

MASTER THESIS IN PHILOSOPHY
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Jacob Moleschott and the conception of science in the 19th century

Scientific materialism as “totalizing” worldview

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Introduction

“And while I was watching that great man of Science, I had in mind the verse pronounced by Demogorgon in the *Prometheus Unbound* by the divine Shelley: - This is alone Life, Joy, Empire, and Victory [...]!”¹

It was the famous Decadent poet Gabriele D’Annunzio who, reviewing Jacob Moleschott’s speech *Per una festa della scienza* (1887) in the newspaper *La Tribuna*, which he was working for, wrote these words about that old and renowned scientist. But how could a personality such as D’Annunzio, whose poetry is characterized by a kind of mysticism, glorification of heroism, dispraise of middle-class mediocrity and philo-aristocratic nationalism, dedicate these words to a materialistic scientist like Moleschott?

If we stick to the standard picture of scientific materialism, the tone and the content of the article by D’Annunzio are quite incomprehensible. Indeed, according to that standard image, which has been exerting its influence on historical and philosophical studies at least from Lange’s *Geschichte des Materialismus* (1914) onwards, passing through Gregory’s *Scientific materialism in the 19th century* (1977) and up to the latest biography about Moleschott by Cosmacini (2005), scientific materialism was a radically innovative movement, which affirmed the superiority of science on every other form of knowledge, and which thus aimed at excluding all non-scientific disciplines from the domain of true knowledge. The materialistic conception of science has at its turn been depicted as purely empiricist, having eliminated every metaphysical ambition, as implying a clear and radical rupture with the philosophical tradition and, finally, as being atheistic and completely separated from, or even opposed to, religion.

Starting from such an idea of materialistic science, D’Annunzio’s statement is rather problematic; hence, the necessity of a revision of the standard image of scientific materialism becomes pressing: this is precisely what we are going to do in this work, which is a case study about scientific materialism in the 19th century and the image of science. We are going to approach this topic mainly through the work of the scientist, politician and philosopher Jacob

¹ My translation from FSM, *B III 8* (copy of D’Annunzio’s article “Su Iacopo Moleschott”, published on *La Tribuna* n. 301, 4 novembre 1887, typewritten by M. L. Patrizi and Carlo Moleschott around 1901): “E mentre io guardava quel grande uomo della Scienza, mi suonava nell’animo il verso che canta Demogorgon nel Prometeo liberato del divino Shelley: - This is alone Life, Joy, Empire, and Victory – là soltanto è la Vita, la Gioja, l’Imperio e la Vittoria!”

Moleschott, a physiologist of Dutch origins whose scientific and political work in the new-born Kingdom of Italy is very significant in order to understand the background and implications of scientific materialism in the late 19th century, as well as for the understanding of its reception in the late 19th and early 20th century. Research on Moleschott, up to now, has been quite scarce, and anyway always limited to a strictly biographical level: Moleschott was himself writing an autobiography, *Für meine Freunde. Lebens-Erinnerungen von Jacob Moleschott*, which has been published posthumous in 1894, and not much work has been done to investigate the background of the information supplied by Moleschott himself. Basing our research on Moleschott's unpublished manuscripts, which are conserved in the archives of the *Biblioteca dell'Archiginnasio* in Bologna, we will sketch a far more complex picture of scientific materialism, of Moleschott's view on science and of the cultural and political function of scientific popularization in the framework of the Italian historical situation of 1870-1900.

Scientific materialism: a form of monism?

Materialistic science is usually considered to be one part of that general movement called "positivism"; positivism and materialism are in fact related to each other in many respects: first of all, they flourished around the same period of time (basically the second half of the 19th century); secondly, they played the same role in the society of the time, which included the "popularization" of scientific ideas; thirdly, they both set for themselves the task and the project of integrating science, philosophy, politics and religion in one all-encompassing worldview.

The term "positivism" has been coined by Saint-Simon in 1830 in order to indicate the scientific method and its extension to the domain of philosophy. It had actually already been used by Condorcet, during the Enlightenment, to indicate something which was experimental in its method and concretely useful in its function, but Saint-Simon and his school used it for the first time to indicate the peculiar character of scientific knowledge.² It was the French philosopher Auguste Comte who theorized on it in his *Cours de philosophie positive* (1830-42), describing an anti-metaphysical approach, and it has since then characterized one of the most important currents of thought in European philosophy and culture in the second half of the 19th century. Comte interpreted science as well as history and society as a continuous and

² Cioffi, F., Gallo, F., Luppi, G., Vigorelli, A., Zanette, E., 2000. *Diálogos*. III. Milano: Mondadori, p. 116.

necessary progress, and argued for the use of the scientific positivistic method in all fields of knowledge. Herbert Spencer further developed the doctrine of a progressive evolution of social history, modeling his thought on the evolutionistic theory. The fact that Moleschott abundantly quoted Spencer in his sketched *Anthropologie* shows that he knew his doctrines and was inspired by them.³

Positivism has been mostly interpreted in a mechanistic and deterministic sense, if not even in a reductionistic sense, i.e. as being in favour of a reduction of all disciplines to the scientific method, and of all phenomena (be they natural, social or historical) to the same fundamental laws. But, in fact, we will show that what we find in scientific materialism is a definitely organicistic viewpoint, and a strong presence of explicitly religious, rhetoric and literary elements, whose importance for scientific ideas and the image of science the materialists are completely aware of. The same problem pertains to the interpretation of Moleschott's thought: he is generally considered to be a materialist, but his contemporaries interpreted him as a monist⁴. The standard interpretation of scientific materialism, which has been the dominant view since the end of the 19th century, depicts it as naïf scientism, which pretended to deny the very existence of everything which could not be defined in terms of matter and force; scientific materialism has thus been described as fundamentally reductionist, physicalist and mechanistic. Interestingly, this view was common to detractors⁵ of materialism, to historians⁶, and even to those who presented themselves as continuing the materialistic tradition⁷ (and who, thus, were continuing that tradition only insofar as it had been interpreted in a certain way).

But, in fact, scientific materialism is characterized by the presence of monistic ideas: implicitly or explicitly, Spinoza was clearly the source of inspiration both for Moleschott and Haeckel; indeed, Moleschott conceived of nature as the only divine principle, and of matter

³ This could have affected also Moleschott's own reception of evolutionism: besides Darwin, Spencer is his fundamental source on the topic (compare FSM, *B I 6 d, Quaderni*: notes on Darwin, 9th December 1882, manuscript); but we have to specify that, even if Goethe's influence was very important as well, the fact that his theories, as we will see, were marked as unscientific explains, at least partly, why this influence did not lead to a Goethe-mediated form of Darwinism, as it has been the case with Haeckel.

⁴ Compare the articles contained in FSM, *A I 8*.

⁵ Maschi, L., 1869. *Il panteismo in Italia e il prof. Moleschott*. In: *Rivista universale*, anno III, vol. VIII, p. 101-118; 249-265. Genova; Firenze.

⁶ Lange, F. A., 1914-1915. *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart. II. Geschichte des Materialismus seit Kant*. Leipzig: Brandstetter; Gregory, F., 1977. *Scientific materialism in 19th-century Germany*. Dordrecht: Reidel.

⁷ Armstrong, David Malet, 1993. *A materialist theory of the mind*. London: Routledge.

and force as two inseparable manifestations of the universal law governing all the existent: life itself was defined in terms of changing forms of matter, as a continuous “metamorphosis of composition”, an “eternal genesis and passing of forms”, an eternal exchange of matter (*Stoffwechsel*)⁸. These central issues of Moleschott’s materialism suggest that its essential character was monistic rather than dualistic; as we will see in the last section of the third chapter, his contemporaries perceived it exactly in this way: “his materialism should rather be named monism”, wrote a journalist in 1864⁹. But also primary sources demonstrate this point very well: in 1852, Moleschott published *Der Kreislauf des Lebens*, which was written in epistolary form and had as a subtitle “Physiologische Antworten auf Liebig’s Chemische Briefe”. The main thesis of that book was that life was but one particular variation of matter in motion, the general principle which constituted the universe. The particular motion of matter which defined life was by nature cyclical, at least in three senses: first of all, there is the cycle of individual life, then the loop of matters (*Kreislauf des Stoffes*) which permits to animals and plants to cooperate and benefit from each other, and finally the cycle of activity which preserves species and life in general. The death of the individual, i.e. the final oxidation of its tissues, responds to the needs of the second cycle, since decomposed elements would then serve as raw material for the construction of new organic life¹⁰. This image is of fundamental meaning for the understanding of Moleschott’s worldview, since it carries a unifying significance which will be central to Moleschott’s rhetoric.

Monism proposes a unitary explanation and vision of the world which includes natural sciences, religion and philosophy; however, the basis for this all-encompassing view was considered to be natural science¹¹, which therefore included also “spiritual” aspects. Monism is a kind of crossing movement, in that both authors who are considered as taking part in positivism (such as Ernst Haeckel, who divulged the theory of evolution in Germany) and scientists who were definitely part of neo-positivism (such as Ernst Mach) had a worldview which can be called monistic, because it was based on one unifying explanatory principle.

⁸ Gregory, F., 1977. *Scientific materialism in 19th-century Germany*. Dordrecht: Reidel, p. 89.

⁹ From an article about Moleschott’s speech at the University of Turin, held in 1863, in *Rivista italiana di scienze, lettere ed arti colle effemeridi della pubblica istruzione*, N. 172, Anno quinto, 3 Gennaio 1864. Viewed in FSM, A I 8.

¹⁰ Moleschott, J. 1852. *Der Kreislauf des Lebens: Physiologische Antworten auf Liebig’s Chemische Briefe*. Mainz: Von Zabern, p. 455; compare also Moleschott, J. 1989. *De eenheid des levens* (uitg., ingel. en van aant. voorzien door Vincent J. B. M. Peeters). Baarn: Ambo.

¹¹ Ziche, P., 2008. *Wissenschaftslandschaften um 1900: Philosophie, die Wissenschaften und der nichtreduktive Szientismus*. Zürich: Chronos, p. 3.

Moleschott's materialism, insofar as it was also a form of monism, tried to integrate, more than exclude. In this way, the morally good, the socially right, the esthetically beautiful, were all understood as deriving from certain physiological functions in the mechanics of neurosciences¹²; in this way, for Haeckel moral duties were no longer the result of an abstract categorical imperative, but of concrete social instincts¹³.

The difference between monism and materialism basically lies in the acknowledgment of spiritual aspects: while monism is defined by its theorization of one single principle being the only origin of the universe and its only universal law, materialism puts a stronger accent on the materiality of the universe and of its general ruling principle rather than on the singularity (in the sense of its being the only one) of the principle; this implies that the presence of spiritual aspects in science, which is not problematic for monists, becomes unacceptable for the materialists, since their view is centered on matter as the unique principle of every aspect of natural life and of human action as well.

Monism thus aimed at including, leaving nothing outside the task and the domain of science; this is why it could without any doubt be classified as a scientific movement, but also as a philosophical approach to science and reality, or as a form of religion. The fact that monism was in fact very narrowly connected to organizations of "freethinkers" and "freemasons"¹⁴ confirms its intrinsic pantheistic (not atheistic) and religious attitude. As a form of religion¹⁵ (or, better, as a substitute for all of them), monism (and materialism, insofar as its approach was monistic) offered a unifying and unique form of understanding and explanation of the whole of reality. Only such a unifying and totalizing vision of the world was likely to function

¹² Ziche, P., 2008. *Wissenschaftslandschaften um 1900: Philosophie, die Wissenschaften und der nichtreduktive Szientismus*. Zürich: Chronos, p. 13.

¹³ Compare Haeckel, E., 1899. *Welträthsel*, p. 403: „[Der Kategorische] Imperativ beruht auf dem realen Boden der sozialen Instinkte“. Quoted by Olaf Breidbach, Alle für Eines. Der Monismus als wissenschaftsgeschichtliches Problem, in Ziche, Paul (Hg.), 2000. *Monismus um 1900: Wissenschaftskultur und Weltanschauung*. Berlin: VWB, Verlag für Wissenschaft und Bildung, p. 12.

¹⁴ Compare H.-D. Mebes, Zur Gründungs- und ersten Entwicklungsgeschichte eines „Allgemeinen Freimaurer-Bundes auf monistischer Weltanschauung“, des nachmaligen (Reform-) „Freimaurerbundes zur aufgehenden Sonne“, in Ziche, Paul (Hg.), 2000. *Monismus um 1900: Wissenschaftskultur und Weltanschauung*. Berlin: VWB, Verlag für Wissenschaft und Bildung, pp. 129 ff.

¹⁵ Compare Olaf Breidbach, Alle für Eines. Der Monismus als wissenschaftsgeschichtliches Problem, in Ziche, Paul (Hg.), 2000. *Monismus um 1900: Wissenschaftskultur und Weltanschauung*. Berlin: VWB, Verlag für Wissenschaft und Bildung, p. 11: „Der Monismus ist demnach ein auf einzelwissenschaftliche Resultate verweisendes Postulat. Dies ist nicht begründet, es ist zu glauben. Konsequenter spricht der Biologe Ernst Haeckel denn in seinen, um 1900 breit rezipierten, Welträthseln auch von einer monistischen Religion.“ (Compare Haeckel, E., 1899. *Welträthsel*, p. 381),

as a surrogate, taking the place of the unifying and “totalizing” vision of the world proposed by the Catholic Church since centuries¹⁶.

The inclusive attitude and the structure paradigm

There are then two main attitudes by which 19th-century reflection on science can be characterized. The first one, which we will call “inclusive” attitude, consisted in trying to encompass within the domain of science all possible disciplines, in order to absorb their tasks and substitute them altogether; the other, which we call “demarcating”, consisted in excluding from scientific knowledge (and, scientific knowledge being identified with the only true knowledge, from knowledge as such), all forms of knowledge which did not conform to the method adopted by science. The first attitude has its origins in the Romantic tradition and in Idealism: it was in the first half of the 19th century that philosophers began to speak about “philosophy as science”; Fichte gave birth, in this way, to the project of a scientific philosophy, which should deal with phenomena by asking the same empirical and theoretical questions which are asked by natural sciences, raising philosophy to the level of science. The project of a philosophy of nature which is meant to transcend abstract knowledge through concrete knowledge, as it was conceived by Schelling and Hegel and then up to the materialists, also follows from this approach: the perfection of the form and the completeness of details are the results of the rational study and conception of nature in the *Phänomenologie des Geistes*.¹⁷ Exactly as it had been the case for the Romantic conception of art, positivistic science had assigned to itself an all-encompassing task, being convinced that not only nature, but the whole of human, natural, social and political reality was connected to science; this did not mean that all forms of reality had to be scientifically described, but rather that every

¹⁶ Compare Olaf Breidbach, *Alle für Eines. Der Monismus als wissenschaftsgeschichtliches Problem*, in Ziche, Paul (Hg.), 2000. *Monismus um 1900: Wissenschaftskultur und Weltanschauung*. Berlin: VWB, Verlag für Wissenschaft und Bildung, pp. 14-15: „Allerdings zeigt der Ablauf des Kongresses von 1904 in Rom – mit der Proklamation Haeckels zum offiziellen Gegenpapst der Freidenkerorganisationen – die stark antiklerikale Stoßrichtung, aus der heraus die monistische Religion, wie sie sich in Haeckels *Welträthseln* findet, eine eindeutige Konturierung erhält. Monismus war damit [...] eine politische, auf soziokulturelle Umorientierung zielende Weltanschauung.“

¹⁷ Renault, Emmanuel, 2002. *Philosophie chimique: Hegel et la science dynamiste de son temps*. Pessac: Presses Univ. de Bordeaux, pp. 27-28 : « L’appel à la philosophie pour résoudre les problèmes conceptuels et méthodologiques fondamentaux rencontre à l’époque une autre dynamique, proprement philosophique. La redéfinition fichtéenne de la philosophie comme science fait naître en effet le projet d’une philosophie scientifique s’attachant au détail des phénomènes et retrouvant par là même les problèmes théoriques et empiriques dont traitent les sciences de la nature. D’où le projet d’une philosophie de la nature tentant de transcender la connaissance abstraite vers la connaissance concrète à même de faire entrer le rationnel dans la description de la nature en associant ‘la perfection de la forme’ et ‘l’exhaustivité du détail’. »

phenomenon functioned according to the same general laws (most of the times, of one all-embracing general law). In this way nature, society and politics were presented as being subject to the same laws and the same gradual development¹⁸. At the same time, the influence of both subjective experience and cultural or environmental conditions was acknowledged by the materialists: Moleschott often reported that his way of perceiving certain things was influenced by his personal experience¹⁹; this is the precondition for the strong connection between ethics and epistemology about which we will speak in the third chapter, since, in order to avoid both subjective and external influence and to be able to observe nature through a neutral and disinterested gaze, the scientist had to train his own “self”. Moral virtues are clearly invoked as the guide for the good scientist; but that good scientist was at his turn called to interpret society and to lead political decisions (if not directly, as Moleschott himself did, then at least indirectly). We will argue that scientific materialism was not a “demarcating” view of the world: on the contrary, it inherited from Hegelian philosophy that inclusive attitude which was typical for great metaphysical systems, organizing reality under one single principle and connecting all levels of the system with each other.

This inclusive approach could at first sight seem to be completely opposed to the approach of neo-positivism (or logical empiricism), which focused on building up a common scientific method rather than a system, where all disciplines are at the same level, insofar as they conform to the same method (which can also be conceived as the same “language game”, or the same “syntax”). This point mirrors the fundamental change of perspective, namely from objects to structures in contemporary science and from the centrality of the subject to the centrality of language in 20th-century philosophy: it is with regard to this aspect that we will have to keep in mind the fundamental debates about philosophy and the language paradigm, in particular within Postmodernism. We will interpret the simultaneous presence of both innovative and conservative aspects in scientific materialism as the tangible sign of the particular position it occupied, standing in the middle of that transition. Thus, insofar as materialism considered nature as an objective reality which had to be studied and described in terms of universal laws, it was still attaining to the ancient categories as they had been elaborated by German Idealism; but, insofar as it conceived of the subject as the structuring element in the process of knowledge, it was already entering another scheme. Monism has

¹⁸ Moleschott, J., *Sul codice penale*. Parole dette in Senato da Jac. Moleschott [12 Novembre 1888]. Roma, Forzani e C., Tipografi del Senato 1888, p. 13

¹⁹ FSM, *A II 3 a, Fisica dell' organismo* (manuscript, 1883), § 31-33.

been an important step in what we can call the “implosion” of those categories, where the implicit presuppositions of materialism lead to overcome its own explicit fundamental principles. In fact, the rejection of dualism which characterizes monistic attitudes implies, as such, also a rejection of the categories on which dualism was itself based. It is true that monism declared to be inspired by Goethe’s philosophy of nature, referring in this respect to the Idealistic and Spinozistic tradition rather than making up a completely new point of view – new conceptions, in science as well as in philosophy, are never born from without, and never exclude the relation to ancient concepts: on the contrary, they evolve from previous conceptions. But it is also true that, while making use of those categories, monism was inscribing them into another context, which was very different from that of Romanticist philosophy of nature, thereby transforming them.

Therefore, we can argue that, within positivism itself, there have been some instances of the natural sciences which have made an important contribution to the overcoming of the old conceptions of objectivity and of science itself; after the refusal of the classical oppositions between object and subject, sensible and intelligible, and mind and body, monistic and materialistic science constituted a step towards the abandonment of ancient metaphysical categories.

On the basis of Moleschott’s documents, we will propose an interpretation of scientific materialism which implies, on the one hand, that materialism has wrongly been conceived as mere reductionism (i.e. as implying a “demarcating” attitude); on the other hand, it will also be apparent that scientific materialism has been almost identified with Feuerbach’s materialism, that it has been seen as its natural consequence and radicalization, while there are important qualitative differences in their way of thinking: both parts were striving for unification in science and in the relationship between knowledge and practice, but their different methods brought to very different results in the achievement of this unification. These differences imply that science could have never played the role of “totalizing worldview” in Feuerbach’s thought, because of his critical attitude vis-à-vis every absolutizing and idealizing way of thinking.

At the same time, the comparison between scientific materialism on the one hand and Kantian, Romantic and Hegelian philosophy of nature on the other hand underlines the elements of continuity between the respective views on nature and science. The centrality of

Kantian thought, especially with regard to teleology, organicism and mechanism, will be analyzed and reassessed, although maintaining the great differences between Kantian epistemology, which principally aims at defining the limits of science, and materialistic theory of knowledge, which gives science an absolute position and an all-embracing task.

Precisely this ambition relates scientific materialism to Hegelian philosophy and Romantic instances of absolute knowledge, which are transferred, by materialistic and positivistic science in general, from the subjective-artistic level to the objective-scientific level (this is what we have called “inclusive” attitude). Apart from ambitions of absoluteness, Hegelian influences are very strong also in the conception of history, which plays a fundamental part in the self-representation of materialistic science: in fact, materialist or monist science is presented, by Moleschott as well as by Büchner and Haeckel, as the highest form of knowledge, the necessary result of all precedent forms of science and at the same time the unity of the most disparate fields of study. Hegelianism is then the background for the interest of materialism in the history of philosophy, which constitutes, together with literature, the constant reference both of Moleschott’s lectures on physiology at the university and of his discourses at the Senate (when he had to justify his approval or rejection of a certain law).

Materialistic science justified its very ambitious all-encompassing task by presenting oneself as the only way of objectively describing reality, of representing it and therefore being able to dominate it (there are abundant metaphors implying dominion upon nature, and upon humanity insofar as it is part of nature)²⁰; in other words, the capacity of science of correctly describing and predicting natural phenomena and consequently providing a correct standard for normativity in social life, i.e. its capacity of being both true knowledge and effective praxis, depends on its objectively mirroring the world: on being, indeed, reflected nature.

Hence, the issue of objectivity is of great interest in the consideration of scientific materialism, and scientific materialism, in its turn, provides us with a very good perspective regarding the relation between ethics and epistemology, which permits to have some insight into the problem of objectivity for two main reasons: first, the concern with the objectivity of knowledge, and the consideration of science as the most objective form of knowledge and therefore as the best form of knowledge, have been formed in the 19th century; secondly, the

²⁰ Compare also Moleschott, J., *Kreislauf des Lebens*, p. 480, quoted by Gregory, 1977, p. 96: “Knowledge is insurmountable power, it is [...] not merely the greatest prize, it is also the broadest foundation for a life worthy of human beings”.

position of scientific materialism vis-à-vis the question of objectivity is quite particular, for it is not merely reductionist: materialistic science rather aimed at taking the place of old idealist metaphysics, and the object of science was not reduced to pure sense-data (it is not comparable to Mach's *Elemente*), for the recognition of the influence of the "environment" (of the "object") in the process of knowledge and of the preconceptions and prejudices of the knowing subject impeded to believe in the existence of such primary elements.

This also implies, then, a reassessment of scientific materialism on the basis of its tendency to inclusion which we have characterized as being opposite to demarcating attitudes and which, although not articulating all the relations between subject and object as Feuerbachian dialectics did, was nevertheless able to incorporate all kinds of disciplines and forms of knowledge, without leaving out any expression of human understanding. The attention to historical conditions, social milieus and anthropological variations (races), which were also the three pivotal elements of Comte's philosophy, led to a first comprehension of the relativity of experience and of its necessary dependency on subjective elements, and thus also to the acknowledgement of the impossibility of a subject-neutral knowledge. But, if a subject-neutral knowledge is impossible to achieve within an object-centered model, the categories of scientific materialism implicitly contain the hint to another paradigm, where nature is understood in terms of network relations and science has got the task of structuring those relations. This new conception of science and nature, which we will call "structure paradigm", is, as we said above, intimately connected to the tendency to inclusiveness: our two main themes, namely the characterization of scientific materialism as all-encompassing form of knowledge and of its epistemology as implying a shift to a new criterion for objectivity, are therefore strictly related to each other.

Summing up, the analysis of Moleschott's documents provides us with a new and very different picture of scientific materialism and of its attitude towards religion, the philosophical and literary tradition, and politics. We will here outline this revised image of materialistic science in three steps: the first chapter will present (a) Moleschott's work, with particular reference to his popularizing aim; (b) an overview of the movements in experimental science and physiology which constituted the framework of scientific materialism, and (c) an overview of the philosophical currents to which scientific materialism was related; both points show that scientific materialism was in contact with very heterogeneous philosophical and scientific traditions, and that its relation was not one of exclusion, but rather an open and

flexible one, where there was no rigid demarcation between scientific and non-scientific spheres.

The second chapter will then be concerned with a comparison of scientific materialism with the philosophical thinking of the main authors it was related with and it referred to; it will then turn out that scientific materialism tended to inclusiveness rather than exclusion: we will underline differences and analogies with (a) Feuerbach's materialism and, in particular, his epistemology, (b) the Kantian conception of organism and of the unity of nature conceived as regulative ideas of reason, (c) Hegel's and Schelling's philosophy of nature, underlining the deep connection of scientific materialism to Romantic and Idealistic philosophy of nature; we will finally illustrate (d) the very conscious way in which the materialists made use of high-culture in order to diffuse their idea of science among a broader public: Goethe's literary works provided the materialists with the image of science they divulged in their popularizing works. Referring to the tradition, scientific materialism claimed to be the most perfect and complete form of knowledge, in which all other forms and all products of human understanding were included, even non-scientific ones. In this way, it tended not only to inclusion vis-à-vis previous forms of scientific knowledge, in the sense that it presented itself as their legitimate heir; but it also had the tendency to absorb and appropriate even forms of culture and of knowledge which were completely foreign to science. Hence, these references do not only have the purpose of admitting that materialism belongs to that tradition, but rather of stating that the tradition is one moment of materialism, which constitutes its highest synthesis. We will call the latter attitude a totalizing and unitary worldview, which aimed at substituting Catholic religion (and, on a political level, the power of the Church over middleclass masses) through incorporating its tasks, its rhetoric style and even its values.

In the third chapter, it will be explained in which sense this inclusive attitude was transferred from the theoretical to the practical level, becoming a totalizing worldview which aimed at giving an explanation and a justification for every aspect of life: the way Moleschott's materialism was both presented to and perceived by his contemporaries will clearly show (a) that ethics was an integral part of materialistic epistemology, and that the latter one has been a fundamental step in the transition from an object-centered to a structure-centered epistemological paradigm; (b) that religious aspects are not at all excluded: rather, materialistic science encompassed religious tasks, trying to take up the role of the Church; (c) that scientific materialism, far from being a revolutionary or extremely socialistic movement,

had a rather moderate and conservative attitude, and that its theories as well as its most important application on the social level, i.e. criminal anthropology, were functional to the maintenance and justification of the political situation of that time. This distinction is not a further step with regard to an imaginary rigid scale going from demarcation to inclusiveness and to further levels of inclusiveness, nor does it constitute an alternative to both of them: rather, it is recognizable in that the accent of inclusiveness is shifted to political and social reality; therefore, it constitutes a development of the inclusive attitude on the objective (in the Hegelian sense of the word) level of social relations, broadening its inclusive potential from the absorption of the philosophical and scientific tradition to the construction of an entire and complete worldview which can be understood and assimilated by a whole social class (and not only by philosophers or scientists).

The main theme of the thesis is thus a revision of the fundamental characters of scientific materialism, which is developed following a climax from a negation of its tendency to exclusion to the affirmation of its inclusive and finally totalizing attitude. But there is another main line of thoughts which gradually emerges from this analysis, and which regards an important change in epistemological conceptions about science and nature that was already immanently implied by materialistic categories; in this respect, scientific materialism appears to play a crucial role in the formation of a way of understanding objectivity which no longer thinks in terms of objective representation, but rather in terms of structures. On the philosophical level, it will be shown that this shift was rooted in the Kantian theory of knowledge, and that the Feuerbachian conception of the relation between subject and object played an essential role in its development; on the scientific level, we will argue that physiology contributed to the redefinition of the subject-object relation in the process of acquisition of knowledge, and that neurophysiology made possible a new understanding of knowledge based on network relations. In this framework, scientific materialism definitely had a great importance for this transition: by what we have called its inclusive attitude, it had already paved the way for a non-hierarchical conception of science, where no discipline is excluded, but all are absorbed in the scientific domain.

Moleschott's activity in politics and scientific popularization give evidence of his attempt to bring together science, religion, ethics, education and politics in one all-encompassing form of knowledge. Although being occupied with different activities, he demonstrated to have a unifying method and goal, and therefore his work is particularly apt to be the subject of a

work of contextualization such as the one we are introducing here. Contextualizing science and contextualizing philosophy will have as a result the understanding of their reciprocal interdependency, and this will show that both are related to political ideas as well. This contextualization is at the same time the recognition of the fundamental historicity of ideas.

