There is a general question I want to address in this paper, namely, what is the meaning of machine in the philosophical statement, that man is a machine. The particular aim of this paper is to focus on the writings of Denis Diderot and clarify his use of the term machine in the description of man.

This paper has two parts: In the first part I want to introduce Diderot’s understanding of life as well as his understanding of man. I intend to point out to a contradictory use of the term machine. In the second part I want to suggest an understanding of machine as explanatory model and show how this interpretation can resolve the given conflict.

1 Diderot’s understanding of life

Who was Denis Diderot? Diderot appears to be a multi-layered figure among the philosophers of the early modern period. He wrote about a variety of different philosophical topics; among them are morality, language philosophy, sensation and perception, natural philosophy, religion, metaphysics, aesthetics and his writings cover several different genres like letters, dialogues, essays, etc. He distrusted and rejected philosophical systems, his opinions were tentative and explorative (cf. Barzun, 1986, p. 18). Hence his philosophical reception was rather limited, but it was manifold. Opinions about him range from severe criticism to excessive praise. While for instance Jules Barbey d’Aurevilly called Diderot a “charlatan”, who is not capable of a consistent philosophy in 1880 essay Gæthe
et Diderot (cf. Barbey d’Aurevilly, 2014), Philipp Blom recently praised Diderot as the glorious mind who represents what enlightenment should stand for (cf. Blom, 2013). Probably the best approach to Diderot’s philosophy is to follow his *Encyclopédie* article on *Éclectisme*, eclecticism, for reading him as an eclecticism thinker: Someone who is much more interested in discussing different problems in a reasonable manner, rather than following a particular school of thought.

1.1 Diderot’s natural philosophy

*What is his (natural) philosophy about?* Diderot propagated a materialism but not from a classical mechanistic materialism perspective, like it can be reconstructed with Thomas Hobbes or René Descartes. Diderot advocated a substance monism; that can be stated without any controversy. He rejects to believe in the existence of an immaterial substance in favour of matter. In the *Éléments de physiologie*, Elements of physiology, he accuses a substance dualist – it is quite clear that Descartes is his addressee – for the inability to answer three metaphysical questions: “You do not really know what that substance is, which you call soul, you know less with what it is associated with and just as little on how they have effects on each other” (DPV XVII: 330–331). There are no satisfying answers to any of these questions and therefore Diderot does not believe that an immaterial substance exists. With this choice he challenges himself for providing explanations for the phenomena that Descartes’ and the Cartesians ascribed to *res cogitans*: thinking, sensing, experiencing.

At the beginning of *Le rêve de d’Alembert*, The dream of d’Alembert, Diderot writes about the contradictory concept of an immaterial being: if it existed, it would not have any spatial extent but yet exist in the extended physical space; and if it had extent, it would not be immaterial. So, he offers two choices: To accept a contradiction or to accept that matter itself carries the properties, which were ascribed to the erroneous immaterial substance. Diderot adopts the second option\(^1\) and believes that matter is sensitive. The consequences that follow from this assumption are directly given: “if this sensitivity which you put in its place is a universal and essential quality of matter, then a stone must feel” (DPV XVII: 90). This assumption – with the acceptance that stones feel, think, sense,

---

\(^1\) A clear rejection of the first one is to be read in the *Principes philosophiques sur la matière et le mouvement* (1770): “La supposition d’un être quelconque place hors de l’univers matériel, est impossible. Il ne faut jamais faire de pareilles suppositions, parce qu’on n’en peut jamais rien inférer.” (DPV XVII: 19)
and experience – is one of the fundamental characteristics of Diderot’s natural philosophy.2

