The Atheist's Bible

Diderot and the Éléments de physiologie

Caroline Warman

In offering the first book-length study of the 'Éléments de physiologie', Warman raises the stakes high: she wants to show that, far from being a long-unknown draft, it is a powerful philosophical work whose hidden presence was visible in certain circles from the Revolution on. And it works! Warman's study is original and stimulating, a historical investigation that is both rigorous and fascinating.

— François Pépin, École normale supérieure, Lyon

This is high-quality intellectual and literary history, the erudition and close argument suffused by a wit and humour Diderot himself would surely have appreciated.

— Michael Moriarty, University of Cambridge

In 'The Atheist’s Bible', Caroline Warman applies deft, tenacious and often witty textual detective work to the case, as she explores the shadowy passage and influence of Diderot's materialist writings in manuscript samizdat-like form from the Revolutionary era through to the Restoration.

— Colin Jones, Queen Mary University of London

'Love is harder to explain than hunger, for a piece of fruit does not feel the desire to be eaten': Denis Diderot's Éléments de physiologie presents a world in flux, turning on the relationship between man, matter and mind. In this late work, Diderot delves playfully into the relationship between bodily sensation, emotion and perception, and asks his readers what it means to be human in the absence of a soul.

The Atheist's Bible challenges prevailing scholarly views on Diderot's Éléments, asserting its contemporary philosophical importance and prompting its readers to inspect more closely this little-known and little-studied work. This book is accompanied by a digital edition of Jacques-André Naigeon's Mémoires historiques et philosophiques sur la vie et les ouvrages de Denis Diderot (1823), a work which, Warman argues, represents the first publicaion of Diderot's Éléments, long before its official publicaion date of 1875.

The Atheist's Bible constitutes a major contribution to the field of Diderot studies, and is of further interest to scholars and students of materialist natural philosophy in the Age of Enlightenment and beyond.

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In 1764, Toussaint Bordenave, a surgeon respected both for his practical experience and his mastery of Latin, which made him doubly useful to his many students, brought out for their use an *Essai sur la physiologie*. His aim was to give a comprehensive but concise overview of the workings of the human body, and he drew closely on the work of the preeminent Swiss physiologist Albrecht von Haller, whose works were all written in Latin, and whose own condensed handbook on the subject, the *Prima lineae physiologiae*, Bordenave would later translate into French under the title *Éléments de physiologie*, no doubt driven by his continuing pedagogical impulse. His 1764 *Essai* is printed in a handy duodecimo size, and has 253 pages: he packs a lot of definition and description into his pages, and here, to give a flavour of it, is how he defines giving birth, from a physiological point of view:

L’Accouchement est une fonction naturelle, par laquelle le foetus parvenu a un certain terme est expulsé au-dehors.¹

Delivery is a natural function by which the foetus having reached a certain term is expelled outside.

There is nothing wrong with this definition from a mid-to-late eighteenth-century point of view; it is clear and concise, while its emphasis on delivery as a natural function shows that Bordenave is within the mainstream of Haller-influenced physiological thinking in seeing physiology as not just anatomy but as the ensemble of (partly mechanical) processes within a living body. However, it is not exactly whizzy. It uses impersonal almost

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abstract substantives (‘l’accouchement’; ‘le foetus’; ‘une fonction’; ‘un terme’) that completely detach the process from any specific living (and presumably gendered) body. It is also simultaneously tautologous (the foetus is not just ‘expelled’, but ‘expelled outside’) and incomplete: there is no mention of what this foetus is expelled out of—we assume a/the body. Bordenave’s definition is generalised and at once over-emphatic and underspecified. Compare it with what Denis Diderot says in the Éléments de physiologie:

‘L’accouchement est une espèce de vomissement [...]’.2

Delivery is a sort of vomiting [...].

In essence, he is saying the same thing as Bordenave, but he is more severely concise and direct. He avoids the formalising and repetitive language so common to definitions (‘it is a natural function by which’, etc), and he also sidesteps the depersonalised mechanical model implicit in the notion of automatic expulsion. In comparing delivery to vomiting, he communicates the idea of the foetus being ‘expelled outside’ with piercing clarity, presenting it as an experience all humans (male as well as female) can relate to and have a bodily memory of, one that carries physical sensation and its associated emotional response in the shape of extreme discomfort.3 His definition is sparer, less formalised, much more violent, and much more effective. Its brevity and impact are typical of Diderot’s Éléments de physiologie more widely. He systematically avoids generalisation and abstraction and tends to communicate his point by connecting it to relatable experience, whether by example or—as here—by analogy. This chapter will look at Diderot’s Physiology next to other introductory overviews to the subject from the period, and will aim to show where it is similar to them and of course also where it diverges. It is not attempting to take into account the variety and specificity of Diderot’s medical reading

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3 This is not the first time we have mentioned vomiting. See also the mouthless oyster in Chapter 1.
and influences: fine work has already been done in this area by Jean Mayer, Paolo Quintili, and Motoichi Terada. One of the things we will be arguing is, as has already been sketched out, that Diderot’s *Physiology* is better written and therefore that, quite concretely, it is a better introduction to physiology than many others were, or it would have been, had it been published. The vexed question of its publication history however is for later chapters.

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But what is physiology? This is not a question which we have even touched on yet. The definition which Paris-trained medic Pierre Tarin (1725–61) gives in his *Encyclopédie* article is this:

PHYSIOLOGIE, s. f. de Φύσις, nature, & λόγος, discourse, partie de la Médecine, qui considere ce en quoi consiste la vie, ce que c’est que la santé, & quels en sont les effets. Voyez Vie & Santé. On l’appelle aussi économie animale, traité de l’usage des parties; & ses objets se nomment communément choses naturelles ou conformes aux lois de la nature. Voyez Naturel & Nature.  

PHYSIOLOGY, feminine noun from Φύσις, nature, & λόγος, discourse, part of Medicine, which looks at what life consists of, what health is, and what their effects are. See Life & Health. It is also called animal economy, treatise of the use of parts; and its objects are commonly called things which are natural or which conform to the laws of nature. See Natural & Nature.

So, it is part of medicine, it specifically asks what life is, what health is, and what the effects of life and health are. It can also be called animal economy and treatise of the use of parts, and what it (all this) looks at,

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4 See their editions, and also Jean Mayer, *Diderot, homme de science* (Rennes: Imprimerie Bretonne, 1959). See also Gilles Barroux’s study of the importance of medical knowledge for Diderot’s materialism: *Le Cabinet médical de Diderot: la part de la médecine dans l’élaboration d’une philosophie matérialiste* (Paris: Éditions Matériologiques, 2018), although Barroux does not specifically focus on the Éléments de physiologie.

that is, the objects of its attention, are commonly known as things which are natural or conform to the laws of nature. One of the characteristic features of the Encyclopédie is the way in which it integrates cross-references to connected articles: the immediate ring of closest related articles to ‘physiologie’ are Life, Health, Natural, and Nature. We notice, therefore, that the terms human and body do not feature in this first most concentrated nugget of the definition, although they appear in the first line of the next paragraph, which commences a more detailed exposition and description (the whole article is just over a thousand words). So physiology, despite belonging to medicine and therefore being inevitably and implicitly connected to human beings and illness, is in fact explicitly concerned with general questions about life and health. Beyond that, it is also to do with the animal economy, how the different parts of the body work together, and about how things are natural, how they do or do not conform to the laws of nature. Physiology could not therefore be called a limited field of enquiry, and it is not even principally to do with the human body.

In his article, Tarin mentions three authorities: firstly, Montaigne, a remark of whose he uses to cast ridicule on daft concretisations of the soul, and the other two—Herman Boerhaave and Albrecht von Haller—to indicate the two greatest authorities in the field. Tarin had in fact executed a first translation of Haller’s Primae lineae physiologiae (‘First Lines’, 1747): it was published under the title Éléments de physiologie in 1752, and was the only translation available in French until Bordenave’s tighter version of 1769 (this will be the version Diderot uses for his Éléments de physiologie as we can tell from the echoes in the phrasing; we will come to this aspect in due course). So Tarin very thoroughly associates his work with Haller, as indeed all the writers about physiology mentioned in this chapter do. Where there is polemic, it is not about whether Haller was or was not an authority on the workings of the human body. Haller himself would later write the revised and extended version of Tarin’s definition for Jean-Baptiste Robinet’s edition of the Supplément to the Encyclopédie (1776, 4 vols); Haller expanded it to nearly 25,000 words, relating in chronological order who made what discoveries in physiology from Pythagoras onwards: he jettisons Tarin’s
Diderot's ‘Système figuré des connoissances humaines’, that provocatively rearranged fold-out map of human knowledge which features at the beginning of the Encyclopédie, in fact places physiology as a subset of zoology, on a par with anatomy, medecine, and then a group of associated veterinary areas (‘la vétérinaire’, horse-riding, hunting, fishing, and falconry). Medicine has its own subsets, not including physiology. These are: hygiene (the art of preventing disease), pathology and ‘seméiotique’ (respectively the knowledge of disease and of its signs and symptoms), and therapeutics (the art of healing). By contrast, in the text accompanying the diagram of the ‘système figuré’, Diderot presents things slightly differently: medecine either focuses on the ‘economy of the human body’ and theorises (‘raisonne’) its anatomy, this area becoming physiology, or deals with illness and health, and how to avoid, recognise, and cure the former, and reinforce the latter. So there is clearly some variation in the understanding of where physiology sits as a branch of knowledge (whether or not it is a subset of medecine; its relation to anatomy), and within that, what it covers. We can tell that this is not just a question of uncertainty but of debate, even polemic, when we read that the influential Parisian medic and writer, Félix Vicq d’Azyr (1748–94) made a point of combining

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7 Religion, for example, appears as a sub-section of, in the first instance, ‘Reason’, secondly ‘Philosophie’, thirdly ‘Science de Dieu’, and fourthly ‘Théologie naturelle, Théologie révélée’. Only then comes ‘Religion’, immediately qualified by ‘d’où par abus, superstitions’ [whence, by abuse, superstitions]. The ‘Système figuré des connoissances humaines’ was first published as part of the prospectus of the Encyclopédie in 1750, and, as already indicated, features at the head of the first volume of the Encyclopédie proper (volume 1 was published in 1751), https://encyclopedie.uchicago.edu/content/système-figuré-des-connaissances-humaines-0. See also the critical online edition Édition numérique collaborative et critique de l’Encyclopédie ed. by Alexandre Guiblaud, Alain Cernuschi, Marie Léca-Tsiomis and Irène Passeron, http://encre.academie-sciences.fr/encyclopedie/.