Bibliographical note

This work has been based on the study of part of Moleschott's manuscripts lying at the *Biblioteca Comunale dell'Archiginnasio* in Bologna, which have been indicated as "FSM" (Fondo Speciale Moleschott) and are followed by their current classification; we find it appropriate to describe briefly the history of Moleschott's *Nachlaß* in Bologna, which is the most important source we have for an assessment of Moleschott's thought and of materialistic ideas in Italy from the 1860's to the 1890's.²¹ The documents at the Archiginnasio include various kinds of manuscripts and some publications (not of his books: only of the discourses at the Senate and of articles by or about him), including a huge correspondence, the notes (sometimes transformed into booklets) for his university lectures, as well as the manuscripts of the *Anthropologie*, which was meant to be his *opera summa* but which has never been published nor finished: what we have, is a completed introduction, the first and the second book, and then a huge amount of citations conserved into folders with a hierarchic order (probably corresponding to chapters, sections etc.). It has to be noticed also that this collection underwent serious damages during World War II, that, at present, there is no complete catalogue of the folders available and that a great deal of the material is not ordered, while often the title of the folders does not correspond to their content.

The present work is based, as far as the primary literature is concerned, on Moleschott's manuscripts, to which it refers using the classification available at the moment (based on the one which was already present in the Moleschott library, the one made by archivists of the Archiginnasio and the one established during the partial work of classification made by Marcel Desittere). The letters A, B and C refer to the shelves in which the folders have previously been located. Some of the manuscripts have been recently found in some deposits

²¹ Moleschott's own library had been donated by his family to the Science Academy in Turin, and it has been completely destroyed in 1944. See De Pascale, C., & Savorelli, A., 1986. L'archivio di Jakob Moleschott: con documenti inediti e lettere di F. de Sanctis, S. Tommasi, A.C. de Meis. *Giornale Critico Della Filosofia Italiana*. 6(2), 219.

of the Archiginnasio in 1996 and at the end of 2007, and a work of inventarization is currently in progress.

1. Jacob Moleschott's conception of science: inclusive materialism

1.1. Jacob Moleschott: materialist, positivist, monist?

Let us thus first introduce the figure of Jacob Moleschott and his position within scientific materialism; in particular, we will underline his work of divulgation of materialistic science.

Jacob Moleschott was born in 't Hertogenbosch, the Netherlands, in 1822, and died in Rome in 1892, after having been a Professor of Physiology at the Universities of Turin and Rome, and Senator in the new-born Italian Kingdom. He had studied medicine at the University of Heidelberg, where Tiedemann, Gmelin, Nägeli and Bischoff were teaching science, while the Hegelian Moritz Carrière taught philosophy. Immediately after he got his degree (on January 22, 1845), he went to Utrecht to work in the physiological lab of G. J. Mulder, part of whose work on physiological chemistry he had recently translated, and whom he had met, together with Franciscus Cornelis Donders, during the fall of the previous year. Thanks to the contact with Mulder (first with his scientific work, and then with his practice in the laboratory), he learnt the importance of the experimental method in scientific research. Donders regarded as false the idea that organic and inorganic matter did not obey the same laws, and he wanted to explain vital phenomena by means of knowledge of inorganic matter²². Even if the collaboration did not last for a long time, Mulder surely influenced Moleschott's position on issues such as antivitalism, the experimental approach, the attention to *Stoffwechsel* and physiological chemistry, and the study of diet and its effects on the national mind (in 1847, Moleschott translated into German Mulder's *Die Ernährung in ihrem Zusammenhange mit dem Volksgeist*). Together with Donders and the physician van Deen, who became close friends of him, Moleschott edited, from 1845 to 1847, the *Holländische Beiträge zu den anatomischen und physiologischen Wissenschaften*, which appeared in three volumes from 1846 to 1848, and included some scientific articles by Mulder and other Dutch scientists too. However, Moleschott missed the excitement of the German university setting, and in 1847 he

²² Gregory, F., 1977. *Scientific materialism in 19th-century Germany*. Dordrecht: Reidel, pp. 84-85.

decided to go back to Heidelberg as a *Privatdozent*, and there he gave his first lecture in physiological chemistry in the summer of that year²³.

In Heidelberg, he belonged to the group of intellectuals who gathered at Christian Kapp's house, where he met, among others, Kapp's friend Ludwig Feuerbach; in 1848, he had been involved in political discussions together with Hermann Hettner, Gottfried Keller and Berthold Auerbach²⁴. In 1854, he had been asked by the University of Heidelberg to cease diffusing his immoral doctrines, and he had reacted resigning from his position; in 1856, when he was offered the possibility to teach at the University of Zürich, he promptly accepted.

It was in Zürich that Moleschott started to learn Italian and attended the lectures on Italian literature given by Francesco De Sanctis; as a Minister of Public Education in the new born Italian kingdom, De Sanctis called Moleschott to teach physiology at the University of Turin. Shortly after his appointment, he became a member of the commission on higher education; he became an Italian citizen in 1866 (this was made possible by a new law which had been proposed and approved for Moleschott's special case²⁵), and ten years later he was appointed by King Victor Emmanuel as a Senator of the Kingdom. In 1879 he left the University of Turin and became professor at the University of Rome, where he remained until his death in 1893 (on the reasons of this change and on the impossibility of getting the post he was aiming at in Florence, see the interesting correspondence between him and De Sanctis²⁶). In the last period of his life he dedicated most of his time to political activity, rather than to physiological research.

Moleschott's figure has always been associated with the one of a scientist fighting for materialistic ideas to be accepted and, more generally, for the autonomy of science and the necessity of independent thinking for scientists. He is considered, and he considered himself

²³ Ibidem.

²⁴ Gregory, F., 1977. *Scientific materialism in 19th-century Germany*. Dordrecht: Reidel, pp. 86.

²⁵ "Legge 19 Giugno 1866, N. 3015. – Che accorda la Cittadinanza Italiana al Professore Giacomo Moleschott, nato a Bois-le-Duc (Olanda)." From *Supplemento ordinario n. 25/L* alla GAZZETTA UFFICIALE *Serie generale* - n. 42. 20.02.2009.

²⁶ See for example the letters reported in De Pascale, C., & Savorelli, A., 1986. L'archivio di Jakob Moleschott: con documenti inediti e lettere di F. de Sanctis, S. Tommasi, A.C. de Meis. *Giornale Critico Della Filosofia Italiana*. 6(2), 216-248.

to be, not only a physician, physiologist and politician, but also a philosopher²⁷, because of the effort he put in the divulgation of materialistic ideas among the non-scientific public (the new-born mass society, indeed), and it is usually assumed that his position was completely innovative vis-à-vis the established view of the world and of science; for this reason, his moving from country to country was interpreted as a continuous exile in order to seek refuge in places where the mentality of governors would be more open.²⁸

Moleschott's fame is mostly due to his attempt (a quite successful one) to popularize science: in 1850 he had already published a popular version of his scientific research, in a book called *Lehre der Nahrungsmittel: Für das Volk*, which had soon been translated into Dutch, French, Italian, Russian, English and Spanish. He justified his decision to popularize scientific discoveries by appealing to the results of his physiological researches: in fact he wrote that, having the same material composition, all human beings were "capable of the genuinely human", since they are "all similarly dependent on air and soil, on men and animals, on plants and stones", and only different circumstances could determine that alteration in matter and force which makes each human being different from the others²⁹. The unity of matter (*Stoff*) and force (*Kraft*) was seen as the origin of this democratic ideal of there being no intrinsic difference in value between human beings³⁰.

Moleschott's divulgation of science is a very interesting instance of the work of popularization on a large scale with which the scientists of the late 19th century have been occupied; such a great popularizing effort was only possible – and necessary – in the epoch of mass society, and therefore the task of those scientist was to create an image of science (subjective genitive) which had to be communicated to a broader public. While the attempts of popularization of science in the 18th century were directed to small groups of high society who were at that time emerging as a new subject of public life (women), in the 19th century scientists had to address new social classes; in the case of Moleschott, this new social class

²⁷ Both Lange and Gregory are concerned with considering Moleschott's ideas from a historic and philosophical point of view. Compare Lange, F. A., 1914-1915. *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart. II. Geschichte des Materialismus seit Kant*. Leipzig: Brandstetter; and Gregory, F., 1977. *Scientific materialism in 19th-century Germany*. Dordrecht: Reidel.

²⁸ See for example: Cosmacini, G., 2005. *Il medico materialista: vita e pensiero di Jakob Moleschott*. Roma-Bari: Laterza. Gregory, F., 1977. *Scientific materialism in 19th-century Germany*. Dordrecht: Reidel. Laage, R. J. Ch. V. ter, 1980. *Jacques Moleschott: een markante persoonlijkheid in de negentiende eeuwse fysiologie?* (English: *Jacques Moleschott a striking figure in nineteenth century physiology?*). Zeist: Druk Gregoriushuis.

²⁹ Moleschott, J., 1850. *Die Lehre der Nahrungsmittel: Für das Volk*, Erlangen, cit. in Gregory, 1977, p. 88.

³⁰ Gregory, F., 1977. *Scientific materialism in 19th-century Germany*. Dordrecht: Reidel, p. 89.

was the middleclass, which, even if it was not born in that century, had recently assumed a new, central role in the political scene, a role which had been formalized by the new nation-states.

But there are also the images of science (objective genitive), the images which are used in order to describe natural processes, such as the image of the cycle, which have a heuristic function even within science. Rhetoric is not only the instrument which is used in order to make science understandable, acceptable, and finally authoritative, but it shapes from within the structure of science: rhetoric imagery, parallelisms, metaphors and analogies are the condition of possibility of new scientific conceptions. Actually, scientific research and rhetoric imagery can be seen as not completely separated the one from the other: in fact, the images which are used to clarify and explain natural phenomena are also images which recall, in the mind of the readers, the vivid echo of a whole pattern of familiar narrative or symbolic situations.

Science too, as well as literature, needs to be woven into a range of significances which can be immediately recognized by its public, building on a tradition which is already established, whose task is then that of finding out the link between the two domains of reality juxtaposed and at the same time connected by a very conscious use of rhetoric strategies, transferring the meaning from one domain to the other. We can understand the reasons why a certain kind of imagery is used in a certain way only by considering the sources of that imagery, which were often well-known to contemporary readers but less known to us.

1.2. Physiology in the 19th century and the conception of organism

Since Moleschott was, as far as his studies and his profession are concerned, first of all a physician and a physiologist, we will briefly speak about the situation of physiology in the 19th century, following the basic lines of its origin and development and recognizing the main characteristics of this science; we will see that, very often, the categories which are used to classify its currents are too narrow if we want to fully understand all possible differentiations within theories. Therefore, we will proceed not by describing each movement, but by listing the central ideas or methods which have played an important role in the history of the discipline, according to three main themes: firstly, the experimental method; secondly, the centrality of matter; thirdly, the necessity of conciliating a mechanistic vision of the world

with the study and explanation of organisms. In this first section, the common interpretation of natural sciences in the late 19th century as “scientific reductionism”, i.e. as being essentially demarcating, will already appear to be insufficient.

We have here selected some physiologists whose work and conceptions overlap the definitions which have been established in order to classify the currents of the period of time they belong to, and whose work has been particularly significant to Moleschott.

The experimental method was not something new in the 19th century, having been present in the modern world since at least two centuries (if we take, as it is usually agreed, Galileo Galilei as its initiator); what was new in the 19th century was its being part of physiology (as well as chemistry and biology, two sciences which flourished at that time and which are of course strongly connected to physiology).

In the process according to which physiology became explicitly experimental, French physiology played a leading role. Two scientists had a great importance in this process: François Magendie and Claude Bernard (both quoted by Moleschott all along his *Anthropologie* and his notes, especially the ones about the constitution of the brain, although Bernard more frequently than Magendie³¹).

Magendie (1783-1855), one of the most important experimental physiologists in the first decades of the 19th century, searched for a unitary principle of explanation for the diverse life phenomena; he also studied the important role played by the phenomenon of nutrition (which would have been elevated to the central activity of living beings by Moleschott), to which he added action as the movement by which organisms or their parts could accomplish their function. This immediately leads to the second of the abovementioned themes, underlining that teleology was present even in currents which were mechanistic and experimental: the historian of science John Lesch even speaks about “ends”³², but the word “function” makes it easier to understand in which way the references to purposiveness are essential to the discourse about organisms. We can define the notion of function as the collective end of the actions of a certain number of organs, working according to a unitary principle of explanation which Magendie called “vital force” and which, in his opinion, did not have to be an

³¹ Jacob Moleschott, manuscript: *Das Wesen des Menschen*, FSM, B V 1-8, B II 14.

³² Lesch, J. E., 1984. *Science and medicine in France: the emergence of experimental physiology, 1790-1855*. Cambridge, Massachusetts: Harvard U.P., p. 92.

observable phenomenon; while organization was seen as the principle of differentiation, which made the manifold variety of natural life possible, vital force played the role of general explanatory principle. The task of physiology was then conceived as “the experimental investigation of functions at the level of phenomena accessible to the senses in order to determine the laws through which vital force acts, and specifically how these laws are determined by the anatomical organization of the parts”³³. There are two main innovative features in Magendie’s approach, namely: the critique of vital-properties as they were previously understood, and the notion of function taken as means to explain physiological phenomena; moreover, the institutionalization of experimental physiology in the form given to it by Magendie represented the “crucial step which constituted modern physiology in the first two decades of the nineteenth century”³⁴.

French physiology underwent an important change in its central purpose by the mid 1840s, passing from its position as a medically oriented science to general science of life: this shift is exemplified by Claude Bernard’s early career, when he was occupied with significant studies on the nervous system³⁵. Claude Bernard (1813-78) was a French physiologist, and one of the principal figures in 19th century physiology. He had been student, assistant and collaborator of Magendie; in 1854, a chair of general physiology had been created for him at the Sorbonne. Bernard believed that living organisms were never at rest but constantly underwent dynamic changes to maintain internal equilibrium, which he understood as the basis of health. As a positivist, he limited his field of research to the investigation of phenomena and to their reciprocal relations; he thought that scientific research had to be based on controlled and repeatable experiments. Claude Bernard had been formed in Paris in a time in which the theories of Xavier Bichat, according to whom the body is composed by tissues and each tissue has a definite combination of properties, believed that physiology was an autonomous science, the science of the living organism, and that it could not be reduced to mechanistic materialism, nor to vitalism. The notion of environment is one of the central notions in Bernard’s physiology, since every animal being is in a continuous relation both with the external environment, in which the organism lives, and with the internal environment, in

³³ Lesch, J. E., 1984. *Science and medicine in France: the emergence of experimental physiology, 1790-1855*. Cambridge, Massachusetts: Harvard U.P., p. 94.

³⁴ Lesch, J. E., 1984. *Science and medicine in France: the emergence of experimental physiology, 1790-1855*. Cambridge, Massachusetts: Harvard U.P., p. 100.

³⁵ Lesch, J. E., 1984. *Science and medicine in France: the emergence of experimental physiology, 1790-1855*. Cambridge, Massachusetts: Harvard U.P., p. 196.

which the cells, i.e. the unities which compose the tissues, live and interact with each other; it is the same notion of environment which will be one of the central issues both for scientific materialism and positivism in general: in fact, the whole project of Moleschott's *Anthropologie* focuses on the relationship between the object which is studied in each section (from tissues to populations) and its respective environment. The awareness of the dependency upon the environment also implied the awareness of the reciprocal determination of man and nature, subject and object, which will be crucial with regard to the shift involved by the "structure paradigm".

The main difference between French and German physiology has to be found in the status of physiology: in Germany, physiology was born within the frame of teleomechanism, and it was seen as part of biology, as well as anatomy was, because form and function were both necessary to the understanding of organism as teleological unity³⁶. Johannes Müller was the first scientist who based physiology on experiment; with his followers, Schleiden and Schwann, physiology obtained a firm experimental foundation. According to Schwann (1810-82), organic and inorganic life were not essentially different: in fact, Schwann developed the theory of the formation of the cells, and described it as a crystallization, a word which is normally used to indicate the formation and solidification of some inorganic compounds, hence clearly showing his distance from vitalistic positions and the *Lebenskraft* conception. The botanist Schleiden had found the existence of cells in the structure of plants, and Schwann sought then a similar elementary structure in animal organisms. Cellular division has been acknowledged as the reproduction process of the cells only later on³⁷, for in the 1820s Schleiden and Schwann believed that new cells could be formed in the cytoblastema, some liquid around the cells. However, Schwann saw the cells as independent unities, with autonomous function and form. Organisms are defined as the form in which matter capable of absorption (thus, nutrition) crystallize, and are therefore seen as the result of a physico-chemical process, in analogy with inorganic nature. While Claude Bernard presents his theories as departing both from reductionism and vitalism, Schwann's position can be interpreted as the passage between teleomechanism (nature is teleologically organized) and reductionism (mechanic laws of inorganic nature apply to all domains). Both organic and inorganic life being constituted by the same fundamental material elements or unities, organic

³⁶ Theunissen, L. T. G., 1996. *De wetten van het leven: historische grondslagen van de biologie, 1750-1950*. Baarn: Ambo, p. 107.

³⁷ Rudolph Virchow stated it explicitly in 1855: *omnis cellula e cellula*. See Theunissen, 1996, p. 111.

life could not be thought as being governed by hidden immaterial forces: the centrality of matter leads to an automatic negation of vital forces.

The term “vitalism” has been employed to characterize a whole range of attitudes within scientific theory: from the assumption of the presence of an agent selecting and arranging matter in the organism, to the one of the existence of a rational soul which can subsist separately from matter, to the more general position of the recognition of forces such as sensibility and irritability (understood as organic analogues of Newtonian forces), these are all positions which have been called “vitalistic”³⁸. According to the historian of the sciences T. Lenoir, there is one form of teleology which considers force as an emergent property dependent upon the specific organization of its constituent elements rather than as an independent entity, and he calls it “vital materialism”. There is a second form of teleology, namely functionalism, which assumes that functional requirements establish the conditions within which the laws of physics and chemistry are to be applied; thus, it stands in the middle between the two other positions, because it does not reduce biological organization to physical and chemical forces, even if it does not postulate other forces than those ones. A third teleological approach acknowledges only biological laws in the organization of the universe, in which each part is essential to the whole; this holist position can be found for example in Aristotelian and Hegelian thought, as well as in German *Naturphilosophie*.

Johannes Müller (1801-1858), another scientist often quoted in Moleschott’s notes, is considered the “father” of German physiology. Müller’s comparative anatomical studies revealed the functions of the nervous, sensory, endocrine and reproductive systems. Müller opposed both empty theorizing and blind empiricism, advocating natural science based on close observation and philosophical systematization. Through his studies of the nervous system, Müller realized that nerves are not passive conductors of outer stimuli, since the same external event or mechanical pinch affects different nerves in different ways and can be perceived as light, sound, or pain. His discoveries are significant even with regard to epistemology, and, in particular, they concern the relation between the knowing subject and its object: Müller claimed in fact that perception is not the conduction to our consciousness of a quality or circumstance outside of our body, but the conduction to our consciousness of a quality or circumstance of our nerves which has been caused by an external event. Each nerve

³⁸ Lenoir, T., 1982. *The Strategy of Life. Theology and Mechanics in nineteenth century German biology*. Dordrecht: Reidel, p. 9.

can respond to stimuli only in a specific way, so that our knowledge of the world reflects the structure of our nervous system (a kind of physiologic equivalent of the Kantian theory of knowledge). His approach to the relationship between function and form in his theory of specific sense energy incorporated both teleological and mechanical modes of explanation: it was mechanical in that “the specific functioning of the organ was to be explained not as the result of a vital force but in terms of the forces of physics and organic chemistry; it was teleological in the sense that, according to Müller, the same sorts of physico-chemical causation that account for the functioning of the organ are not capable of explaining the source of its organization.”³⁹ This position was consistent with the Kantian account of biological explanation, which requires a “special form of causality in which each part is so ordered in respect to others that it is both cause and effect at the same time”⁴⁰. Müller was a supporter of comparative anatomy as the means to the understanding of organic functions.

In this sense, we can find some similarities with Goethe, who strongly promoted comparative studies in anatomy and botany, even if his theoretical grounds were very different from the ones of experimental physiologists and biologists of the 19th century: the latter ones, in fact, both fully accepted and worked within the framework of Newtonian mechanics. But, at the same time, they had to acknowledge that the Newtonian model alone was not doing justice to the explanation of organisms, as it is indeed adequately exemplified by Johannes Müller who, like the “vital materialists”, believed that “the mechanical framework alone was insufficient for conducting physiological research and that chemical experimentation in physiology must always stand under the higher guidance of a teleological framework”⁴¹ in which organization comes first (in a logical sense, of course). Therefore, Müller is another figure standing in the middle, which current classifications (first of all the representation given by his students, who accused him to be a vitalist), are not completely able to explain.

Another important personality for the evolution of Moleschott’s thought was Justus von Liebig (1803-1873), whose conception of chemistry seems to incorporate two opposing tendencies: on the one hand, he was a supporter of the application of chemical methods to physiological analysis; on the other hand, he firmly believed in the existence of a vital force

³⁹ Lenoir, T., 1982. *The Strategy of Life. Theology and Mechanics in nineteenth century German biology*. Dordrecht: Reidel, p. 159.

⁴⁰ Ibidem.

⁴¹ Lenoir, T., 1982. *The Strategy of Life. Theology and Mechanics in nineteenth century German biology*. Dordrecht: Reidel, p. 103.

necessarily acting in living organisms. Therefore, physiology is by him reduced to the laws of chemistry, and at the same time its processes are seen as the result of some vital force. Yet, this vital principle plays no significant role in Liebig's scientific research: the *raison d'être* of this force lies in the holistic idea of an organism as a "functional unity" acting in the direction of an aim; the only explanation Liebig could find for the teleology he had recognized in the acting and transforming of organisms lies in the notion of *Lebenskraft*, the principle which explains the growth and development of organisms and species towards a regulative ideal of perfection but which will not be accepted by Moleschott.

Finally, Pierre Jean Georges Cabanis (1757-1808) is probably the most important author Moleschott refers to regarding the relation between science, ethics and the divine; Cabanis is another example of those scientists whose approach does not fit in the definitions available: he passed from an extremely materialistic position to the admission of finalism; the principle of unity both within nature and within science pushed him to conceive of physiology, ethics and the critique of ideas as the tasks of one general discipline⁴².

This is the framework in the history of science, and of physiology in particular, in which Moleschott was working; let us now see which was the theoretical framework constituting the (more or less sedimented) ground on which he built up his conceptions.

1.3. Materialistic science and its relation to the philosophical tradition

While, in the previous section, we have shown that there were very heterogeneous movements within positivistic science, and that their approach and their conceptions had important implications on the epistemological level, we are here willing to question the interpretation of scientific materialism as *Vulgärmaterialismus* (i.e. as a scientific attitude excluding from the domain of knowledge everything which cannot be reduced to the scientific method *stricto sensu*, thereby reducing science to mere description of empirical facts) through comparing its positions with the philosophical tradition.

Scientific materialism is not an easily definable stream: both its philosophical background and its influence on the formulation and approach of epistemological problems in philosophy are

⁴² See Staum, Martin S., 1980. *Cabanis: Enlightenment and medical philosophy in the French revolution*. Princeton, New Jersey: Princeton U.P.

related to multifarious and sometimes opposing traditions. The main question of this section pertains to the relation between scientific materialism and the philosophical tradition, trying both to enumerate the philosophers and scientists to which Moleschott's thought is indebted, and to pose these relations as problematic.

Moleschott's works and speeches are an infinite source of quotations and direct or indirect references to ancient, modern and contemporary scientists, philosophers and poets. Already the fact that his thought interacted with such a large number of philosophical traditions, joining them in his theorization on science, is a very interesting fact, since the encounter of these different traditions did not engender a clash; rather, integration and absorption have been fostered and finally accomplished.

The word "materialism" itself can have different meanings in philosophy, the only common feature of which is the emphasis on matter as the basic principle of explanation for both natural and historical phenomena. Starting with Feuerbach, who gives the background of both philosophical and scientific developments of materialistic ideas, we will end with the conception of positivistic science, a conception born from materialistic ideas which presented itself as an all-encompassing general science (in fact, the direct substitute for philosophy in an Enlightened world). It appears that, although being a reaction to Hegelianism, materialistic and positivistic science is rooted in Idealistic ideas: either implicitly, as a presupposition of Haeckel's monism (his Trinitarian ideas, although referring to Christianity, are clearly mediated by Hegelianism), or even very explicitly, in some speeches by the late Moleschott for example.

Further, the sides of continuity and the ones of break with Romanticism are among the most controversial aspects in the interpretation and definition of positivism: positivistic philosophy has been interpreted by some scholars as being radically opposed to Romanticism and continuing instead the tradition of Enlightenment, while on the other hand other scholars have even defined positivism as "Romanticism of science" (in particular, Nicola Abbagnano explained this point of view by noticing the absoluteness of science and the idea of a necessary progress of science and humanity within positivistic thought: both attitudes are typical of Romanticism and Idealism⁴³). The connection of both Moleschott's and Haeckel's work with the thoughts of Goethe and Hegel will make it clear that there are very important

⁴³ Abbagnano, N., 1946-1950. *Storia della filosofia*, III. Torino: UTET, p. 240.

elements of continuity with Romantic and Idealistic ideas not only in positivistic but also in materialistic and monistic science, especially in scientific materialism. For instance, Ernst Haeckel diffused evolutionism in Germany by connecting Darwinism to Goethian morphology, which interpreted the different forms of living beings as variations and evolutions from the same ideal *Ur-Typus*, and he explained their analogies by noticing that ontogenesis (individual development), for Goethe, was analogous to phylogenesis (the evolution of the species). Haeckel did not define himself a materialist, but a monist, linking his thought to Goethe's pantheism and affirming that matter and spirit are but two fundamental attributes of the all-embracing divine essence of the universal substance⁴⁴.

The relation to Feuerbach's philosophy: straightforward continuity?

Feuerbach has been regarded as the "father" of materialism both by exponents of scientific materialism and of dialectical (or historical) materialism, even if those two movements have very different conceptions and purposes at the basis of their philosophical programme.

Feuerbachian materialism was clearly a reaction to Idealism, in particular to the hegemony of the *Geist* in the whole Hegelian system, in which individuality and the sensible were sacrificed to the advantage of universality and the Spirit. The starting point of Feuerbach's philosophy is not the Hegelian Spirit and abstract self-consciousness, but the concrete man with his finiteness, sensibility and individuality, a concrete being whose humanity (his Spirit, his culture) is rooted in his sensibility and corporeity (nature within himself). Feuerbach's critique addresses mainly two instances: idealism (as the transposition of theology on a metaphysical level) and philosophy as such (insofar as it tries to abstract from materiality)⁴⁵. While Hegel posited the commencement of his system in the Not-Being, Feuerbach states that philosophy has its commencement in Non-Philosophy; namely, in the non-idealistic, concrete principle of the materiality of the senses: "[...] Die Philosophie hat daher nicht *mit sich*, sondern mit ihrer *Antithese*, mit der *Nichtphilosophie* zu beginnen. Dieses vom Denken unterschiedene, unphilosophische, absolute *antischolastische* Wesen in uns ist das Prinzip des *Sensualismus*"⁴⁶. While thought is an abstract scholastic principle, sense-perception is said to

⁴⁴ The interest in a "genetic method" was present, much interestingly, in another important philosopher of that period, whose position was far from the one of the positivists but who similarly had elements of continuity with Romanticism: Friedrich Nietzsche.

⁴⁵ Compare also Schmidt, A., 1973. *Emanzipatorische Sinnlichkeit: Ludwig Feuerbachs anthropologischer Materialismus*. München: Hanser, p. 75-76.

⁴⁶ L. Feuerbach, *Vorläufige Thesen zur Reformation der Philosophie*, p. 254 (quoted by Schmidt, p. 76).

be the principle of life, in which it is not the subject that determines the object, as in thought, but it is the object itself which conditions and therefore determines the subject:

Das Denken ist das Prinzip der Schule, des Systems, die Anschauung das *Prinzip des Lebens*. In der Anschauung werde ich *bestimmt* vom Gegenstande, im Denken *bestimme* ich den Gegenstand; im Denken bin ich *Ich*, in der Anschauung *Nicht-Ich*. Nur aus der *Negation* des Denkens, aus dem *Bestimmtsein* vom Gegenstande, aus der *Passion*, aus der Quelle aller Lust und Not erzeugt sich der wahre objective Gedanke⁴⁷.

