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Empiricism contra Experiment :
 Harvey, Locke and the Revisionist View of Experimental Philosophy¹

Alan Salter and Charles T. Wolfe²

Pour des raisons techniques, le présent article, qui devait être inclus dans le dossier "Observation et expérience dans les sciences de la vie du 18^{ème} siècle" (dir. Philippe Huneman et Patrick Singy) publié dans le numéro 15/2 (2008) du Bulletin, n'a pas été inséré à sa place par suite d'un problème indépendant de la volonté des coordinateurs et des auteurs. Il est publié ici, mais fait bien partie intégrante dudit dossier, dans l'introduction duquel il est mentionné.

This article, which was intended to be a chapter of the file "Observations and experiences in the science of life in the xviiith century" (Philippe Huneman and Patrick Singy eds.) published in Volume 15/2 (2008) of the Bulletin, was not inserted in its due place for technical reasons independent from the will of the authors and editors. We publish it in this issue, but it remains part and parcel of volume 15/2, where it is mentioned in the introduction.

RESUME. Dans cet article nous suggérons une réévaluation du statut de l'empirisme chez deux figures majeures de la science médicale et de la philosophie classique, William Harvey et John Locke. Harvey, le découvreur de la circulation du sang, est souvent cité comme un des rares représentants des « sciences de la vie » au sein de la Révolution Scientifique. Quoique ce statut lui-même pose problème, nous aimerions attirer l'attention sur une question différente : Harvey se méfie de l'abstraction et des expériences « contrôlées » (à part celle de la ligature dans *De Motu Cordis*), rejette la valeur d'instruments tel que le microscope, et souligne à leur place le statut privilégié de l'« expérience observée ». Pour employer un terme contemporain, Harvey estime et se fie à la « connaissance tacite ». Ensuite, le projet de Locke est souvent expliqué en référence à l'expression qu'il emploie dans l'Épître au Lecteur de *l'Essai sur l'entendement humain* : il ne serait que le « manouvrier », l'ouvrier subalterne des sciences par rapport aux grands Newton, Boyle, Sydenham et

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² Unit for History and Philosophy of Science, University of Sydney.

Huygens. Contrairement à cette lecture, et malgré les rapports que Locke a pu avoir avec la médecine, nous suggérons que son empirisme est avant tout un projet « pratique » ou « moral », qui vise à délimiter nos capacités afin que nous puissions en faire usage pour être heureux ; et cet empirisme ne vise pas à naturaliser la connaissance. Si nous prenons ces deux exemples ensemble, il en résulte une nouvelle vision de certains moments canoniques de la philosophie naturelle à l'âge classique.

MOTS-CLES : empirisme, expérience, médecine, morale, Harvey, Locke, Sydenham

ABSTRACT. In this paper we suggest a revisionist perspective on two significant figures in early modern life science and philosophy: William Harvey and John Locke. Harvey, the discoverer of the circulation of the blood, is often named as one of the rare representatives of the 'life sciences' who was a major figure in the Scientific Revolution. While this status itself is problematic, we would like to call attention to a different kind of problem: Harvey dislikes abstraction and controlled experiments (aside from the ligature experiment in *De Motu Cordis*), tends to dismiss the value of instruments such as the microscope, and emphasizes instead the privileged status of 'observed experience'. To use a contemporary term, Harvey appears to rely on, and chiefly value, 'tacit knowledge'. Secondly, Locke's project is often explained with reference to the image he uses in the Epistle to the Reader of his *Essay*, that he was an "underlabourer" of the sciences. In fact, despite the significant medical phase of his career, Locke's 'empiricism' turns out to be above all a practical (i.e. 'moral') project, which focuses on the delimitation of our powers in order to achieve happiness, and rejects the possibility of naturalizing knowledge. When combined, these two cases suggest a different view of some canonical moments in early modern natural philosophy.

KEYWORDS : empiricism, experiments, medicine, ethics, Harvey, Locke, Sydenham

There is an enduring and influential story about empiricism, which runs as follows: from Locke onwards to Carnap, empiricism is the doctrine in which raw sense-data are received through the passive mechanism of perception; experience is the effect produced by external reality on the mind or 'receptors'.³ By extension, empiricism is the 'handmaiden' of experimental natural science, seeking to redefine philosophy and its methods in conformity with the results of modern science. If we consider the two figures treated in this essay, Harvey and Locke, nothing seems to be amiss: Harvey was the discoverer of the circulation of the blood (even if he also had a decidedly Aristotelian theory of generation), and Locke subscribed to a version of corpuscularianism, the mechanical philosophy, the distinction

³ Russell (1959), p.58; Taylor (1964), p.92. See also Nagel (2006), p.236.

between primary and secondary qualities, and described himself as the "underlabourer" of Boyle and Newton... In fact, in what follows we suggest a contrarian view according to which this story is not true.