8 Denis Diderot, ‘Prospectus’ (1750), p. 8, see http://artflsrv02.uchicago.edu/cgi-bin/extras/diderotimg.pl?0035_pg8_section3.jpg (the link for the prospectus as a whole is https://encyclopedie.uchicago.edu/node/174).
physiology and anatomy in his teaching: Laurence Brockliss and Colin Jones tell us that he ‘founded each part of his physiology course on an anatomical description of a vital organ’. Diderot also lobbies, in the final chapter of his Éléments de physiologie, for post-mortem dissection to be much more widespread; his argument is that only through anatomy can the science of medicine progress.

Why should this be an issue? Indeed, what is the issue? It is not easy for the modern reader to comprehend the arguments of past centuries: for us, it is perfectly obvious that the detailed knowledge of the human body is in fact synonymous with advanced anatomical knowledge and furthermore, that anatomy and physiology occupy overlapping areas of biology. What this means, however, is that thinkers like Vicq and, before him, Diderot, won the argument, and that—to put it one way—our understanding of the sciences comes down to us from such as them—and to put it another—that they influenced the shape of things to come. This is not to exaggerate the importance of any particular moment or group of thinkers—every link or generation in a genealogy is a crucial one, without which the cumulative inheritance would be different. The more general point is to recognise and understand that the field of knowledge broadly conceived is the result of a complex and multi-generational intellectual genealogy, and within the context of this study, the aim is to look at one of those generations and, insofar as possible, at the precise historical conditions of its production. For instance, when we blithely throw the term ‘biology’ into the discussion as if it were a given, we ought perhaps to consider that neither term nor concept existed when Diderot was writing. It seems to have emerged in response to the debates pervading the wider fields of natural philosophy, physiology, and zoology, and its adoption was propelled into general usage by the French naturalist Jean-Baptiste Lamarck (1744–1829). The fact that the

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11 Shirley A. Roe tells us that ‘around 1800, the word “biology” began to be used independently by Lamarck and Bichat in France, and Karl Friedrich Burdach and Gottfried Reinhold Treviranus in Germany’ (Roe, ‘The Life Sciences’, in The Cambridge History of Science: Volume 4, Eighteenth-Century Science, ed. by Roy Porter
now familiar field of biology did not exist in the period we are looking at, but very soon would, is itself an indicator of the considerable change and reorganisation of the map of knowledge that was occurring at the time. François Duchesneau, eminent historian of eighteenth-century French physiology, puts it this way: ‘Le XVIIIe siècle, suggérons-nous, voit la transition des théories de l’être vivant à la théorie physiologique’ [The Eighteenth Century, we would suggest, sees a transition, from theories of the living being to physiological theory]. This is a pithy encapsulation of an immense epistemological shift. Yet its retrospective assessment consigns the variation around the definition that we have been briefly sketching to a hazy past, as Duchesneau goes on to make clear:

La physiologie, division de la philosophie naturelle sans spécificité de méthodes ou de concepts thématiques dans la période précédente, acquiert l’autonomie d’un savoir empirique strictement délimité avec les *Elementa physiologiae corporis humani* (1757–1766) de Haller.  

Physiology, a part of natural philosophy without, in the preceding period, any specific methods or thematic concepts, gains autonomy as an empirical and strictly defined body of knowledge with the publication of Haller’s *Elementa physiologiae corporis humani* (1757–1766).

For Duchesneau therefore, the watershed is Haller, who establishes physiology as a defined empirical science. Haller’s impact was immense and Duchesneau’s clear statement gives him due prominence. It is however interesting to note that pre-Hallerian physiology is simply brushed aside as having been ‘sans spécificité’; such an attitude derives from a notion of history as progress, one which is particularly hard to avoid when looking at the history of science, where we have manifest and endless evidence that things can be done ‘now’ which weren’t possible or even conceivable ‘before’. So, to be clear: we are not suggesting that there is anything wrong, as in factually incorrect or

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13 Ibid.
intellectually faulty, with that sort of march-of-science history or with that view of the truth. It is just not what we are looking at: our focus is on the constituent elements and strands within physiology in the latter half of the eighteenth century in France so that we can understand what physiology was understood to be, what its debates were, what Diderot’s position in all this was, and finally, what his contribution was or might have been.

Major Debates in Physiology: Mechanism and Vitalism

The major debates around physiology, its definition and its mapping within medical knowledge more broadly turned on the approaches generally known as mechanism and vitalism. Mechanism was, as its name suggests, the theory that the body was best understood as a mechanism or machine, an infinitely complex assemblage of working parts, with pumps (such as the heart) and levers (such as the muscles), and so forth. René Descartes’ understanding of the body is exactly this. As the mention of Descartes serves to remind us, mechanism usefully hives off discussion of the soul, while continuing to press for empirical investigation of the body. Its primary tools of research are anatomy and dissection: if the body is a mechanism, then what better way to understand it than to take it apart? The pre-eminent mechanist was Dutch anatomist and chemist Herman Boerhaave (1668–1738) who taught generations of students at Leiden, amongst whom were the aforementioned Haller, the medically-trained philosopher La Mettrie (1709–51), author of L’Homme-machine (1747), and Louis de Jaucourt (1704–79), contributor of no fewer than seventeen thousand articles to the Encyclopédie including some on physiology and chemistry. An important sub-section of mechanism is iatromechanism (‘iatro’ is a prefix from the Greek word for ‘physician’); the crucial contribution its adherents made was to bring chemistry into the mechanist fold, viewing chemical processes in mechanical terms; iatrochemistry applies this approach to the body, seeing it as a chemical machine, with functions

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14 The leading contributors in these areas however were Venel (chemistry) and, in the area of physiology and medicine, Tarin and Ménuret de Chambaud. On chemistry in the Encyclopédie, see Christine Lehman and François Pépin, ‘La Chimie et l’Encyclopédie’, Corpus, revue de philosophie, 56 (2009).
such as digestion or secretion being understood as primarily chemical processes.\textsuperscript{15}

Vitalism, with \textit{vita}—‘life’—at its core, picks up something we have already touched on, that is to say, the enquiry into what life actually is. Vitalist medicine, particularly associated with the medical school of Montpellier, sees the body as the ensemble of its living functions; it is particularly interested in the life of the organs which it conceptualises according to a model of interdependent independence.\textsuperscript{16} For vitalists, to dissect a cadaver is a subordinate if not pointless activity, as the key object of enquiry—life—is no longer present. Hence the wide-spread practice of (animal) vivisection in the eighteenth century, amongst both mechanists and vitalists, given that the former understood the importance of looking at the living machine, and that the latter realised the need for detailed knowledge of physiology, that is, of the body’s constituent parts and how they work together in the ‘animal economy’.\textsuperscript{17} The cleft stick that this put actual physiologists in is well if disturbingly expressed by Vicq d’Azyr in his heartfelt account of, on the one hand, dissecting a body whose muscles and nerves no longer respond to ‘the instrument’ and whose dead silence is a great enigma, and on the other, the awfulness of attempting to see or understand any phenomenon at all while inflicting extreme pain and fear on a live animal, in the midst of its convulsions, screams, and pouring blood. The first passage records post-mortem dissection; the second describes vivisection.

\[ \text{[...] tout est insensible, tout est muet; le muscle ne se roidit plus sous l’instrument qui le blesse; le nerf est déchiré sans exciter ni trouble ni douleur; toute connexion, toute sympathie sont détruites, et les corps} \]

\begin{itemize}
\item[\textsuperscript{15}] Laurence Brockliss and Colin Jones provide a helpful survey of iatromechanism and its main proponents, see in \textit{The Medical World of Early Modern France} (Oxford: Clarendon Press, 1997), pp. 419–33. See also Kurt Ballstadt’s deft mapping of Diderot’s attitude to iatromechanism in his \textit{Diderot: Natural Philosopher}, SVEC 2008:09 (Oxford: Voltaire Foundation, 2008), pp. 204–05.
\item[\textsuperscript{17}] Rey, \textit{Naissance et développement}, p. 139 (on animal economy); p. 405 (on vivisection).
\end{itemize}
Everything is unresponsive, everything is mute; the muscle no longer stiffens at the touch of the instrument which injures it; the nerve can be severed without provoking disturbance or pain; every connection, every sympathy is destroyed, and the bodies of animals in this state are a great enigma for he who dissects them.