In other words, we can know the object (“the true objective thought manifests itself”) only insofar as we give up our determining activity and we let us being determined by the object itself: real thought occurs only after the negation of abstract thought. Through this new perspective, Feuerbach wanted to overcome the separation which lies at the core of modern western philosophy: the dualism of matter and thought, of body and soul, which isolates men and therefore causes their alienation – separation and alienation occur vis-à-vis nature within man as well as vis-à-vis nature outside him and the other human beings.

There are two aspects of the fundamental relationship of the subject to the world: the dialectic-dialogical relation with the other human beings on the one hand, and the accent on materiality on the other hand. The first feature constitutes the dialectical side of the new philosophy: in this respect, Feuerbach’s philosophy maintains the dialectical character which is typical of Hegelian thought. The emphasis on materiality, instead, will be further thematized by materialist thought in general; in particular, materialistic science seems to be forgetful of the dialectic-dialogical character of the material existence, consisting in the reciprocal dependence and constitutive relationship between subject and object; in so doing, scientific materialism absolutizes matter and conceives it as something objective and therefore not dependent on the subject, while dialectical materialism, from Marx and Engels on, recognizes the historicity of both man and nature. But scientific materialism achieves very similar results concerning the reciprocal influence of man and environment (i.e., of subject and object) through other means: the interaction of subjective and objective elements in the process of acquisition of knowledge is also an epistemological consequence of the studies on the nervous system, such as Claude Bernard’s or Johannes Müller’s researches, as we have seen in the previous section.

⁴⁷ Ibidem.

Feuerbach's critique of Idealism and of religion was for sure of great importance for modern and contemporary philosophy and for the whole dialectical and critical tradition which followed. Marx and Engels will criticize Hegel's deduction of reality from an absolute principle, i.e. the Idea: in this way, the Idea becomes subject and real individuals become objective moments of the Idea. Beginning from the abstract level of ideality, the Hegelian system is unable to provide the categories for the understanding of the particular, since it uncritically assumes reality qua legitimate, universal and necessary entity. In fact Marx wrote, in an article published in the *Anekdoten (Luther als Schiedsrichter zwischen Strauß und Feuerbach)*, that theologians and speculative philosophers necessarily had to pass through that "Feuerbach" which alone could lead them to truth and freedom:

Und euch, ihr spekulativen Theologen und Philosophen, rate ich: macht euch frei von den Begriffen und Vorurteilen der bisherigen spekulativen Philosophie, wenn ihr anders zu den Dingen, wie sie sind, d.h. zur Wahrheit kommen wollt. Und es gibt keinen andern Weg für euch zur Wahrheit und Freiheit, als durch den Feuerbach. Der Feuerbach ist das Purgatorium der Gegenwart.⁴⁸

But in how far has Feuerbach really been the firm basis and the necessary condition of Moleschott's thought? We will argue that, although criticizing the abstract Idea of Hegelism and Idealism in general, scientific materialism was also strongly indebted to Hegelian philosophy: the structure of Moleschott's work (in particular, his *Anthropologie*) reveals the influence of Hegelian dialectics not only in the way it develops from the particular to the universal, from the parts of the human body to human social life and organization, but also in the acknowledgment of the reciprocal relation of humanity (in Hegelian terms, we would say the "subject") and material environment (the Hegelian "object").

These issues will be dealt with in more detail in the next chapter, where we will examine the absorption of themes from diverse philosophical and cultural traditions.

⁴⁸ Karl Marx, *Luther als Schiedsrichter zwischen Strauß und Feuerbach*, in "Anekdoten zur neuesten deutschen Philosophie und Publicistik", Bd. II, 1843, in Karl Marx, Friedrich Engels (1976). *Werke*, Band 1, pp. 26 – 27. Berlin: Dietz Verlag. The text is signed "Kein Berliner" and it is usually attributed to Marx. However, the same text is also published in the third volume of the Thies edition of Feuerbach's *Werke* (pp. 244-246), and that recent critics attribute it to Feuerbach (compare Thies, note 108, pp. 368-372).

2. Scientific materialism and the philosophical tradition

2.1. Feuerbach

The aim of this chapter is to consider the origins of materialistic thought and its implications in the history of ideas.

In this section, we will argue that Feuerbach's approval of the programme of scientific materialism is not so strong as it is usually thought to be, and that the differences between Feuerbach's philosophy and scientific materialistic thought are much more important than what is generally acknowledged; in fact, on the one hand, the materialists themselves stressed the continuity of scientific materialism with Feuerbachian materialism (the first one being an accomplishment of the latter one), while, on the other hand, a whole tradition of anti-materialistic thought (neo-Hegelians *in primis*, e.g. Giovanni Gentile) extended its critique of scientific materialism as *Vulgärmaterialismus* to materialism *tout court*, including Feuerbach's philosophy. At least from Friedrich Albert Lange onwards, philosophers immediately associated scientific materialism with Feuerbach and vice versa; but what emerges from the following comparison of "materialisms" is a different picture: focusing on the most important issues of Feuerbach's "future philosophy" (*Philosophie der Zukunft*), we will show that, in many respects, Feuerbach had established a distance between his own philosophy and scientific materialism. Interpreting the *Philosophie der Zukunft* as an important step in the process which recognizes the dependency of the subject on the object and of the theoretical on the practical level, thereby redefining them, we will assume three significant points, with respect to which we will show the distance or the proximity of Feuerbachian materialism and scientific materialism, namely: the primacy of sense-perception, the relationship between subject and object, and the role of science.

The role of science: against the abstract, against the absolute

Moleschott and Feuerbach knew each other, they used to write letters to each other⁴⁹ and their correspondence seems to indicate that Feuerbach supported Moleschott's project of a materialistic science and anthropology⁵⁰. They had known each other in Heidelberg, and they

⁴⁹ Feuerbach's replies to Moleschott have first been published in De Pascale, C., & Savorelli, A. 1988. Sechzehn Briefe von L. Feuerbach an J. Moleschott. *Archiv Für Geschichte Der Philosophie*. 70, 46-77.

⁵⁰ Compare both Lange, F. A., 1914-1915. *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart*. II. *Geschichte des Materialismus seit Kant*. Leipzig: Brandstetter, and Gregory, F., 1977. *Scientific*

had participated together in the meetings at Christian Kapp's house. We have at least sixteen letters of Feuerbach to Moleschott, in which Feuerbach seems to appreciate the project of writing a work on anthropology, basing it on physiology. But is Moleschott's materialism actually the direct consequence of Feuerbach's philosophy? Briefly analyzing Feuerbach's thought, in particular his project for a "new philosophy" or "philosophy of the future", we will see that, in fact, Feuerbach's position is much more complex than Moleschott's interpretation of it.

In the following passage, Feuerbach explicitly affirms that matter and the concept of matter cannot subsist independently from each other: in fact, matter can only be conceptualized and recognized as existing by some being which is also partly differentiating and differentiated from it. This clearly shows that, already in the 1830s, Feuerbach expressly criticized a naïf conception of materiality; he criticized it by turning the question "how could man get the representation or the thought of a spirit, if everything in him is material?" into the question "how could man get the conception of matter, if he were a corporeal being and nothing more?".

Ich stelle eine andere Frage an euch, und zwar nicht die schon oft an euch gerichtete: Wie kommt denn nun der Mensch zur Vorstellung oder zu dem Gedanken eines Geistes, wenn alles in ihm materiell ist? Sondern die ganz *entgegengesetzte* Frage: Wie kommt der Mensch zum Begriffe einer Materie, wie nennt er seinem Leib einen Leib, wenn er nur ein leibliches Wesen ist? *Wo nur Materie ist, da ist kein Begriff der Materie.* [...] Die Materie wird nur im Gegensatze zum Geiste bekannt und erkannt. *Nur für ein von der Materie unterscheidenes, richtiger: sich unterscheidendes, Wesen existiert eine Materie, wie die Finsternis nur für ein sehendes, aber kein blindes Wesen.*⁵¹

A little further, in the same text, Feuerbach expresses his disapproval regarding the naïf conception which identifies thought with the physiological process taking place in the brain; he unambiguously condemns it and judges it absurd by comparing it to the identification of the spiritual process of reading with a mere act of visual perception: "Den physiologischen Akt für Denkkakt selbst zu halten [...] ist gerade soviel, als wenn den sinnlichen Akt des Lesens für den geistigen Akt des Lesens nehmen, das Lesen als einen Augenakt definieren

materialism in 19th-century Germany. Dordrecht: Reidel, who, in his book, presents Moleschott as straightforwardly continuing, on a scientific level, Feuerbach's philosophy.

⁵¹ Feuerbach, L., *Zur Kritik des Empirismus*, „Kritik des Idealismus und Materialien zur Grundlage der apodiktischen Realrationalismus.“ Von F. Dorguth, Geh. Justiz- und Oberlandes Gerichtsrat. gr. 8. Magdeburg, 1837. Heinrichshofen, pp. 158-159. In Feuerbach, Ludwig. 1989. *Kleinere Schriften I.* Editie 3., gegenüber der 2. durchges. Aufl.; Red. Werner Schuffenhauer. Berlin: Akademie-Verlag, p. 149.

wollte.”⁵² Using at his turn a rhetoric image (an analogy), Feuerbach criticizes the reductionistic approach to thought, which reduced it to the physiological process by which it is constituted. The reduction taking place in such a case is the one drawing the parallel between mental and physical acts: as the parallelism with the act of reading explicates, according to Feuerbach physiological processes are a necessary condition of thought, but they are not equivalent to it.

The use of analogy as anti-reductionistic argument also contributes to underline the point about the importance given to structures rather than entities, since an analogy establishes relations between two domains of reality, but does not rigidly identify something. Analogy, traditionally the sign of a demarcating attitude in materialism, here serves an anti-reductionistic purpose.

Even Feuerbach’s famous review of Moleschott’s *Lehre der Nahrungsmittel*, in which he states that “Der Mensch ist, was er ißt”, can be read as far from being willing to reduce man to matter; in fact, it has already been read in this way by M. Chernov, who, in an article written in 1963, sees Feuerbach’s strong statement as a reaffirmation, in the ironic terms which he demonstrates are typical of Feuerbach’s style in those years, of the concreteness of the individual (in opposition to the abstract Hegelian subject). But this concreteness is not merely material: it is also constituted by culture, a theme which will be fully developed and taken into consideration by historical materialism, but not by scientific materialism, according to which culture is, on the contrary, explained on the basis of physical features, both of the population and of its environment⁵³.

Both Moleschott and Feuerbach, actually, searched for unification: unification between the sphere of the subject and the sphere of the object (using Hegelian terms), between man and world, between *Geisteswissenschaft* and *Naturwissenschaft* (using Diltheyan terms); in fact, Moleschott never made such a rigid distinction between these fields, but rather integrated discourses about the physical level with discourses about what he calls *das Geistige*⁵⁴. But Feuerbach’s unification was due to the dialectical relation of subject and object, of matter and

⁵² Feuerbach, L., *Zur Kritik des Empirismus*, „Kritik des Idealismus und Materialien zur Grundlage der apodiktischen Realrationalismus.“ Von F. Dorguth, Geh. Justiz- und Oberlandes Gerichtsrat. gr. 8. Magdeburg, 1837. Heinrichshofen, p. 162. In Feuerbach, Ludwig. 1989.

⁵³ All the chapters of the *Anthropologie* end with a section about the reciprocal relationship of every part with each other and with the environment.

⁵⁴ Compare in particular *Anthropologie*, FSM, B V 1-B V 8..

spirit: the theoretical level is dependent on the practical one, epistemology is indissolubly related to ethics (a feature that, as we will see later on, is common to scientific materialism as well), because the immediacy of sense-perception acquires an epistemological value only when it is mediated by another consciousness, so that the source of truth does not lie in the subject, but it comes from outside him and it is therefore fundamentally heteronomous:

Alle unsere Ideen entspringen [...] den Sinnen; darin hat der Empirismus [...] recht; nur vergißt er, daß das [...] wesentlichste Sinnenobjekt des Menschen der *Mensch selbst* ist, dass nur im Blicke des Menschen in den Menschen das Licht des Bewußtseins und Verstandes sich entzündet.⁵⁵

For this reason, the essence of man lies only in the community, where there is a unity of men with other men: “[...] Das Wesen des Menschen ist nur in der Gemeinschaft, in der *Einheit des Menschen mit dem Menschen* enthalten – eine Einheit, die sich aber nur auf die *Realität des Unterschieds* von Ich und Du stützt.“⁵⁶

Moleschott, on the other hand, based his unification on the absorption of the spiritual (in the sense of *Geistiges*, thus also in the sense of mental) in the material domain. A different method of unification leads to a different kind of unification: Feuerbach’s dialectics leads to a relational conception of identity (this is especially evident in his conception of practical philosophy, of intersubjectivity and of the community of subjects)⁵⁷. The focus is completely shifted and philosophy must not proceed from the abstract consciousness of the isolated subject to the investigation of whether and how this subject can know the world outside himself, but, instead, it must ask for the conditions of existence of this subject, the subject which is then able to ask and to philosophize:

Wenn daher die [...] im Anfang eigentlich schon mit sich fertige Philosophie ihr wesentlichstes Interesse in die Beantwortung der Frage setzt: Wie kommt Ich zur Annahme einer Welt, eines Objects, so stellt die sich objectiv erzeugende [...] Philosophie vielmehr sich die *entgegengesetzte*, weit interessantere und fruchtbarere Frage: *Wie kommen wir zur Annahme eines Ich, welches also fragt und fragen kann?*⁵⁸.

On the other hand, Moleschott’s all-encompassing absorption leads to a unification in which nothing is excluded, but nothing is accorded its own specificity as well: this is a kind of

⁵⁵ Feuerbach, L., *Grundsätze einer Philosophie der Zukunft*, § 42.

⁵⁶ Feuerbach, L., *Grundsätze einer Philosophie der Zukunft*, § 61.

⁵⁷ Compare Feuerbach, L., *Grundsätze einer Philosophie der Zukunft*, § 62, where he states that the unity of man with man is God, and that freedom can be reached only in a community: „*Einsamkeit ist Endlichkeit und Beschränktheit, Gemeinschaftlichkeit ist Freiheit und Unendlichkeit. Der Mensch für sich ist Mensch (im gewöhnlichen Sinn); der Mensch mit Mensch – die Einheit von Ich und Du – ist Gott.*“

⁵⁸ A. Schmidt, p. 116. Quotation from Feuerbach’s *Anfang der Philosophie*, p. 147.

unification reached through integration more than relation, where everything is supposed to obey to the same material principle. Thus, Moleschott's materialism is close to monism, insofar as everything is subsumed under one principle, and science, which means knowledge and study of that principle, is considered as the only possible form of knowledge; which does not mean that there are forms of knowledge that are excluded from true knowledge, but rather that science embraces all of them.

However, Feuerbach had a different position with regard to the role and form of scientific knowledge: he was against the reduction of organic to inorganic nature⁵⁹, as well as against the utilization of the method of exact sciences within philosophy, and his materialism was accompanied by criticism. Materialistic scientists, on the other hand, seem to be forgetful of the dialectic-dialogical character of material existence, and in so doing they absolutize matter and conceive it as something objective and therefore not dependent on the subject, while dialectical materialism, from Marx and Engels on, makes the important step further of recognizing the historicity of both man and nature. This theme is strictly connected to the awareness of the relativity of knowledge (relativity to the knowing subject and to the environment), of which we will speak further on.

How did dialectical materialism develop its argument about the rejection of every absolutization, which makes it different from scientific materialism? We will answer this question by considering the way in which Feuerbach deals with the problem of the Hegelian absolute subject. In fact, he substitutes it with its contrary: the materiality of man, which is the "contrary" (*Gegensatz*) of the absolute subject and of abstract philosophy, is posited by Feuerbach as a constitutive element of the subject itself (and not merely biologically, but fundamentally philosophically). Hence, Feuerbach is critical vis-à-vis that scientific attitude which, unaware of the constitutive role of the subject in the acquisition of knowledge, reifies natural laws understanding the structure the subject gives to the world as the ontological structure of the universe (this approach is very similar to what Husserl will call "natural attitude", where men are unaware of the constitutive role of the knowing subject and conceive the whole world as simply present, objectively there as they perceive it⁶⁰). Concerning this

⁵⁹ Chernov, M., 1963. "Feuerbach's 'Man Is What He Eats': A Rectification", *Journal of the History of Ideas*, 24: 397-406, p. 406.

⁶⁰ Compare for instance Husserl, Edmund, 1976. *Ideen zu einer reinen Phänomenologie und phänomenologischen Philosophie*. Den Haag: Nijhoff.

issue, there is a passage in Feuerbach's writing *Über Spiritualismus und Materialismus* which is very significant with regard to the relationship between subject and object and the formation of a new perspective about the contribution of the subject in the process of knowledge:

Ich stimme dem Idealismus darin bei, dass man vom Subjekt ausgehen müsse, da ja ganz offenbar das Wesen der Welt, die und wie sie für mich ist, nur von meinem eigenen Wesen, meiner eigenen Fassungskraft und Beschaffenheit überhaupt abhängt, die Welt also, wie sie mir Gegenstand, unbeschadet ihrer Selbstständigkeit, nur mein vergegenständlichtes Selbst ist.⁶¹

The subjective faculties of understanding and imagination are held to be the conditions of the appearance of the world as object: the world is the objectified self. Feuerbach thereby explicitly recognizes the contribution of Idealism in this new way of thinking of the subject and its relation to the world, and it is in this sense that we can speak of critical materialism in Feuerbach, since he is aware of the role played by the subject in the constitution of the object during the process of knowledge:

Die sich daraus ergebende kritische Haltung der Philosophie, der ständige Rekurs auf das erkennende und sprechende Subjekt, ist von Bedeutung nicht nur in Bezug auf jeden 'dogmatischen' Materialismus oder Idealismus, sondern auch auf die Naturwissenschaft, die stets in Gefahr sind, sich als festgelegte, objektive Systeme zu verstehen und zu vergessen, daß sie Resultat bestimmter menschlicher Handlungen sind, dem unaufhörlich eine subjektive Seite anhaftet.⁶²

This passage contains at the same time an accusation against the attitude which the natural sciences assume when they tend to understand themselves as objective and steadfastly founded systems, forgetting that they are the result of human practice, which always entails a subjective component.

The theme of internal finalism in organized living beings is related to the one of the constitutive role of the knowing subject we have just dealt with, since the object itself is not considered as striving towards a purpose nor as being so structured by any external intentionality; on the contrary, the origin of teleology lies in the limits of the human faculty of knowledge, which thinks of organisms as teleologically ordered. It seems that also according to Feuerbach, as according to Kant, we cannot help thinking of organisms as ordered by a

⁶¹ Ludwig Feuerbach, *Über Spiritualismus und Materialismus*, quoted by Francesco Tomasoni, „Feuerbachs Kritik der Wissenschaftsideologie und Evolutionstheorie“, in Braun, H.-J., et al. (hrsg. von), 1990. *Ludwig Feuerbach und die Philosophie der Zukunft: internationale Arbeitsgemeinschaft am ZiF der Universität Bielefeld 1989*. Berlin: Akademie-Verlag, p. 81.

⁶² Francesco Tomasoni, „Feuerbachs Kritik der Wissenschaftsideologie und Evolutionstheorie“, in Braun, H.-J., et al. (hrsg. von), 1990). *Ludwig Feuerbach und die Philosophie der Zukunft: internationale Arbeitsgemeinschaft am ZiF der Universität Bielefeld 1989*. Berlin: Akademie-Verlag, p. 81.

finalism without scope (*Zweckmässigkeit ohne Zweck*), but we cannot thereby infer that this structure is constitutive of the object, as this would imply the presence of an external intentionality.⁶³ Feuerbach's position regarding materialistic science is thus ambiguous, but in a positive sense: if, on the one hand, his philosophy has been the inspiration for at least a whole generation of scientists, on the other hand his critical attitude already identified the problem of the reification of physical laws, which are always formulated from a human, subjective perspective⁶⁴. Therefore, the conviction that science can contribute positive values to society does not become ideological absolutization of the scientific method.

Feuerbach's all-embracing conception of materialism, instead, could be compared with the inclusive tendency of materialistic science, a kind of science which is at the same time the highest form of religion and which plays a key role in politics and the government of public life. Feuerbach conceives materialism as the only possible philosophy, because there is nothing else besides matter; therefore, even traditional philosophy is in fact materialistic, even if unconsciously. Therefore, this supports the point we made about the tendency to inclusiveness: materialism does not force to eliminate anything, but rather includes everything within its own domain.

Matter becomes the true transcendental element, as we can understand from the following lines of *Spiritualismus und Sensualismus*, the writing on which Feuerbach was working between the end of the 1850s and the beginning of the 1860s⁶⁵:

Der gegenwärtige Streit zwischen dem Spiritualismus und Materialismus wird aus einem falschen Gesichtspunkt betrachtet, wenn man sie sich als absolute Gegensätze vorstellt. Der Materialismus ist so alt und weit verbreitet als die Menschheit, so einleuchtend wie das Licht, so notwendig wie Wasser und Brot, so unentbehrlich, so zudringlich und unabweisbar wie die Luft. Der Spiritualismus ist nicht anders als der spiritualistische Materialismus.⁶⁶

⁶³ Francesco Tomasoni, „Feuerbachs Kritik der Wissenschaftsideologie und Evolutionstheorie“, in Braun, H.-J., et al. (Hrsg. von, 1990). *Ludwig Feuerbach und die Philosophie der Zukunft: internationale Arbeitsgemeinschaft am ZiF der Universität Bielefeld 1989*. Berlin: Akademie-Verlag, p. 92.

⁶⁴ Ibidem: „Feuerbach gab dem positivistischen Denken starke Impulse, indem er den notwendigen Ansatzpunkt der Sinne und der universellen Gehalt der Wissenschaft bekräftigt, aber zugleich brachte er ihm eine kritische Haltung entgegen, und zwar nicht in nebensächliche Anmerkungen, sondern im Kern seiner Philosophie.“

⁶⁵ Compare the 14th letter to Moleschott in De Pascale, C., & Savorelli, A. (1988). *Sechzehn Briefe von L. Feuerbach an J. Moleschott. Archiv Für Geschichte Der Philosophie*. 70, p. 71: „Mein hauptsächlichles Lesen und Studieren bezieht sich schon seit fast zwei Jahren auf den Streit des Spiritualismus und Materialismus.“

⁶⁶ Feuerbach, L., *Spiritualismus und Sensualismus* [Über:] *System der Rechtsphilosophie* von Ludwig Knapp, Erlangen 1857 [1858], in Feuerbach, L., 1975. *Werke*; Hrsg. von Erich Thies. Frankfurt am Main: Suhrkamp, p. 266.

The new philosophy, i.e. materialism, is conceived in this way as taking the place of idealistic philosophy and religion, not by excluding them but by absorbing their tasks. Materialism and science are but one all-encompassing worldview, and science is therefore politics at the same time; but materialism is nothing else than the consciousness of the material essence of man and world, it is thought which has finally become aware of its material basis:

Der gegenwärtige Kampf zwischen Spiritualismus und Materialismus ist daher nur der Kampf zwischen dem alten und dem neuen, d. h. dem himmlischen und dem irdischen, dem phantastischen und dem realistischen, dem gemüthlichen und dem gesetzlichen, dem willkürlichen und dem konsequenten, dem versteckten und dem offenen, dem unwissenden und dem bewussten, wissenschaftlichen Materialismus.⁶⁷

With reference to precisely this topic, Feuerbach confessed to Moleschott that his primary interest had been ancient medicine books, since it was there, he believed, that one could trace back the scission of the material sphere from the intellectual sphere:

Meine ersten Bücher, die ich aus der hiesige Bibliothek mir holte, waren medicinische aber aus alter Zeit, aus der Zeit, wo noch Galen herrschte. Der höchst interessante Gegensatz zwischen Aristoteles, der den Verstand von der Materie absonderte, der das Hirn bekanntlich zu einem bloßen Abkühlungsmittel des zu heißen Herzens machte, und Galen, der das Denken vom Hirn abhängig erkannte, führte mich auf den Gegensatz von Philosophie und Medicin, Psychologie und Pathologie, als die Quellen des Spiritualismus und Materialismus und auf die Nothwendigkeit der Bekanntschaft mit der alten Medicin.⁶⁸

It is therefore likely that Feuerbach envisaged materialistic science as the way to finally exit (or, better, overcome) this opposition lasting since centuries. It is in this sense that also Feuerbach's intention to demonstrate how Moleschott's *Lehre der Nahrungsmittel für das Volk* was the true basis and foundation of the philosophy of the future must be understood: in a letter he sent on the 10th of May 1850, he wrote: "wie Ihre Schrift allein die *wahren* Grundstoffe und 'Grundsätze der Philosophie der Zukunft', der Ethik und socialen Politik enthält"⁶⁹; moreover, in *Die Naturwissenschaft*, Feuerbach had written, in his review of Moleschott's *Lehre der Nahrungsmittel*: "ich behaupte, dass nur sie die wahren 'Grundsätze der Philosophie der Zukunft' und Gegenwart enthält"⁷⁰.

⁶⁷ Feuerbach, L., *Spiritualismus und Sensualismus* [Über:] *System der Rechtsphilosophie* von Ludwig Knapp, Erlangen 1857 [1858], in Feuerbach, L., 1975. *Werke*; hrsg. von Erich Thies. Frankfurt am Main: Suhrkamp, p. 267.

⁶⁸ De Pascale, C., & Savorelli, A. (1988). Sechzehn Briefe von L. Feuerbach an J. Moleschott. *Archiv Für Geschichte Der Philosophie*. 70, pp. 71-72.

⁶⁹ De Pascale, C., & Savorelli, A. (1988). Sechzehn Briefe von L. Feuerbach an J. Moleschott. *Archiv Für Geschichte Der Philosophie*. 70, p. 49.

⁷⁰ Feuerbach, L., 1989. *Gesammelte Werke* (ed. W. Schuffenhauer), Bd. 10, p. 357.

All this perfectly suits the materialistic, and above all monistic programme of a unifying and totalizing *Weltanschauung* where science encompasses and substitutes the humanities, social sciences, politics, philosophy of law and finally religion; this is also apparent when reading the following lines in one of Feuerbach's letters to Moleschott: "Doch ich hoffe: er kommt noch der glückliche Zeitpunkt, wo ich mit dem Moleschott der Physiologie und Chemie den Duns-Scot der christlichen Philosophie, Religion und Politik vertreiben und vertauschen kann."⁷¹

The dialectics between subject and object

However, as we have seen, Feuerbach's conception of the relationship between subject and object allows him to envisage critically even such a totalizing form of materialism: man and nature are dependent on one another⁷², since human existence depends on the material world, but natural laws depend on the organizing faculty of the subject. It is precisely the organs of sense-perception which relate the subject to the world, and recognizing the epistemological importance of the senses goes hand in hand with recognizing the dependence of men on the natural and material world: "Was bin ich denn, vom organischen Leben ausgegangen, ohne die Aussenwelt? Sogut die Lunge zu mir gehört, sogut gehört die Luft zu mir, sogut das Auge zu mir gehört, sogut gehört das Licht zu mir; denn was ist die Lunge ohne Luft, das Auge ohne Licht?" (*Vorlesungen über das Wesen der Religion*). This conception of interrelation and interdependence between man and nature can also be found in the *Vorläufige Thesen zur Reformation der Philosophie*. Indeed, the re-appropriation of man's alienated essence can only happen, according to Feuerbach, through the negation of Hegelianism; as it appears from the following text, the negation of speculative philosophy implies also the refusal of the Hegelian abstract man (i.e., considered separately from his material nature):

Die unmittelbare, sonnenklare, truglose Identifikation des durch die Abstraktion vom Menschen entäußerten Wesens des Menschen *mit* dem Menschen kann nicht auf positivem Wege, kann nur als die *Negation* der Hegelschen Philosophie aus ihr abgeleitet, kann überhaupt *nur begriffen*, nur *verstanden* werden, wenn sie *als die totale Negation* der spekulativen Philosophie begriffen wird, ob sie gleich die *Wahrheit* derselben ist. Alles steckt zwar in der Hegelschen Philosophie, aber immer zugleich mit seiner *Negation*, seinem *Gegensatze*.⁷³

⁷¹ De Pascale, C., & Savorelli, A. (1988). Sechzehn Briefe von L. Feuerbach an J. Moleschott. *Archiv Für Geschichte Der Philosophie*. 70, pp. 50-51 (Bruckberg 12 Oct. 1850).

⁷² 'Der Natur bedarf des Menschen wie der Mensch der Natur', as Feuerbach wrote in *Das Wesen des Christentums*, chapter 28.

⁷³ Feuerbach, L., *Vorläufige Thesen zur Reformation der Philosophie*, p. 259-260.

