it would be inaccurate or directly ideologically fraud to claim that *Diamat* was totally

[34] Jarochewski (1975), p. 168.

[35] Bunge (2010), p. 127.

anti-science or that all research was bankrupt under Soviet leadership. Communist countries in general, and specifically the Soviet Union, devoted significant resources to scientific research, most often with practical purposes such as industrialization, weaponry, and the space race (Kojevnikov 2004). And recognized scientist such as Landau, Ginzburg, Fock, Zeldovich, and many others were allowed to work on theoretical physics, arriving, on many occasions, to impressive results.

Less dogmatic were the application and transformation of Marxist ideas to the fields of prehistory, history, sociology, and cultural anthropology outside the communist sphere. Among these we can highlight the works of Gordon Childe (2017[1951], 2009[1958]), Leslie White 2007[1959], and Marvin Harris (1979). But their ontological and epistemological significance regarding materialism was also less prominent.

Eliminative Materialism,Reductive Materialism,and Revisionary Materialism

If Marxist materialism was the official ontological view of the majority of communist countries, reductive materialism (or physicalism), along with eliminativism, became the dominant materialist counterpart in countries outside the communist sphere. When talking about physicalism, we might distinguish its ontological and epistemological variations. Otto Neurath (1983[1931]) and Rudolf Carnap (1959[1932/33]) coined "physicalism" as a philosophical concept. Despite some differences in their respective understandings of it, both philosophers gave it a purely epistemological sense: every empirical statement is equivalent with a physical statement (Hempel 1949[1980]). The Vienna Circle combined this epistemological physicalism with an implicit phenomenalist metaphysics very close to idealism and, in some cases, to solipsism.

Ontological physicalism is more interesting for the purposes of this chapter. It states that everything real is either physical or ontologically reducible to the physical. This thesis has been particularly successful in the twentieth century philosophy of mind. Within this theory, the Australian "identity theory" between mental processes and brain processes represents a very good example of both the philosophical virtues and flaws of ontological physicalism. Australian materialism (also called "Australian realism") started as a philosophical movement in the mid-twentieth century and spread in several Australian universities despite the social stigma of materialism in the Cold War context. Philosophers such as Place (1956), Smart (1963), and Armstrong (1968) confronted the mind–body problem, instead of despising it as a pseudo-problem as most members of the Vienna Circle. These authors developed the theory of the identity of mental processes and brain processes, which they called "identity theory" and "central–state materialism". Although this identification is millennia old, Australian materialists could for the first time support it on solid scientific neurological evidence.

The theory's virtues with respect to animism and metaphysical spiritualism are obvious. But, as nineteenth century "vulgar materialisms", its proponents failed to develop a sufficiently rigorous ontological and epistemological background to support their claims. They remained unaware of the pitfalls and dead ends of

reductionistic materialism. Although neurological processes cannot obviously exist without chemical reactions, or more basic biological processes, they have qualitative properties irreducible to chemistry, not to mention physics. It is simply not possible to account for psychological processes only in physical terms. It was even harder for Australian materialist to say something meaningful about political, economic, and social systems without betraying their own physicalist assumptions. But even limiting the analyses to their ontology of physical matter, Australian materialists lacked rigorous ontological doctrines on causality, spacetime,[36] and modal ideas. Current versions of this tradition have, in Bunge's ironic and somehow unfair terms, "dematerialized for lack of scientific nourishment" (Bunge 2010). Armstrong, one of its main founders, has developed a "states of affairs" ontology that seems no longer interested in matter (1997). Armstrong claims that "affairs" (or states) are the universe's basic ontological units, but he lacks the enough knowledge on physics to develop a consistent process metaphysics, as for example Gustavo E. Romero's more recent materialist event ontology has done (2016).[37]

Some philosophers have sought to supersede the reductionist materialism of identity theory while keeping their distance from spiritualism. John Searle's solution is that the brain "causes" the mind. Searle's philosophy of mind (1992, 1995, 1997, 2005, 2007) seeks a middle ground between materialism (which he identifies with physicalism) and psychoneural dualism (shared by Christians, Soviet Marxists, and philosophers like Karl Popper and John Eccles). Regrettably, the price he is ready to pay is a confusing and contradictory ontological doctrine of causality. Bunge ironically objected to Searle that to "maintain that the brain causes the mind (. . .) is like stating that legs cause walking, rather than walking being the specific function of legs."[38]