Vicq contrasts the process of the post-mortem we have just read with the distress and uproar of vivisection:

For an animal who is tied down, the slightest movement is the signal of pain and intensifies its fear; its whole body contracts, each part of it rises up against the enemy which threatens or torments it. Amidst the pouring blood, the convulsions, the piercing screams and the anguish, how can we hope to find the root of the feeling? Who could suppose, within such general paroxysms, that it was ever possible to discern the trace of any natural movement? And what infinite amounts of care and sagacity are required to be able to draw any useful results from it!

Vicq is an expressive, self-questioning, and impassioned writer as well as an important physiologist, and he draws attention here to one of eighteenth-century culture’s defining characteristics, its interest in the question of sensibility, that is to say, the ability to feel sensation. Manifestly, life and sensibility are almost synonymous here. Haller’s extensive research into the property of sensation in bodies, and his careful differentiation of it into irritation and sensation, constitute his most important actual discovery, as distinct from his wider importance.
as the author of a comprehensive and empirically-based account of human physiology.  

Irritation is a reactive convulsive property of human tissue; it is not necessarily consciously felt, unlike sensation, which operates through the nerves, and therefore by definition is felt. An easy way to grasp the distinction is to think of irritation in relation to the muscles: muscular action happens without our being particularly conscious of it (think of heart beats, for instance), whereas pain causes sensation, of which we are aware and to which we respond. Haller’s work on irritability was of great importance in helping physiologists to think about the specific properties of muscle fibre (or more widely what will come to be known as human tissue), and indeed Diderot was extremely interested in this aspect. In part, what the physiological concept of irritation did was provide fodder for materialist thinkers. If materialism posited that nothing exists in the universe other than matter in different combinations, and therefore that everything is made of matter, then one of its main questions was how matter could feel, and subsequently, if it could think; its many detractors derisively called on materialists to explain this, satirically asking if they thought rocks could think. Jean-Jacques Rousseau was one such, as we saw in the previous chapter.  

Haller himself was a devout Calvinist, and within physiology, firmly situated in the mechanist camp, and he rejected appropriations or extensions of his work which denied or questioned the existence of the soul. However, the concept of irritability did make it possible to see that matter could

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22 ‘Il me semble que loin de dire que les rochers pensent la philosophie moderne a découvert au contraire que les hommes ne pensent point’ [It seems to me that far from saying that rocks think, modern philosophy has discovered, on the contrary, that men do not think], Jean-Jacques Rousseau, ‘Profession de foi du vicaire savoyard’, in *Émile* (1762), *Œuvres complètes*, ed. by Bernard Gagnebin and Marcel Raymond (Paris: Gallimard Pléiade, 1964), vol. 4, p. 584n; *Emile*, trans. by Allan Bloom (London: Penguin, 1979), p. 279 (slightly amended), as discussed above in Chapter 3.

23 For an immensely careful and illuminating account of this quarrel, see Marian Hobson, ‘Sensibility and Spectacle: the Medical Context for the “Paradox”’, in *Diderot and Rousseau: Networks of Enlightenment*, ed. by Kate E. Tunstall and Caroline
be reactive or responsive without consciousness, with a form of life and independence distinct from thought, whether or not thought was considered to be immaterial. Furthermore, a model according to which some sorts of organised matter have irritability and others sensibility makes it possible to conceptualise sensibility as a further development of irritability, and therefore to see it, and consciousness more widely, as a property of matter rather than of the soul.

Leading vitalists such as Théophile de Bordeu (familiar to readers of Diderot in the shape of the doctor in Le Rêve de d’Alembert) were directly challenged by Haller for using a notion of sensibility which was too broad-brush, giving too much self-organising autonomy and movement to the parts of the body.24 Yet Bordeu, in his work on the glands (1751), on the pulse (1756), and later on chronic diseases (1775), again and again returns to the question of the relation of part to whole, to the extent to which we can say that organs do or do not have their own particular life, using as his investigative principle this notion of the sensibility of flesh. The great anatomist Xavier Bichat (1771–1802), whose ground-breaking microscopy work on human tissue would found the medical sub-discipline of histology, claims Bordeu along with Haller as two of his three medical masters, so if one single thing is clear it is that this quarrel around sensibility and irritability was a productive one.25 What may not yet be particularly clear is how working on the organs, on the relationship of part to whole, and on their interdependence or independence is at all the same thing as looking at the properties of sensibility or irritability in human fibre, or what we now call tissue. This is because the definition of what an organ is has changed, and this is in part due to Bordeu and others like him. In the first edition of the Dictionnaire de l’Académie française (1694), the organ is the ‘instrument de quelque faculté dans l’animal’ [the instrument of some faculty in

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24 Marian Hobson, ‘Sensibility and Spectacle’, p. 76.
25 Rey, Naissance et développement, p. 371. Bichat’s third master was Lazzaro Spallanzani (1729–99), and he shouldn’t really be relegated to a footnote. He is celebrated for his work refuting the theory of the spontaneous generation of matter, for establishing once and for all that human reproduction requires both ovum and sperm, and for showing that digestion is not a muscular process whereby the stomach physically grinds the food but a chemical one in which the food is turned into a solution by the action of acid.
the animal]; in the second edition (1762), it has become a ‘partie du corps servant aux sensations et aux opérations de l’animal’ [part of the body of use to the sensations and operations of the animal]; it changes in the sixth edition (1835) to become ‘partie du corps organisé, laquelle remplit quelque fonction nécessaire ou utile de la vie’ [part of the organised body, filling some necessary or useful function of life]. This final definition is more or less the one we now work with, focusing on our vital functions, but it is clear that there is considerable change over the century, from ‘instrument of some faculty’ to ‘part of the body of use to the sensations and operations of the animal’ which is at once very important and very general. It might as well just mean ‘body part’, and the definition indicates a sort of problem with working out which bits exactly are of use, and in what way. This is where Bordeu’s insistence on the relation of part to whole was so important; it allowed physiologists to distinguish what exactly was a part that had autonomy, what wasn’t, and how those parts communicated. In his Recherches sur les glandes, Bordeu uses the metaphor of the swarm of bees to explore this idea. I would probably want to argue that Diderot’s famous development in the Rêve de d’Alembert of this exact same metaphor fed back into Bordeu’s thinking as we see it in the Recherches sur les maladies chroniques, where his model of the organisation of organs has moved on from the mechanical bee cog idea to take into account a more organic vitalist concept of reciprocity within the organism. As the previous sentence makes manifest, ‘organ’ and its multiple cognates are all coming under some pressure during this period: the term ‘organism’ is invented at the beginning of the century; ‘organisation’ has its own quite specific physiological meaning which also mutates throughout the century.

26 ARTFL’s database of French dictionaries, Dictionnaires d’autrefois (https://artfl-project.uchicago.edu/content/dictionnaires-dautrefois), is a vital tool for tracking definition shifts across time, see https://artflsrv03.uchicago.edu/philologic4/publicdicos/query?report=bibliography&head=organe.


This general account of the definitions and theories influencing physiology in the eighteenth century, specifically in France, and specifically with a view to enabling the reader to judge where Diderot locates himself, is inevitably cursory and reductive, foregrounding certain aspects and omitting others. There is a longer heritage to the way in which physiological thought underpins vitalism than has so far been suggested; the chemist and physiologist Georg Ernst von Stahl (1660–1734) who has just been invisibly referenced (as the coiner of the term ‘organism’) conceptualised the soul in terms of energy which moved the inert matter of the body: his theory is known as animism.\(^{29}\) Stahl’s animism was a crucial trigger for the development of vitalism in Montpellier through François Boissier de Sauvages (1706–67) who taught physiology and pathology there from 1734, and through him on Montpellier students such as Bordeu who qualified as a physician in 1744,\(^{30}\) and Paul-Joseph Barthez (1734–1806) who qualified ten years later in 1754, becoming known for his crusading theory of the ‘principe vital’. Laurence Brockliss and Colin Jones explain this theory


\(^{30}\) On Bordeu: Pierre Roussel, *Éloge historique de M. Théophile de Bordeu* (Paris: Ruault et Mequignon, 1788), p. 7. Pierre Roussel was himself a Montpellier doctor trained in vitalism; his *Système physique et moral de la femme* (Paris: Vincent, 1775) was well-received, and features on the reading list Diderot drew up for himself (see ‘Notes de la main de mon père sur la physiologie’, Diderot, *Éléments de physiologie*, ed. by P. Quintili, p. 389, and for the editor’s commentary, pp. 33–34). François Pépin convincingly argues that Stahl’s influence on Enlightenment vitalism is not in the mode of direct adoption, extension, or application, but is about countering his dualism: ‘il n’y a aucun lien possible entre l’animisme de Stahl et le vitalisme des Lumières. Il faut au contraire considérer que ce vitalisme se construit en large part contre Stahl, l’enjeu étant, non seulement d’étudier le vivant à partir du vivant en soulignant sa spécificité, mais d’inscrire les processus et les fonctions organiques dans le corps organique lui-même’ [there is no possible link between Stahl’s animism and Enlightenment vitalism. On the contrary, one should think of this sort of vitalism as constructed largely against Stahl, the issue being not only to study what life is in the living and thereby underline its specificity, but also to think of organic processes and functions in the context of the organic body itself]. François Pépin, ‘Diderot et Leibniz face à la chimie du vivant’ in *Leibniz et Diderot: rencontres et transformations*, ed. by Christian Leduc, François Pépin, Anne-Lise Rey, and Mitia Rioux-Beaulne (Paris: Vrin, 2015), pp. 211–35 (p. 235), https://doi.org/10.4000/books.pum.2153.
in their usual succinct and helpful way: the vital principal ‘was both a sensible and motor force, varied in its power from organ to organ, and operated sympathetically so that its activation in one spot could lead to its activation in another’.\textsuperscript{31} Barthez’s \textit{Nouveaux éléments de la science de l’homme} (1778) is rather unlike the other works of physiology looked at in this chapter, in that it focuses uniquely on the presentation of its own theory, and is therefore neither introductory nor comprehensive.\textsuperscript{32} It is nonetheless worth mentioning because of Barthez’s prominence as a vitalist looking at organs and their interconnectedness in ways not dissimilar to Bordeu’s thinking on the matter, and because his title, \textit{Nouveaux éléments de la science de l’homme}, seems to promise something both introductory (‘elements’) and revisionary (‘new’), setting itself apart from other texts by choosing to describe its object as ‘the knowledge of man’ rather than ‘physiology’. Diderot includes Barthez’s book in the reading list he drew up for himself when working on his own \textit{Éléments de physiologie}, but in fact only mentions the ‘principe vital’ once in the finished work.\textsuperscript{33} 