This statement is very significant with regard to the central point concerning the relationship between dialectics and historicity in Feuerbach's thought, two features which, together with the end of philosophy conceived as mere speculation, will be fully developed by Engels and Marx. At this point of the analysis, we have enough elements to conclude that the important role of both dialectics and historicity in Feuerbach's thought is connected with the dialectics of subject and object; in fact, according to the materialists, there is always a subjective component in the process of knowing and structuring the world, and this subjective element is not only, as in Kant, something which cannot be overcome because we will always look at things from a human perspective, but it is also what must be valued as the condition of possibility of that interaction between subject and world, between man and nature. It is namely the structuring and organizing faculty of the knowing subject, which is actualized in the transforming and building attitude of his practical life, which is constitutive of what we call nature; therefore, just like in Marx, nature is an historical product, which has always already been explored, manipulated and transformed by man. But, at the same time, man is constitutively "natural": the material component is an intrinsic element of the subject, as well as sensibility is a constitutive organ of philosophy. Feuerbach recognizes both the materiality of man, its being a natural being whose way of knowing essentially takes place through the senses, and the historicity of nature, which does not possess an independent, immediate objectivity of and on its own, which is not immediately given, but which instead needs the mediation of the subject who gives it a structure but also acts upon it. Thus, nature and culture are not opposed, and they are not independent the one from the other either: they need each other, they acquire a significance not as abstract terms but only in relation to one another. Nature exists in relation to men, it is shaped by culture and therefore essentially historical, while man is fundamentally a material being, and thus also part of nature: his perspective on nature is a subjective one, not in the sense of arbitrary but in the sense of human, but it is also necessarily a perspective from within, since man can never exit his material condition; he is part of the same object he studies and he acts upon.

On the one hand, materialistic science tended to conceive the natural world as something which is (or which, anyway, can be) objectively known and described by science, absolutizing matter as the only ontological principle of reality, in which the subject is also completely included, but which exists independently from it (the relation is thus only univocal). On the other hand, Feuerbach stresses the importance of the subject in the relation between man and

world also when he speaks about the indispensable role of sense-perception even for the constitution of the object: as we can infer from § 34 of the *Grundsätze*⁷⁴, according to Feuerbach it would not make sense to say that something exists as an object if there is no perception of it by a subject: there would be no world without a perceiving subject who lives in it, acts in it and is conscious of it, but there would also be no subject without that world in which he lives and by which he is himself constituted.

Even speculative skills must be based on that relation with the world and with the other subjects, so that dialectics itself is, in this perspective, a dialogue between an *Ich* and a *Du*: “Die wahre Dialektik ist kein Monolog des einsamen Denkers mit sich selbst, sie ist ein Dialog zwischen Ich und Du”⁷⁵. In this sense, dialogue and sensibility are two indissoluble themes in Feuerbach. Feuerbach’s materialism, then, is essentially different from Moleschott’s thought, in that Feuerbach conceives culture as co-originating with matter: the “new philosophy”, in order to overcome the traditional dualism of spirit and nature, must incorporate its opposite. If separation arises from the excluding attitude represented by taking just one human faculty (abstract thought) as the only philosophical object, unification is reached through the appropriation of this opposite:

Die Philosophie als Sache einer besondern Fakultät, [...] des bloßen *abgesonderten* Denkens isoliert und entzweit den Menschen; sie hat daher die übrigen Fakultäten *notwendig* zu ihrem Gegensatze. Nur dann [...] wird die Philosophie von diesem Gegensatze frei, wenn sie den *Gegensatz* zur Philosophie in sich selbst aufnimmt.⁷⁶

Feuerbach finds this *Gegensatz* within man itself: it is his living body, his *Leib*. In this way, he avoids projecting once more human faculties out of himself, he avoids his alienation. And yet Feuerbach’s sensism is of a completely different nature if compared to ancient empiricism, as well as to modern scientism, since sense-perception does not mean only passive receptiveness: “Sinnlichkeit wird [...] bei Feuerbach nicht länger als Rezeptivität überhaupt behandelt. Ebenso wenig ist es darauf aus, im Stil des älteren empiristischen

⁷⁴ Feuerbach, L., *Grundsätze einer Philosophie der Zukunft*, § 34: „So ist die Liebe der wahre *ontologische* Beweis vom Dasein eines Gegenstands auser unserm Kopf – und es gibt keinen andern Beweis vom Sein als die Liebe, die Empfindung überhaupt. Das, dessen *Sein* dir *Freude*, dessen *Nichtsein* dir *Schmerz* bereitet, das nur *ist*. Der Unterschied zwischen Objekt und Subjekt, zwischen Sein und Nichtsein ist ein ebenso *erfreulicher* als *schmerzlicher* Unterschied.“

⁷⁵ Feuerbach, L., *Grundsätze einer Philosophie der Zukunft*, § 64.

⁷⁶ L. Feuerbach, *Zur Beurteilung der Schrift “Das Wesen des Christentums“*, p. 241 (quoted by Schmidt, p. 77).

Denkens oder des neueren Szientivismus ‘Bewußtseinstatsachen’ zu analysieren”⁷⁷. The traditional epistemological division of the faculty of knowledge into a passive and an active part is rejected and perceiving is conceived as an active process, while to act is to know – in its deepest meaning. Indeed, sense-perception presupposes the active faculty of understanding and, therefore, as already evidenced by Kant, it is the subject who exerts his structuring activity on the world (the object); but we can know the object only insofar as we are in contact with it, so that when we determine the object, through our action, we are at the same time conditioned by the object. This point is supported by our observations both about Feuerbach’s rejection of the position of abstract thought as the commencement of philosophy and about the role of corporality and love; but it is also verifiable in what we are about to say concerning the cultural determination of the senses and of the body: perceiving is actively knowing and having already actively known.

Feuerbach thus understands that it is not possible to neutralize the role of the subject: we simply have to acknowledge and value the role of sense-perception both for the constitution of knowledge and for the formation of the self, who can know himself not through abstract thought, but through the concreteness of his senses and the relation to the others, which are the only ways in which he can become object to himself. Nothing has to be purified, according to Feuerbach; this feature is common to inclusive materialism and non-reductionist science too, with the difference that, although nothing is eliminated or left outside science, there is a process the self of the scientist has to go through in order to match the criterion for scientificity.

Because all of his *Leib*, and all of his senses, are culturally determined, man is what he is. Therefore, it is up to him, whether he is to distinguish himself from the other animals, or not: since there is nothing intrinsic human in his nature, apart from the fact of being able to be socially and historically determined, the cultural difference which makes man man can be seen in how far his gestures, his senses, his way of acting, his way of loving (his brain, as well as his stomach), are cultural. So, a man with the stomach of a lion or of a horse would certainly stop being a man, since only a human stomach is not bound to particular sorts of food and is, hence, universal:

⁷⁷ Schmidt, A., 1973. *Emanzipatorische Sinnlichkeit: Ludwig Feuerbachs anthropologischer Materialismus*. München: Hanser, p. 110.

Wo sich aber ein Sinn erhebt über die Schranke der Partikularität und seine Gebundenheit an das Bedürfnis, da erhebt er sich zu *selbständiger*, zur *theoretischer* Bedeutung und Würde: *Universeller* Sinn ist *Verstand*, *universelle* Sinnlichkeit *Geistigkeit*. [...] Ja, selbst der *Magen* des Menschen, so verächtlich wir auch auf ihn herabblicken, ist kein thierisches, sondern *menschliches*, weil universales, nicht auf bestimmte Arten von Nahrungsmitteln eingeschränktes Wesen. [...] Laß einem Menschen seinen Kopf, gib ihm aber den Magen eines Löwes oder Pferdes – er hört sicherlich auf, ein Mensch zu sein.⁷⁸

The whole of human corporeity is therefore radically different from animal corporeity: humanity is deeply rooted in sensibility and corporeity, and yet at the same time man has got the capacity of being superior to mere need. Human spirituality arises precisely from sensibility: being determined, conditioned, limited to the materiality of one's body and to what the senses can perceive means, at the same time, being free, because there is a kind of universality in human sensibility which is not present in the other animals. Man is free insofar as he is able to characterize his action as civilized action, since human behaviour is capable of socio-cultural education (*Bildung*). What distinguishes man from the other animals is that, for him, every action, even the most common one such as eating, is not the result of pure instinct, but is instead always a cultural construction, a historical product. Not only "man is what he eats", but man is how he eats; read in this way, the famous sentence which Feuerbach wrote when commenting Moleschott's *Lehre der Nahrungsmittel* is much more than just a "vulgar materialistic" affirmation: also eating determines the essence of man; therefore, *Die Wissenschaft und die Revolution* (1858) is not contradictory, nor naïf, compared to the rest of his works⁷⁹.

Even when Feuerbach states the essentiality of nutrition for man, this tension between concreteness (the dependence of man upon matter) and abstraction (man's capacity to transform everything he gets in contact with from sheer materiality to culture) does not allow for any naïf materialistic interpretation of it. The objectivity of the world is subjectively mediated, while the subjectivity of consciousness is objectively mediated, and the joining ring in this relationship is the living body.

Feuerbach manages, through this dialectics of immediacy and objectification, to do justice to the concreteness of the subject and to its corporeity and, at the same time, to its being essentially cultural and historical; those two features reach a unity, a conciliation in what

⁷⁸ Feuerbach, L., *Grundsätze einer Philosophie der Zukunft*, § 54.

⁷⁹ Chernov, M., 1963. "Feuerbach's 'Man Is What He Eats': A Rectification", *Journal of the History of Ideas*; 24: 397-406.

Feuerbach calls *Liebe*. Love is the relation between an *Ich* and a *Du* in which individuality is constituted (and not just maintained), which is at the same time mediation par excellence and immediacy, in Feuerbach's sense (the immediacy of the senses). This is why love is the "ontological proof" for Feuerbach⁸⁰, and that which cannot be felt by the senses does not exist: "[...] *Wahrheit, Wirklichkeit, Sinnlichkeit* sind identisch. Nur ein sinnliches Wesen ist ein *wahres, ein wirkliches* Wesen, nur die *Sinnlichkeit Wahrheit und Wirklichkeit*"⁸¹. It is exactly through that feeling, through that sensing which is first of all corporeal, that the subject becomes aware both of the world and of himself.

Feuerbach's "philosophy of the future" involves a complex epistemological conception, which implies a reciprocal influence of constitutive intellectual activity and receptive sensibility; or, better, one in which none of them is purely passive or purely active. Exactly the absence of this critical attitude in Moleschott's thought, this naiveté which implied a reification of nature and an absolutization of science, will allow the bending of "scientific materialism" at the service of nation-building and of rather conservative ideologies, as we will suggest in the last chapter.

Summing up, Feuerbach surely demonstrated to appreciate the practical character of Moleschott's scientific materialism, as it is evident from the words of appreciation he wrote in the letters he sent to Moleschott:

Der theoretische Mensch geht bei mir, wie Sie sehen werden, ganz in den praktischen, das Wesen des Menschen, das Wesen der Vernunft ganz in das Wesen des Verlangens, des Wunsches auf. Daher hat es mich sehr erfreut von Ihnen zu vernehmen, daß sie im Gegensatz zu dem jämmerlichen Heidelberger Facultätsunwesen einen so sicheren praktischen Rückhalt haben.⁸²

And yet the dialectical method of his philosophy, his critical consideration of naïf scientific attitude and the prominent role he acknowledged to the cultural and subjective components of knowledge mark a distinction with scientific materialism; this distinction signals the impossibility of identifying Feuerbach's materialism with scientific materialism, and even his most materialistic statements should be reconsidered in this light.

⁸⁰ Feuerbach, L., *Grundsätze einer Philosophie der Zukunft*, § 34: „So ist die Liebe der wahre *ontologische* Beweis vom Dasein eines Gegenstands auser unserm Kopf – und es gibt keinen andern Beweis vom Sein als die Liebe, die Empfindung überhaupt. Das, dessen *Sein* dir *Freude*, dessen *Nichtsein* dir *Schmerz* bereitet, das nur *ist*. Der Unterschied zwischen Objekt und Subjekt, zwischen Sein und Nichtsein ist ein ebenso *erfreulicher* als *schmerzlicher* Unterschied.“

⁸¹ Feuerbach, L., *Grundsätze einer Philosophie der Zukunft*, § 32.

⁸² De Pascale, C., & Savorelli, A., 1988. Sechzehn Briefe von L. Feuerbach an J. Moleschott. *Archiv Für Geschichte Der Philosophie*. 70, p. 67.

2.2. Kant, Schelling and Hegel

In order to have a better understanding of how nature was conceived by materialistic science and where this conception came from, we are going to consider the development of the conception of nature through Kantian and Hegelian philosophy, which are interpreted as two fundamental steps towards the centrality of the subject. We are focusing on the relationship between nature and the knowing subject because it is on the basis of this conception of knowledge and of nature that the philosophy of subjectivity – and, therefore, the conception of objectivity as the criterion for scientificity – will be thought throughout the 19th century.

From Kant on, the concepts of world and nature become problematic, and questioning the idea of nature and of philosophy of nature constituted one of the fundamental problems of German Idealism after Kant, from Schelling to Hegel, passing through Jacobi, Fichte, Hölderlin and Friedrich Schlegel. The *incipit* of Hegel's lectures on philosophy of nature is the best affirmation of nature's becoming problematic for Idealistic philosophers, to which nature is not merely given, but is presented as a problem: "Die Natur ist dem Menschen als ein Problem aufgegeben, zu dessen Auflösung er sich ebensosehr angezogen fühlt, als er davon abgestoßen wird".⁸³

The problems related to the conception of nature and of science in scientific materialism derive from the problems posed by Kantian philosophy, and the solutions eventually attempted by German Idealism. The methodological innovations of Kant's transcendental project were due to the difficulties encountered in the justification of the modern conception of nature, on the one hand, and to the will of breaking with the metaphysical attitude of knowing nature by means of abstract reflection rather than starting from the positive results of natural sciences, on the other hand.

Kant has been also the crucial point in the definition of the modern conception of nature, which originated when the identification of *physis* and *ousia*⁸⁴, conserved in the concept of *natura rerum* and still in use in the School metaphysics of the 18th century, has been substituted by the concept of law of nature. In that way, the ancient conception of nature as *physis*, as free generation, production and development (< φύω) is substituted with the one of

⁸³ Hegel, G. W. F., 1982. *Naturphilosophie*, Bd. I, Die Vorlesung von 1819/1820. Napoli: Bibliopolis, p. 3.

⁸⁴ Compare Aristotle, *Physica II*, 1.

nature as constrained by necessary laws⁸⁵. The effects of this change can be seen also in Kant's *Preface* to the second edition of the *Kritik der reinen Vernunft*⁸⁶, where he states that nature must be constrained to answer the questions posed by human reason not as the pupil interrogates his master, but rather as the inquisitor interrogates the inquired.

The difference with Descartes and Leibniz is that the author of those laws is not a divine intellect anymore, but rather the human intellect; however, that does not mean that they are pure constructions, illusions or productions of the subject. But, according to the materialists, natural laws assume an ontological value and become objective facts: they are the laws according to which the universe really functions independently of human knowledge⁸⁷; nature is therefore conceived as being bound by necessary laws whose origin is immanent to nature itself. The reality and the unity of nature, which were problematic for Kant, are thought by the materialists to belong to the realm of objectivity.

In so doing, the materialists got back to the idea according to which nature is free because it is the principle of its own becoming, but at the same time they absorbed the Kantian instance of the necessity of natural laws.

As it is human reason itself which is at the origin of those laws of nature, there is a sort of de-realization of the concept of nature: according to Kant, nature is no longer conceived as an independent reality, but as a reality for us, or a series of phenomena. The unity of natural phenomena is given by human intellect⁸⁸ and, therefore, it is a formal unity: the systematic unity of nature is, also, a regulative idea of reason, as it is clearly stated in the *Anhang zur transzendentalen Dialektik: Von dem regulativen Gebrauch der Ideen der reinen Vernunft*, in the *Kritik der reinen Vernunft*. But if we use those regulative ideas of reason as ontological principles, instead of simply methodological ones, the transcendental ideas by means of which we think the unity of nature (such as its first cause, or God, or the spatial or temporal limitation of the world) lead to antinomies, since they are indeed formal principles, which

⁸⁵ This change indicates a rupture with the Aristotelian view and the ancient view in general: compare Renault, Emmanuel, 2002. *Philosophie chimique: Hegel et la science dynamiste de son temps*. Pessac: Presses Univ. de Bordeaux, p. 59.

⁸⁶ Kant, I., *Kritik der reinen Vernunft*, B XIII-B XVIII.

⁸⁷ Compare Moleschott, J. 1989. *De eenheid des levens* (uitg., ingel. en van aant. voorzien door Vincent J. B. M. Peeters). Baarn: Ambo.

⁸⁸ Kant, I., *Kritik der reinen Vernunft*, A 126-127: "ohne Verstand würde es überall nicht Natur, d. i. synthetische Einheit des Mannigfaltigen der Erscheinungen nach Regeln geben". On the unity of nature as a regulative ideal of reason, compare also Guyer, Paul, 2005. *Kant's system of nature and freedom: selected essays*. Oxford: Clarendon.

have their origin in the structuring activity of the subject and which therefore only have a regulative use, according to Kant, but which will become ontological principles according to Post-Kantians. Regulative ideas of reason are at the basis of biology and life sciences in general: in his *Kritik der Urteilskraft*, Kant extends the doctrine of the regulative use of reason to the faculty of reflective judgment, and he now applies this faculty, in particular, to the case of biology⁸⁹. As, for Kant, all matter in general and as such is essentially lifeless⁹⁰, then biology, the study of life, can never be a science in the strict sense: it can never be constitutively grounded in the fundamental forces of matter. Then, the doctrine of the regulative use of reason, via the teleological idea of purposiveness (*Zweckmässigkeit*), has to be applied to particular objects of nature or “natural products” (i.e., living organisms) insofar as they are conceived as themselves purposively organized. But such a mode of conception is in no way constitutive of natural objects: it is rather a merely regulative ideal which guides the empirical inquiry into living organisms. The fact that organisms are regulated by a sort of finalism which is not constitutive of the object is necessarily related to its being characterized as internal purposiveness, which is immanent to the development of the organism and does not come from any external intentionality: in fact, unlike artifacts, organisms are not the realization of the intention of a subject, where his purpose, his intentions and his project, assume a constitutive value for the object. If we were to think of the teleology of organisms in this way, we would necessarily presuppose the existence of a purposive agent; in this way, we would explain natural phenomena by means of a principle which transcends them and, as this principle is not immanent, teleology would immediately become external and not internal: in other words, as soon as final causality becomes constitutive of the object, it becomes necessarily external. Kantian teleology is conceived as an idea of reason, whose use is only regulative: it serves human intellect in order to be able to think of self-organized living beings which are able of self-production and reproduction and are at the same time cause and effect of themselves, and whose parts are necessarily related to each other and to the whole: it is a finalism without intentionality⁹¹.

⁸⁹ Compare for instance Kant, I., *Kritik der Urteilskraft*, § 68.

⁹⁰ Michael Friedman, Kant – *Naturphilosophie* – Electromagnetism, in Friedman, Michael, and Nordmann, Alfred (ed.), 2006. *The Kantian legacy in nineteenth-century science*. Cambridge, MA: MIT Press, p. 56: “This, in fact, is how Kant interprets the law of inertia, which law, in turn, is itself constitutively grounded by a further specification of the a priori principle of causality articulated in the first Critique.”

⁹¹ On this issue, compare: Chiereghin, Franco, 1990. *Finalità e idea della vita. La recezione hegeliana della teleologia di Kant*, in “Verifiche: rivista trimestrale di scienze umane”, XIX, pp. 127-229; and Šustar, Predrag,

While the Kantian criticism of metaphysics and of its absolutizations (which consists exactly in this limitation of the use of the ideas of reason only as methodological principles and not as being constitutive of the object) implied a restriction of philosophical ambitions, materialism broadens these ambitions again: insofar as science becomes philosophy and philosophy is identical with science, the attitude of scientific materialism could be seen on a line of continuity with the Fichtean project of elevation of philosophy to science⁹².

Thus, according to Kant, the unity of nature was a *focus imaginarius* dictated by the exigency of a real unification of phenomena:

die transzendentalen Ideen [...] haben [...] einen vortrefflichen und unentbehrlichnotwendigen regulative Gebrauch, nämlich den Verstand zu einem Gewissen Ziele zu richten, in Aussicht auf welches die Richtungslinien aller seiner Regeln in einen Punkt zusammenlaufen, der, ob er zwar nur eine Idee (*focus imaginarius*) d. i. ein Punkt ist, aus welchem die Verstandsbegriffe wirklich nicht ausgehen, indem er ganz außerhalb den Grenzen möglicher Erfahrung liegt, dennoch dazu dient, ihnen die größte Einheit neben der größten Ausbreitung zu verschaffen.⁹³

This unity, as we have previously noticed, was seen as problematic⁹⁴ and, while nature was conceived as the set of causal relations unifying different phenomena, as dynamic whole, as connection, the world was envisaged as the total unification of phenomena, as their synthesis; it was the whole conceived as transcendental concept:

Wir haben zwei Ausdrücke: *Welt* und *Natur*, welche bisweilen in einander laufen. Das erste bedeutet das mathematische Ganze aller Erscheinungen und die Totalität ihrer Synthesis [...]. Eben dieselbe Welt wird aber *Natur* genannt, so fern sie als ein dynamisches Ganzes betrachtet wird, und man [...] auf die Einheit im *Dasein* der Erscheinungen siehet.⁹⁵

After the attempt of a transcendental foundation of the concept of nature had led to a questioning of the reality and unity of nature, Hegel and Schelling will inherit those problems, trying to solve them by thinking about them differently. While Kant avoided imposing ends to nature itself, because one should rather search them by means of physical investigation⁹⁶, and

2001. *La generazione e l'impresa critica. La costituzione della filosofia kantiana della "biologia"*, in "Verifiche: rivista trimestrale di scienze umane", XXX, pp. 75-136.

⁹² Renault, Emmanuel, 2002. *Philosophie chimique: Hegel et la science dynamiste de son temps*. Pessac: Presses Univ. de Bordeaux, p. 58.

⁹³ Kant, I., *Kritik der reinen Vernunft*, A 644; compare also B 712: „Denn Natur ist eigentlich nur das einzige gegebene Objekt, in Ansehung dessen die Vernunft regulative Prinzipien bedarf.“

⁹⁴ Kant, I., *Kritik der reinen Vernunft*, A 647 / B 675: „Der hypothetische Vernunftgebrauch geht also auf die systematische Einheit der Verstandeserkenntnisse, diese aber ist der *Probierteinheit* der Regeln. Umgekehrt ist die systematische Einheit (als bloße Idee) lediglich nur *projektierte* Einheit, die man an sich nicht als gegeben, sondern nur als Problem ansehen muß [...].“

⁹⁵ Kant, I., *Kritik der reinen Vernunft*, A 418-19 / B 446.

⁹⁶ Kant, I., *Kritik der reinen Vernunft*, A 692 / B 720

defined teleology and unity of nature as an exigency of reason which, however, one cannot conceive as a determinate concept⁹⁷, for Schelling the reality of nature was based on absolute productivity, and its unity was conceived as an organic whole: nature was, for him, the identity of product and productivity, of *natura naturans* and *natura naturata*.

Post-Kantian German Idealism is indeed characterized by a rejection of Kant's fundamental distinctions between appearances and things in themselves, between constitutive and regulative principles, between a passive or receptive faculty of pure sensibility and an active or intellectual faculty of pure understanding; finally, between understanding, conceived as the intellectual faculty applied to sensibility, and reason, which would be the same intellectual faculty considered independently from sensibility. It is thus a rejection of his dualism, which implies a radical re-conceptualization of transcendental philosophy⁹⁸. Kantian dualism has an essentially dialectical character, in that it gives rise to the antinomies of pure reason, which can only be resolved by a higher synthesis based on the infinite nature of the dialectical process as such (in fact, properly speaking it is not Hegel, but Kant, who makes dialectic end with a synthesis of thesis and antithesis).

Therefore, according to Schelling transcendental philosophy has a necessary "counterpart or dual [...] in *Naturphilosophie*, the story of how nature itself successively unfolds or dialectically evolves from the 'dead' or inert matter considered in statics and mechanics, to the essentially dynamical forms of interaction considered in chemistry, and finally to the living or organic matter considered in biology"⁹⁹: in fact, nature dialectically unfolds in a way that "precisely mirrors the evolution or development of our rational conception of nature"¹⁰⁰. In this way, not only do the constitutive domain of understanding and the regulative domain of reason reach a unity, but also chemical and biological phenomena, as the whole of natural phenomena, are now equally rationally or objectively grounded.

It is thus within Romantic *Naturphilosophie* that teleology assumes an essential and objective role which, as we will see, it will continue to play within scientific materialism: the Kantian idea of natural purpose as granting organic unity (each part is inseparable from the whole, and

⁹⁷ Kant, I., *Kritik der reinen Vernunft*, A 653 / B 681

⁹⁸ Michael Friedman, Kant – *Naturphilosophie* – Electromagnetism, in Friedman, Michael, and Nordmann, Alfred (ed.), 2006. *The Kantian legacy in nineteenth-century science*. Cambridge, MA: MIT Press, p. 57.

⁹⁹ Michael Friedman, Kant – *Naturphilosophie* – Electromagnetism, in Friedman, Michael, and Nordmann, Alfred (ed.), 2006. *The Kantian legacy in nineteenth-century science*. Cambridge, MA: MIT Press, p. 58.

¹⁰⁰ Ibidem.

the very idea of the whole determines the place of each part within it) and as the principle of self-generating and self-organizing life (all of its parts are reciprocally the cause and effect of one another, and it has no external cause: organisms produce themselves)¹⁰¹, which emerges from the antinomy of the *Kritik der Urteilskraft* and is thereby limited to function as regulative ideal of reason, acquires, for the materialists, an ontological and objective status. Teleology thus refers to a structure, function, or form of the organic, which is different from the ones of mechanism; but it also denotes a force, whose manifestations are organic structures, functions, or forms.¹⁰² In fact, only under the assumption that there is an organism is it possible to explain the actual interaction between the subjective and objective, the ideal and the real, the noumenal and the phenomenal. Moreover, the *Naturphilosophers* believed that the concept of an organism had its own transcendental deduction: it was nothing less than a necessary condition of possible experience¹⁰³, in the sense that it is the bridge between the domains of organic and inorganic, nature and freedom, mechanism and teleology: the conception of organism constituted the real unification of these spheres of Kantian philosophy, which Post-Kantian philosophers tried to connect. What follows from this transcendental conception of organic nature, envisaged as a necessary condition of possible experience, is that there is no fundamental difference in kind between the ideal and the real, apart from their different level of organization: there is no distinction in kind, but only one of degree, between the mental and the physical, the subjective and the objective, the ideal and the real, which are then simply different degrees of organization and development of a single living force; in this way, these “apparent opposites can then be viewed as interdependent”, since the mental is “the highest degree of organization and development of the living powers of the body”, and the body is “the lowest degree of organization and development of the living powers of the mind”¹⁰⁴.

Natural self-production and reproduction were conceived as the processes defining organisms, and the organic whole was considered as constituting the unity of nature¹⁰⁵; but, at the same

¹⁰¹ Compare for instance Kant, I., *Kritik der Urteilskraft*, § 65.

¹⁰² Frederick Beiser, Kant and *Naturphilosophie*, in Friedman, Michael, and Nordmann, Alfred (ed.), 2006. *The Kantian legacy in nineteenth-century science*. Cambridge, MA: MIT Press, p. 17.

¹⁰³ Ibidem: the transcendental argument is present in the early writings of Schelling and Hegel; Schelling first suggested the argument in the introduction to his 1797's *Ideas for a Philosophy of Nature*; Hegel later developed it in *The Difference between the Fichtean and Schellingian Systems of Philosophy*.

¹⁰⁴ Ibidem.

¹⁰⁵ Renault, Emmanuel, 2002. *Philosophie chimique: Hegel et la science dynamiste de son temps*. Pessac: Presses Univ. de Bordeaux, p. 63.

time, this development expressed a contradiction: the subject becomes object, and it is freedom itself which determines its own limits¹⁰⁶. Therefore, nature is seen as the place of contradiction and conflict, a representation which is also present in Romantic poetry (see especially Hölderlin, Goethe, Novalis), which celebrates this eternal struggle within nature, at the same time free and constrained.