What are the central characteristics of Diderot’s monistic natural philosophy? Although there is the notion of atom in Diderot’s writings, described as “petits corpuscules indivisibles”, tiny atomic corpuscles, as in the Encyclopédie article on Atomes, atoms, (Unknown author, 2016a), the fundamental component of nature is the molecule. A molecule is a small material unit, described as a vivid point (cf. DPV VIII: 47); it is indirectly perceivable by the senses and it links together with other molecules for forming bigger, sensible parts of matter (cf. DPV IX: 92ff.). Matter is heterogeneous. This means “there are infinite different elements in nature; that every of these elements, because of their difference, has its particular, innate, constant, eternal, indestructible force and this force that inhere the bodies has it effects outside the body. This is where motion, or rather, the general fermentation of the universe comes from” (DPV XVII: 18).3

In other writings this force is called explicitly sensibilité. This sensitivity is both, the “faculty of feeling” as well as “the basis and conserving agent of life”, as it is described in the Encyclopédie article on Sensibilité, sentiment from the medicine section by Henri Fouquet (Fouquet, 2016).4 These properties can be given to living creatures as well as to elementary particles and Diderot does both: Motion and gravity are described as secondary effects of a primary property of sensibilité (cf. DPV: 17–19). The material sensitivity is a potential property of matter; it is always present but it can have two different states: An active and an inactive state; there is a sensibilité active and a sensibilité inerte. Therefore, Diderot writes in Le rêve de d'Alembert about a vivid force and a dead force:

Could it by chance be the case that you recognize an active sensitivity and a latent sensitivity, just as there is an active and latent force?

An active force which manifests itself by displacement, and a latent force which manifests itself by pressure, an active sensitivity which is

---

2 Although, the notion of sensible matter – or sensible molecules – is not genuinely Diderot; one can find the similar notion of molécule organique in Georges-Louis Buffon’s Histoire naturelle générale et particulière (1749–1788), which Diderot evidently knew (cf. Fellows, 1970, p. 68; Efrosini Gregory, 2007, p. 109). So, there is history of the term as well a continuation that leads to vitalism and the notion of élan vital, but nevertheless, it was Diderot’s contribution to natural philosophy to develop a physics on the basis of sensible matter.

3 “qu’il existe une infinité d’éléments divers dans la nature; que chacun de ses éléments par sa diversité a sa force particulière, innée, immuable, éternelle, indestructible; et que ces forces intimes au corps ont leurs actions hors du corps; d’où naît le mouvement ou plutôt la fermentation générale dans l’univers.” (DPV XVII: 18)

4 In the Encyclopédie article, sensibilité is also described as the property of certain parts of a living body to perceive impressions of external objects (Fouquet, 2016).
characterized by certain observable actions in an animal and perhaps
in a plant, and a latent sensitivity which we would confirm by its
transformation into a condition of active sensitivity? (DPV XVII:
92)

The questions asked in this passage do not get answered affirmatively in a strict
sense. But in this text and with texts it becomes quite clear that Diderot ex-
presses his own views in questions like these. Hence, his view about animals
and plants, as expressed in the Éléments de physiologie can be generalised to
understand his notion about life: “What is a plant and what is an animal? A
coordination of infinite active molecules, a connection of little vivid forces, and
everything works towards their separation.” (DPV XVII: 297)

It needs certain causes for activating molecules; possible candidates for these
causes are warmth (DPV XVII: 104) and warmth together with fermentation
(DPV XVII: 297). Another example is the assimilation of inactive matter in a
cluster of active matter, which is described in the Encyclopédie article Naître,
emerge, by Diderot as well as in Le rêve de d’Alembert. In the latter, the given
example is to grind stone, mix it with soil, plant vegetables in it, eat the vege-
tables and voilà: The inactive matter of the stone, which is absorbed by the
plants, becomes a part of the living body and therefore becomes active: “In this
way I make flesh or soul, as my daughter says—active, sensitive matter” (DPV
XVII: 95). With death, the process is inverted: Molecules lose their activity,
molecule complexes become dry, fibres become rough, and eventually an organic
composition falls apart. So there is a progression from molecule, to fibre, to flesh
and back again: „The expressions life and death do not have anything absolute;
they denote the successive states of the very same being” (DPV VIII: 48)