There is a further crucial ingredient that needs adding into the mix of concepts and models which Diderot had available to him, and it has already been mentioned both in relation to mechanism and vitalism: chemistry. Seminal mechanist and animist-vitalist physiologists Boerhaave and Stahl were both also chemists; their understanding of chemistry unsurprisingly splits along mechanical and vitalist lines. It was however the later research of Diderot’s chemistry tutor Guillaume-François Rouelle (1703–70) and \textit{Encyclopédie} contributor Gabriel François Venel (1723–75) that most influenced to Diderot’s thinking, and which leads François Pépin in his monumental study of the importance of chemistry for Diderot to conclude that chemistry provides him more than anything else with a ‘modèle de penser’ [model with which to

\begin{footnotes}
\footnotetext[31]{Brockliss and Jones, \textit{The Medical World}, p. 429.}
\footnotetext[33]{'Notes de la main de mon père sur la physiologie’, Diderot, \textit{Éléments de physiologie}, ed. by Quintili, p. 389 (and for the editor’s discussion of Barthez, pp. 43–44); the ‘principe vital’ is mentioned within the text on p. 126, almost in passing as a synonym for ‘life’, and therefore without any particular emphasis or attention being drawn to it. Terada adds depth to our knowledge of the extent to which Barthez contributes to Diderot’s thinking in the \textit{Éléments de physiologie}, see esp. MT 161n, 168n, 174n.}
\end{footnotes}
think] and ‘une source de modèles et d’orientations pour penser la nature et des processus’ [a source of models and perspectives to use for conceptualising nature and natural processes].

Fermentation will be one such specifically chemical notion which, in Diderot’s hands, becomes a tool for thinking about change in matter, in bodies, and in species.

In sum, eighteenth-century physiology can be understood as covering a spectrum of enquiry from the workings of bodies to life itself. Bodies themselves were understood to be a mixture of solids and fluids and needed to be investigated as such. There was great emphasis on the properties of flesh, specifically sensation and irritation, on the organs, their functions, and how they communicated or contributed to the body as a whole. These bodily functions generally include the following list: circulation, secretion, nutrition, digestion, respiration, sensation, and reproduction. The brain was mostly a mystery, although its physical appearance and constituent parts were recorded in ever greater detail.

Diderot’s Éléments de physiologie, like other general works of physiology, contains all these aspects, and takes up its own particular positions on them.

It might be helpful to indicate where critical literature has generally situated Diderot with respect to his physiological sources. The first point to make therefore, specifically in relation to this question, is that a clear differentiation has tended to be made between him and physiological writers who underwent professional medical training; he is understood to be at one remove from physiological research. Thus, he is seen to draw rather selectively on the careful physiological or anatomical descriptions of others, without also importing their conceptual frameworks. This

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35 Pépin, La Philosophie expérimentale, pp. 718–19.
36 Vicq’s Traité d’anatomie et de physiologie, coming out in 1786, two years after Diderot’s death, presents itself as ground-breaking in its investigations of the brain. It advertises itself as being the first of many volumes but in fact there was only one (was it too expensive a publication project?), and that one only covers dissections of the brain. The plates, of which there are seventy, are exquisite (Traité d’anatomie et de physiologie: avec des planches coloriées représentant au naturel les divers organes de l’homme et des animaux (Paris: de l’Imprimerie de Franç. Amb. Didot l’Aîné, 1786).
37 This is the case with respect to Jean-Paul Marat, Adriaan van der Spiegel (also known as Adrianus Spiegelius), Lorenz Heister, Marin Cureau de la Chambre, and
also applies to what is termed his appropriation and repurposing of the arguments or ideas of others, such that, as Andrew Clark puts it, their ‘meaning must be renegotiated’.\(^{38}\) Jean Mayer hones in on how he rewrites his ‘informants’: ‘il ne prendra chez ses informateurs que l’essentiel, simplifiant leur prose, comme Pascal lorsqu’il s’inspire de Montaigne ou de Charron’ [he will take from his informants only the essential, simplifying their prose, like Pascal does when taking inspiration from Montaigne or Charron].\(^{39}\) One might say that the definition of giving birth that opens the chapter is a good example of this stylistic paring down, but it is an interesting question as to whether what Diderot does is simpler, precisely. Paolo Quintili has a nicely paradoxical way of expressing the balance between source text and its new home: he talks of the ‘originalité de la synthèse diderotienne’ [the originality of the diderotian synthesis].\(^{40}\) Motoichi Terada follows the same line when he talks about ‘l’éclectisme diderotien, qui tisse un texte original à partir d’emprunts variés’ [diderotian eclecticism, weaving an original text from various borrowings].\(^{41}\) Alexandre Wenger and others characterise the recycling of pre-existing elements by reference to that mutating, splitting and reforming basic organism of nature, the polyp: they call it Diderot’s ‘style-polype’.\(^{42}\) Clark will see this in transformational terms, talking about ‘a poetics of physiology’, and in part what he is doing is extending the implicit analogy between physiological theory and its stylistic expression that Wenger is also using; Clark pushes it further, establishing a parallel between the physiological focus on the relationship between part and whole which has already been alluded to in relation to Bordeu, and Diderot’s new ‘assemblages’.\(^{43}\) François Pépin will emphasise instead (and in less exalted terms) just how hard it is to

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\(^{38}\) Quintili, ‘Introduction’, p. 36; and also with respect to Roussel and A. L. Thomas on the female variety of the human (Quintili, p. 40).

\(^{39}\) Mayer, Diderot, homme de science, p. 317.


\(^{41}\) MT 54.


\(^{43}\) Clark, Diderot’s Part, pp. 84, 81 respectively.
‘séparer ce qui appartiendrait à un savoir constitué en dehors de l’œuvre de Diderot et ce que celui-ci en fait’ [separate what belongs to specialist knowledge from outside Diderot’s œuvre and what he does with it].

It seems helpful here to heed Wenger’s remark about the relationship between Diderot’s text and the field of physiology, despite the fact that he is referring to the Rêve de d’Alembert rather than the Éléments de physiologie: ‘ce texte, partie d’un tout dont l’achèvement se situe toujours dans le futur, est appelé à être révisé sans cesse’ [this text, part of a whole whose completion is always located somewhere in the future, requires constant revision]. Hopefully, this reminds us why Diderot needs to draw on quite so many sources: it is not that he lacks originality or is a plagiarist, but rather that the area covered by physiology is vast and that he is integrating new developments; as a field of knowledge (what we now call a science) it was changing all the time, ceaselessly revised, modified, added to, whether in terms of specific details that came to be better understood, or in terms of the over-arching theories that make sense of the cumulative mass of local description and information. To have a single text which contained all this, was both introductory (in the sense that ‘éléments’ provide the basics), complete, up-to-date and accurate (in that it covered all constituent parts and how they operate together), and clear (in that the details did not overwhelm a sense of the whole) was (and remains) extremely challenging.

‘Il faudroit enfin un Descartes ou un Leibniz’

Physiologists of the period were aware of the difficulties of the genre, and repeatedly mention it as a challenge or a problem. Vitalist contributer to the Encyclopédie Ménuret de Chambaud gives a long list of what is required ‘pour faire une bonne physiologie’ [to do a good physiology] in his article OBSERVATION. Bordeu lambasts the ‘faiseurs de physiologie ordinaire’ [‘the makers [writers/compilers]
of ordinary physiology’] and Bordenave, lobbying for the qualities of his own *Essai sur la physiologie*, writes that ‘Je sçais qu’on ne manque point de Livres sur la Physiologie, mais ils sont ou trop abrégés, ou trop étendus, ou au-dessus de la portée des Etudians’ [‘I know that there is no lack of books on physiology, but they’re either too short, too long, or beyond the reach of students.’].

Perhaps here he is allowing himself to criticise Haller, whose summum, the *Elementa physiologiae corporis humani*, ran to eight relatively indigestible (and Latin) volumes (1757–66); perhaps however Bordenave’s subsequent translation of Haller’s *Prima lineae* (1769) is an implicit avowal that his own *Essai* had not turned out to be quite so authoritative or popular as he had hoped.