Such an image is present in scientific materialism, too: the cycle is, one might say, a “tamed” image, an image where contradiction and conflict are not plainly visible, which is nevertheless used to express exactly that same unity of identity and difference, permanence and becoming, productive activity and product. The continuous reference to cyclical processes represents both a link with the philosophical tradition (a tradition which, in this case, is much more ancient than Idealistic philosophy) and a sign of that new “structure paradigm” which begins to emerge in scientific epistemology and philosophical theory: cyclical processes are not objects in themselves, but rather a model of interpretation of reality which gives a unifying character to scientific theory. The idea of cyclical process, in which each point can be at the same time beginning or end (and, therefore, there is no proper beginning and no proper ending point), is the explicit central theme of Moleschott’s *Kreislauf des Lebens*:

Derselbe Kohlenstoff und Stickstoff, welche die Pflanzen der Kohlensäure, der Dammsäure und der Ammoniak entnehmen, sind nach einander Gras, Klee und Weizen, Thier und Mensch, um zuletzt wieder zu zerfallen in Kohlensäure und Wasser, in Dammsäure und Ammoniak. Hierin liegt das natürliche Wunder des Kreislaufs, mir scheint es platt, um nicht zu sagen fade, wenn man es wunderbar findet, daß der Kohlenstoff unsres Herzens, der Stickstoff unsres Hirns früher vielleicht einem Aegypter oder Neger angehörte.¹⁰⁷

The last remark seems to recall the Romantic conception of love, involving a kind of universal fusion of matter. What is more, the exchange of matter becomes rebirth, transmigration of the souls, metempsychosis:

Diese Seelenwanderung wäre die engste Folgerung aus dem Kreislauf des Stoffs. Das Wunder liegt in der Ewigkeit des Stoffs durch den Wechsel der Form, in dem Wechsel des Stoffs von Form zu Form, in dem Stoffwechsel als Urgrund des irdischen Lebens. Alle Mühe des Menschen bewegt sich auf Bahnen, die in jenen Kreislauf einmünden wie Strahlen. Das Ringen ist näher und ferner des Mittelpunkt, je nach den Graden des Bewußtseins [...]¹⁰⁸

¹⁰⁶ Renault, Emmanuel, 2002. *Philosophie chimique: Hegel et la science dynamiste de son temps*. Pessac: Presses Univ. de Bordeaux, p. 65.

¹⁰⁷ Moleschott, J. (1852). *Der Kreislauf des Lebens: Physiologische Antworten auf Liebig’s Chemische Briefe* (2. Aufl.). Mainz: Von Zabern., p. 83.

¹⁰⁸ Ibidem.

In this way, the image of the circle represents a connection not only with the most recent philosophical tradition (Idealism), but also with ancient religious traditions. Moreover, it constitutes a link between the different aspects of natural life which are taken into account by Moleschott's scientific theory; for example, we find the themes of illness and death, which we will deal with shortly, where the very structure of the circle is taken as a justification for the argument of the necessity of individual death for universal life, being death the condition which enables the immortality of the circle:

Denn das ist die erhabene Schöpfung, von der wir täglich Zeugen sind, die nichts veralten und nichts vermodern läßt, [...] daß jedes Einzelwesen nur der Gattung zum Opfer fällt, daß der Tod selbst nichts ist als die Unsterblichkeit des Kreislaufs.¹⁰⁹

It is because of this lack of a starting point and of an ending point, or, better, because of their coincidence, that there is no creation *ex nihilo*, and also no destruction.

Moleschott thus found the unifying principle of the multiplicity of physical phenomena in the concept of *Kreislauf*. Cyclical structures display an intrinsic finalism, thereby constituting at the same time the application of the Kantian conception of finalism: the principle, the beginning, is at the same time the end and the purpose of the whole process, the αρχή coincides with the τέλος, so that, as in Hegel's dialectics, one cannot speak about a beginning, but rather about a commencement. A cyclical process is one in which everything is repeated always and again in the same way, and its order is necessary, for the path is a closed loop and not an infinite straight line.

The unity of difference and identity, which is represented in the harmonic image of the cycle, is posited as problematic in the conception of nature as contradiction, which was already present in Hegel, where nature is the alienation of the Absolute Idea, its becoming other and therefore being the negation of subjectivity, i.e. objectivity¹¹⁰. Through Hegelian dialectics, the objectivity of nature assumes an ontological meaning; but this achievement represents the truth of the methodology and of the process, i.e. of dialectics itself: nature is objective insofar as it is the objective moment of the Absolute Spirit.

Since nature, being alienated concept, participates of the development of the Spirit, there is a unity of organic and inorganic phenomena, where galvanism and electricity are the key

¹⁰⁹ Moleschott, J. (1852). *Der Kreislauf des Lebens: Physiologische Antworten auf Liebig's Chemische Briefe* (2. Aufl.). Mainz: Von Zabern, p. 84.

¹¹⁰ Hegel, G. W. F., *Enzyklopädie der philosophischen Wissenschaften im Grundrisse* (1830), § 247.

passage from one domain to the other; hence, the unity of nature as an organic whole is granted to be also real, overcoming in this way the Kantian conception of unity as exigency of reason and of its regulative ideas:

Auch die Entwicklung der Chemie stellt sich dar als Vermittlung von Begriff und Realität. Die Realität von Magnetismus und Elektrizität läßt einen Begriff entstehen, dessen Wirklichkeit die Chemie ist – in der Chemie bildet sich der Begriff der organischen Welt.¹¹¹

This continuity is a common ground of *Naturphilosophie*, being present also in Goethe's idea of metamorphosis from inferior to upper levels, and in Schelling's *Ideen zu einer Philosophie der Natur*, according to which nature is visible Spirit and Spirit is invisible nature¹¹².

It is in Hegel that we also find another important representation of nature which will be fully appropriated by the materialists, i.e. the one of nature as deriving its own life from death; the difference is that in Moleschott and the other materialists this image becomes factual and it is transferred to biological reality, and at the same time it is used independently from the dialectical method¹¹³. Even the presence of the chapters named *Krankheiten* and *Tod* (illnesses and death) at the end of every volume of Moleschott's *Anthropologie* is of Hegelian origin: illness and death of organic phenomena are the most visible limitations of freedom in nature, but also that from which nature can regenerate. The ideal is present only *an sich* in Hegel's nature, because the exteriority, the materiality, which is the fundamental feature of nature, is an impediment to the affirmation of freedom and interiority (*das Geistliche*)¹¹⁴. Since the ideal remains simply "internal" to nature, unable to give form to an exteriority

¹¹¹ Engelhardt, Dietrich von, 1976. *Hegel und die Chemie: Studie zur Philosophie und Wissenschaft der Natur um 1800*. Wiesbaden: Pressler, p. 99.

¹¹² Schelling, Friedrich Wilhelm Joseph von, 1803. *Ideen zu einer Philosophie der Natur, als Einleitung in das Studium dieser Wissenschaft*. Landshut: Krüll (Introduction).

¹¹³ Compare Hegel, G. W. F., *Enzyklopädie der philosophischen Wissenschaften im Grundrisse* (1830), § 251: „Die Natur ist an sich ein lebendiges Ganzes; die Bewegung durch ihren Stufengang ist näher die, daß die Idee sich als das setze, was sie an sich ist; oder was dasselbe ist, daß sie aus ihrer Unmittelbarkeit und Aeußerlichkeit, welche der *Tod* ist, *in sich* gehe und zunächst als *Lebendiges* zu seyn, aber ferner auch diese Bestimmtheit, in welcher sie nur Leben ist, aufhebe, und sich zur Existenz des Geistes hervorbringe, der die Wahrheit und der Endzweck der Natur und die wahre Wirklichkeit der Idee ist.“ In Hegel, Georg Wilhelm Friedrich, 1978. *Gesammelte Werke*. Bd. XX, *Enzyklopädie der philosophischen Wissenschaften im Grundrisse* (1830), hrsg. von Wolfgang Bonsiepen und Hans-Christian Lucas. Hamburg: Meiner.

¹¹⁴ Compare Hegel, G. W. F., *Enzyklopädie der philosophischen Wissenschaften im Grundrisse* (1830), § 247: „**Begriff der Natur**. Die Natur hat sich als die Idee in der Form des *Andresseyns* ergeben. Da die Idee so als das Negative ihrer selbst oder sich *äußerlich* ist, so ist die Natur nicht, äußerlich nur relativ gegen diese Idee (und gegen die subjective Existenz derselben, den Geist) sondern die *Aeußerlichkeit* macht die Bestimmung aus, in welcher sie als Natur ist.“ On the necessity of death for nature, compare §195 and § 251. In Hegel, 1978.

mirroring the interiority¹¹⁵, nature is characterized by contradiction: it is “unsolved contradiction”¹¹⁶.

According to Hegel, nature is the idea under the form of being other, it is the reign of necessity, not of freedom¹¹⁷, and it is characterized by determinability from the exterior¹¹⁸; according to Schelling, on the other hand, nature as subjectivity is characterized by pure freedom and pure necessity, because all phenomena are produced by nature on the basis of the same principles.

Therefore, the great difference between Schelling’s and Hegel’s conception of nature lies in their respective opinions regarding empirical sciences. Schelling drew the conclusion that, if nature is the domain of absolute necessity, then it must be studied through *a priori* principles, and that empirical sciences, which cannot pretend to grasp scientific truth, must be guided by philosophical hypotheses¹¹⁹; moreover, if nature is an organic whole, then the plurality of science is not justified: only an all-encompassing theory which is able to comprehend the principles of organicism can aim at being scientific¹²⁰. The Hegelian definition of nature as alienated Idea, on the contrary, implied a criticism with regard both to Schelling and to scientific reductionism, because the contingency of nature requires empirical scientific

¹¹⁵ Compare Hegel, G. W. F., *Enzyklopädie der philosophischen Wissenschaften im Grundrisse* (1830), § 249: „Die Natur ist als ein *System von Stufen* zu betrachten, deren eine aus der andern nothwendig hervorgeht und die nächste Wahrheit derjenigen ist, aus welcher sie resultirt, aber nicht so daß die eine aus der andern *natürlich* erzeugt würde, sondern in der innern der Grund der Natur ausmachenden Idee. Die *Metamorphose* kommt nur dem Begriffe als solchem zu, da dessen Veränderung allein Entwicklung ist. Der Begriff aber ist in der Natur theils nur inneres, theils existirend nur als lebendiges Individuum; auf dieses allein ist daher *existirende* Metamorphose beschränkt.“ In Hegel, 1978.

¹¹⁶ Compare Hegel, G. W. F., *Enzyklopädie der philosophischen Wissenschaften im Grundrisse* (1830), note to §248: „[...] Die Natur ist *an sich*, in der Idee göttlich, aber wie sie ist, entspricht ihr Seyn ihrem Begriffe nicht; sie ist vielmehr der *unaufgelöste Widerspruch*. Ihre Eigenthümlichkeit ist das *Gesetzseyn*, das Negative, wie die alten die *Materie* überhaupt als das **non-ens** gefaßt haben.“ In Hegel, 1978.

¹¹⁷ Compare Hegel, G. W. F., *Enzyklopädie der philosophischen Wissenschaften im Grundrisse* (1830), § 193: „Diese *Realisirung* des Begriffs, in welcher das Allgemeine diese *Eine* in sich zurückgegangene Totalität ist, deren Unterschiede ebenso diese Totalität sind, und die durch Aufheben der Vermittlung als *unmittelbare* Einheit sich bestimmt hat, - ist das *Object*.“ In Hegel, 1978.

¹¹⁸ Compare Hegel, G. W. F., *Enzyklopädie der philosophischen Wissenschaften im Grundrisse* (1830), § 250: „[...] Die Zufälligkeit und Bestimmbarkeit von Außen hat in der Sphäre der Natur ihr Recht. [...]“ In Hegel, 1978.

¹¹⁹ Schelling, Friedrich Wilhelm Joseph von, 1803. *Ideen zu einer Philosophie der Natur, als Einleitung in das Studium dieser Wissenschaft*. Landshut: Krüll (Introduction).

¹²⁰ Renault, Emmanuel, 2002. *Philosophie chimique: Hegel et la science dynamiste de son temps*. Pessac: Presses Univ. de Bordeaux, p. 103.

research; philosophy and empirical sciences must collaborate, because philosophy alone cannot achieve a complete knowledge of nature¹²¹.

Against Schelling's unity of nature as an organic whole, Hegel's idea of nature as essential exteriority and otherness (including the differentiation of the parts of nature with each other, corresponding to different levels with their specific ontological relations) is the presupposition of an idea of unity of nature which is not conceived as an organic whole, but as articulation of various levels¹²², as structural unity where these different levels are the moments of the qualitative variation of the same structure; thereby, this conception of a structural unity of nature constitutes not just an ideal unity, but a real one¹²³. This constructive use of boundaries within an inclusive framework relates the issue of the connection between scientific materialism and Idealism to the broader issue of the inclusive attitude of materialism vis-à-vis other domains, an attitude which is indeed typical for Idealistic philosophical systems, where all aspects of reality are connected to one another forming an organic unity and a logical progression: grasping the Absolute is the aim of these systems, so that nothing is left aside, nothing is excluded, since everything is part of that whole. This idea of inclusiveness is very well exemplified by this statement, which has been written by Schelling in his *System des transzendentalen Idealismus*: "Ist das Wissen überhaupt produktiv, so muß es ganz und durchein, nicht nur zum Theil, produktiv sein, es kann nichts von außen in das Wissen kommen, denn alles, was ist, ist mit dem Wissen identisch, und nichts ist außer ihm"¹²⁴.

Summing up, the elements which are central to *Naturphilosophie* and with respect to which scientific materialism will define or redefine its main concepts, are: the idea of nature as contradiction and conflict; the idea according to which exteriority impedes an adequate expression of the ideal in the phenomenal; the unity of nature not as an organic whole, but as a "system" constituted by different levels, and thus as structural unity. Scientific materialism absorbed, among other Hegelian and Romantic influences, also the idea of structural unity, and its having an ontological status; again, we could apply the aforementioned category of

¹²¹ Compare Hegel, G. W. F., *Enzyklopädie der philosophischen Wissenschaften im Grundrisse* (1830), § 246: „[...] Nicht nur muß die Philosophie mit der Natur-Erfahrung übereinstimmend seyn, sondern die *Entstehung* und *Bildung* der philosophischen Wissenschaft hat die empirische Physik zur Voraussetzung und Bedingung. [...]“ In Hegel, 1978.

¹²² Compare Hegel, G. W. F., *Enzyklopädie der philosophischen Wissenschaften im Grundrisse* (1830), § 249.

¹²³ Compare Renault, Emmanuel, 2002. *Philosophie chimique: Hegel et la science dynamiste de son temps*. Pessac: Presses Univ. de Bordeaux, p. 84.

¹²⁴ Schelling, Friedrich Wilhelm Joseph von (hrsg. von Steffen Dietzsch), 1979. *System des transzendentalen Idealismus*. Leipzig: Reclam, pp. 70-71.

“implosion” in order to explain how this idea of structural unity originated: in fact, it is the conception of nature as conflict which, annihilating the idea of a final synthesis and a definitive conciliation, and, hence, of a positive result of dialectics leading to a certain fixed hierarchy, opened the possibility for another kind of order (an order with no hierarchy, but one horizontal level where connections could be established). With this respect, the materialists anticipated the fundamental approach of neo-positivism; however, the method which was used by the materialists to reach the unification of scientific disciplines was very different from the one adopted by the positivists of the *Wiener Kreis*.¹²⁵ While the latter ones wanted to reform philosophy by means of the generalization of the methods which were valid for scientific theory, the materialists did not aim at integrating philosophy with the sciences, in order to form one unified science, nor did they aim at reconstructing both science and philosophy giving it the axiomatic form of mathematical disciplines, nor the form of empirical inductive disciplines in which every generalization and abstract concept can be confirmed by empirical observation. The materialists integrated non-scientific disciplines with science absorbing them as they were, and making them an essential part of their theories; there is, thus, no reduction of epistemology to the analysis of perceptions (Ernst Mach’s *Analyse der Empfindungen*), nor of philosophy to empirical and inductive sciences formalized in a system of axioms, analogously to the axiomatic system of pure mathematics. While logical empiricism is characterized by a fundamental dichotomy between logical and factual, emotive and cognitive, this was not at all the case with scientific materialism, which, both on the ontological level and on the level of the systematization of disciplines, operated no separation.

2.3. Goethe

We have been speaking about the inclusive attitude which was typical of Idealism, and which has been taken up by scientific materialism. But such an “inclusive” attitude on the theoretical level will only be radically inclusive when it is applied to the practical level, when theory becomes practice, thereby becoming also *de facto* all-embracing with regard to every domain of reality: it becomes “totalizing”, and this is exactly what has happened with scientific materialism. On a systematical level, we will now have to deal with the passage from the “inclusive” to the “totalizing” attitude of materialism: how did this transition actually take

¹²⁵ Compare Janik, Allan S., & Toulmin, Stephen Edelston, 1973. *Wittgenstein's Vienna*. London: Weidenfeld and Nicolson.

place, then? What are the elements which transferred the inclusive attitude to the socio-political level? What kind of process transformed it into a “totalizing worldview”?

We will show that this transition is exemplified by the relation between scientific materialism and Goethe: the mediation of the (self-)representation of science through literature constitutes the transposition of “inclusivism” from the philosophical and scientific-historical level to the social and political level. This section is thus concerned with throwing light on the figure to which the materialists refer in the most controversial way: Johann Wolfgang von Goethe. Goethe is one of the most important authors whose work is frequently quoted, not only by Moleschott, but by a large number of materialists (such as Ludwig Büchner) and monists (such as Ernst Haeckel, who even conceived of his work as completing Goethe’s philosophy¹²⁶): what did Goethe mean to such scientists, then? Were they only using his authority to justify their own scientific theories? Did Goethe represent the tradition to which they wanted to connect their own work, presenting it as the natural continuation of that tradition? Or, instead, did they truly take Goethe as a model for scientific research and theory?

We will here deal with these hypotheses, showing that both options carry a grain of truth, even if none of them could be taken as the only explanation of Goethe’s importance for scientific materialism in the 19th century. Moreover, both have to be specified: it would not be right to say that the materialists were merely using Goethe’s quotes, even if they consciously wanted to establish a clear link between that tradition which Goethe represented, and their own work as the continuation of that tradition. In the same way, it would not be right to say that the materialists fully accepted Goethe’s way of understanding and doing science (not to speak about his scientific theories and conceptions).

In fact, although Goethe as a poet was considered as a cultural hero, the materialists overtly criticize Goethean science: Moleschott wrote that Goethe’s theory of colours is just a product of the imagination if one compares it to Huygens’s theories¹²⁷ and, more generally, we can see

¹²⁶ Compare Olaf Breidbach, *Alle für Eines. Der Monismus als wissenschaftsgeschichtliches Problem*, in Ziche, Paul (Hg.), 2000. *Monismus um 1900: Wissenschaftskultur und Weltanschauung*. Berlin: VWB, Verlag für Wissenschaft und Bildung, p. 18: „Haeckel sieht sich selbst als dem Vollender des naturphilosophischen Programms Goethes“ (compare Haeckel, E., 1899. *Welträthsel*, pp. 23, 86 ff., 440).

¹²⁷ Compare FSM, *B I 8*, notes dated “Venerdì 8 Gennaio 1886”, p. 17: “[...] Similmente non vogliamo comparare le favole di Esopo colle tragedie di Sofocle, né la divina comedia colle poesie del Giusti, né le fantasie di Goethe sui colori colle teorie del Huyghens sulla luce; eppure l’equivalente calorico del lavoro intellettuale, non ostante i frutti così diversi che esso ha prodotto resta paragonabile. [...]”. (English version, my translation: “In the same way, we do not want to compare Esopus’s tales with Sophocles’s tragedies, nor the

that their ideal of science was far from Goethe's idea of integration between objective knowledge and knowing subject, between science and art, where the particular was not sacrificed to the general nor the concrete to the abstract. Indeed, materialistic science was very Idealistic with this respect: its "inclusive" attitude aimed at subsuming under general and abstract scientific concepts all non-scientific (i.e. ethical and political) values. But what did Goethe represent to their eyes?

The fact that Goethe does not really seem to fit among the inspirers of scientific materialism suggests that this is an important point which should make us look for crucial aspects of a new interpretation of materialism. Goethe's quotes function, in the texts and in the speeches of the materialists, on a self-representational level which, however, is not only an external level, because internal and external are never considered as two opposing and independent realities: rather, they are two aspects of the same "general law", as in Hegel's system, and as their tendency to "inclusivism" itself explains. Indeed, the effect of "inclusivism" on the social and political sphere, as it is made possible by the references to Goethe, is a "totalizing" worldview.

In order to elucidate the relation of scientific materialism to the literary, scientific and philosophical tradition, we can consider some of the quotes which appear in Moleschott's writings; in the final discourse for the conference on criminal anthropology held in Rome in 1885, we find the following lines:

*Greift nur hinein in's volle Menschenleben!
Ein jeder lebt's, nicht vielen ist's bekannt,
Und wo ihr's packt, da ist's interessant.*¹²⁸

In this case, the function of the quotation is quite easy to recognize: first, its aim is to encourage and praise the scientists in their research; second, it is a constitutive part in the network of literary references essential to the whole speech: from Dante to Shakespeare, from Goethe to Protagoras and to Christian doctrine, from Victor Hugo to Garibaldi, Moleschott attentively constructs a historical framework of personalities, of which the materialists are the highest synthesis.

divine comedy with Giusti's poems, nor Goethe's fancies about colours with Huyghen's theories on light; and yet the caloric equivalent of intellectual work, although it produced such different fruits, can still be compared".)

¹²⁸ Jac. Moleschott, *Discours prononcés dans la séance d'ouverture (17 Novembre 1885) et à la conclusion (25 Novembre 1885) du Congrès International d'anthropologie criminelle à Rome*. Ippolito Sciolla, Imprimeur du Ministère des Affaires Étrangères. Rome, 1886, p. 4 of the speech of 25th November 1885.

A similar role is played by the quote which opens the *Anthropologie*, which has the function of introducing and justifying the main theme of the whole book:

Dem einzelnen bleibe die Freiheit sich mit dem zu beschäftigen, was ihn anzieht, was ihm Freude macht, was ihm nützlich deucht, aber das eigentliche Studium der Menschheit ist der Mensch.

Goethe, Wahlverwandschaften.

Bd. 2 S. 572.¹²⁹

But we can also find the lines of some of Goethe's poems integrated in the main text of Moleschott's lectures, in his notes and in the transcriptions of his speeches: in these cases, the poetic text is in fact an example for some particular situation, the illustration and at the same time the clarification of a theory, or the justification of an hypothesis, as in the following case:

Zeitmass

*Eros, wie seh'ich Dich hier! In jeglichem Händchen die Sanduhr!
Wie? leichtsinniger Gott, missest Du doppelt die Zeit?
„Langsam rinnen aus einer die Stunden entfernter Geliebten;
Gegenwärtigen fließt eilig die zweite herab.“*

Goethe I 97.¹³⁰

These lines are related to the importance of subjective experience for time-perception (anticipating, on a primordial level, the theories on the inner time such as Bergson's and Joyce's).

On the other hand, there are some quotes whose function is the fusion of the functions of the last two examples we have just provided, as, for instance, in the citation written at the beginning of the 22nd chapter of *Rückblick und Ergebniss*, taken from Goethe's *Faust*:

*„Sie hören nicht die folgenden Gesänge,
Die Seelen, denen ich die ersten sang,
Zerstoben ist das freundliche Gedränge,
Verklungen, ach der erste Wiederklang.“*

Göthe, Faust. ¹³¹

But were Goethe's stances really a model for materialistic scientists? In fact, Goethe's idea of scientific research was far from the idea of the materialists, who undoubtedly adhere to the Newtonian model of science. But, at the same time, there are certain characters of Goethean

¹²⁹ Moleschott, J., FSM, B V 1.

¹³⁰ Moleschott, J., FSM, A II 3 a.

¹³¹ FSM, A I 4 a, *Rückblick und Ergebniss*, chapter XXII, manuscript (from Goethe, *Faust*, Erster Theil, Zueignung).

thought, such as pantheism and organicism¹³², which are completely accepted and actively fostered by scientific materialism.

According to Goethe, religion, art and science all have the task of satisfying man's fundamental needs: "*anzubeten, hervorzubringen, zu schauen*"; this implies an active gaze towards the object, the gaze of a subject who participates in the constitution of the object throughout the process of knowledge¹³³. But the image which one obtains is far from the abstract ideal of mechanical objectivity represented by Galilean and Newtonian science: instead of getting a mechanical presentation of the world, the Goethean scientist-artist had an indirect conception of his object, which could be grasped not in abstract forms, but only in its particular instantiations, in concrete examples, in symbols.¹³⁴ Therefore, the whole is not conceivable as such, and yet it is present in every single natural phenomenon: this aspect can be seen as a sort of pantheism, similar to Spinoza's *Deus sive natura*, and it was one of the Goethean aspects which had the greatest influence on the philosophy of scientific materialism.

If, on the one hand, Goethe's conception of nature is not mechanistic, on the other hand his conception of science is not systematic¹³⁵: he does not attempt to constrain nature into any preformed system, and this is one of the main reasons why, despite the admiration they nurtured with respect to his figure, the scientists who were not adepts of *Naturphilosophie* could not follow and agree with his way of intending scientific research.

And yet, in general terms, Goethe's image of science resembles the image of science the materialists adopted and proposed: Goethe's statement that nature (which is mirrored by

¹³² It is also possible that Goethe had some influence even on the positivistic conception of milieu and therefore on the great importance of the notion of environment and of its reciprocal interrelation with organisms for scientific materialism (this is also one of the senses in which Moleschott means that life is cyclical); compare indeed Bell, Matthew, 1994. *Goethe's naturalistic anthropology: man and other plants*. Oxford: Clarendon Press, p. 195, where it is reported that, according to Goethe, art is a product of its milieu (letter to Heyne, 24th July 1788).

¹³³ Viëtor, Karl, 1949. *Goethe: Dichtung, Wissenschaft, Weltbild*. Bern: Francke, p. 375: „Von der Wissenschaft sagt er, daß sie schauen solle. Er vermeidet das abstraktere Wort „erkennen“. [...] „Schauen“ ist nicht passives Gewahrwerden: erkennen, begreifen sind darin eingeschlossen, aber so, daß der Weg zur Einsicht in den Gegenstand eben durch das anschauende Erfassen seiner Erscheinung führt.“

¹³⁴ Viëtor, Karl, 1949. *Goethe: Dichtung, Wissenschaft, Weltbild*. Bern: Francke, p. 378: „Der Weltgeist erscheint dem Mensch nicht direkt. Wir können ihn nur „im Abglanz, im Beispiel, Symbol, in einzelnen und verwandten Erscheinungen“ erkennen. [...] So werden alle Erscheinungen der Natur, wird jeder einzelne Fall zum Symbol des Ganzen, das wir nicht schauen und fassen können.“

¹³⁵ Viëtor, Karl, 1949. *Goethe: Dichtung, Wissenschaft, Weltbild*. Bern: Francke, p. 379: „Goethe hat gesagt, als Forscher habe er kein System. Denn die Natur habe auch keines. „Sie hat, sie ist Leben und Folge aus einem unbekanntem Zentrum, zu einer nicht erkennbaren Grenze“. Aber diese Freiheit ist nicht Willkür. Die Natur schafft nach festen Grundformen, nach geistigen Bildungsprinzipien, die Goethe „Idee“ nennt.“

science) is life proceeding from an unknown centre to an unknowable border¹³⁶ can immediately be associated with Moleschott's image of science as a sphere, the volume of which expands at the expenses of the unknown, in an endless process where knowledge always increases:

Si nous regardons la science comme une sphère qui s'agrandit sans cesse, nous pouvons dire que son agrandissement ne fait qu'accroître ses points de contact avec l'inconnu qui l'environne. Herbert Spencer III 1¹³⁷

Hence, it was not scientific theory (or pieces of theory) what Moleschott took from Goethe, nor scientific methodology either, but something more general and more abstract, which is the representation of science; this image corresponded to the one of an all-encompassing worldview, with pantheistic traits, but it did not go so far as to affect the reception of theories or as to indicate a possible anticipation, in Goethe's philosophy, of scientific theories which were typical for materialism.

In fact, although Goethe's morphology has been connected to evolutionism¹³⁸, there is only an outer resemblance between them: according to Goethe, morphological transformations work according to categories such as *Idealtypus*, *Typus*, *Idee*, *Urbild*, which are all purely ideal, and do not correspond to unmediated data. The development of the forms is caused by *vis centrifuga* and *vis centripeta*, whose opposing forces allow the metamorphosis of organisms; but Nature itself has no system, and without the opposition of one force to the other its development would get lost in infinite transformations, ever becoming and ever changing.