On the contrary, Harvey's theory and practice of experiment turns out to be quite different from 'mainstream', Royal Society régimes of experiment as found in Bacon and Boyle, and as such is far removed from the depersonalized, third-person perspective we associate with the birth of modern science.⁴ Similarly, Locke's empiricism is less 'science-friendly' and more concerned with 'practical', moral matters such as the question of our conduct in this life and the after-life, and the proper 'fit' between our abilities (notably cognitive) and our duties. Indeed, scholars differ widely about the meaning of experiment in the early modern period, from treating it as identical to its modern equivalent, which is to say the measurement and assessment of a controlled intervention in a natural effect, to the mere recording of personal experience, to a medical recipe, and others.⁵

We will argue for an irreducibly personal dimension of empiricism, including in its medical variants – indeed, when Ephraim Chambers discusses the original empiricists, namely the medical 'empirics' of Ancient Greece, in his *Cyclopaedia*, he defines them by their insistence on developing rules for practice out of their own experience, rather than from any received forms of medical learning.⁶ A key trait that emerges in most portrayals of the ancient empirics is their emphasis on description rather than definition and the compilation of what might be called tables of induction: collections of instances where one thing (say an illness) is seen to follow from another, which then constitutes an "experience" (*empeiria*).⁷ But Harvey's vision of

⁴ For the standard view of empiricism as tied to the Royal Society's experimental culture and its origins in Bacon and the Oxford Philosophical Club, see Kaplan (1993), e.g. p.44. For this point of view as represented in the 18th century, see D'Alembert's article "Expérimental" in the *Encyclopédie*, vol. VI (1756), p.298.

⁵ See for example Dear (2006), p.114. A stimulating argument for the lack of relevance of experimental philosophy to experimental practice, in the particular case of Boyle, is Chalmers (1993).

⁶ Chambers (1728), vol. 1, s.v. 'Empiric'. Indeed, empiricism is essentially a medical invention, dating back to the school of the Empirics in the third century BC, with Serapion, a disciple of Herophilus of Alexandria (although 'empiricist' tendencies can be made out as far back as Hippocrates' treatise *On Ancient Medicine*). The distinction between Empiric[ist]s, Methodists and Dogmatists comes down to us from Galen's accounts in *On Medical Experience* and *On Medical Sects* (in Walter & Frede [1985]).

⁷ See Hankinson (1995), p.64, and more broadly Pentzopoulou-Vallas (1990). In 'modernity' we find Harvey, in the Preface to *De Generatione Animalium*, and later Mandeville, in his book on hysterick and hypochondriac diseases, quoting the basic

experience, or the attitude towards experiment found in Thomas Sydenham and Locke, is distinctly different from the 'Experimental Philosophy' propounded by the Royal Society.

This revision of the picture of early modern empiricism and its approach to experiment complements recent work in the history of philosophy which suggests that empiricism was neither a uniquely British phenomenon (witness Gassendi, or in a different way, the influence of Malebranche on Locke or Bayle on Hume), nor an 'epistemology' in the restrictive, contemporary sense. Rather than continuing this challenge to the opposition between 'rationalism' and 'empiricism' as fundamental categories in modern philosophy,⁸ we will restrict ourselves to providing a different kind of context for key figures such as Harvey and Locke, showing that Locke's empiricism is fundamentally understood by him as a *moral* project, and not an epistemology. Our claim is that 'canonical' empiricism does not match the canon; the consequence is not so much that we should broaden the canon (e.g. by including a Mandeville or a Glisson in any sustained analysis of early modern thought), as that we need a revised, indeed a revisionist view of these canonical figures. Harvey and Locke, instead of being champions of mechanism, are respectively defenders of an *embodied* practice of experiment (resting on an idea of tacit knowledge) and a *moral* vision of empiricism.

1. HARVEY'S EMBODIED EXPERIMENTALISM

Harvey seldom uses evidence drawn from experiment. In the only works published in his lifetime, *De Motu Cordis* (1628) and *De Generatione Animalium* (1651), there are no more than a dozen or so references to 'experiment' in over 600 pages of text.⁹ A similar number of procedures

empiricist credo *nihil est in intellectu quod non fuerit in sensu*, as a credo of the physician; cf. Harvey (1651/1981), p. 10 and Mandeville (1730/1976), p. vi. On the history of this phrase as inseparably philosophical and medical, see Cranefield (1970). In the 18th century, the article "Empirisme" in Diderot and D'Alembert's *Encyclopédie* is much shorter than the article "Empirique," which is entirely devoted to medicine.