Vicq d’Azyr will be very critical of the sloppy and discursive writing styles of his brother physiologists (sadly, no sisters): ‘Ce qui a le plus contribué à rendre les descriptions informes et prolixes, c’est l’usage où la plupart des auteurs sont de s’interrompre pour disserter sur ce qu’ils exposent’ [What has contributed the most to the shapelessness and verbosity of [physiological] description is the habit that most authors have of interrupting themselves to comment on what they are describing].

But then Vicq only completed the first volume of his ambitious and no doubt extremely expensive entreprise, the *Traité d’anatomie et de physiologie*, while Bordeu never did get round to writing a ‘physiologie’. He did however call for a philosophical genius to do so: ‘Il faudroit enfin un Descartes ou un Leibniz, pour débrouiller ce qui concerne les causes, l’ordre, le rapport, les variations, l’harmonie, et les lois des fonctions de l’économie animale’ [ultimately what is needed is a Descartes or a Leibniz to disentangle everything relating to the causes, order, connections, variations, harmony, and laws of the functions of the animal economy].

An interesting and surely significant appeal, this, in a book we know Diderot read, written by a friend of his whom he will later transform into a major voicepiece for materialist and medical theory in *Le Rêve de d’Alembert* (1769). Certainly, Diderot’s own

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Physiologie does attempt to cover all these aspects, although he leaves speculation about impenetrable causes aside, exorting us instead to start with the facts. So, if on the one hand there was a sense of the need for a ‘bonne physiologie’ to rise above the ‘faiseurs de physiologie ordinaire’, to avoid tedious commentary, to be neither too short, too long or too hard for the student to understand, and if, on the other hand, at least one of these physiologists considered that the only person able to balance all the different aspects would be a philosopher of the stature of a Descartes or a Leibniz, then it does look as if there was room and even appetite for such as Diderot to have a go.

Indeed, in his 1964 edition of Diderot’s Éléments de physiologie, Jean Mayer ‘noted that it is superior, in many respects, to most other such tracts that were available at the time’. Kurt Ballstadt is more effusive than the cautious Mayer: he calls it ‘Diderot’s second encyclopedia’ and his ‘pièce de résistance’. Even Jean Rostand, who only knew the Éléments in the early incomplete draft (published by Assézat and Tourneux from the manuscript in the St Petersburg archive) writes the following words in praise of the Éléments: ‘Enfin, indépendamment de leur contenu scientifique, que de formules vives et plaisantes, dans les Éléments de physiologie, nous font souvenir du grand écrivain qu’était Diderot’ [Also, scientific content apart, how truly the vigorous and striking expressions we find in the Éléments de physiologie remind us of what a great writer Diderot was].

Of course, we already know that there is another side to this story of praise: viz, that critics often refer to it as incomplete. We looked at how the mystification about fragments came to have purchase in Chapter 2. We will not open that question again here, returning instead...
to the comparative analysis of different introductory works to the field of physiology in France in the second half of the eighteenth century. A simple way to grasp the continuities or differences in emphasis and approach is to compare their structure and contents, and to do so in chronological order of their publication (or, in the case of Diderot, composition). This handful of works, starting with Haller, have been chosen to span the period just before and after Diderot was writing so as to get some sense of what the field was like, and also in reference to their title: they need to be attempting some form of introduction or overview of physiology. Specialist works, even if they are known to have influenced Diderot’s thinking on physiology, will not therefore be taken into consideration.56

Introductory Physiologies: Structures and Contents

The master Haller’s one-volume *Primae lineae physiologiae* (1747) and his eight-volume master work the *Elementa physiologiae* (1757–66) move through the same sequence of body parts and functions. As he is the reference point for every subsequent physiologist we will be looking at, the sequence is worth describing. The *Primae lineae*, or *Éléments de physiologie* as both Tarin and Bordenave’s translations call it, plunges straight into a description of the fibre after only the briefest introduction. The *Elementa physiologiae* itself does not have a great deal of introductory matter, and after only a few pages establishing the recent history of new discoveries in physiology and anatomy and one introductory page on the wider subject of physiology and proper methods of observation, also gets straight into detailed description of the fibre.57 The *Primae lineae* has thirty-five chapters (there is no superstructure grouping these chapters into various parts), and their headings contain about an equal number of named body parts or elements of the body (such as cellular tissue and fat, or the heart, the brain, the intestines, etc) and functions (such as circulation, secretion, nutrition, muscular movement, etc). As we already said, Haller’s *Elementa* moves through the same sequence

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56 The interested reader may wish instead to consult Motoichi Terada’s edition, with its panoply of helpfully-reproduced sources.

57 The volumes of Haller’s *Elementa physiologiae corporis humani* are online at https://catalog.hathitrust.org/Record/008593541.
as the *Prima lineae*, although grouped into separate volumes. The first
volume looks at the fibre, blood vessels, circulation of the blood and at
the heart. Volume 2 looks in greater detail at the character of blood and
then at secretions. Volume 3 looks at respiration and the voice; volume
4 at the brain, nerves, and muscles. Volume 5 treats the internal and
external senses. Volume 6 looks at deglutition, the stomach, the stomach
lining, the spleen, pancreas and liver. Volume 7 turns to the intestine,
the digestive fluid chyle, urine, semen and ‘women’s matters’. The final
volume deals with the life of the foetus. Interestingly, there is no main
heading dealing with the skeleton or with bones more generally.

Bordenave’s *Essai sur la physiologie* (1764) is close to Haller in
terms of content and order with one principal difference: he also has
a substantial first part entitled ‘Des Élémens ou principes en général’
which looks at the properties of matter and their different elements,
including a section on sources of heat (air, water, oil, salt and earth). His
‘Parties qui constituent le corps de l’homme’ [constituent parts of the
human body] then broadly follows Haller’s sequence, with an increased
focus on bodily functions as opposed to body parts in the chapter titles.
Bordenave also inserts a chapter on sensibility and irritability in a
prominently early position (after chapters on Fibre and then Cellular
Tissue and Fat), which also draws closely on Haller.

Diderot’s *Éléments de physiologie*, which in terms of the dates of its
composition (c.1773–c.84) falls between Bordenave and Vicq d’Azyr
(1786), also has a first part. He names it ‘Des Êtres’, and it starts, like
Bordenave, with elements, matter, and molecules, moving on to consider
life in its ‘végéto-animal’, ‘animal’, and human forms. He makes some
strongly vitalist statements: ‘Sans la vie rien ne s’explique’ [without
life nothing can be explained] and ‘Sans la vie, nulle distinction entre
l’homme et son cadavre’ [without life, there is no distinction between
a man and his corpse]. He considers both sensibility and irritability
as general properties of living things, looking in turn at life, death,
movement, reproduction, species, size, the morality (or behaviour)
of animals, their grace and beauty. In the chapter on Man he looks at
reason, thought, and soul. His second part, the ‘Éléments et parties du
corps humain’ [Elements and parts of the human body] is famously the

58 *Éléments de physiologie*, PQ 126.
part which is closest to Haller, with a first chapter on the fibre, and a first line of that first chapter which reproduces a sentence of Haller’s almost word for word.⁵⁹ However, this chapter on ‘Fibre’ is preceded by a very unHallerian introduction, opening with the following sentence:

L’homme a toutes les sortes d’existence: l’inertie, la sensibilité, la vie végétale, la vie polypeuse, la vie animale, la vie humaine.⁶⁰

Man has every kind of existence: inertia, feeling, vegetable life, polypous life, human life.

Diderot’s framing gives a decidedly materialist orientation to this second part on the ‘Elements and parts of the human body’, emphasising its relationship to the contextualising first part on ‘Beings’ more widely. It contains twenty-five chapters, and all, apart from one (‘Génération’), have an element or part of the human body as their title, and are not therefore organised according to abstracted bodily functions. In general, it contains a good deal of Hallerian physiology, but the order is different, starting with no fewer than four chapters on the basic constituent parts of flesh (fibre, cellular tissue, membranes, fat), then moving to the brain and nerves, thereafter muscles generally, then heart, blood, arteries and the lymphatic system, glands and other secretions, and bit by bit down the torso from chest to stomach and organs of digestion and excretion, and finally the reproductive organs, ending with the foetus.⁶¹ It packs a great deal of very succinct description into about a third of the length of Haller’s Primae lineae.

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⁵⁹ ‘En physiologie la fibre est ce que la ligne est en mathématiques’ [in physiology the fibre is what the line is in mathematics], (PQ 156): Editors Jean Mayer and Paolo Quintili remind us of Haller’s Latin: ‘Fibra enim physiologo id est, quod linea geometrae’ (Elementa physiologiae, vol. 1, p. 2, quoted DPV 338n and Éléments de physiologie PQ 156n). Clark draws attention to Diderot’s meaningful substitution of mathematics for geometry, and points out that Diderot may have got the phrasing from Haller, but that it wasn’t original to Haller either. Haller got it from Francis Glisson (1597–1677), Professor of Physic at Cambridge from 1636. Clark, Diderot’s Part, p. 75.

⁶⁰ DPV 337/PQ 155/MT 157.