The eternal ideal essence of each *Typus* becomes manifest under different forms, which are the external and physical apparitions of a deeper unity. If the *Typus* was the general principle for all the particular manifestations of organic nature, the *Urphänomen* was the organizing principle of all multifarious forms in the sphere of inorganic nature: in this way, magnetism was one of those phenomena, since it was the "symbol", the original and general typology for all the particular phenomena which are instantiations of polarity; at the same time, it is also

¹³⁶ Ibidem.

¹³⁷ FSM, *B I 6 b*, *Quaderni*, 16 Dicembre 1882 (manuscript).

¹³⁸ Compare for example Richards, R. J., 2002. *The romantic conception of life: science and philosophy in the age of Goethe*. Chicago: Univ. of Chicago Press; but also, already in 1903, Wasielewski, Waldemar von, *Goethe und die Descendenzlehre*, Rütten und Loening, Frankfurt a. M.

the purest manifestation of the idea. Schelling called it a general dualism, which does not work on a physical level, but rather on the logical level of fundamental assumptions.¹³⁹

The scientist is not allowed to go further, trying to find something beyond the *Urphänomen*: this is the limit he must respect, if he does not want to incur in the ancient sin of *hybris*: “Ein Weiteres soll er nicht dahinter suchen”, says Goethe in his letter to Eckermann of 18th February 1829¹⁴⁰; and, in the poetic language of his *Faust*, “Kein Weg! Ins Unbetretene, / Nicht zu Betretende”¹⁴¹. This is a typical theme of Romantic philosophy of nature: being *stolz* as lacking respect for nature and therefore going beyond the limit imposed by her. But, to the materialists, such ideas are completely foreign, because science, according to them, has no limits¹⁴²; therefore, it is not nature which imposes a limit to science, but science which constrains nature.

The materialists do not refer to Goethe’s scientific theories or achievements and, when they do, that does not have a positive meaning, as we have seen. And yet Goethe had reached some important results in compared anatomy (for instance, he discovered the *Os intermaxillare*), although approaching the observation of natural phenomena in a completely different way from the one of modern science: modern science interprets the world as the result of relations of cause and consequences, with the only purpose of the analysis of single objects, the explanation of their function and form according to the law of causality, while Goethe, on the contrary, saw nature as a whole, which is regulated by forces of attraction and repulsion. The single phenomenon was understood starting from its relationship to the whole and as being part of the whole and, at the same time, in its particularity and individuality. He searched the

¹³⁹ Viëtor, Karl, 1949. *Goethe: Dichtung, Wissenschaft, Weltbild*. Bern: Francke, p. 385: „Wenn der Typus in der Sphäre der organischen Wesen das organisierende Prinzip, die höhere Natur ist, so nennt Goethe das Analoge im Gebiet des Anorganischen *Urphänomen*. [...] Der Magnetismus etwa ist eine solche Grunderscheinung. Er kann als Symbol für alle einzelnen Erscheinungen der Polarität gelten, weil in ihm die Idee sich aufs reinste manifestiert, - ein allgemeiner Dualismus (wie Schelling sagt), der in der Physik nicht weiter abgeleitet, sondern als Grundbedingung vorausgesetzt werden muß.“

¹⁴⁰ Reyhler, Lucien, 1932. *Goethe dans ses rapports avec les représentants de la science: tels qu'ils nous sont révélés par Eckermann dans ses conversations avec Goethe*. Anvers: Dauphin.

¹⁴¹ Goethe, J. W., *Faust*, v. 6222.

¹⁴² Compare Büchner, Ludwig, 1864. *Kraft und Stoff: empirisch-naturphilosophische Studien in allgemein-verständlicher Darstellung*. Leipzig: Theodor Thomas, p. 266: „Indessen muß es uns in *letzter Linie* erlaubt sein, von allen derartigen Moral- oder Nützlichkeitsfragen vollkommen abzusehen. Der einzige und oberste bestimmende Gesichtspunkt unserer Untersuchungen liegt in der *Wahrheit*. Die Natur ist nicht um der Religion, um der Moral, um der Menschen, sondern um ihrer selbst willen da. Was können wir anders thun, als sie nehmen, wie sie ist?“

ideas in the phenomena and he believed in a sort of spirituality or ideality of nature, in the sense of the hylozoism of ancient philosophers.¹⁴³

In the same way as the whole of nature is a living organism, which has no purpose and no end out of itself, so also every single living being is a microcosm in the macrocosm, which is not conceived as being there simply for man's own use and sake: it is a *Zweck seiner selbst*. This can be regarded as an important similarity between the conception of organism in Goethe's philosophy of nature and in materialistic science, mediated through the Kantian idea of immanent teleology in self-organizing living beings (the regulative idea of reason of *Zweckmäßigkeit ohne Zweck*, or: finalism without intentionality).

Which elements did Moleschott take from Goethe's philosophy of nature? Which aspects of his view of science did he implicitly or explicitly absorb, and which other aspects did he refuse?

There are for sure important differences in the understanding of the task of science and, above all, of its methods. For example, Goethe's very conception of experiment is radically different from the one accepted by the materialists: while Moleschott's view on the purposes and conditions of scientific experiments sticks to the Newtonian and Galilean conception, Goethe's understanding of experiment was closely related to that of directly experiencing nature through observing it, through interacting with it without constraining it. Walking, swimming, climbing, were for Goethe all ways to feel nature and to be in contact with it; they were the only ways to truly understand nature.

This also implies a different conception of sense-perception: for Moleschott and the materialists what matters in the experiment is its repeatability and the data resulting from it; for Goethe, instead, every observation was irreplaceable and not interchangeable, since every person had to learn to observe nature¹⁴⁴. Learning to observe, one could finally get to the vision of the Ideal Plant, the Ideal Rock, etc., which are the essence, the original form of a

¹⁴³ Compare Viëtor, Karl, 1949. *Goethe: Dichtung, Wissenschaft, Weltbild*. Bern: Francke, p. 390.

¹⁴⁴ C. F. von Weizsäcker, Goethe and modern science, in Amrine, F., Zucker, F. J., 1987. *Goethe and the sciences: a reappraisal*. Dordrecht: Reidel, p. 117.

plant, of a rock, etc., presented as real because they could actually be seen (< ἰδεῖν, to see)¹⁴⁵; truth is itself defined as the presence of essence in the appearance¹⁴⁶.

We can conclude that what passed from Goethe's philosophy to scientific materialism was not so much the scientific method, but rather the general idea of science, as well as the conscious use of certain forms of representation of science on whose basis the idea of science is constructed and divulged (by means of poetry in the case of Goethe, by means of public speeches and publications for non-specialists in the case of scientific materialism). In this way, Goethe's images of harmony, polarity and intensification, conceived as the great archetypes in the understanding of nature, were built upon "the images of the Great Chain of Being or the ancient symbolism of alchemy"¹⁴⁷. Exactly the same images can be abundantly found in Moleschott and Haeckel; their origin is, thus, more remote than *Naturphilosophie*: indeed, both Goethe and materialist or monistic scientists such as Haeckel and Moleschott were members of freethinkers' societies inspired by pantheistic ideals¹⁴⁸.

Finally, the legacy of monistic and pantheistic thought goes beyond the sheer image of science, redefining its domain and its tasks; in the same way as Goethe's philosophy of nature did, scientific materialism and monism tried to encompass experimental science, history of science and philosophy of science, understood not as independent disciplines but as the aspects of one single enterprise: comprehending nature.

The relationship between the materialists and Goethe's thought perfectly exemplifies that inclusive tendency of scientific materialism, which shows how the self-representation of materialistic science did not constitute a rupture with the tradition, and how its innovations only came from within the established scientific tradition. All conceptual changes brought forth by scientific materialism have been developing, so to say, from within the ancient categories: they immanently followed from the categories which materialism inherited from

¹⁴⁵ C. F. von Weizsäcker, Goethe and modern science, in Amrine, F., Zucker, F. J., 1987. *Goethe and the sciences: a reappraisal*. Dordrecht: Reidel, p. 120.

¹⁴⁶ C. F. von Weizsäcker, Goethe and modern science, in Amrine, F., Zucker, F. J., 1987. *Goethe and the sciences: a reappraisal*. Dordrecht: Reidel, p. 127.

¹⁴⁷ A. Portmann, Goethe and the concept of metamorphosis, in Amrine, F., Zucker, F. J., 1987. *Goethe and the sciences: a reappraisal*. Dordrecht: Reidel, p. 144.

¹⁴⁸ On monism and freemasonry, compare H.-D. Mebes, Zur Gründungs- und ersten Entwicklungsgeschichte eines „Allgemeinen Freimaurer-Bundes auf monistischer Weltanschauung“, des nachmaligen (Reform-) „Freimaurerbundes zur aufgehenden Sonne“, in Ziche, Paul (Hg.), 2000. *Monismus um 1900: Wissenschaftskultur und Weltanschauung*. Berlin: VWB, Verlag für Wissenschaft und Bildung, pp. 129 ff.. On Goethe and freemasonry, compare Viëtor, Karl. 1949. *Goethe: Dichtung, Wissenschaft, Weltbild*. Bern: Francke.

the philosophical and scientific tradition. Indeed, it was precisely from the evolution of Romantic categories that the materialists started to elaborate a unity based on structures more than on objects, as we will see later on.

But the presence of Goethean themes at the same time alludes to a deeper level of integration between materialism and philosophical worldview: it suggests that scientific materialism aimed at being (and for a large part succeeded to be) a totalizing interpretation of the world. According to this model, that is, the totalizing model, scientific materialism had to provide the middle class with an interpretation of the world which not only referred to the past philosophical and literary tradition, but which also implied a certain vision of ethics, society and politics, thus conveying new values – and this has been the true success of materialism, as far as popularization and mass communication is concerned.

The discourse on penal law Moleschott pronounced at the Senate is an illuminating example regarding the level of universality (in the sense of including all domains) to which scientific materialism aspired, as well as the extent to which its interpretations penetrated all aspects of human knowledge: here, Moleschott refers at the same time to a strophe of Goethe's *Faust* and to its translation by Andrea Maffei, Senator of the Kingdom in the 13th legislature:

*Leggi, diritti e patti,
Quasi malor, trapassano in retaggio
Da questo a quel lignaggio,
E striscian quatti quatti
Di paese in paese,
Tal che demenza
Diventa la ragione,
Tormento il beneficio.*

[13] Signori senatori, io credo che sia impossibile svellere la mala pianta per sostituirvi di un tratto una nuova, sana, rigogliosa, soddisfacente alle migliori esigenze, perché ciò supporrebbe che si potessero distruggere parecchie generazioni da questo mondo, senza avere alcuna speranza di vederne sorgere delle successive che potessero scrivere una nuova legge su vergini pagine.¹⁴⁹

Moleschott's justification for his vote is thus illustrated by the linkage with Goethe's thought, and the meaning of this linkage, again, was also a clear statement of belonging to a certain

¹⁴⁹ Moleschott, J., *Sul codice penale*. Parole dette in Senato da Jac. Moleschott [12 Novembre 1888]. Roma, Forzani e C., Tipografi del Senato 1888, p. 13. The translation is: "All rights and laws are still transmitted / Like an eternal sickness of the race, - / From generation unto generation fitted, / And shifted round from place to place. / Reason becomes a sham, Beneficence a worry: / [...] [Goethe, *Faust*, translated by Bayard Taylor, 1864] Sirs of the Senate, I believe it is impossible to eradicate the ill plant in order to suddenly substitute it with a new one, a healthy one, flourishing, satisfying the best exigencies, because this would suppose that one could annihilate several generations from this world, without having any hope of seeing the following generations being born and then able to write a new law on blank pages." [My translation]

tradition of belief and thought; but, at the same time, his justification referred also to the Goethean conception of metamorphosis of organisms, which takes place step by step and not all at once. The Goethean idea of gradual progression (*Steigerung*) is, in this way, the basis for the vote of a Senator which directly influenced Italian penal law¹⁵⁰.

3. Popularization of science between moralizing, religious and nationalistic tones: scientific materialism as “totalizing” worldview

3.1. The relation between epistemology and ethics, and the conception of objectivity

What the materialists learnt from Goethe is thus the role of representation: mediated through the poetical and literary forms of Goethe’s works, the relevance of materialistic science is transferred to the social and political level. The political implications of scientific materialism and of its representation, as well as its attitude with regard to religion, are the issues of this chapter, in which materialism’s “totalizing” attitude will be outlined.

This first section is concerned with an analysis of the conception of objectivity, and therefore of the criterion for scientificity, adopted by scientific materialism. The analysis of objectivity also implies the study of subjectivity: the way in which the role of the subject in the process of acquisition of knowledge is understood by scientific materialism also affects the way in which the idea of objectivity is thought of. Which is, then, the position of scientific materialism with regard to the criteria for objectivity and to the conception of science as objective knowledge? How was this related to the conception of the self, how was science related to ethics, objectivity to subjectivity? Above all: did scientific materialism play a significant role in the transition towards a new type of objectivity, and therefore a new conception of nature and science?

The epistemology of ethics

We will argue that scientific materialism played an essential role in the development of a new conception of objectivity, and that this change in the conception of scientificity was due to the implications of scientific materialism’s own epistemological categories. Ethics, justice and

¹⁵⁰ Regarding the principle of gradual development in Goethe’s both scientific and political thinking, compare Bell, Matthew, 1994. *Goethe’s naturalistic anthropology: man and other plants*. Oxford: Clarendon Press, p. 194.

philosophy are also included in the materialistic worldview, which means that there are no specific objects of study for science, but just general structures in which everything can be included, at least in principle.

If, on the one hand, scientific materialism does not possess a dialectical conception of the relationship between subject and object as Feuerbachian materialism or Hegelian philosophy did, on the other hand, science had a new manner of thinking about this relationship, which involved a new way of thinking about science itself: we are here speaking about the conception of scientific knowledge as necessarily involving the pretension and exigency of objectivity.

The term objective was used, from medieval times up to Kant and Coleridge, with the meaning that the term “subjective” has nowadays and vice versa: it is only after Kant’s theory of knowledge, i.e., after the theorization of the influence of subjective categories on knowledge, that science began its striving towards objective knowledge (and, thus, elimination of its subjective components), while artists were required to develop their subjective experiences to the extreme¹⁵¹.

It will be said that science had already been existing long before the 19th century, that its origins come from centuries, or even millennia ago; perhaps this is true, if we have a rather broad concept of science, but the conception of objectivity as the scientific value par excellence is more or less two centuries old. Objectivity is not identical with truth, nor is it identical with certainty, and it is newer than both; very often, truth and certainty have been sacrificed for the sake of objectivity. Objectivity has not always been the inseparable companion of scientific research: on the contrary, it only arose in the second half of the 19th century as the ideal of science towards which the scientist had to strive¹⁵².

However, this quest for objectivity and the attention for its epistemological conditions did not rule out the ethical dimension: in Moleschott’s speeches we also see an increasing importance of ethical values, and he even clearly states that morality and justice must lead scientific research; this is accompanied by a moderate position, where the references to the tradition serve to create an image of science which matches the ideas of the establishment and reinforces the consensus both of the government towards science and of the population

¹⁵¹ Daston, Lorraine J.; Galison, Peter, 2007. *Objectivity*. New York: Zone Books, pp. 31 ff.

¹⁵² Daston, Lorraine J.; Galison, Peter, 2007. *Objectivity*. New York: Zone Books, pp. 29-30.

towards the government. What is extremely interesting, is that in fact there is an argumentative circle between, on the one hand, ethical values which become necessary values for the scientist, and, on the other hand, epistemological values which become the scientist's ethics: in fact, the quest for objectivity was born precisely in this period, and divulging a representation of science as universal knowledge, thus substituting philosophy and taking up its tasks, was one of Moleschott's crucial goals; this implied that ethical value must lead the work of the scientist, while epistemic value was at the same time a "moral" value which the scientist must achieve. Moleschott for example admitted that women and humanities students can see better than scientists what is under the microscope, because they do not think according to the same prejudices and preformed concepts as medicine students do.¹⁵³ As the historians Lorraine Daston and Peter Galison notice, the practice of employing women as workers in the laboratories was considered by the scientists as a guarantee for objective results: in fact, workers who did not have a scientific education, and were therefore scientifically unskilled, were thought not to be influenced by any philosophical or scientific preconception: "like the machines, in their 'emptiness' they offered a transparency through which nature could speak"¹⁵⁴.

When the idea of an objective science was being formed, ethics and epistemology were not two separate and independent spheres: on the contrary, they mingled at the point that the history of objectivity as a value is strictly interwoven with the history of the scientific self. To be objective becomes a moral virtue, part of the ethics of the scientist, and not just an epistemic virtue; or, better, epistemic and ethical virtue correspond, even (or, maybe, more than ever before) in the epoch of materialism and positivism. Objectivity means abstraction from subjective idiosyncrasies, and a self who is able to perform this abstraction must, so to say, go beyond, or elevate itself above his own self: heroism is strictly connected with the way leading to objective knowledge (as it has been with truth, in mysticism for example), in self-experimentation, exploration journeys, alpine ascents (the 19th century is the century of alpinism, and of the scientist-alpinist in particular). Romanticism is far from being defeated

¹⁵³ FSM, *A II 3 a, Fisica dell'organismo*, manuscript, p. 30: "Influenza d'idee preconette: sotto il microscopio in genere vedono meglio le donne che gli uomini, meglio gli stud[ent]i di letteratura o di teologia che gli studenti di medicina." (English version, my translation: "Influence of preformed ideas: generally women see better than men what is under the microscope, literature or theology students see better than medicine students.")

¹⁵⁴ Daston, Lorraine J.; Galison, Peter, 2007. *Objectivity*. New York: Zone Books, p. 341, where it is also reported that, among others, Claude Bernard and the Harvard College Observatory employed women workers precisely for this reason (respectively for physiological research and astronomical calculations).

by positivistic science: on the contrary, we can say that positivism and materialism have absorbed and appropriated (thereby, interpreting and transforming them) several Romantic instances.

Interestingly, the argumentative circle between ethics and epistemology has been one of the points on which Idealistic and neo-Hegelian philosophers have been criticizing scientific materialism. Giovanni Gentile, for example, noticed and criticized a similar circuit (implying inconsistency, according to his analysis) in the relationship between moral duty and natural necessity: speaking about the “perennial contradiction” of Lombroso’s anthropology, which is the more acute the less its supporters are aware of its existence, he remarks that criminal anthropology assumes that law derives from nature and he, who violates law and social rules, is affected from (mental) illness and that, since a criminal is an ill person, then the “therapy” (punishment was understood by criminal anthropology in this way) is a duty for society¹⁵⁵. Gentile, in his typically Hegelian terms, criticizes such an argument by stating that duty, indeed, originates from freedom, not from nature, and in this way he confutes Lombroso’s theses about criminal anthropology, which is the most important application of materialistic science to socio-political problems and to the legislative and ethical domain.

The ethics of epistemology

The relation between scientific materialism and morality, as well as between criminal anthropology and the conception of justice, can be better understood if we consider Moleschott’s final discourse for the international conference on criminal anthropology where, through the use of literary references, he underlines the centrality of morality and justice in the work of criminal anthropologists, even stating that the highest form of morality which has to be taken as an example is Christian morality¹⁵⁶:

Vous n’avez pas perdu ce guide, cette boussole suprême (sic) qui s’appelle la morale. Dans toutes nos réunions, je n’ai pas eu un moment de satisfaction plus grande que lorsque vous avez applaudi à mes paroles, que, **quelle que puisse être notre opinion sur les dogmes du Christianisme, nous sommes tous d’accord en considérant sa morale comme la couronne de l’humanité affranchie de l’esclavage. [...] Or, si la morale est notre guide, la justice est notre phare.**

¹⁵⁵ Gentile, Giovanni, 1917-1923. *Le origini della filosofia contemporanea in Italia. II, I Positivisti*. Messina: Principato, p. 171.

¹⁵⁶ Jac. Moleschott, *Discours prononcés dans la séance d’ouverture (17 Novembre 1885) et à la conclusion (25 Novembre 1885) du Congrès International d’anthropologie criminelle à Rome*. Ippolito Sciolla, Imprimeur du Ministère des Affaires Étrangères. Rome, 1886. Final discourse, pp. 4-5 (my bold type).

These kinds of references are even more evident, and pushed to the extreme, in the discourse on penal law he held at the Senate, which also concerns the new school of criminal anthropology and the reform of the penal system: here he is even able to justify his vote by referring at the same time to a strophe of Goethe's *Faust* and to its translation by Andrea Maffei, Senator of the Kingdom in the 13th legislature. The idea about law and its reform is here described as a gradual process of transformation, with explicit reference to the metamorphoses of organisms: Moleschott thinks that law has to be changed gradually, not in just one step (this idea being, on the contrary, typical for revolutions and constitutional law systems as well, which present themselves as completely new and independent from the past)¹⁵⁷. Moleschott's references go from ancient Greece (Antigone) to Roman law, from Beccaria to the accent on nature rather than on the (Kantian) categorical imperative, tracing the main lines of criminal anthropology and its underlying theory, and, above all, underlining that in fact such theories are not new at all, and, in particular, that they are already present in the Italian legislative tradition¹⁵⁸: in fact, positivistic criminal anthropology was proposed by its supporters as nothing else than the natural development of enlightened instances of Roman law and Italian penal law. According to Moleschott, the result is that the person, who applies those theories, will be a kind of "holy" judge, who forgives in the same way as Christ did.

The scientific self must then tend, as far as possible, to impartiality and to neutrality; achieving this state of mind which enables objective research and therefore objective judgment, turns out to be an ethical virtue. But, at its turn, it is the ethical virtue of ascetic abstention from personal idiosyncrasies and the exercise of control of one's prejudices which allow the formation and transmission of objective knowledge; self-control was reached through self-awareness: indeed, Moleschott reported in his notes, lectures and books

¹⁵⁷ Moleschott, J., *Sul codice penale*. Parole dette in Senato da Jac. Moleschott [12 Novembre 1888]. Roma, Forzani e C., Tipografi del Senato 1888, p. 13: "La legge, il diritto deve rifarsi per modo di frammenti, nella stessa maniera in cui si rifà, si rinnovella a nuova vita vigorosa l'organismo vivente." (English version, my translation: "Law has to be reformed fragment by fragment, in the same way as the living organism is renewed and gains new life.")

¹⁵⁸ "Signori senatori! io sono salito in un campo arduo e spinoso, nel quale noi troviamo l'Italia in piedi, l'Italia che **scioglie un debito d'onore e di gloria, riconoscendo l'eredità della sapienza legislativa dell'antica Roma e sviluppando le iniziative e l'opera dei nostri Filangeri e Beccaria**. Sono salito in un campo nel quale l'Italia ha precorso le altre nazioni nello strenuo lavoro di dissodarlo." Ibidem, my bold type. (English version, my translation: "Sirs of the Senate! I have approached an arduous and thorny field, in which we find Italy standing up, Italy **discharging a debt of honour and of glory, recognizing the inheritance of the legislative knowledge of ancient Rome and developing the initiatives and the work of our Filangeri and Beccaria**. I have approached a ground on which Italy has acted in advance of the other nations in the courageous work of preparing it.")

(especially, of course, in his autobiography), all the conditions he retained to have influenced somehow his perception or conception of events. As in Hegelian philosophy, self-awareness finally ends up in self-dominion.

But this does not mean that Moleschott tended towards a total elimination of individual personality and subjective components in the acquisition and transmission of knowledge: in this sense, there is a dialectical relation between “mechanical objectivity” and “structural objectivity”, as Daston and Galison call it, due to the fact that some implications of the first one lead to the formation of the latter one; in fact, Lorraine Daston and Peter Galison, in their book *Objectivity* (2007), theorize on the intimate connection between ethics and epistemology, with special attention to their link with the modern conception of objectivity. They also distinguish between two kinds of objectivity, which they call “mechanical” and “structural”; we will now show that scientific materialism stood in the middle of that transition: its categories represent the precondition for the development of the conception of science and nature which will be typical of neo-positivism, and which mirrors the fundamental shift from the centrality of the subject to the centrality of language in 20th-century philosophy.

“Mechanical objectivity” is characterized by the will to represent nature “as it really is”, beyond every particular interpretation, eliminating every trace of subjectivity which could impede the development of a neutral point of view and a mechanical description of reality: photography has been thought to be the perfect means which could represent “pure facts”, but as an alternative or before its invention also drawings could be used with the same goal, as well as reports of repeated experiments and their results, or lists of data scientifically obtained (for instance, Moleschott’s tables about the nutritive values of different kinds of food). The presupposition of this way of thinking about objectivity is a conception of nature as object, as a set of processes, completely opposed to the subject conceived as Spirit, mind, or reason. Nature is thus the reign of necessity as opposed to the reign of freedom, it is passive matter which lies there, inert or dynamic, the difference is not very important; nature is an object whose processes are to be organized by human intellect, objectively represented and understood: only in this way is it possible for the subject to appropriate nature, to absorb it and subsume it under its own principle and thereby dominate it. Therefore, nature is understood as object (as objective processes, or factual events, or mechanical states), but ultimately it becomes subject; and yet it can only become subject insofar as the researcher

deprives his description of nature of every subjective element: in fact, that which objective nature must become is not the individual subject, but the absolute subject, dispossessed of particularity but enriched in generality.

The history of objectivity as a value is thus strictly interwoven with the history of the scientific self. Objectivity means abstraction from subjective idiosyncrasies, and a self who is able to perform this abstraction must go beyond its own self. The history of the “subjectification” of nature is, then, the history of the objectification of the subject: the more the subject abstracts from its particularities, the more it becomes impartial. But insofar as the subject is meant to organize the object, the shift to another kind of scientific paradigm and representation of nature is already present in the subject-object model: indeed, this shift entails precisely a passage from an emphasis on the structuring subject to an emphasis on the structuring function of logic.

The conception of nature also changes, thereby, and instead of being object it becomes a set of relations, a network whose connection one has to find out: science consists then in deciphering a code, so that nature can be understood in terms of language. Formal logic, differential equations and mathematical logic are different ways of attempting to give form to the undifferentiated domain of nature.

Scientific materialism described processes and displayed collections of data, thereby sticking to a form of “mechanical objectivity” (compare the huge amount of collected data about nutritional values which have been published in the 254 pages of tables of Moleschott’s *Physiologie der Nahrungsmittel*) which aimed at representing natural processes and their laws rather than at creating and using a universal language which had to mirror natural structure and express it in a rational way. But, insofar as the materialists were aware of the role of subjective experience and of the influence of specific culture differences in the results of experiments and in the description and observation of nature, in particular giving relevance to the fundamental role of the nervous system in organisms (included human beings), they were themselves anticipating, on the epistemological level, the shift in the direction of “structural objectivity”.

Even with respect to this issue, scientific materialism seems to be in the middle of a sort of crisis (intending the word in its significance of *vox media*, i.e. as crucial point for the

development and transformation of something during the course of its history¹⁵⁹): it seems to stand at the crossing point between two different ways of conceiving nature and science, at the turning point of a transition which was to affect every aspect of science, philosophy and culture in general.

As it will turn out considering the following passages of Moleschott's notes, he conceived the relation between subject and object as being essential for the constitution of both individual personality (the subject) and knowledge of the world (the object).

In the notes of one of Moleschott's lectures, which has been held at the end of November 1883 and was called "Physics of the organism", we can find an explicit recognition of the dependency of subjectivity on the environment, i.e. on objectivity:

[33] Dal fatto che nulla si perde nella fiumana delle influenze che invadono la vita, che ogni impressione lascia una traccia che può indebolirsi ma non si cancella mai, che tutti gli eccitam[ent]i, tutte le sensaz[ion]i, speranze e timori, piaceri e dolori, pensieri ed aspiraz[ion]i si fondono insieme e come in un movimento ondulatorio per l'etere l'ultima onda si risente della prima, o come nell'aria i più diversi sistemi di onde possono incontrarsi ed esistere simultaneamente – dal fatto di questi effetti multipli ed incancellabili risulta l'individualità dell'uomo, la sua persona, il suo stile.¹⁶⁰

This paragraph of Moleschott's lecture deals with the influence of external (cultural and emotional) conditions on human subjective personality; once again, his argument is supported by a comparison: "emotions, hopes and fears, pleasures and displeasures, thoughts and ambitions merge together and, just as the last wave of a wave-like movement is influenced by the first one, or just as in the ether the most different wave systems can join together and exist simultaneously, so the personality of each individual depends on the experiences of his life, which can be weakened but never can disappear".