⁸ The distinction between rationalism and empiricism as two systems, each with their weaknesses, which are ultimately brought together in a grand synthesis with Kant, who is a transcendental idealist and an empirical realist goes back at least as far as Friedrich Lange's *History of Materialism* in the 19th century, and is widespread today, from Jonathan Bennett (most recently Bennett 2001) to most early modern philosophy textbooks, e.g. Ariew and Watkins (2000), Thomson (2002), and Markie (2004) – an entry in a major reference source.

⁹ In *De Circulatione Sanguinis* (1649), which consisted of two anatomical essays to Jean Riolan, Harvey included details of some experiments, notably in the second

display the same characteristics as those formally described as experiments but are not described as such in the text. What then can we learn from the small number of experiments Harvey acknowledged in his published work? Can they be distinguished in any way from his far more frequent 'observations'? Were his experiments subject to a distinctive inquisitorial régime, quite separate to the carefully worked-out system of inquiry based on sense-perception that he examines in the Preface to *De Generatione Animalium* (hereafter DGA) and elsewhere? And what legacy of experimental technique, if any, did Harvey bequeath to Highmore, Charleton, Boyle, Hooke and other scientists of Commonwealth and Restoration England?

When Harvey wishes to refer to experimental procedure he sometimes uses nouns like 'experiment' or 'trial', sometimes verbs like 'tried' and sometimes imperatives like 'try this for yourself' and so on. In Chapter 22 of DGA in a short description of cooking eggs to discover the situation of the foetus, Harvey says that this is "...something which I have often tried."¹⁰ And in Chapter 10 of *De Motu Cordis* (hereafter DMC) he insists that "the first proposition (of circulation) has been proved...by reference to experimental evidence..."¹¹

There is every appearance that these terms are deliberately chosen to convey a meaning that is distinguished from ordinary sense-perception. References to 'experiment' and 'trial', to 'trying' and so on are associated with the active intervention in natural processes by Harvey or the frequently mentioned 'you' the reader. For example when in Chapter 17 of DGA Harvey claims to show that there is movement and sensation in the *punctum saliens*, he first touches it, then exposes it to cold air and subsequently touches it again. He concludes that "I am quite certain from many experiments I have made that..." (DGA, p. 99). And in seeking to prove that the foetus has an existence independent of the mother in the discussion "Of the membranes and humours of the uterus" he does so by demonstrating that the foetal and maternal pulses differ. He offers the reader the following as proof: "...This you may easily try for yourself if you...lay one hand on the mother's wrist and the other on the navel string" (he means the umbilical cord; DGA, p. 439). And in the most well-known and elaborate case of experimental evidence derived from intervention, the ligature procedure in Chapter 11 of DMC, Harvey refers to "...he on whose arm the experiment is

essay. See Harvey (1649/1958) for these essays, as well as nine letters obviously not published in the 1649 edition.

¹⁰ Harvey (1651/1981), p.126 (hereafter indicated as DGA in the text).

¹¹ Harvey (1628/1976), p.85 (hereafter indicated as DMC in the text).

made..." (DMC, p. 90). And instead of 'experiment' he often speaks of "frequent experience," adding "anyone who likes may try it..." (*ibid.*, p.174).

When Harvey uses the word 'experiment' he does not do so as something specific, distinct from experience and in amplification of our ordinary observations, as we do today. Sometimes he means a simple observation, as in DGA, when he refers to the experiment 'goodwives' (that is, housewives) perform to distinguish fertile eggs from barren by putting them into warm water and watching the fertile eggs 'tumble about hither and thither' as the live chick responds to the stimulus of the warm water (DGA, p. 125). And sometimes he means a substantial, controlled and measured intervention, more akin to our modern understanding of the concept, as in DMC when he ligates the upper arm of a man to test the effect of the constriction of the arteries and veins on the passage of blood outward from and inward to the heart.¹²