⁶¹ Mayer points out that this second part is influenced in its broad conception by Bordeu’s emphasis on the triumvirate of brain, heart, and stomach, as well as being packed with physiological information from Haller’s Primae lineae and Elementa physiologiae. Mayer, Diderot, homme de science, pp. 279–80. Terada shows that while the earlier draft of the Éléments de physiologie, which we call SP, follows Haller’s conceptual ordering of subjects, the mature one, known as V, departs from it (MT 53).
The third part contains the ‘Phénomènes du cerveau’ [phenomena of the brain], and most of it does not have an equivalent in Haller. In its opening chapter, Diderot describes sensation and the sensory organs, to which the Primae lineae had given six separate chapters, book-ended by the topics of muscular movement and sleep; ‘Sleep’ in Haller’s treatment is then followed by twelve chapters on hunger and aspects of digestion. Diderot, as we see, organises things very differently: from sensation he moves to ‘the understanding’, memory, imagination, sleep, the will, passions, organs (which looks, Bordeu-fashion, at the extent of their independence and dependence), diseases, and finally the conclusion. Memory in fact is briefly treated in Haller as part of a chapter on ‘internal senses’, while sleep, as we have seen, has its own chapter. They do not have the rest of the chapter headings in common. So Diderot’s Physiology has its own quite distinct character, commencing with matter and living beings, then describing the human body, and finally moving to the mind and looking at our experience of the outside world and of ourselves, as rooted in our physiology and its particularities or (more often than not) peculiarities.

Vicq’s Traité d’anatomie et de physiologie (1786) has a fifty-page opening discourse in which he discusses the difficulty of the subject, opines that physiologists should not attempt to track down causes but base their analyses on effects, as has only just begun to be attempted by ‘[les] écrivains les plus modernes’ [the most modern writers] and that enough is now known, however imperfect, to supply ‘des résultats utiles à la Médecine et à la Philosophie’ [useful results for both medicine and philosophy]. The structure that he announces gives headings only to nine identified bodily functions, in the following order: digestion, nutrition, circulation, respiration, secretion, ossification, reproduction, irritability, sensibility. It is interesting to see ossification appear here, as bones do not feature as a chapter heading in the previous works we have been considering. Exactly how Vicq would have managed the structure cannot be predicted, given that all we have is this first volume. Apart

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62 Terada discusses, with respect to the ordering of Éléments de physiologie, part 3, what he calls ‘la singularité du châpitrage’ (the peculiarity of the chapter divisions) (MT 97).

63 Vicq, Traité d’anatomie, pp. 6–7.

64 Vicq, Traité d’anatomie, p. 15.
from its introductory discourse, it contains a seventy-page physiological vocabulary list with definitions, and then moves on to the plates describing the brain.

Fig. 4.1 Felix Vicq D’Azyr, Traité d’anatomie et de physiologie, EPB F694. Plate 19, engraving showing dissection of the brain, Wellcome Collection, https://wellcomecollection.org/works/yprjdx8t, CC BY 4.0
The final work we will be looking at, the *Nouveaux élémens de physiologie*, signals its revisionary and introductory aim very clearly. Its author, Anthelme Richerand, would go on to edit Bordeu’s complete works.\(^{65}\) Dedicated to the influential ideologue Pierre-Jean-Georges Cabanis (whom we will be discussing in ‘9. 1796–97: Cabanis and Destutt de Tracy at the Institut national’), it appeared in 1801 and by 1811 was being reprinted in its fifth revised edition.\(^{66}\) His *Nouveaux élémens* spans two volumes and has two parts: the shorter introductory first part discusses natural beings, differences between organic and inorganic bodies, animal and vegetable properties, life, sensibility, a series of Barthez-influenced chapters on sympathies between different parts of the body and on habit and the ‘principe vital’. Part two looks at the vital functions (digestion, absorption, circulation, respiration, secretion, nutrition, sensation, reproduction) and also contains separate chapters on movement, voice and speech, ending with a survey of ageing and variety in temperament, death and decay. The chapter on sensation (which falls at the beginning of volume 2) has subsections on the understanding, on passions, sleep and sleepwalking. The opening topics in part one are, of course, strikingly close to Diderot’s own opening section.\(^{67}\)

Of all these figures, Haller is the only one not to include introductory matter setting human physiology in a vaster context, whatever that might be. It is interesting to consider the extent to which his omission of these sorts of questions might well be one of the factors enabling historians of science such as François Duchesneau to identify him as a founder of modern physiology, introducing a sort of medical modernity which is in fact synonymous with the abandonment of philosophical enquiry. Haller himself would have been anxiously determined to adhere to a religious and Calvinistic understanding of creation, and therefore left these questions aside precisely because they were important and polemical. The modern science of physiology with its delimited definition does not include such contextualising questions in its introductory

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67 We do not have the space here to develop this particular parallel, but Richerand appears again later in the book in ‘9. 1796–97: Cabanis and Destutt de Tracy at the Institut national’. 
overview textbooks. However, most of the physiologists mentioned in this chapter—Bordeu, Tarin, Bordeneuve, Barthez, Diderot, Vicq, and Richerand—all of whom were aware of and variously influenced by Haller’s work, did emphasise such questions, and perhaps this is because of the increasingly dominant vitalism in French physiology of the period. As François Victor Mérat de Vaumartoise, co-editor of the *Dictionnaire des sciences médicales* (1812–22) remarked in his definition of ‘Vitalistes,’ ‘il n’est guère permis à l’époque actuelle de n’être pas vitaliste; les progrès des sciences médicales nous ont ramené de toutes parts à cette croyance en nous montrant le vide des autres opinions, et la puissance des forces de la vie’ [it is hardly acceptable in current times not to be vitalist; the progress of the medical sciences has in every instance reinforced the validity of this view while demonstrating the nullity of any other opinion, as well as the power of the forces of life]. If Vaumartoise’s strident assertion in fact indicates the continuing presence of debate rather than the contrary, there is no real doubt that physiology of the period did see itself as linked to understanding what life was.

Diderot will answer this question from an unhesitatingly materialist point of view, and this, therefore, is what makes his *Physiologie* distinctive. The actual number of pages taken up by the description of

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68 Walter F. Boron and Emile L. Boulpaep open their Physiological textbook with the title question ‘What is physiology?’ This is their definition: ‘Physiology is the dynamic study of life. Physiology describes the ‘vital’ functions of living organisms and their organs, cells, and molecules. For centuries, the discipline of physiology has been closely intertwined with medicine. Although physiology is not primarily concerned with structure – as is the case for anatomy, histology, and structural biology – structure and function are inextricably linked beause the living structures perform the functions.’ Walter F. Boron and Emile L. Boulpaep, *Medical Physiology*, 3rd edn (Philadelphia, PA: Elsevier, 2017), p. 2. It is interesting to note, given the earlier discussion of the aims and conversely pitfalls of physiology manuals, that Boron and Boulpaep also have a sense of the difficulty of the entreprise: ‘We were intrigued by an idea suggested to us by W.B. Saunders: write a modern textbook of physiology that combines the expertise of a multi-author book with the consistency of a single pen’ (Preface to the First Edition, p. ix).

human physiology is proportionally smaller than these other writers, while the opening and final sections on, firstly, the elements of life and death, and secondly, sensation, the mind, and experience, are proportionally greater. His *Physiologie* is characterised by descriptions which are more severely concise and selective than those of his peers, and also by a consistently anti-abstract approach. He gives many more case studies, examples, and anecdotes than these other writers who consistently describe a universalised body. For him, instead, it is always about a particular body in time and space, whether his own or someone else’s.  

If nature is matter and life is sensibility, and physiology is nature, matter, life and sensibility all in one conjoined mass, then what does that feel like? The point being, presumably, that that conjoined mass is what we are, no more or less and for no longer than it continues to function. This approach is what characterises Diderot’s particular brand of materialist vitalism. We will now turn to look at these two aspects of concise description and anti-abstraction in more detail.

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Here is how Haller describes what the chest is, what it’s made of and what its three-dimensional form is:

Nous appelons POITRINE ou THORAX une espece de cage composée d’os & de cartilages, dont les intervalles sont remplis par des muscles; elle a la figure d’un cône obtus, plus étroit à la partie supérieure et presque ellyptique; cependant applati en devant et divisé à sa partie postérieure par une éminence.  

We will call CHEST or THORAX a sort of cage made of bone and cartilage with muscles filling the spaces in between; its shape is of an obtuse cone, narrower at the top and almost elliptical, flattened on the front and divided at the back by an eminence or raised part.

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70 See Diderot, *Éléments de physiologie*, ‘j’avais 66 ans quand je me disais ces vérités’ [I was 66 years old when I told myself these truths] (DPV 313/PQ 129/MT 136); ‘Il me semble que j’entends crier ma femme’ [I seem to hear my wife cry out] (DPV 359/ PQ 179/MT 179).

A sort of cage made of bone and cartilage with muscles filling the spaces in between is relatively straightforward to visualise, although rather grotesque if taken literally. The second part with its sequential geometrical description is less easy to absorb or translate into an image. An obtuse cone, narrower at the top, almost elliptical, that is flatter on the front and divided at the back by an eminence, or raised part? If I did not know already what a chest looked like, I would have no idea how to translate this description into a meaningful shape. Elsewhere, it is described not as an obtuse cone but as a truncated one (a ‘cône tronqué’). Bordenave followed this definition very closely in his own attempt at a concise physiological manual. He writes:

La Poitrine ou Thorax est une espece de cage composé d’os, de cartilages et de muscles. Sa figure dans l’homme pourrait être comparé à un cône tronqué, aplati sur le devant, dont la base est inférieure. Son plus grand diamètre est d’un coté à l’autre, et le plus petit de la partie antérieure à la postérieure.