This implies a holistic approach to anthropology, as it is explained in the next paragraph:

[34] Ecco perché si giudica così superficialm[ent]e di un uomo, se si prende in disamina un brano isolato della sua vita. Tanto il biologo, quanto lo statista ed il filosofo aspirano oggi ad una storia prammatica dell'uomo, allo studio dell'evoluzione dei fenomeni dello sviluppo ontogenico e filogenico della vita. Ed indagando l'organismo non mai dimenticano che ogni nuovo eccitam[ent]o si sovrappone agli effetti d'innumerabili altri, al punto che non si dica male asseverando che ogni nuovo avvenimento in certa guisa incontra un nuovo individuo.¹⁶¹

¹⁵⁹ The word "crisis" derives from the Greek verb κρίνειν = to judge; it has the same origin of the word "critique", in fact we could also call it "critical point".

¹⁶⁰ FSM, A II 3 a, "Vorbereitung 1883 Ende November". *Fisica dell'organismo*, § 33 (manuscript). A shorter sketch of the same lecture is reported also in FSM, B I 8.

¹⁶¹ FSM, A II 3 a, "Vorbereitung 1883 Ende November". *Fisica dell'organismo*, § 34 (manuscript).

In this text, Moleschott states that “biologists, statesmen and philosophers aim at a pragmatic history of man, at the study of the evolution of the phenomena of the ontogenic and phylogenic development of his life, because, through the superimposition of experiences, each person continuously changes”. It is in this sense that each individual is in each moment different from what he previously was; however, it must be noticed that this does not amount to the well-known interpretation of Moleschott’s thought and of criminal anthropology as considering every individual as a completely different one from what it had been in the past, and as therefore implying that no individual ought to be punished for something it committed in the past. Once more, scientific materialism seems far from being that extreme and radical conception of nature, man and law it is usually interpreted to be¹⁶².

Neurophysiology and epistemology

It is interesting to notice that some of the scientific discoveries of positivistic science, in particular in the field of physiology, led to the consideration of the relativity of sense-perception: the constitution of the subject (Helmholtz), personal emotional experiences and cultural background (Moleschott) have been recognized as playing an essential role in every observation, no matter how “objective” it is meant to be. The impossibility of reaching universality on the level of objects already entails the overcoming of the conception of “mechanical objectivity”, towards a kind of objectivity lying on a deeper level: the one of structures and relations between phenomena¹⁶³. The invariant element of scientific theories, which grants their universality beyond every historical, cultural and social context, is shifted from the objective to the structural level: instead of theoretical objects (such as the ether), abstract and universal structures (such as Maxwell’s equations) have been taken to be the level on which the universality of scientific knowledge had to be acknowledged and understood. From neo-positivism on, it is those structures which build up the connection between phenomena which are irremediably perceived in infinitely different ways; it is the relations of these phenomena with one another that matters, if science is to reach communicability and universality beyond historical variations: these are the essential changes in the very conception of objectivity and scientificity which materialistic science has contributed to bring forth. In fact, philosophical arguments and scientific studies

¹⁶² Above all by its opponents: see Maschi, L., 1869. *Il panteismo in Italia e il prof. Moleschott*. In: *Rivista universale*, anno III, vol. VIII, p. 101-118; 249-265. Genova; Firenze.

¹⁶³ Daston, Lorraine J.; Galison, Peter, 2007. *Objectivity*. New York: Zone Books, pp. 270 ff.

demonstrating the irreducibility of subjective and cultural particularities did not lead to an abandonment of a criterion for scientificity; rather, they led to a new, even deeper criterion: instead of “objectivity”, we could call it “structurality”.

This shift from a criterion for scientificity based on objective processes to a criterion for scientificity based on structuring relations could be interpreted as an anticipation of the shift from the subject-object to the language-world view; however, this should not be understood as a completely new, revolutionary instance, of which positivistic science would be the forerunner: applying to the history of positivism Derrida’s observations about the history of metaphysics, we would rather suggest that science, as well as philosophy, tried to salvage and maintain the ancient categories¹⁶⁴, which for the first time in Western culture began to be questioned and to appear as problematic. The conception of nature as a set of relations and of science as logical formalization of the structure of these relations has been a response to the problematic aspects of the subject and its *a priori* categories as unitary organizing principles; but this response did not yet question the classical notion of language, a questioning to which the abandonment of the opposition between subject and object would nevertheless necessarily lead, since it is itself based on the conception of language as involving a system of oppositions between *signans* and *signatum*, reference and meaning, sensible and intelligible, thing and word (i.e., of metaphysics *tout court*). The conception of structure in positivistic science is, indeed, still firmly based on this metaphysical conception of language.

Interestingly, as we were saying, the study of the nervous system is one of the elements which contributed to the shift from one model of objectivity to the other: in this way, physiological research itself seems to have contributed to a very particular and important extent to the development of the very criterion for scientific objectivity. On the one hand, the nervous system, which is peculiar to every individual and even determines the individuality of every particular person, does not allow for pure mechanical objectivity; but the nervous system is also determined by material conditions, i.e. the same three variables of Comte’s positivism

¹⁶⁴ Not only the categories of subject and object, but still more fundamental ones such as being and identity. Derrida, J., 1967. *De la grammatologie*. Paris: Minuit, p. 139 : “[...] le décentrement nécessaire ne peut être un acte philosophique ou scientifique en tant que tel, puisqu’il s’agit ici de disloquer, par l’accès à un autre système liant la parole et l’écriture, les catégories fondatrices de la langue et de la grammaire de l’*epistémè*. La tendance naturelle de la *théorie* – de ce qui unit la philosophie et la science dans l’*epistémè* – poussera plutôt à colmater les brèches qu’à forcer la clôture. Il était normal que la percée fût plus sûre et plus pénétrante du côté de la littérature et de l’écriture poétique ; normal aussi qu’elle fit vaciller, comme Nietzsche, l’autorité transcendante et la catégorie maîtresse de l’*epistémè* : l’être.”

(milieu, race, time). In this case, too, there is a dialectical relation between subject and object, where the subject is determined by his individual nervous system but, at the same time, the nervous system is determined by the object, i.e. the historical, social and physical conditions.

But the nervous system is not something which one could represent by means of “mechanical” reproduction: drawings, photographs, set of data could hardly describe its real bearings and effects, for a nervous system is basically made up of relations (synapses, but also neuronal connections which have implications on language, character, bodily and behavioural dispositions, etc.). Therefore, relations, and not mechanical presentations, are the only means to say something meaningful about the nervous system; and, insofar as it is the nervous system which determines subjectivity, it is in its own terms that science must describe the world, so that it be comprehensible to individual subjects: the world has now to be structured according to certain kinds of relations and linkages, not merely presented or described.¹⁶⁵

But what were indeed Moleschott’s ideas about neurophysiology and the functions of the nervous system? Taking into consideration his thoughts might help to understand to which extent this influenced his epistemological conceptions. To this purpose, it will be worth reading part of Moleschott’s “Introduction to the physiology of the nervous system”, which is one of the lectures he pronounced at the university, and which he transcribed in one of his notebooks. Here, Moleschott speaks about the progress of neurophysiology; what is interesting for us is that he stresses the essentially relational character of the functioning of the nervous system, which then implies also a fundamental and continuous relation between consciousness and (external) world, between internal, mental processes (the subject) and the “environment” (the object):

[3] Ma il pensiero non si forma se non dietro ad impressioni sensitive che negli animali superiori sono legate all’esistenza del sistema nervoso*, il quale come organo di squisita reazione, deve subire le influenze degli agenti del mondo esterno, in via diretta o indiretta. Egli è perciò che tutte le azioni che si svolgono nel sistema nervoso o per mezzo di esso, soglionsi riferire alla vita di relazione [...]¹⁶⁶

This discourse about the necessary connection between subject and object, conceived not in an abstract way but in a very concrete manner (meaning relation between man and

¹⁶⁵ About the nervous system, compare: FSM, *A II 3*, manuscript (Veränderlichkeit des Menschen. 14 Nov 1833, *A II 3 b*).

¹⁶⁶ FSM, *Quaderni, B I 6 C, 8. Introduzione alla Fisiologia del sistema nervoso*, § 3: “But thought is only formed as a result of sensitive impressions which in “superior animals” are connected to the existence of the nervous system [he refers to Henle in a note], which, as a reacting organ only, must undergo the influences of the agents in the external world, directly or indirectly. This is why all actions taking place in the nervous system or through it usually refer to ‘relational life’ [...]” (My translation).

environment, between culture and nature) was, as we have seen, a central theme of Feuerbach's philosophy; scientific materialism arrives at very similar conclusions through a very different path, namely through considerations related to neurophysiologic achievements and their epistemological implications. Another interesting point is that Moleschott did not conceive of the nervous system as only formed by the neuronal cells, but as being constitutively a network enveloping and connecting those cells: "[...] I filamenti nervei, vi dicea, avvolgono ed allacciano le cellule."¹⁶⁷

Moleschott thus consciously speaks about relations: on a physiological level, he quotes F. G. J. Henle's studies and underlines the importance of nervous terminations, which connect nerve cells to each other¹⁶⁸; on a philosophical level, he focuses on the importance of the relation between man and environment (which constitutes a meaningful acknowledgement of the fundamental heteronomy of human knowledge and action), and he even states that if one could perfectly know all the relations between man and universe, he would have achieved knowledge of the absolute": "[...] Imperocché chi conoscesse perfettamente tutti i rapporti dell'uomo coll'universo, conoscerebbe quello che per l'uomo costituisce l'assoluto."¹⁶⁹

This quite clearly implies that the whole of these relations between man and universe constitute the "absolute": once more, Moleschott passes with nonchalance from the scientific to the philosophic-religious level; in the next section we will speak about this religious tone of materialistic science, in which its all-including and "totalizing" aims become concretely tangible.

¹⁶⁷ FSM, *Quaderni, B I 6 C, 8. Introduzione alla Fisiologia del sistema nervoso*, § 12: "As I told you, nervous filaments enfold and connect [nerve] cells." (My translation).

¹⁶⁸ Compare the developments of studies on the nervous system: only at the beginning of the 20th century did Ramòn y Cajal conceive his neuroanatomy as functional morphology; he distinguished three areas of the cortex, with their own specific function: sensorial, motorial and associative; more neuronal network relations meant for him more mental connection and thus more "spirit". Compare Breidbach, Olaf, 1997. *Die Materialisierung des Ichs. Zur Geschichte der Hirnforschung im 19. und 20. Jahrhundert*. Frankfurt am Main: Suhrkamp, p. 215-216 and p. 220.

¹⁶⁹ FSM, *Quaderni, B I 6 C, 8. Introduzione alla Fisiologia del sistema nervoso*, § 31: "But he, who perfectly knew all relations between man and universe, would know what constitutes the absolute for man." (My translation).

3.2. *The image of science: science as religion*

This section deals with the link between positivistic science and religion; the strong presence of references to Christian symbolism in Ernst Haeckel's books very well illustrates the way in which monistic science at the end of the 19th century was linked to religious traditions. The way in which the materialists made use of high culture can be interpreted as a step towards the construction of a totalizing worldview, where science substitutes religion by assuming itself a religious character; as Andreas Daum puts it with regard to Bölsche's popularization of Darwinism:

Die monistisch-ästhetische Übersteigerung machte schließlich den Weg dafür frei, der Naturforschung religiösen Charakter zuzubilligen. [...] Die Einpassung des Darwinismus in eine idealistische Weltanschauung war gelungen, das Totalitätsbewußtsein der Welt hatte gesiegt und selbst religiöse Charakter angenommen.¹⁷⁰

This attitude could also be described as a new kind of mysticism, which was configured as a worldview lying in between Romantic philosophy of nature and Spinozistic pantheism.¹⁷¹

Goethe and his philosophy of nature, which apparently represent the opposite of positivistic science, became in this way the herald of scientific materialism, while the lines of Goethe's poems became the slogan of the scientific approach to the understanding of phenomena.¹⁷²

Religion therefore becomes both a manner to make science acceptable and a way to take over the role of religion itself. Which is, then, the role which science is taking over from religion, thereby substituting it? On the one hand, it is a "political function", the one of forming a centre around which a whole conception of the world and, subsequently, a whole community of people, could be coherently organized; on the other hand, it is a theoretical and

¹⁷⁰ Daum, Andreas W., 1998. *Wissenschaftspopularisierung im 19. Jahrhundert: bürgerliche Kultur, naturwissenschaftliche Bildung und die deutsche Öffentlichkeit, 1848 – 1914*. München: Oldenbourg, p. 321.

¹⁷¹ Compare also Daum, Andreas W., 1998. *Wissenschaftspopularisierung im 19. Jahrhundert: bürgerliche Kultur, naturwissenschaftliche Bildung und die deutsche Öffentlichkeit, 1848 – 1914*. München: Oldenbourg, p. 320: "In dieser lebensphilosophischen Einkleidung rehabilitierte die ästhetische Naturlehre nicht nur romantische und naturphilosophische Vorstellungen, sondern ermöglichte eine neue Mystik des Zusammenfindens von Mensch und Gott-Natur."

¹⁷² Interestingly, Daum had noticed that the work of another figure who stood between literature and natural science, namely Gustav Theodor Fechner, was also used, precisely in the same way as Goethe's work, in order to connect „heterogeneous anti-positivistic traditions“ and the „physical and scientific argumentation“: „Als intellektuelle Verbindung zwischen diesen heterogenen antipositivistischen Traditionen und der physikalisch-naturwissenschaftlichen Argumentation fungierte neben Goethe das Werk eines akademischen Außenseiters, die literarisch-naturwissenschaftliche Hinterlassenschaft Gustav Theodor Fechners“. Daum, Andreas W., 1998. *Wissenschaftspopularisierung im 19. Jahrhundert: bürgerliche Kultur, naturwissenschaftliche Bildung und die deutsche Öffentlichkeit, 1848 – 1914*. München: Oldenbourg, p. 311.

programmatic function, in the sense that it makes clear, since the very beginning of every chapter, that monistic science is not just a discipline, not just a collection and systematization of disciplines, but rather the synthesis of every aspect of human knowledge.

Besides explicit religious references, literature and rhetoric also play a significant role in building the image of materialistic and positivistic science: as it becomes evident from Moleschott's quotations and even his entire discourses based upon the reference to the work of past scientists and philosophers and to famous lines of poetry, the mediation of new positivistic science through literature is particularly important in Moleschott; rhetoric also makes his defense of science more easily acceptable.

While emphasizing the primacy of facts over ideas, Moleschott uses the authority of "classical" poets such as Goethe and Dante in order to defend his conceptions; in so doing, he creates an imagery more than giving a univocal definition of his conception of science: it seems that a formal unity of science, based on logics rather than on literature, is not needed for Moleschott. Science does not need a metaphysical foundation, because it is itself the highest value, substituting metaphysics.

In the same way, in Ernst Haeckel we find the explicit attempt to unify science and philosophy, which are, according to him, one and the same thing; this implies that there is no need for a philosophical foundation of science, but that, instead, science is the highest form of philosophy: science substitutes speculation as well as religion. At the same time, there is a strong influence of Goethe's philosophy of nature (this can be easily inferred from the quotations of Goethe's poems at the beginning of almost all chapters of Haeckel's *Welträthsel*, including the poem *Gott und Welt* at the beginning of the book). Even if the general view is completely mechanistic, and Haeckel explicitly marks finalism as unscientific, both his monism and his conception of Darwinism seem to be influenced by the Goethean ideal of a unification of philosophy, art and science.

This totalizing model also entails the suppression of a dualistic perspective (actually the only thing which monism "excludes") in favour of a "cosmologic perspective" leading to the all-encompassing comprehension of the whole:

Nicht allein die drei anthropistischen Dogmen, sondern auch viele andere Anschauungen der dualistischen Philosophie und der orthodoxen Religion offenbaren ihren Unhaltbarkeit, sobald wir sie aus der *kosmologischen Perspektive* unseres Monismus kritisch betrachten. Wir verstehen darunter jene umfassende *Anschauung des Weltganzen*, welche wir vom höchsten erklommenen Standpunkt der

monistischen Naturerkenntnis gewonnen haben. Da überzeugen wir uns von folgenden wichtigen, nach unserer Ansicht jetzt größtenteils bewiesenen “kosmologischen Lehrsätzen”.¹⁷³

Goethe’s influence is explicitly recognized also in the following lines, where Haeckel states that the monistic method has its origins back in Goethe’s poetry:

Wir sind endlich am Ende des neunzehnten Jahrhunderts zu jener *monistischen Erkenntnismethode* zurückgekehrt, welche schon an dessen Anfang von unserem größten realistischen Weltkenner und Dichter, *Goethe*, als die einzig naturgemäße anerkannt war.¹⁷⁴

Also dualistic religious conceptions are rejected, because monistic religion cannot accept but one God, a Spinozian *Deus sive natura*:

Der *Monismus* hingegen (ebenfalls im weitesten Sinne begriffen!) erkennt im Universum nur eine einzige Substanz, die “Gott und Natur” zugleich ist; Körper und Geist (oder Materie und Energie) sind in ihr untrennbar verbunden. Der *extramundane* “persönliche” Gott des Dualismus (ein idealisierter Mensch!) führt notwendig zum anthropistischen *Theismus*; hingegen der *intramundane* Gott des Monismus (das allumfassende Weltwesen!) zum *Pantheismus*.¹⁷⁵

Here we also find again the *Leitmotiv* of materialism, namely the inseparability (which, according to monistic theories, surely becomes identity) of matter and energy; this rejection of dualism is at the same time a refusal of the theistic conception of a “personal God” (which is, as Feuerbach taught, an idealization of man): the immanent God of monism is, on the contrary, the God of pantheism, intrinsic to nature and ultimately identical with it.

However, this including attitude cannot be envisaged as being common to all scientists who worked towards the end of the 19th century: the Ludwig Büchner of *Kraft und Stoff* considered science and religion as two excluding attitudes, which cannot coexist in the beliefs of the same scientist¹⁷⁶ (which does not seem to be the case for Moleschott). And yet, for Büchner as well as for Moleschott and Haeckel, science had at the same time a highly practical value for society, because of its possibility to set men free from superstition and allow them to master

¹⁷³ Haeckel, Ernst, 1911. *Die Welträtsel: gemeinverständliche Studien über monistische Philosophie*. Leipzig: Kröner, p. 14.

¹⁷⁴ Haeckel, Ernst, 1911. *Die Welträtsel: gemeinverständliche Studien über monistische Philosophie*. Leipzig: Kröner, p. 20.

¹⁷⁵ Ibidem.

¹⁷⁶ Büchner, Ludwig, 1864. *Kraft und Stoff: empirisch-naturphilosophische Studien in allgemein-verständlicher Darstellung*. Leipzig: Theodor Thomas, p. 266: „Indessen muß es uns in *letzter Linie* erlaubt sein, von allen derartigen Moral- oder Nützlichkeitsfragen vollkommen abzusehen. Der einzige und oberste bestimmende Gesichtspunkt unserer Untersuchungen liegt in der *Wahrheit*. Die Natur ist nicht um der Religion, um der Moral, um der Menschen, sondern um ihrer selbst willen da. Was können wir anders thun, als sie nehmen, wie sie ist?“; compare also p. VII.

natural phenomena by understanding their laws¹⁷⁷; finally, as man is himself part of nature, science is at the same time the solution to every problem of governance of public life. According to Büchner, science has to search the truth, and truth has to be found in nature, whose processes must be objectively studied; therefore, it has nothing to do with morality, and Büchner's attitude turns out to be characterized by exclusion, while Moleschott's attitude is characterized by inclusion.

The place where Moleschott most clearly deals with the issue of pantheism is the translation from German into Dutch of a work by Karl Christian Philipp Snell, which had been published in 1839 and whose main purpose was to give a naturalistic explanation of phenomena usually attributed to supernatural and divine intervention (in particular, with reference to miracles and other episodes of the Gospels)¹⁷⁸. Moleschott, defending Snell's work from some criticism, notices that it is not true that pantheism excludes creation: it rejects a unique creation taking place in a certain time because of a certain action, but it theorizes on creation as eternal action of the ever becoming "God of the philosophers", which is nothing else than nature itself in its ever-becoming process: the whole of nature (or: the universe) is God¹⁷⁹.

Even as far as the religious aspect is concerned, then, we see a tendency to that totalizing attitude which emerges as its principal feature: siding with pantheism implies identifying the whole of nature, which is the object of science, with the concept of God; therefore, materialistic science is occupied with nothing less than the divine itself. How did this tendency relate to the attitude of Moleschott vis-à-vis politics (including the Church's

¹⁷⁷ Compare Büchner, Ludwig, 1864. *Kraft und Stoff: empirisch-naturphilosophische Studien in allgemein-verständlicher Darstellung*. Leipzig: Theodor Thomas, p. 29.

¹⁷⁸ Snell, Karl Christian Philipp, 1842. *Philosophische beschouwingen der natuur*; uit het Hoogduitsch van Karl Snell vert. door Jac. Moleschott. 's Hertogenbosch: Palier. The original title is *Philosophische Betrachtungen der Natur*, and it was published in 1839. Snell was professor of mathematics at the Kreuzschule in Dresden.

¹⁷⁹ Compare FSM, A III 7 ll, p.164, note 1: "Zeer ten onregte merkt Verwij hier aan, dat het "eigenaardige kenmerk van het pantheismus daarin bestaat, dat het van geene schepping wil weten: alles is, het is niet geworden." Eene schepping neemt de philosophie aan, doch geene schpping die van een bepaald tijdstip, aan ééne bepaalde handeling gebonden is. De God der philosophie is eeuwig, niet alleen volgens een dood zijn, maar volgens een levend werkend – daarom is de schepping eeuwig, en niets is wat niet geworden is, of met andere worden alléén het worden is. Dat leerde reeds Heraclitus, schoon eenigzins verhulden minder duidelijk. – Wat overigens den naam pantheismus betreft, waarmede men zo dikwerf de nieuwe rigtingen der philosophie geloof te kunnen brandmerken, zoo houde men in het oog dat de bedoeling daarom is: τὸ πᾶν θεός, en niet πάντες of πάντα θεοί, hoewel de laatste verklaring maar al te dikwerf gebruikt of liever misbruikt wordt, om de zaak in een geheel verkeerd daglicht te stellen, Aanmerking v. d. vertaler." This note by Moleschott is quoted from the original manuscript of his first publication; the abovementioned folder (A III 7) contains an envelop (ll) where Marcel Desittere has collected pages 125-192 (it is not known whether and where the preceding and following pages of the manuscript are conserved in the archive), classifying them as "Parte ms Moleschott sulla dottrina cristiana"; at the time I viewed the content of the envelop, no one had recognized it as belonging to Moleschott's translation of Snell's work yet.

temporal power)? As we will see in the next section, Moleschott's speeches were understood as (and actually were) moderate and conciliating; once more, the image of scientific materialism is the one of a rather conservative movement, which was perceived as very moderate and, above all, as able to include almost every position, every object of human knowledge and every aspect of human life.

3.3. Science and politics: a new science for a new nation

The particular historical period in which scientific materialism developed, and the political situation in which Moleschott operated (both as a scientist and as a politician) play an essential role in the understanding of his version of scientific materialism. Not only is it worth considering such "worldly" aspects, but it is also necessary, if we take into account the fact that a new-born nation such as Italy was undertaking a process of "nationalization of truth"¹⁸⁰: when dealing with such moments in the history of ideas, taking into account national interests and viewpoints is far from being superficial.

As we have seen, the position of scientific materialism in the history of science and of philosophy is connected to various currents, which are all very different as far as their theoretical framework and factual provenance are concerned: Hegelian philosophy, Feuerbachian materialism, positivism, not to speak about the work of several scientists all belonging to different schools or movements, converge in scientific materialism and its broad scope and theorizations. It is likely that the fact of being at the crossroad between these traditions, and of taking into consideration instances coming from very different scientific contexts and philosophical environments, permitted and even encouraged the interpretation of materialistic epigrammatic statements in various ways, sometimes even opposing one another. The way which will be brought forth by Moleschott, especially in the period of his political activity at the Senate in the 1880's, is undoubtedly a conservative one, despite the fact that he has often been considered as one of the most extreme materialists. This has happened, for instance, with regard to the moral values which Moleschott always attached to the work of a good scientist: although rejecting Christian doctrine, he actually took over much of its fundamental values, as he himself said in the concluding discourse for the conference on

¹⁸⁰ I borrow the expression from Emmanuel Renault, who speaks about a process of "nationalisation de la vérité": Renault, Emmanuel, 2002. *Philosophie chimique: Hegel et la science dynamiste de son temps*. Pessac: Presses Univ. de Bordeaux, p. 34.

criminal anthropology held in Rome; his discourse in Dutch for the monument to Giordano Bruno in Rome (*De oprichting van het standbeeld voor Giordano Bruno. Rome 25 Mei 1889*) even ends with the (indirect) identification of Giordano Bruno as the hero of free thinking, and heir of both Socrates and Christ.

Let us now see what this way of developing and applying materialistic theories looks like. Materialism, in Moleschott's version, has been deprived of all vestiges of revolutionary, socialist and radical ideas. Lombroso's criminal anthropology derived from Moleschott's teachings and, in general, Moleschott represented the beginnings of positivistic science and culture in Italy. And yet the poet Gabriele D'Annunzio, who was everything but a socialist, and not a liberal either, admired Moleschott and his doctrines. A volunteer during World War I, D'Annunzio was an ideologue in favour of fascism after the war, sharing with futurism the ideals celebrating industrial development, scientific progress, modern war, the world of machines; but there is also a kind of mysticism in his poetry, together with a glorification of heroism and dispraising of middle-class mediocrity, and an anti-democratic, philo-aristocratic kind of nationalism. However, D'Annunzio wrote an article about Moleschott (from which we quoted the last paragraph at the very beginning of this paper), summarizing his discourse *Per una festa della scienza* and ending with a glorification of the scientist, whose figure is described as if he were a prophet, or a divine being:

In sulla fine, quando li ascoltatori erano impazienti di entusiasmo e per l'aula correva quasi un fluido elettrico, egli, in piedi su quella specie di cattedra, sovrastava di tutte le late spalle alla calca. [L]a luce della finestra, di dietro, gl'illuminava vivamente la pura canizia; e la sua testa così raggiante spiccava dal fondo della portiera di damasco, più venerabile. A pena pronunciata la frase – Le tenebre hanno paura di una statua – un altissimo clamore è sorto dall'adunati, prolungandosi per qualche minuto. E nell'intervallo Jacopo Moleschott è rimasto con la mano levata, con la faccia rivolta a noi, trasfigurato dalla commozione, aspettando che il clamore si placasse.

E mentre io guardava quel grande uomo della Scienza, mi suonava nell'animo il verso che canta Demogorgon nel *Prometeo liberato* del divino Shelley: - This is alone Life, Joy, Empire, and Victory – là soltanto è la Vita, la Gioja, l'Imperio e la Vittoria!¹⁸¹

¹⁸¹ FSM, *B III* 8 (copy of D'Annunzio's article "Su Iacopo Moleschott", published on *La Tribuna* n. 301, 4 novembre 1887, typewritten by M. L. Patrizi and Carlo Moleschott around 1901): "Towards the end [of the speech], when the public was impatient for the enthusiasm and the hall was almost electrified [because of the tension he had created], he, standing on that sort of cathedra, was above the mass of people with his large shoulders. The light coming from the window behind him enlightened his pure hoariness; and his luminous head was appearing more venerable on the damask door. As soon as he pronounced the sentence – darkness is frightened of a statue – a very loud clamour came from the public, lasting for several minutes. And during this pause Moleschott stood with his hand raised, the face looking at us, transfigured because of the commotion, waiting for the clamour to stop. And while I was watching that great man of Science, I had in mind the verse pronounced by Demogorgon in the *Prometheus Unbound* by the divine Shelley: [...]" (my translation).

This is, then, a very concrete example of the application of the “totalizing” materialistic worldview, as well as of its reception and further diffusion in the newspapers of that epoch. How and why, then, could Moleschott, one of the most important positivists in Italy, whose work has directly influenced positivist scientists as Cesare Lombroso and Roberto Ardigò, be described as an ancient, heroic (see the imagery concerning “victory”) wise man?

Looking at the passages which are viewed as being characteristic of scientific materialism, we find a series of apodictic statements such as “Without phosphorous no thought”, or “The brains secretes thoughts as the kidney secretes urines”, or “Man is what he eats” (as we have seen, the latter one can be, and has in fact been, legitimately interpreted in different ways), which can give the idea of a “radical” position, but, in fact, they could be interpreted in very different ways, and even adapted from time to time to what was best needed by the cultural politics of the moment.