It is unclear how these progressions work in detail. In a thought experiment,
Diderot imagines the evolution of monsters and worlds that vanish because they
lack certain details (DPV XVII: 127–129). After all, Diderot remains a sceptic
concerning his own natural philosophy (DPV IX: 89–91). But his account
certainly represents the convictions that nature itself is vivid, that life emerges
when a material cluster is formed, that life vanishes when a material cluster is
destroyed, and that this process is on-going: „I see everything in action and re-
action, everything destroys its’ form, everything recomposes in another form”
(DPV XVII: 18). The core of Diderot’s philosophical convictions is that both,
the progression of life and death as well as knowing about this progression share
an immanent principle. A divine intervention for activating a molecule is su-
perfluous and Diderot also leaves the believe in a separate creation of man and
animal or in a fundamental difference between species behind. The creation and
destruction of life is immanent to matter; we can know about these processes just
from experiencing a nature without a metaphysical framework needed.

1.2 Diderot’s explanations of man

It appears that Diderot’s philosophy is not highly compatible with a mechanical
natural philosophy; his remarks in the Éléments de physiologie often seem to
be written against a mechanistic opponent: The behaviour of animals during
the incubation period is “hard to describe a mechanistic way” (DPV XVII: 324),
as he writes for instance. In the Encyclopédie article on Liberté, Freedom, by
Jacques-André Naigeon and Claude Yvon, machine is the very opposite of the
conception of being free and man can either be free or a machine (cf. Naigeon &
Yvon, 2016). And Diderot states quite clearly in the preamble of his Pensées sur
l’interprétation de la nature, as a note to the, as he writes, “young man who have
decided for a study of natural philosophy”: “Always bear in mind, that nature is
not God, that man is not a machine, that a hypothesis is not a fact.” (DPV IX:
26)

But nevertheless, when he speaks about the human body, he uses the term ma-
chine quite often. And this is the problem I want to address: There are several
references to the human body done with the label ‘machine’. There is the famous
quote from the Encyclopédie article on Philosophe, philosopher,⁵ that states, the
philosopher “is a clock that, so to speak, impels itself sometimes” (Unknown au-
thor, 2016b)⁶. In the the Encyclopédie article on Anatomie, anatomy, Diderot
writes: “The human body is a machine that follows the laws of mechanics, statis-
tics, hydraulics and optics” (Diderot, 2016)⁷. Those who want to know more
about the human body should study those laws.⁸ There is also another use of
the notion, which is used in different explanations in Le rêve de d’Alembert. I

---

⁵ The authorship of this article is unclear; César Chesneau Du Marsais is the author of the
article’s first version, which was not incorporated into the Encyclopédie. Maybe Voltaire
revised Du Marsais’ text for the final version. (cf. Groult, n.d.)

⁶ The original sentence reads “c’est une horloge qui se monte, pour ainsi dire, quelquefois elle-
même” (Unknown Author, 2016b) and is contained in Du Marsais’ original version as well as in
the Encyclopédie. The concept of a self-winding clock can also be found in La Mettrie’s
L’homme machine: “Le corps n’est qu’une horloge, dont le nouveau chyle est l’horloger” (La

⁷ DPV V does not contain the full text of the article.

⁸ “Le corps humain est une machine sujette aux lois de la Mécanique, de la Statique, de
l’Hydraulique & de l’Optique; donc celui qui connoîtra le mieux la machine humaine, & qui
ajoutera à cette connaissance, celle des lois de la Mécanique, sera plus en état de s’assûrer
par la pratique & les expériences, de la manière dont ces lois s’y exécutent, & des moyens
de les y rétablir quand elles s’y dérangent; donc l’Anatomie est absolument nécessaire au
Medecin.” (Diderot, 2016)
want to investigate this text in more detail and discuss three explanations for capabilities of the body and phenomena of life – precisely, of the human life and the human mind. They are given via analogy:

(1) The phenomenon of sensing is explained in an analogy to strings: Diderot compares the fibres of an organ with sensitive, vibrating strings (cf. DPV XVII: 140ff.) and explains how sensing works, how ideas are evoked, and how associations work; in order to show that this explanation is compatible with his monism he extends the analogy to a harpsichord with strings, that plays itself: “We are instruments endowed with sensitivity and memory. Our senses are so many keys which are struck by nature surrounding us and which often strike themselves. And there we have, in my judgment, everything which goes on in an organic harpsichord like you and me” (DPV XVII: 102).