The Chest or Thorax is a sort of cage made of bone, cartilage, and muscle. Its shape in humans is comparable to a truncated cone, flattened on the front, and whose base is at the bottom. Its widest diameter is from one side to the other, and the narrowest from the front to the back.

As we see, the ‘sort of cage’ image is reproduced identically, although Bordenave adds a quick gloss to clarify that the geometrical description which follows relates to its shape as found in a human being. Thereafter he slightly rephrases Haller: using the notion of ‘truncated cone’, he retains the description of the flattened front, but instead of saying that it is narrower at the top, he says that the base—i.e. the wider part—is at the bottom; he then starts talking about diameter, anterior and posterior.

In terms of ekphrasis, his description is not very helpful. His and Haller’s descriptive method would work to a certain extent if the text were accompanied by a diagram, although arguably the diagram would render the description redundant. As a stand-alone description, it is simply confusing. Compare with Diderot’s description:

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73 Bordenave, Essai sur la physiologie, p. 102.
Poitrine, grande cavité formée par les côtes, le cou et le diaphragme.\textsuperscript{74}

Chest, large cavity formed by the ribs, the neck, and the diaphragm.

His brevity is so startling as to be almost comical when compared to the efforts of Haller and Bordenave. He does not overlay his description with metaphorical cages, or geometrical abstractions and measurements. He simply calls the chest a large cavity formed by the ribs, the neck, and the diaphragm, producing an image in words which is immediately comprehensible and visualisable, keeping a consistent and unencumbered focus on what he is talking about—the body itself.

This approach to physiological description which I have called more severely concise and selective than that of his peers derives from unparalleled experience of describing things in words—the decades of work on the Encyclopédie articles and plates, and the experimental ekphrasis of painting and sculpture we find in the Salons. The concision is not an end in itself; it is about the clarity and efficacy of the textual description of a physical object, such that description becomes evocation in the most direct way possible. Freed from the labyrinth of detail that ensnares other physiologists (however much they attempt to clarify, explain, and make accessible in their various manuals, essays, and translations), Diderot starts but does not end with description. He defines, evokes, gives odd variants that may illuminate or may challenge existing knowledge, explains how the part or function of the body he is describing works with the whole, and he moralises, by which I mean, he comments on connected behaviour. This is the pattern that dominates in his Éléments de physiologie, and any one page would give examples of it. We will simply look here at the brief ninety-word sub-section describing the organ of taste, without however contrasting it with Haller’s more exhaustive physiological description; hopefully the way in which Diderot selectively uses and departs from Haller is now clear.\textsuperscript{75} The passage is relatively terse and not particularly striking.

\textsuperscript{74} DPV 392/PQ 210/ MT 211.

\textsuperscript{75} Haller, Éléments de physiologie, ch. XV: ‘Du Goût’, §CDXLVIII-CDLVIII; tr. Tarin, pp. 103–06; tr. Bordenave, t. 2, pp. 18–26. Terada shows that in this section Diderot also draws on Antoine Le Camus’s Médecine de l’esprit, see MT 454, source notes xv–xviii.
Goût
Si l’impression se fait sur les papilles de la langue, la sensation est du goût.
Si le siège du goût est dans la langue, il s’affaiblit en approchant de l’épiglotte. Une fille, qui pour toute langue n’avait qu’un tubercule, goûtait. La langue a des papilles de deux espèces, des tronquées et des frangiformes.
Le palais, le tour de la bouche, le gosier sont encore des organes servant au goût.
Le goût est le dernier des organes qui s’éteigne : il n’est donc pas étonnant que les vieillards aiment la table.76

Taste
If an impression is made on the papillae of the tongue, the sensation is one of taste.
Taste is based in the tongue and is weaker closer to the epiglottis. A girl, who had nothing but a tubercle for a tongue, could still taste. The tongue has two sorts of papilla, truncated and fungiform.
The palate, the whole mouth, and the gullet are also organs which contribute to taste.
Taste is the last organ to go, which explains why old people like eating so much.

Diderot defines and distinguishes taste in the wider context of sensation in general, locating it principally in the tongue but also looking at a counter-example which shows that even with only a sort of protuberance for a tongue, the organ of taste can still function. However, this counter-example is not generalised, unlike my gloss of it; Diderot turns the counter-example into a living case by attaching it—albeit cursorily—to the experience of one particular girl. He moves without explanation or any transitional gestures to the different sorts of papillae (containing the taste buds), then surveying the subsidiary taste organs, to return at the end to taste as a sensory organ amongst others, to its life (its growth and decline) within the life of the body as a whole. The final clause moves further outwards, connecting physiology and its cycles to a sort of common knowledge or received wisdom.

76 DPV 449–50/PQ 274–75/MT 266.
about old people, their behaviour and preferences. The passage as a whole is very economical (more than this commentary on it is able to be!), and gives only key points: what is taste; where is it located; what are its physiological mechanisms; what are its limits; what is its life cycle; what are the implications of this for human experience.

These will be Diderot’s questions for every part of the body; if the patterns and processes of physiology determine, frame, and initiate every interrogation, it is never confined to them, and will always move on to consider the related aspect of human experience, bringing in observations of more or less moralising character and connecting them to shared knowledge about human life, its phases and types. Thus he consistently avoids abstraction by always asking the same question: what does it feel like? And by consistently asking this question, Diderot also avoids the sort of dehumanised approach which underpins Haller’s work, and is objectionable to read when it breaks surface, such as in the following instance, where Haller talks in comparative terms about the properties of skin:

La surface interne de l’épiderme est plus *pulpeuse*, demi-fluide & comme composée de *mucus*; celle des Européens se sépare difficilement, celle des Nègres d’Afrique plus aisément [...].

The internal surface of the epidermis is more *pulpy*, semi-fluid and as if made of *mucus*; in Europeans, it can only be separated with difficulty, whereas in African Negroes it is much easier.

Of course, Haller is not trying to section the epidermis of living Europeans and Africans but is alluding to his difficulties in dissecting corpses; his vivisectional experiments related to animals, and this is a subject we touched on earlier in the chapter. Nonetheless, the generalisation about white and black skins has a nasty resonance, not least because Haller does not talk about white skin and black skin, he talks about Europeans and Negroes from Africa, which in the context of the eighteenth century means colonisers and colonised, masters and slaves. Furthermore, there is an implicit notion of hierarchy in the idea of the tougher European skin, as Haller’s following remarks, likening

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black skin to animal skin, make all too clear. And although Diderot copies almost word-for-word some parts of this chapter on the sense of touch, including Haller’s definition of skin, he places this particular comparison of Haller’s elsewhere, in his chapter on Membranes, and he removes the connected remark about the similarity with animal skin. What we do find in Diderot is an extended meditation on the difference between flesh, which is endowed with sensation, and wood, which is not. Again, Diderot is asking the question: what does it feel like? And it may well be that this passage is at least in part a subterranean reaction to Haller, and an implicit correction. It’s a bravura piece, and here it is:

Pourquoi tant de différence dans le pincer d’une tenaille de bois ou de fer et d’une tenaille de chair, ou de deux doigts ?

La tenaille de bois ne sent pas, celle de chair sent ; la tenaille de bois ne souffre pas, celle de chair souffre, la tenaille de bois n’est pas chatouillée, la tenaille de chair l’est. La tenaille de bois ne se refuse pas à sa rupture, la tenaille de chair s’y refuse. La tenaille de bois ne sent ni sa force, ni sa faiblesse, la tenaille de chair la sent : la tenaille de bois, après sa rupture, ne se meut pas, la tenaille de chair se meut [ ...] la tenaille de chair était en conspiration, et reste en sympathie avec d’autres organes. La tenaille de bois ne s’accroissait, ni ne vivait, la tenaille de chair avait un

78 ‘Chez ces derniers [les Nègres d’Afrique] elle est vraiment membraneuse, solide et séparable, ainsi que dans le palais des animaux’ [In the latter (African negroes) it is truly membranous, solid and separable, similar to the palates of animals] (Haller, Éléments de physiologie, trans. by Bordenave, vol. 2, p. 4). Diderot uses this passage in his chapter on Membranes, but without the comparison to animal skin, see DPV 344/PQ 162/MT 163.

79 ‘Ce qu’on appelle PEAU, est un tissu dense, composé d’une grande quantité de cellules extrêmement rapprochées, dont les fibres sont entrelacées et embarrassées les unes dans les autres; elle est conséquemment extensible, contractile & poreuse’ [What is called SKIN is a dense tissue composed of a great number of cells which are extremely close together and whose fibres are interlaced and entangled; it is consequently extensible, contractile & porous] (Haller, Éléments de physiologie, trans. by Bordenave, vol. 2, p. 2 [§ CDXXVI]; Haller’s capitals and italics). And here is Diderot: ‘La peau est un tissu dense, composé d’un grand nombre de cellules rapprochées, dont les fibres sont entrelacées et embarrassées les unes dans les autres. Elle est extensible, contractile & poreuse’ [The skin is a dense tissue composed of a great number of cells which are close together and whose fibres are interlaced and entangled; it is consequently extensible, contractile & porous] (DPV 447/PQ 272/MT 163). He has simply removed the adverbs and the typographical emphasis. See the previous footnote for the reference to the Membrane chapter.
accroissement, et sa vie. En général dans l’animal et dans chacune de ses parties, vie, sensibilité, irritation. Rien de pareil dans la matière brute.