In the second half of the twentieth century, a more radical form of physicalism arose through the so-called "eliminative materialism". Different versions of it were offered by Randall Jr. (Randall (1958)), Rorty (1970), Churchland and Sejnowski (1993), Churchland (1984), and Dennett (1991). Randall aimed at "killing" the concept of mind, just as William James had destroyed the concept of consciousness. Another early precedent was radical behaviorism, although more methodologically than ontologically. According to eliminativism, psychological entities just do not exist; they belong to "folk psychology" and will gradually disappear from the scientific vocabulary as science moves forward, exactly as we got rid of the pseudo-scientific concept of the phlogiston. The psyche is a misdescription of brain processes. Consequently, it should not play any role in any serious scientific theory of the mind.

[36] Notable exceptions can be found in the work of J.C.C. Smart, Graham Nerlich, and Hugh Price who worked extensively on the ontology of spacetime and related problems.

[37] On the other hand, Bunge (2010) opposed both approaches, because for him there cannot be states or events without entities. Romero, however, points out that materialist ontologies based on concrete things or particular events are formally equivalent (Romero 2013, 2016): to consider things or events as basic is rather a matter or taste and not of fact.

[38] Bunge (2010), p. 148.

Eliminative materialists have often focused their attacks on *qualia*, denying their real existence as mere illusions. But this brings eliminativists to an obvious contradiction: without qualia, which imply the organoleptic scale with which we interact with the world, their own scientific and philosophical investigations would be impossible. Indeed, the eliminativists' point of departure is always a phenomenological world of colors, shapes, smells, desires, thoughts and memories. From there, they regress to the neurobiological processes behind these phenomena, only to deny the starting world as illusory or non-existent (Churchland and Sejnowski 1993; Churchland 1984; Dennett 1991). But they do not specify the ontological status of such an "illusion", a word that eliminative materialists take from the "folk psychology" that they want to get rid of. In other words, eliminativists attempt to explain *qualia* by pretending that these realities do not exist (Bueno 2016; Ongay 2019; Pérez-Jara 2014). The false dilemma of eliminative materialism (to either hypostatize psychological life or to completely deny it) is an unwillingly prisoner of the traditional Christian theological idea whereby the existence of psychological processes implies a supernatural soul or spirit. As such, eliminative materialism is an unconscious victim of theological propaganda (Pérez-Jara 2014).

Granted, eliminative materialism is a useful denounce of spiritualist dualism and brainless psychology. What is more, some of the points of Churchland (1986) and Churchland (1981) for revising "folk psychology" based on neuroscientific advances are commendable. But it is a *non sequitur* to conclude that studying the brain will rule out psychology in general. According to some eliminative materialist philosophers, future developments in the theory of connectionism and its models of the human brain will definitively prove that the processes of language learning, along with other forms of semantic representation, are highly neurologically distributed and parallel. From this, they conclude that there is no need for such discrete and semantically endowed entities as beliefs and desires (Ramsey et al. 1990). There is no reason to share their hopes, beliefs, and desires.[39] The goal should be instead to update psychology in the light of cognitive neuroscience, reinterpreting rather than ignoring concepts such as personality, memories, unconscious, and emotions. This project is not a chimera: it is precisely what current cognitive and affective neuroscience does.

Against the excesses of eliminative materialism, John Bickle and others have sought a middle ground through "revisionary" materialism or physicalism. According to this approach, only a partial revision of both our common sense and traditional psychology would be necessary. In Bickle's own words, "the focus of much recent debate between realists and eliminativists about the propositional attitudes obscures the fact that a spectrum of positions lies between these celebrated extremes (Bickle 1992)." Many have sought such middle positions, not all with equal success.

[39] It would also be interesting to wonder if these philosophers, in their daily lives (or even in their lectures and conferences) exclusively use complex neuroscientific terminology each time that they want to express that they feel tired, forgot something, feel disappointed, or are hungry.