Moleschott’s fame of being a scientist whose theories were radically democratic was very useful to the new-born Italian kingdom, especially since he was also an anti-clericalist; in the practice, his very moderate attitude best suited the Depretis government, and could be then perfectly adapted to fit in the rhetoric of patriotism during Crispi’s legislature. Let us then briefly describe the situation of Italian politics and the main events in that period.

Moleschott was appointed Senator of the Kingdom in 1876; in the same year, Agostino Depretis became prime minister, substituting the right-winged government of Marco Minghetti by what has been called “parliamentary revolution”. In fact, this change had nothing revolutionary: the “historical left” (a term indicating the left wing of the Italian parliament up to 1900, in order to distinguish it from left- and right-winged parties in 20th century mass society), was basically formed by north-western moderate liberals and southern landowners; people having the right to vote were very few and all belonging to the upper-class and, obviously, they elected politicians of the same social class, who could represent their interests. It was exactly this restricted minority of wealthy and educated members of the middleclass that was addressed by Moleschott. Only in 1882 the new electoral law was approved by the parliament; the law extended the right to vote to all male people who were older than 21 (instead of 25), could write and read having attended primary school at least up to the second class (which corresponded to the obligatory education), or who were paying at least 20 lire of taxes per year (instead of 40 lire). In this way, the passive electorate passed

from 450,000 to more than 2 million people (still, only 7% of the total population, but 25% of the adult male population). The working class was still excluded from political life; in fact, Moleschott never really addressed the working-class, and his idea of solidarity remained very abstract. The materialistic idea that all men are equal because they are made of the same substance does never arrive to radical egalitarian consequences and, especially in the '80s, Moleschott always took care of specifying that the democratic ideals of equality among individuals must never be intended as “respect for criminals”¹⁸²; this is an incidental note written by Moleschott in one of his drafts for a public speech, and it seems that, in order to defend his position, he wanted to cite the poet Giacomo Leopardi (1798-1837) and his ideal of solidarity among human beings. Such ideal of solidarity among people is contained for example in his poem *La ginestra*, where the “community” formed by shrubs of broom flowers symbolically represents the community of people helping each other, obliged to do so and to live together in order to survive, fragile but flexible as broom trees are. Solidarity is here conceived as a great chain, an alliance of all men with each other in order to refuse every consolatory illusion and fight against nature, which is essentially conceived as an “evil mother”.

In 1882, the first socialist deputy was elected and, although with some delay with respect to the other European countries, the working class was beginning to play a more important role in Italian society. In order to limit and block the influence of the opposition coming from socialist and radical parties, Agostino Depretis formed a coalition with the right, thereby eliminating every parliamentary dialectics and starting the practice of *trasformismo* (the policy of adapting and transforming political ideas in order to assimilate leaders from different parties and create a coalition which excludes the most extreme positions). In foreign politics, Italy started to engage in colonial enterprises, although not very successful ones (defeat of Dogali, Ethiopia, 1887). The Depretis government lasted until 1887, when Depretis died and Crispi took his place in the parliament.

It is now on Francesco Crispi's government that we are going to focus, and, in particular, on the “political education of the Italians” fostered by him, for it is precisely in this programme that Moleschott's rhetoric completely fits: not only his political activity at the Senate, not only

¹⁸² Compare FSM, A II 16.

his publications and his speeches, but his way of conceiving science itself, all along with its popularization, were what was needed by the government in that historical moment.

First of all, the reception of Moleschott's ideas is well represented by the article of a newspaper of 1879 which we are reporting below:

Il trasferimento del professore Moleschott dall'università di Torino a quella di Roma, ha acquistato le proporzioni di un avvenimento rifocolando il conflitto sempre vivo tra *materialisti* e *spiritualisti*. Grande era dunque l'aspettazione dell'apertura del suo discorso di Fisiologia, ch'ebbe luogo jeri all'una nell'aula N. 5 della Sapienza. [...] Ognuno si aspettava che fino dalla prolusione il nuovo professore di fisiologia avrebbe messo il campo a romore con un'ardita esposizione di principii, in guisa da rompere addirittura la pugna fra la sua scuola e quella degli avversari. **Egli invece ha dato prova di una moderazione, che può interpretarsi come modestia e come avvedutezza. La sua prolusione**, meno qualche particolare di secondaria importanza, meno forse qualche allusione indiretta, **potrebbe essere accettata da qualunque scuola**. Intitolata *Fisiologia e scienze sorelle*, essa fu tutta intesa a dimostrare come ogni scienza in generale, e la fisiologia in particolare, sia collegata colle scienze sorelle in modo da costituire una società di vicendevole aiuto e riuscire infine all'*unità della scienza*. [...] Nella istruzione superiore l'investigatore è inseparabile dall'insegnante, ed ha quindi bisogno del sussidio delle scienze sorelle. Uniti insieme, gli scienziati sono i veri custodi della fiamma eterna contro le tenebre: formano una falange formidabile contro chi volesse incatenare il pensiero. [...] I principii che il grande fisiologo ha svolti con tanta altezza di vedute nella sua prolusione pronunziano uno di quei discorsi scientifici, che alle menti assetate di luce aprono nuovi orizzonti.¹⁸³

Apart from giving a brief summary of the speech held by Moleschott after his appointment at the University of Rome, the journalist makes some remarks that are interesting for the assessment of Moleschott's materialism and its reception in the society of his time: first of all, Moleschott's appointment in 1879 had caused the conflict between "spiritualism" and "materialism" to become harsher. But, instead of imposing dogmatic principles, he surprises his public with his moderation (which, as the journalist observes, could be interpreted either as "modesty" or as "cautiousness"); and he is so moderate, that "his discourse (apart, maybe, from some unimportant and indirect allusions) could be accepted by any school". During the speech, Moleschott focused on the necessity of a "unity of science", where all the scientists, united together, are the "guardians of the eternal flame against obscurity".

At the end of the article, again we find the metaphor of light, central to Moleschott's rhetoric too: light symbolizes scientific knowledge, but it also clearly refers to the image of the Enlightenment and rational illumination, while at the same time being charged with religious and mystic significance coming from a tradition which is millennia old. The same

¹⁸³ FSM, A I 8, Oscar Pio, Roma, 12 gennaio, in *L'illustrazione italiana*. Milano-Roma. Anno VI. – N. 3. – 19 Gennaio 1879. Treves, p. 46: "La prolusione del prof. Moleschott. Fisiologia e scienze sorelle". My bold type

interpretation of Moleschott's speech *La Fisiologia e le scienze sorelle*, as well as the same image of light and enlightening scientific knowledge, is reported in another article, in *La vita italiana*:

Quando gettai gli occhi sulle prime linee di questo libro m'immaginava di vederlo incominciare con uno di quegli assiomi fisiologici, che sono lampi di luce abbagliante e vero terrore degli amici dell'oscurità. [...] Niente di tutto ciò: l'oratore, con quella grazia tutta sua propria, si fa a sbizzare a grandi tratti, ma da vero maestro, la storia della Fisiologia e de' suoi progressi; e nello stesso tempo dimostra come i varii rami della scienza stiano fra loro in intima relazione, e come non possano realmente progredire se i loro sforzi vengono disgiunti. [...] Finisce poi col chiamare a raccolta tutti i cultori della scienza, chiudendo con queste belle parole, che non posso a meno di riportare: "Uniti siamo i veri custodi della fiamma eterna contro le tenebre, una falange invincibile per chiunque voglia incatenare il libero pensiero. – Combattiamo indefessi, ma senza odio. – Non dimentichiamo che il più celebre laboratorio di fisica si fu il Duomo di Pisa, quando *Galileo*, valendosi del suo polso calmo e regolare come cronometro, vi sentiva il palpito dell'umanità progredente." È uno di quei discorsi in cui la scienza va di pari passo colla stupenda forma letteraria, vale a dire come li sa fare il Moleschott.¹⁸⁴

The journalist was expecting to hear at first some dogmatic assumptions, but, with much surprise, he instead listened to a moderate and graceful oration on the history of physiology and of its progress, showing at the same time the intimate correlation of all branches of science with each other. After having stated that science could not even make any progress if the efforts of all scientific disciplines do not join together, he addresses all scientists, called "the true guardians of the eternal flame against obscurity, an invincible phalanx against anyone who is willing to enchain free thinking".

A broad discussion of Moleschott's speech at the University of Turin in 1863 can instead be found in the *Rivista italiana di scienze, lettere ed arti colle effemeridi della pubblica istruzione*, N. 172, Anno quinto, 3 Gennaio 1864: we can see how already at that time Moleschott was defined as "the most spiritualist among the materialists", not denying vital force, but simply defining it differently from the "pure vitalists", and it is stated that his materialism ought in fact to be called monism:

Dal detto s'inferisce che il manifesto liberismo del Moleschott, se può generare una smorfia sul viso degli spiritualisti puri e dei vitalisti astratti, non può non tornare accetto ai naturalisti positivi. Il suo materialismo è qualche cosa di più elevato di quel che intende il volgo. [...] Moleschott non nega la forza vitale, ma la definisce diversamente da' puri vitalisti; Moleschott è il più spiritualista de' materialisti; il materialismo di lui andrebbe meglio chiamato monismo.¹⁸⁵

¹⁸⁴ FSM, A I 8, *La vita italiana*. Torino, 2 febbraio 1879. Anno I. Numero 5. Cenni Bibliografici, p. 44: Jac. Moleschott. *La Fisiologia e le scienze sorelle*. (Prolusione al Corso di Fisiologia sperimentale, nella Sapienza di Roma, pronunciata il dì 11 gennaio 1879) (1).

¹⁸⁵ FSM, A I 8.

This quote states that Moleschott's evident "liberalism" cannot but be approved by "positivist naturalists", even though it could be disliked by "pure spiritualists" and "abstract vitalists"; it is said that Moleschott does not deny the existence of vital force, but he defines it differently with respect to how the "pure vitalists" define it. Therefore, Moleschott is named "the most spiritualist among the materialists", and his materialism is taken to be of a higher level than what is generally thought to be: indeed, "his materialism should rather be called monism".

It is evident that, firstly, the focus is on the opposition between materialism and "spiritualism" (which manifestly had its origin already at that time), but then, the journalist immediately underlines Moleschott's moderation, and he even affirms that such a speech could be approved by anybody, no matter the "school" to which he belonged.

Although Moleschott has been interpreted as an exponent of materialism, and a very extreme one, close to socialism, his position seems in fact to develop in a conservative way, especially in the latest period of his life, i.e. during the Crispi government. This is not only suggested by his position in political activity, but it is confirmed also by his reception, especially if we think about the fact that he was admired by Gabriele D'Annunzio, a poet whose thought, as we have said, was everything but close to radical materialistic positions.

Moleschott's tone, inspiring moderation and will of conciliation, clearly tried to unify rather than divide; the same tendency is present in every strategy (rhetorical and factual) obeying to that programme of "political education" of the nation which was fostered by Crispi.

The unity of science, an important point of the materialistic (as well as monistic) programme, recalls that unity which so strongly began to be sought on a political and cultural level ("Fatta l'Italia, adesso bisogna fare gli Italiani", "Once we have created Italy, now we have to create the Italians", according to the famous quote generally attributed to Massimo D'Azeglio). In fact, what Crispi meant by "political education" was the formation of the spirit of belonging to the same nation, of being part of it and sharing the same ideals: the cult of the (centralized) nation-state conceived in religious or quasi-religious terms, which included the adoration of laic heroes elevated to the level of martyrs of the State (the statue dedicated to Giordano Bruno is a clear example of this plan, and Moleschott wrote two speeches for the occasion of the celebration: one in Dutch, as delegate from the Netherlands, and the other one in Italian, for the conference on Giordano Bruno, both in 1888), anti-clericalism (materialism and its

popularization were perfect for this purpose¹⁸⁶), the cult of the monarchy, the importance of anniversaries and monuments.

If we examine the elements of this ideology and the way in which it has been constructed, we can observe that it displays a kind of “sacralization” of science, where science takes the place of religion, having thus the political function of legitimizing the new State and its governments. We see that this function of legitimization has been very well performed by Moleschott in all of his effective discourses and popularizing books, and we could make an interesting parallel between the conception of science and the one of (national) literature, which were both born around 1800, interestingly enough in the same period of time in which the idea, and the reality, of the nation-state was being created.¹⁸⁷ In this context, both literature and science belong to the way in which the new state invests its institution of a sacred value, and gives science and literature the task of conserving them: the “holy texts” of the nation-state are transmitted and fixed as means of revelation and truth. We have seen that this is true also in the case of Moleschott’s speeches and writings, which indeed functioned as literary texts spreading scientific ideas and at the same time as concrete applications of the inclusion of rhetoric, ethics and religion within science itself. Therefore, science too is, from its very beginning (considering that the modern conception of science originates in the 19th century), a form of transmission, official interpretation and translation of traditional values. In this way, it also diminishes the role and the value of the older institutions, the function of which it is taking over.¹⁸⁸

¹⁸⁶ See, for example, Moleschott’s discourse for the conference on Giordano Bruno, FSM, *CI 30*: “[...] il frutto più maturo è la patria che ci viene contrastata da quel fiero nemico, fiero ed ambizioso, che si dice vicario di Cristo, e nega l’ideale del suo maestro, poiché di Gesù Cristo abbiamo la dichiarazione esplicita, che il suo regno non è di questo mondo.” English version (my translation): “[...] the ripest fruit is the fatherland, which is contested by that fierce enemy, fierce and ambitious, who says to be vicar of Christ, and denies the ideal of his master, because we have the explicit declaration by Jesus Christ, that his kingdom is not of this world.”

¹⁸⁷ For an interesting analysis of the relation between literature and nation-state, see Pornschlegel, Clemens. 1994. *Der literarische Souverän: zur politischen Funktion der deutschen Dichtung bei Goethe, Heidegger, Kafka und im George-Kreis*. Freiburg im Breisgau: Rombach, pp. 8-9: “Das [...] Modell literarischer Erziehung, [...], ist historisch demnach nicht zufällig auf die Zeit um 1800 zu datieren, die unter anderem Begriff und Sache des Bildungsromans erfindet. Und dasselbe Bildungsmodell fällt nicht nur mit der Entstehung des modernen Begriffs von Literatur zusammen, sondern ersichtlich und gleichzeitig auch mit der Entstehung des modernen Nationalstaats und seiner Schulen, dessen Geist oder Wesen (oder eine notwendig als Kanon selektierte Weltsicht) im literarischen Text so fixiert wird, [...], wie umgekehrt die zu bildenden, gebildeten Subjekte über Literatur dann auch verstaatlicht und nationalisiert werden.“

¹⁸⁸ To carry on the comparison with literature, see Pornschlegel, Clemens. 1994. *Der literarische Souverän: zur politischen Funktion der deutschen Dichtung bei Goethe, Heidegger, Kafka und im George-Kreis*. Freiburg im Breisgau: Rombach, pp. 9 and 10.

In the particular situation of Italy in the second half of the 19th century, this devaluation of older institutions such as the Catholic Church must have been particularly appreciated by the political power of the time: the new State had in fact arisen opposing, both territorially and ideologically, the Church and its State. We can better understand the situation if we look again at the politics of Francesco Crispi, prime minister from 1887 to 1891 (and then from 1893 to 1896), who had a clear agenda, which included the reduction of the grip of the Church in Italian society¹⁸⁹:

Crispi's growing concern with generating national sentiment, and inoculating the masses against the preaching of clerics and socialists, led him to modify his earlier liberal view. If in the past he's been an advocate of a weak state and decentralization, more and more [...] he came to regard the centralized state as a necessary instrument for 'political education'.¹⁹⁰

Crispi was indeed concerned, especially in the 1880s and 1890s, with the problem of Italy's 'political education', as he himself called it: his initiatives reflected the anxieties of broad sections of Italy's ruling classes, and

they foreshadowed in significant respects developments that were to occur forty years later [indeed: after World War I, in the years of Fascism]. Like many Italian democrats of his generation, Crispi saw politics in essentially religious terms. Political leaders should be evangelists: it was their duty to enthuse the people with their ideals. Terms such as 'cult', 'faith', 'apostolate', 'baptism', and 'martyrdom' punctuated his letters and speeches. If the liberal state were to survive, and counter the allure of socialism and the Catholic Church (whose capacity to appeal to the emotions and to the imagination as well as to the mind was rightly recognized as formidable), it needed to develop a powerful cult around its institutions.

Crispi promoted a cult of secular saints: Garibaldi and King Victor Emmanuel II in particular, but other heroes of the Risorgimento too. He promoted the Risorgimento as Italy's founding myth, glorifying it as a movement of providential synthesis and glossing over the deep rifts that had in reality characterized it. He developed what he called a "cult of great memories", celebrating episodes from Italy's recent history – 1848, 1860, 1867, 1870 – and from further back in its past (the Sicilian Vespers of 1282, for example). He encouraged the construction of statues, monuments, and public buildings, and looked to mobilize people around major "national" events (the inauguration in 1889 of the Statue to Giordano Bruno, or the commemoration in 1895 of the twenty-fifth anniversary of the seizure of Rome):

¹⁸⁹ Compare Duggan, Christopher, 2002. *Francesco Crispi, 1818-1901: from nation to nationalism*. Oxford: Oxford U.P., p. 546.

¹⁹⁰ Duggan, Christopher, 2002. *Francesco Crispi, 1818-1901: from nation to nationalism*. Oxford: Oxford U.P., pp. 4-5.

[Crispi] strove to create a religion of 'the fatherland' that in its style, vocabulary, and imaginative and appeal would be able to compete with the most powerful cultural force in the peninsula, namely Roman Catholicism. Anniversaries, commemorations of famous men, statues and monuments, what he referred to as 'the cult of great memories', shrines to secular 'saints', such as Garibaldi and Victor Emmanuel, 'pilgrimages' to their tombs, hagiographic bibliographies, and patriotic associations, were just some of the instruments that he looked to deploy. He repeatedly urged the 'nation in arms', compulsory training in marksmanship, and the development of physical education.¹⁹¹

Also in this case, Moleschott's physiology was the right scientific theory with the right application possibilities: Moleschott in fact promoted the teaching of physical education at school and provided the scientific basis for it, while his theory of nutrition was applied to the daily meals of soldiers¹⁹² (both applications were functional to military politics).

The new sanitary law, the new penal legislation and the introduction of physical education at school, are all examples of the very concrete applications which materialistic science has been providing. But there are also less direct implications of such ideas: the objectification of such conceptions as Kantian finalism (which is made constitutive of the object, and not just regulative) and also the forgetfulness of the role of the subject in sense-perception (which Feuerbach instead fully understood) have finally led to the absolutization of matter; eventually, this has allowed the absolutization of races and the idea of the affirmation of national identity in nation-states (an idea which was surely present in whole Europe – both in democratic and non-democratic countries – after World War I, but that may have its ideal origins in this absoluteness and independency of races). The fact that the political programme of the time was explicitly the formation of a national identity and of a national culture seems to uphold this hypothesis.

Having considered the political and historical situation in Italy between 1870 and 1890, we have seen that the problems Moleschott dealt with attained to the most important political issues of the moment, and that the ideas related to those issues were to influence political activity even after the end of the century and after World War I. Moleschott dedicated a whole book of his *Anthropologie* to the discussion of the various types of human races; as with most of the *Anthropologie*, he did not elaborate the chapters: he rather collected empirical observations and data about physical, cultural and sociological aspects of the way of life of different populations, mainly using the work of ethnologists (such as James Cowles Prichard,

¹⁹¹ Duggan, Christopher, 2002. *Francesco Crispi, 1818-1901: from nation to nationalism*. Oxford: Oxford U.P., p. 393.

¹⁹² Moleschott, J., 1883. *Sulla ragione del soldato italiano: relazione di Jac. Moleschott*. *Rivista militare italiana*, 1883, pp. 5-31; Roma: Carlo Voghera.

1786-1848) and paleontologists (such as Louis Agassiz, 1807-1873)¹⁹³. We should at this point remember that, when Moleschott was a Senator and, more exactly, during the Depretis government, Italy had engaged in its first colonial enterprises, breaking with its previous “politics of clean hands” (“politica delle mani nette”, as it had been called the abstention from colonial enterprises in the first years of liberal government). Of course, we are far from explaining every point of Moleschott’s texts as political propaganda or legitimization of political decisions: we rather think that the parallelism between the issues dealt with by Moleschott on the one hand and these historical facts on the other hand supports the thesis of a co-implication of the positivistic concept of “race” and the political utilization of this concept. We are suggesting that this quite rigid separation among different races had such long-lasting consequences as to influence the ideological climate which transformed the idea of nation into an authoritative institution with an aggressive character towards other nation-states; Moleschott’s materialistic ideas (as they have been developed by Lombroso in his criminal anthropology) appear to be strictly related to the political programme of liberal Italy.

Summing up, we have seen how, on the social level, scientific materialism was an expression of dominant classes; there are no traces of radicalism in its public speeches, nor was it perceived as being a radical movement: both on the ideological and social level it was indeed moderate and conservative, and it had a stabilizing rather than revolutionary function, being occupied with the creation of a “cultural unity” of the nation (and, conversely, of a “nationalization of [scientific] truth”¹⁹⁴). Having connected the history of science to its social background, we have finally explained in what sense scientific materialism was a “totalizing” worldview.

As Eugenio Garin wrote in his history of philosophy, “the great merit of Ardigò’s positivism” and, we can no doubt add, of scientific materialism and positivistic science in general, “was that of offering, with an aspect of scientific respectability, a good surrogate to the traditional religion, to those groups of middle culture Italians who had brought about the Unity of Italy in fighting against the Church”¹⁹⁵.

¹⁹³ Compare FSM, *Anthropologie V, VII and VIII*, respectively in *B V 7, B II 14, B V 8*.

¹⁹⁴ Compare Renault, Emmanuel, 2002. *Philosophie chimique: Hegel et la science dynamiste de son temps*. Pessac: Presses Univ. de Bordeaux, p. 34.

¹⁹⁵ Garin, Eugenio, 2008; or. 1947. *History of Italian philosophy* (or. *Storia della filosofia Italiana*; transl. and ed. by Giorgio Pinton). II. Amsterdam: Rodopi, pp. 1001-1002.

Conclusion: Moleschott and D'Annunzio

D'Annunzio's sentence, with all the admiration and even glorification of Moleschott's figure it expressed, now becomes understandable and coherent with the ideals of both D'Annunzio and Moleschott; nor does it seem strange that a Decadent poet as D'Annunzio had such a high consideration of a materialistic scientist as Moleschott: their worldviews do not appear as distant from each other as the common picture of materialism would suggest. But let us take a closer look at D'Annunzio's thinking, in order to have some insight into the differences and analogies with Moleschott's views.

Gabriele D'Annunzio¹⁹⁶ was a poet, a writer, a journalist, a politician and a political "activist" whose work has been having a long lasting influence on literature, politics and the ideology of war. He was born in 1863, and between 1884 and 1888 he worked as a journalist in Rome for the newspaper "La Tribuna"; in this period he got in contact with all most famous personalities of Rome's high society, while the decadent atmosphere of aristocratic Rome has been depicted in his first and very successful novel, *Il Piacere* (1889). It has been during those years that he wrote the aforementioned article about Moleschott's lecture.

After having lived in Naples, Tuscany and France, he went back to Italy soon after the beginning of World War I, becoming one of the most motivated and popular *interventisti* (a term indicating those who were actively promoting the participation of Italy in World War I, which indeed happened in 1915); his contribution in spreading a pro-war attitude was not only ideological, but also practical: he volunteered during the war and in 1916 he had an accident while flying during a war mission. He was wounded and his right eye became completely blind; however, this did not impede him to participate in and promote other dangerous aerial and marine enterprises between 1917 and 1918. His last and most famous one was the action he undertook in order to conquer back the City of Fiume (now Rijeka) and the region of Dalmatia, which had been assigned to Yugoslavia through a secret treaty at the end of the war; D'Annunzio occupied Fiume and governed the city until Christmas 1920, when the Italian army obliged him and his small independent army to leave. From 1924 onwards, fascism did not allow him playing an active role in Italian politics, so that he spent the rest of his life (until his death in 1938) in a great villa which represented the synthesis of his estheticism and of his decadent attitude.

¹⁹⁶ The most recent complete biography of the poet is: Woodhouse, John Robert, 1998. *Gabriele d'Annunzio: defiant archangel*. Oxford: Clarendon Press.

His style referred at the same time to classical literature and to modern European movements such as Symbolism, but also Russian novels; on the ideological level, he was much influenced by Nietzsche's idea of *Übermensch*. Although his polemics and despise of the middleclass, his works addressed (through an extremely clever use of mass communication) exactly the same middleclass public he so strongly despised; after all, both D'Annunzio's apparent despise of the bourgeoisie and Moleschott's superficially socialistic ideals were not really antithetical to the values of the middleclass: in fact, they addressed precisely the same public. In the first part of D'Annunzio's *Elettra* (published in 1902, it is his collection of poems where political propaganda is most direct) we even find the celebration of the same national heroes who have been celebrated (often much more implicitly) by Moleschott, such as King Victor Emmanuel, Garibaldi and his army, and other personalities of the Risorgimento.

As we have seen, Moleschott's political and ideological role was the one of presenting an image of science which had to serve the "real" unification (i.e. a cultural unification, besides the official unification which had just taken place) of the nation. D'Annunzio, after having celebrated Moleschott's figure in the early stages of his career, later took over that task; the difference lies in the mode of diffusion of this same ideology, which was explicitly poetical in D'Annunzio and prosaic in Moleschott, and, of course, in the very strong references to Symbolism, Decadentism and estheticism, which are present in D'Annunzio and absent in Moleschott. But, if we have a closer look, we can notice that Moleschott and D'Annunzio even used the same symbols and the same images: the fusion between man and nature, the image of the circle symbolizing the infinite transformations and at the same time the eternity of natural principles¹⁹⁷, seem to suggest that both authors believed in a pantheistic form of religion, even if, in the case of D'Annunzio, that was based on the cult of the superhero (partly deriving from Nietzsche's philosophy) and on Panic fusion with nature, and even on irrational ecstasies which allowed the poet to have insight into the real essence of things (the poet was indeed believed to hold the magical key to access reality), while, in Moleschott's work, pantheism was presented as the consequence of a scientific materialistic attitude.

We have interpreted Moleschott as a scientist who proposed many instances of Romantic philosophy of nature under the form of modern science; applying the motto by Martin Kusch,

¹⁹⁷ In particular, compare the poems in *Alcyone*, 1902-1912 (for example: *La pioggia nel pineto*, 1902). Besides direct images, one can consider as instances of cyclical images also some metrical and rhythmical aspects of the poems.

“winner takes all”, we could say “science takes all”¹⁹⁸: it takes over the role of religion, it incorporates the tasks of ethics, it is meant to be at the basis of politics. Hence, what differs from Romanticism is the priority given, in the rhetoric of materialism, to a scientific, rational and systematic approach to the study of natural processes. But, in fact, the rationality and the scientificity of materialistic science are full of poetic and literary rhetoric.

The image of Jacob Moleschott emerging from its comparison to Goethe’s poetry on the one hand and D’Annunzio’s ideology on the other hand is very different from the one proposed by the historical and philosophical interpretation of materialism which goes from F. A. Lange to F. Gregory, and which is strongly present in the application of “materialism” to the explanation of thought processes attempted by Armstrong in his “materialistic theory of the mind”¹⁹⁹. The new image we have proposed stands in sharp contrast with the idea of materialism as a straightforwardly mechanistic and reductionist attitude which continued the tradition of the Enlightenment; on the contrary, scientific materialism of the 19th century, although the accent it put on materiality, appears to have a much more ambiguous attitude than what is usually believed, at the point that its programmatic discourses end up in mystic tones. In this respect, we could make a parallel with the poetry of Giovanni Pascoli (1855-1912), another Italian Decadent poet who lived and worked between the end of the 19th and the beginning of the 20th century: even though the attention he paid to the exact names of plants has often been taken as a tribute to positivistic science, in truth his naturalism is not as simplistic as it could seem to be, so that technical botanical terms assume in his poems a magical value, being the key to the revelation of reality. The same is true for Moleschott’s images representing natural laws and the circle of life: they are much more than just technical terms, since they reveal the significance of an entire “totalizing” worldview. At this point, even Decadentism can be considered not as breaking with positivism, but rather as developing on a line of continuity with that inclusive attitude which had been typical of scientific materialism and its culture, and which was monistic rather than dualistic, unifying rather than dividing, all-encompassing rather than reductionist.

¹⁹⁸ Kusch, Martin, 1995. *Psychologism: a case study in the sociology of philosophical knowledge*. London: Routledge, pp. 211 ff.

¹⁹⁹ Armstrong, David Malet, 1993. *A materialist theory of the mind*. London: Routledge.

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