(2) The material composition of an organism, i.e. an individual and sensible unit that consists of many sensible individuals – the molecules –, is explained in analogy to a swarm of bees: In a cluster of bees, there might be as many single sensations as there are bees. But when the bees are thought to be in connection with each other the distinct cluster becomes a unified organism:

9 That organism is later on compared to a polyp, which is understood as unicellular organism without organs. Diderot probably saw the polyp as “végéto-animal”, a creature in the transition between plant and animal (cf. DPV XVII: 297ff.).

Do you wish to transform the cluster of bees into a single unique animal? Soften the feet by which they hold themselves together. Change them from the contiguous condition they are in so that they become continuous” (DPV XVII: 121). The new organism then forms a unit, which is fluid, so additional bees can be attached and even removed from the body of bees, without destroying the unit.

(3) The unity of consciousness and a creature’s ability to have sense experience is compared to a spider in a web. There are two stages for this comparison: In the first stage, a spider and its web are another analogy for sensation: the spider belongs to the net, and it senses its environment via the strands. The analogy is extended to the human body: “The strands are everywhere. There is no part on the surface of your body where they don’t end up. And the spider is lodged in a part of your head—the one I mentioned to you—the meninges, which we can hardly touch without knocking the entire machine unconscious” (DPV XVII: 141). In the second stage, something that draws a creature’s attention is compared to a spider moving towards
a certain position in its web when a strand vibrates. Just like in the second example of the connected bee swarm, the spider and the web form a unit but now there is a centre of attention (which is the spider). Diderot introduces a distinct analogy between spider web, brain, universe, spider and something the reader might add, so: spider web – spider, brain – consciousness, universe –, and in my opinion, sensitivity: “And who told you that this world doesn’t also have its meninges or that there isn’t a huge or a small spider living in some corner of space with its strands extending out to everything” (DPV XVII: 143).

So let me clarify the problem I am addressing: On the one hand there is Diderot’s natural philosophy and it does not seem likely that it incorporates a concept of machine. We can find the literal statement that man is not a machine in his writings. On the other hand there is the reference to the body as machine as well as the mentioned explanations. These explanations may not be typical machines but surprisingly Diderot denotes the spider web as machine (cf. DPV XVII: 141; see also DPV XVII: 150 for a use of the term that is clearly not metaphorical or ironic), and the objects given in the explanations have certain features that also machines have – I will shortly come to this issue. Beside, we can find the literal statement that man is a machine in his writings. So, should this contradictory use be understood?

2 Machines as Models

Before investigating Diderot further, I briefly want to refer to the explanations for phenomena of life that are given in the anatomical writings by René Descartes. Descartes is, or at least he has the reputation of being so, the prototypical thinker of natural machines. His work provides the basis for a mechanical view on nature. How does he address and explain the capabilities of the human body and phenomena of human life? In his *Traité de l’homme*, the reaction to sensation with movement is explained with the analogy of a bell that rings at the end of a bell pull that is like a nerve fibre leading to the brain (cf. Descartes, 2004, p. 117). The drawing of attention towards something, which is in physiological terms described as the pineal gland’s leaning in a certain direction, is explained with the analogy of a small body that is connected to a few threads and hangs inside a chimney. Like the air and the “force of the smoke” move the body, the pineal gland in the human brain is lifted, kept in its places and made to “lean now to one side and now to another” (Descartes, 2004, p. 152). When Descartes explains the ability to memorise, the brain is both: described as structure of small pipes that assume certain forms from the so-called esprits animaux that
flow through the pipes and the space between them; and it is explained in analogy to a linen cloth that carries certain hole figures, which are marked in the tissue by needles or engraver’s points (cf. Descartes, 2004, p. 149–151).