Anti-Reductionist Materialism

Against reductionism and eliminativism, an explicit form of inclusive materialism in the twentieth century was represented by Roy Woods Sellars' "emergent realism". This philosophical approach combined systemic materialism with emergentism and scientism (Sellars 1969[1922]; 1970). Sellars' emergent realism disproved the common misunderstanding of taking "physicalism" and "materialism" as interchangeable terms. His sophisticated materialist metaphysics recognizes that neither psychological nor eidetic contents would exist without a physical substratum. But also that there is enough scientific and philosophical evidence to affirm that psychological and conceptual-abstract realities present ontological properties that qualitatively transcend physical matter.

After Sellars, well-known critiques of ontological and epistemological reductionism from naturalistic approaches, such as the ones held by Dupré (1993), have scarcely contributed to break with the cultural perception that identifies materialism with physicalism. Dupré's process metaphysics puts processes before entities (Nicholson and Dupré 2018). But these processes are so radically plural and discontinuous that Dupré renounces to account for possible epistemological ways in which diverse disciplines could merge into unified theoretical frameworks (Bunge 2003).

The identification of materialism with physicalism lives on despite the existence of non-reductionistic and non-eliminative materialisms. Physicalism enjoys an almost total monopoly of the term "materialism" in philosophical dictionaries and encyclopedias. Current prominent critics of materialism, such as Harman (2010)[40] and Gabriel (2015, 2017) also insist in identifying materialism with reductionism, eliminativism, or both. Even more worryingly, some of the current few non-reductionist materialisms that reject physicalism, such as Quentin Meillassoux's "speculative materialism" and Jane Bennett's "new materialism", end up embracing an updated form of animism, or even spiritualism. We discuss them in what follows.

Animist-Friendly Materialism

In his allegedly materialist metaphysics, Meillassoux (2009) explicitly defends a sort of return to Hume's contingentism, in which things could be radically other than what they are or have been. He calls this ontological hypothesis the "principle of factiality" and (against Leibniz) the "principle of unreason". This principle goes as far as to reject the necessity of both physical and logical laws. Absolute reality is a hyper–chaos where contingency is absolute. Such a position implies a rejection of the traditions that, has we have seen, has been the backbone of Western metaphysics along 25 centuries. Meillassoux sole stronghold against absolute contingentism is the principle of non-contradiction. But Meillassoux's defense of a radical ontological disconnection between psychology and biology,

[40] Also, see in this volume his chapter and his discussion with Javier Pérez-Jara.

biology and chemistry, and chemistry and physics takes him as far as to totally open the door for the ontological possibility of pure spirits and gods. Moral: his "materialism" ends up being an oxymoron (for more arguments on this, see Pérez-Jara in this book).

The so-called "new materialisms", although critical of physicalism, are equally paradoxical. They have a strong tendency towards reducing everything to socio-cultural and political practices and dynamisms. Harman (2016) has correctly seen that these "materialisms" are supported on a reductionism that "overmines" objects. In our own terms: they very often practice an upwards reductionism that ends up in a form of metaphysical holism. From our perspective, the problems of the so-called "new materialisms" run even deeper. If Meillassoux's "speculative materialism" implicitly introduced animism, Jane Bennett's "new materialism" explicitly embraces it. Bennett correctly critiques outdated views of matter as a passive and dull reality, in contrast to active "life". But, following Bruno Latour's Actor–Network–Theory (2005), she considers edibles, commodities, storms and metals as "quasi agents" (Bennett 2010). "New materialism", of course, comes in much more varieties than just Bennett's. But the emphasis on the agential character of matter is common to all (Coole and Frost 2010). As compelling as they are, these approaches confuse the necessary critique of matter as negativity and passivity with a neo-vitalist or neo-animist understanding of the universe. In some sense, we might say that they imply a retreat to *mythos*, an attitude that seemed superseded millennia ago.