Why is there such a difference between the pinch of wooden or iron pincers and of flesh pincers, or of two fingers?
The wooden pincers don’t feel anything, the flesh ones do; the wooden pincers have no pain, the flesh pincers do, the wooden pincers don’t feel any tickling, the flesh pincers do. The wooden pincers do not put up any resistance to being ripped apart, the flesh pincers do. The wooden pincers have no sensation of their strength or weakness, the flesh pincers do: the wooden pincers, once torn apart, don’t twitch, the flesh pincers do (…) the flesh pincers conspired with other organs, and remain in sympathy with them. The wooden pincers didn’t grow or live, the flesh pincers had growth, and their own life. In general in the animal and in each of its parts, there is life, sensibility, irritability. There’s nothing of the sort in raw matter.

This peculiar comparison of flesh pincers and wooden ones is peculiar precisely because it is depersonalised. If at the beginning we are reminded that the analogy is with fingers, thereafter Diderot prefers to use the defamiliarised image of the flesh pincers, thereby emphasising the parallel with the tool made from inanimate matter so as to pursue the imaginative investigation of what sensation is and how it works. It also inverts the expected perspective, in the same way that the comparison between love and a piece of fruit that this study opens with also did. There, we were asked to think about the question of desire from the point of view of the piece of fruit; here, instead of exploring the question of painful sensation being inflicted by pincers, we are thinking of painful sensation inflicted on pincers. And although this analogy is depersonalised, it is not abstract, because it is relatable; it asks its reader to relate to the questions, to follow the thought experiment, and to use that imaginative experience to consider life as characterised by sensation, or in this instance, pain. The narrative moves from the pleasurable notion of a tickling sensation to the violent one of severing, the flesh twitching in reaction to being severed, still ‘in sympathy’ with the other organs it is no longer attached to. And further, it uses this two-part notion of severing and connection to ponder the relation of part

80 DPV 449/PQ 274/MT 265–66.
to whole, a question which was much debated at the time, as we have already mentioned.

Diderot’s ‘what does it feel like’ means, as we have said, that we hear about many people, including himself, in the course of these pages. Perhaps the most remarkable and certainly the longest examples recount, in a footnote which swells to take up the whole page, the stories of two couples who fall pregnant when it should have been anatomically impossible for them to do so.  

Fig. 4.2 The swollen footnote, BnF, Manuscrits, NAF 13762, f. 96v.-97r., Denis Diderot (copyist ‘E’), c. 1780, Pen and Paper, Denis Diderot, Éléments de physiologie, Fonds Vandeul, Bibliothèque nationale de France, CC-BY

81 I further analyse these cases in my chapter “‘Autre fait arrivé au château de Nicklsburg, en Moravie”: Diderot and the Horrid Case Study’, in The Dark Thread: From Tragical Histories to Gothic Tales, ed. by John D. Lyons (Newark: University of Delaware Press, 2019), pp. 149–59. I thank John D. Lyons and the University of Delaware Press for allowing me to re-use some of that analysis here, and I would also like to record my gratitude to Professor Lyons and the University of Virginia for the generous funding which made it possible for me to attend the ‘Dark Thread’ conference (from which the edited book emerged) in Charleston, March 2016.
The footnote is in Part II of the Éléments de physiologie, in the long chapter on reproduction and how it occurs.\(^{82}\) (Diderot presents five different theories.) This footnote gives two examples from two different sources of the statement in the main body of the text about it being possible to get pregnant even when—as he carefully puts it—the woman is infibulated, that is, without any apparent vagina. The first case relates how the lover of a young woman with this particular problem is not put off, but simply requires her to indulge him in a different way, as the text coyly says, going on to report that she happily obliged.

Fig. 4.3 The resourceful lovers, BnF, Manuscrits, NAF 13762, f. 96r., Denis Diderot (copyist ‘E’), c. 1780, Pen and paper, Denis Diderot, Éléments de physiologie, Fonds Vandeul, Bibliothèque nationale de France, CC-BY

Her stomach starts to swell and she calls a doctor, who pronounces her pregnant. She has no difficulty proving to him that this is impossible, and yet her stomach and bosom continue to swell, and she calls him a second time. He swears she is pregnant, but the young

woman and her lover pay no attention. After nine months she has terrible pains, and after horrendous tearing a baby is born ‘by the same route he was conceived’. Diderot finishes by saying he does not know whether the mother and child died or not, but that her particular ‘formation’ is in no way uncommon. He then supplies his scholarly source.

The second instance, repeated verbatim from an account by ‘Mr Nuch’ in the *Journal historique et politique*, is alluringly introduced as ‘another true story that took place in the castle of Nicklsburg in Moravia’—a good gothic setting for a lurid story. It involves a twenty-two-year-old soldier whose stomach started swelling and who complained of nausea. He was treated for dropsy, although to no effect. His stomach kept growing, but he felt fine, and it had no impact on his ability to carry out his duties which he kept on with very cheerfully.

Then, on 3 February 1774 he suddenly had acute pains in his lumbar region. First he was treated with sedatives, which did not work, then they gave him a lumbar puncture which also did not work. They tried bleeding him. Nothing worked, and the pains just grew worse and worse. He started going into convulsions. After ninety-seven hours of suffering, he died. This was all so surprising and baffling that an autopsy was performed, and imagine everyone’s surprise—interjects Nuch—when they discovered a sort of cyst or sac in the soldier’s abdomen in which they found a perfectly formed—although dead—baby boy. This sack was of course a uterus which communicated with the rectum by means...
of a very narrow tube that was even smaller, we read, than the ink feeder in a fountain pen. Otherwise, the soldier was ‘perfectly’ male both internally and externally. The unnamed and unpersonalised observers then remember that the soldier had complained he felt something moving inside him about thirty hours before he died. The story ends balefully: ‘they’ are in no doubt about how this all happened, but just for the avoidance of doubt, they seize the soldier’s bedfellow, clap him in irons and repeatedly ‘threaten him’ until he finally admits what ‘they’ had ‘violently suspected’. And there, with a cursory reference to the source, the footnote ends.84

84 Gazette des Deux-Ponts (1775), number 22. At the beginning of the anecdote, he had also referenced ‘Mr Nuch, chirurgien-major des troupes de la garnison de ce
Of course the history of medicine and of law is full of bizarre ‘cases’ that sometimes leap off the page in a way that brings their subjects to life—as many have noticed, not least Natalie Zemon Davis in her work on Martin Guerre and on the pardon cases in *Fiction in the Archives*. Such cases offer a very rich and deep meeting of high and low cultures, where the educated writer—a literate observer, whether lawyer or doctor—commits to writing the events and words of those being observed, generally according to certain forms of professional code. These sorts of ‘cases’ are obviously both problematic and revealing in equal measure, but when a writer such as Diderot extracts them from their original context and re-uses them, they begin to resonate in an entirely new way; as Clark put it, and as we quoted a few pages earlier, their ‘meaning must be renegotiated’.

Diderot’s adoption and framing of these two tales and the way in which he brings them together gives them great prominence, even just in terms of space on the page. Lightly sketched as they are, both stories are full of human detail and character—the lovers in the first story who eagerly find a way round the woman’s irregular physical formation, and who repeatedly reject the doctor’s prognosis; in the second, the cheerful character of the soldier who willingly gets on with his duties, and the intimacy of the hidden relationship. The economy of the telling and the narrative trajectory increase—I would argue—the impact of the shadows around the story—that which is not known, or not said. The brutal statement about not knowing whether the mother and child died in the first case prods the reader to notice the callousness of the reporting observer, while also returning attention to the human outcome—certainly shocking and probably tragic for those involved. The shape of the Moravian story is not dissimilar, in that the relation of the everyday duties and interactions also end in baffled suffering and tragedy. In this case however, it seems more intensely tragic: the soldier suffers for ninety-seven hours, he does die, and so does the child, while his ‘bedfellow’ or rather his lover not only loses him, but is imprisoned because of their relationship, the violence of the suspicion being a transposition, we assume, of the way in which

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86 See above.
he is treated. These cases sharply juxtapose the precise and sceptical empiricism of the doctor anatomist with a complex human situation in time—the emphasis is not only on the person with the malformed body but on the human relationships he or she has, and on the consequences of the bodily malformation on those relationships. The distance of the recording eye in combination with the intensity, strangeness, and tragedy of the human events make for a powerful mix.

The effect that the presence of these and other such narratives have on the *Éléments de physiologie* as a whole is to make sure we do not get lost in abstractions about physiology, matter and its movement. They tell us what it feels like to be a piece of matter, or a piece of malformed matter, experiencing love and tragedy. These people or characters are not special, not heroic, yet their experience is still intense, still worthy of attention and compassion. They are part of Diderot’s answer to the philosophical question about what happens to identity, individuality, and the all-round unique specialness and perfection of the human being when viewed as nothing more or less than the temporary happenstance of material organisation and physiology. These notions of uniqueness with their theological and hierarchical dimensions may all fall away when humans are viewed as a certain species of animal, and what is left may well be both fragile and impermanent, but perception and experience—what it feels like to be alive—are no less complex or intense. Or, in these cases, tragic.

To briefly sum up: what distinguishes Diderot’s *Éléments de physiologie* from similar introductory surveys of the period is in part the way in which it is framed with materialist questions (about matter, life, experience, illness, and death). It is also characterised by its much sharper style, and by a resolutely anti-abstract approach; again we can link this to Diderot’s materialism and his interrogation of it, refusing to universalise. The basics of physiology involve, for Diderot, understanding our experience of being alive, of being ill, of feeling desire, of being driven by it.