Why did I mention Descartes? Well, firstly, to discuss how the writings of Diderot and Descartes differ from each other: One difference between them is that Descartes’ use of machine can refer to a universal principle, meaning that the machine is something that consists of causal mechanisms. So, there is a deterministic nature that is factually represented by mechanical physics. But this understanding of machine cannot be ascribed to Diderot’s matière sensible; he also continuously denies this interpretation of nature. Diderot certainly has a negative attitude towards positions that can be called objectivist, in modern terms. For him, it is inaccurate to investigate nature in terms of mathematical abstractions. There is no absolute rest, there is always motion; there is no point without length and so on (cf. DPV XVII: 13–14). An investigation in these concepts is the occupation of “mathematics and metaphysics”, and he views himself as “physicist and chemist”, when he makes statement about nature. It is even wrong to speak of “a body as a body”, because that means to abstract from what can actually be perceived (DPV XVII: 16). Diderot stresses that he is concerned with physics, not with metaphysics and follows a classic empiricist’s critique of abstract, rational reasoning in favour of sense experience (cf. DPV IX: 27–39).

Nevertheless, the given examples from Descartes are not fundamentally different to the examples given by Diderot. Both have in common that their explanations actually do not incorporate typical machines (instruments, natural processes, different human constructions). Both do not make literal attributions: the vivid molecules are not literally bees and so on. What both try to do is to provide an explanation. There is a metaphysical concept of matter and nature that might appear rather odd, but it is not prominently brought in as justification. Even without accepting metaphysics, the analogy of vibrating strings for thought associations can be understood. In order to answer certain, implicit or explicit, questions, they develop the analogies that are meant to explain something. These explanations are comprehensive narratives and although there are certain intertextual connections in Diderot, like the vibrating string and the web’s strands, the explanations are not meant to fit cohesively together: Man is not explained as a piano-spider-bee.

Since for Diderot, there is no res cogitans, self-reference is incorporated in many of his analogies. There is the mentioned harpsichord that plays itself, there is also an example of a book that reads and writes itself (cf. DPV XVII: 470). All of his examples do have a certain regularity. One could even say, in a weak sense, they
are mechanical: The string cannot do other but vibrate; also the spider cannot act, or do, anything other but rushing to the origin of a vibration.

This circumstance gives the clue to find an understanding of machine that is not to be read literally but metaphorically. My suggestion is to understand machine in terms of being a model. A machine model bears the regularity in order to provide a convincing explanation; it refers to a commonly accepted procedure and in the same time it is not meant to exist. I want to summarise the given analysis and list the characteristics of Diderot’s explanation: They are not to be understood literal (they have this in common with the Cartesian explanations), they get discarded or changed when they do not work anymore, they are not meant to fit together but are complete in the sense that there is nothing beyond the analogy needed in order to justify the explanation: The explanation is immanently derived from the analogy. Nevertheless they incorporate regular processes, causes and effects. Machine becomes more than a label use and just a metaphor.

Diderot’s explanations are no classical arguments, neither are they proofs: Diderot does not give reasons in order to come to a conclusion. They explain but do not abstract from nature. Nevertheless there is a formal structure in his texts: When there is a question, an analogy is developed in order to answer the question and when problems arise or the limits of the analogy are reached, he changes it. So, there is no steady referring to the same example, but a number of variations of one example . He also plays with these examples; they are of philosophical significance, but they are not only of philosophical significance. Diderot as writer of fiction is always as present as Diderot the philosopher. With this observation I want to close this paper. I think we have found a notion of machine somewhere between a metaphysical principle, like the Cartesian mechanical nature, and a literal concept like in La Mettrie. Machine can be understood as narrative model with the function to provide explanations. The man that is a machine, is therefore explained. Nevertheless a machine description does not stop us from asking what man is.
References*

Abbreviations
DPV V: Diderot (1976a).
DPV VIII: Diderot (1976b).


* If not stated otherwise, the French quotations were translated into English by T.H.