1.9 Two Current Forms of Inclusive Materialism

Our historical approach to changing ideas of matter has demonstrated that philosophical materialism is not identical with physicalism. In this chapter (and this book) we want to emphasize two materialistic approaches relatively little known to an anglophone readership: systemic materialism and discontinuous materialism. Their main importance lies in that, contrary to the current practical monopoly of the term "materialism" by reductionist and eliminativist physicalism, both philosophical systems put forward an inclusive and non-reductionist materialism. Although both systems of thought have gone well beyond their authors, their origins and most significant developments need to be referred respectively to Mario A. Bunge (1919–2020) and Gustavo Bueno (1924–2016).

Argentinian-born Bunge has worked and lived in Canada since the mid-1960s and published most of his most relevant epistemological and ontological works in English and in conversation with the great figures of analytic philosophy of his time. Thus, some of his works have been widely debated in mainstream philosophy, particularly *Causality* (1959), *Foundations of Physics* (1967), the 8-volumed *Treatise on Basic Philosophy* (1974–1989), *The Mind-Body Problem* (1980), and *Emergence and Convergence*: *Qualitative Novelty and the Unity of Knowledge* (2003). Furthermore, he was active until weeks before his death, at

the age of 100 years old (see his contribution to this volume, submitted shortly before he passed way). Two recent *festschrift* volumes speak of the recognition his ideas have achieved in the philosophical debate (Martino 2019 and Matthews 2019). And yet, Bunge's systemic materialism is rarely considered among the great philosophical systems of thought of the twentieth century in textbooks, compilations or encyclopedias (in the *Stanford Encyclopedia of Philosophy*, for instance, his work is only briefly discussed as part of an article on "Philosophy of Science in Latin-America").

Gustavo Bueno, on his part, worked in Spain for his entire life and published in Spanish with only few exceptions (1990). One of his books has been translated into German (2002), one into Chinese (Bueno 2012), and only two of them into English, a summary of his epistemology (*Sciences as Categorical Closures*, in 2013) and an application of his ontology to the history of philosophy (*The Happiness Delusion*, in 2019). Thus, Bueno's main ontological and epistemological contributions are hardly known outside of the Spanish-speaking world. And yet, it is our contention that his discontinuous materialism deserves a place in current debates on metaphysics.[41] In particular, his *Ensayos Materialistas* (1972), *La Metafísica Presocrática* (1974), *Teoría del Cierre Categorial* (1992–1995), and *El Ego Trascendental* (2016), among others, put together an ontological and epistemological perspective with the potential of enriching the current state of the art.

In order to contribute to the demolishing of the ideological kidnapping of "materialism" by physicalism, in this chapter we will mainly stress the strong ontological and epistemological similarities between Bunge and Bueno's materialisms. Other chapters and the Discussions' section of this book's will elaborate on some significant differences between both systems. As we have stated, their common criticism of metaphysical reductionism situates both systems as *inclusive materialisms*. This means that, while rejecting spiritualism, these philosophies also *include* psychic contents as real components of some parts of the universe. While, based on incontrovertible scientific results, both Bunge and Bueno strongly defend that minds cannot exist without biological, chemical and physical processes, they also hold that such psychic contents represent a qualitative novelty that cannot be ontologically reduced to chemistry or physics. This means that, in some non-trivial way, both Bunge's and Bueno's systems can be considered as ontologically pluralist. The reason is clear: they defend (against absolute monism) that, aside of ontological continuities, there are also *structural discontinuities* in the universe (but see Ongay in this volume and the discussion between him and Pérez-Jara, also in this volume).

In addition to their common strong criticism of physicalism (which both authors considered as "vulgar materialism"), another key similarity between both thinkers is the elaboration of rigorous systems of thought supported on updated science. With such scientifically-supported philosophies, both Bunge and Bueno placed ontology

[41] While Bueno himself referred to his system as "philosophical materialism" in the 1970s, as he was seeking to differentiate it from historical materialism, that conceptualization is too general and common to other philosophies; in later works, Bueno spoke of "discontinuous materialism".

and epistemology in the core of their systems. Supported on that ontological and epistemological core, they also developed their systems in other important areas of philosophy, from anthropology and politics to ethics and philosophy of economy and history. Bunge did much to move the scientificity of the social sciences forward and Bueno developed an original theory of religion.

Bunge, trained as a professional physicist, grants philosophy the key role of ordering the knowledge generated by the different sciences, coordinating it into a general and systemic view of the universe. Bueno, in turn, pictured philosophy as a "second-degree knowledge" devoted to the systematic discussion of the ideas resulting from the confrontation of the multiple "first-degree" sciences, technologies, and techniques. Also important to note is that for both authors there is a virtuous circle between sciences and philosophy, since many philosophical ideas have a strong importance in the explicit or implicit presuppositions and methodologies of scientists. Bad philosophy can lead to bad science.

Both Bunge's "levels of emergence" and Bueno's ontological "categories" are directly related to the distinction between the different sciences and their scales of analysis. In that sense, both thinkers have been critical of the imperialistic attempts of certain disciplines to go beyond their realms or fields of action. Thus, a chemist, for instance, cannot study biological organisms in their specificity because these ones have qualitative properties that are not reducible to chemistry. More generally: while social interactions are made by living beings that are composed of chemical elements, and these ones of physical matter, the laws of physics alone cannot take account of chemical reactions, to say nothing of psychological or sociocultural realities.

There are some important differences between Bunge's and Bueno's epistemologies. They revolve around specific notions of representation, truth, logical necessity, and mathematical concepts. The two authors had an intense conversation about them in Oviedo in 1982 (Hidalgo and Bueno 1982: 25–59; also, see in this volume Camprubí, Madrid, and the discussion between Madrid and Romero; see also Primero and Barrera 2019). But both authors agree, against relativism and radical constructivism, that scientific *truths* grant humans firm access to objective properties of the universe, even if those truths are always partial due to our constitutive finitude.

A relevant difference between both systems would be precisely on what they understand by the universe. Bunge defines the universe as the "system of systems" that includes everything that exists. Against any attempt of hypostatization, Bueno in turn emphasized that the universe, rather than exhausting the material reality, should be considered as a finite episode of unknown ontological processes (see Pérez-Jara in this volume).

Neither systemic materialism nor discontinuous materialism have never been presented by their authors (or by us) as concluded philosophical systems, finally culminating the long history of materialism. While they do draw (often polemically) from previous and current philosophical materialisms, no system of philosophy is

exhaustive. They are open to interpretations and discussions as well as flexible enough to adapt themselves to an ever-updating scientific reality. Along the book we will point to the issues in which contradictions or insufficient analyses invite further revisions and formulations. Through such analysis and discussions, we hope to contribute to make these two philosophical systems find the place they deserve in future discussions on materialism.

1.10 The Future of Materialism

This chapter, though ambitious, does not aim at exhausting the richness of materialist approaches, even in the realm of Western philosophy to which it limits itself. But we have endeavored to show that a valuable lesson derives from this history: that materialists philosophies are not fixed in stone. Despite the millennial critiques of spiritualism and idealism, and the identification of matter with the general features of changeability and plurality, philosophical materialisms evolve together with scientific outcomes. Reality itself poses new problems. Against neophobic metaphysics, new categories, levels, or dimensions of matter may arise, opening new problems and unveiling unforeseen objects and relationships. New technologies can also yield new versions of materialism, both as tools for research (for instance, big data offering new results in both the natural and human sciences and experimental philosophy providing empirical results to resolve ontological problems such as black holes), and by constituting new realities in themselves, such as "artificial intelligence" (AI) and the "technosphere".

Moreover, the very history of materialism is movable. This is because philosophical history of philosophy is already mobilizing conceptions of matter, being, knowledge, and truth. Rather than from the God's eye view, our reconstruction of the development of matter is grounded on our own inclusive materialist conception. As such, readers can judge the power of inclusive materialism by checking our historical reconstruction against the conceptual richness of the history of philosophical conceptions of matter and against other existing approaches. We hope to have complicated the picture of Greek, Christian, modern and contemporary approaches, while at the same time providing tools to navigate that complexity and built new productive approaches from it.

Conversely, if the historical reconstruction we offer here is compelling in whole or in part, this would already be an argument for the potentiality of inclusive materialisms. The future developments of materialism will rely as much on the ability to productively appropriate the philosophical tradition (including here spiritualism and idealism) as in the capacity to analyze current transformations of matter and of the sciences that study it.

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