Given the polarization of 'observation' and 'experiment' in the Hippocratic tradition, notably in Sydenham, where careful observation is opposed to artificial, crude experimentation (such as vivisection),¹³ or with other English physicians such as Gideon Harvey declaring that "it's necessary we should make a Transit to the reason of the thing, without resting satisfied, like Empiricks, in experiment only,"¹⁴ it is intriguing that Harvey seems to deliberately blur the distinction between the two. Consider the ligature experiment from Chapter 11 mentioned above. Harvey instructs the reader to follow his (Harvey's) more typical procedure and simply *look*: "[M]ake a tight ligature (on a man's arm)... you may observe first that beyond the ligature...the artery does not beat..."; later in the same passage he says "... you will see that..." and "... (you) will feel the blood as it were slipping underneath (your) finger" (DMC, p.90). The subject of the procedure too "... will have the sensation of something passing along the course of the arteries... and his hand will become hot and distended" (*ibid.*, p.91). And in Chapter 9, Harvey writes that "... you will see with amazement..." (*ibid.*, p.82) how the blood behaves once the carotid artery is cut. In Chapter 17 of DGA he refers to touching and seeing the effects of his actions on the *punctum saliens*. For example, "upon every touch you will see this *punctum* to be disturbed," and later in the same passage "I have... often seen, and so

¹² DMC ch. 11, in Harvey (1628/1976), pp.88-94.

¹³ We discuss Sydenham and Locke's opposition between observation and anatomy below.

¹⁴ G. Harvey, *The Conclave of Physicians, detecting their Intrigues, Frauds and Plots against their Patients* (London, 1683), p.149, quoted in Cunningham (1989), p.182.

have many more who have been present with me, this *punctum* upon being touched...give diverse indications of sensation..." (DGA, p. 100).

Now, neither in the ligature experiment nor the experiment in which he cooked chickens' eggs in order to study the foetus, did Harvey privilege experiment over observation or even distinguish between them. Both require preparation and intervention. Much of the text of DGA consists of destroying eggs and vivisectioning hens in order to track the generation and development of the foetus from conception through incubation to hatching as well as examining hens and other animals non-destructively. The observation of the heart in systole which Harvey described in DMC was grounded in vivisection and arteriotomy. Harvey may have based his system of inquiry on sense-perception but it was an active system, requiring intervention in order to arrange circumstances and context in which the senses could perceive natural effects.

Harvey's experiments typically lack the controlled intervention we should expect from an investigative procedure carefully designed to quarantine a natural process in order to observe a particular effect. He does not articulate a formal or even informal experimental procedure covering how to control, how to design, how to 'background', how to conclude and so on. In some cases his experiments are similar to the procedures he calls observations, in others unnecessary in so far as they terminate a passage in which the point at issue has already been adequately dealt with and demonstrated. What he calls experiments cannot be distinguished from the things he calls his observations. Both involve the inspection of nature by sensory perception, both involve active intervention and both require repetition to validate and justify the conclusions they suggest. A telling comment on this issue of the difference or similarity between experiments and observation comes from Chapter 9 of DMC. Harvey is discussing the three propositions that together demonstrate circulation. "Let us suppose," he writes, "*either theoretically or experimentally*, how much blood the left ventricle may contain in its dilatation..." (DMC, p.79, emphasis ours). There is in this textual conjunction of experiment and theory a strong suggestion of opposition. The two are different. Theory is reason, experiment a form of experience. Theory is subordinate to experience, for as Harvey insists in DGA citing Fabricius, "let reason be silent when experience gainsays it" (DGA, p. 69). We are mistaken when we say that Harvey's experiments are few in number or can be identified in such and such a way or display such and such a design. Harvey's experiments cannot be enumerated or defined; they are indistinguishable from his observations and are part of the same system of inquiry that he grounds in experience derived from sense-perception. But his experiments are not valueless. They provide clear and concise evidence of

Harvey's proof tests and preview the experimental practices of later philosophers such as Highmore and Boyle. In this next passage we discuss four experiments from DMC and DGA which display certain central aspects of Harvey's system of inquiry.

1.1 Harvey's experiments: four case studies

*On the varied means of searching, from De Motu Cordis, chapter 8*¹⁵

From his "varied means of searching," Harvey concludes that blood moves "... as it were in a circle..." What were these varied means of searching and what do they tell us about his empiricism? A reading of his text suggests the following :

(a) Harvey's means of searching comprise

- experiments: "the dissection of living creatures for experiment's sake" and "...from the opening of arteries..."
- observation: "...from the great size of the ventricles of the heart..."
- philosophical principles, such as "...from ...symmetry," and Nature's purpose "...for Nature makes nothing in vain..." and the perfection of Nature's design "...from the carefully balanced and exquisite contrivance of the valves..."
- and "...from many other things..." though he does not say what these other things are, whether they are particular things, such as the size of the vessels of the heart, or categories of things, such as experiments in general, or observations and so on.

(b) All these means of searching were equal; none was privileged against another, for in the same passage he writes

- "...when I had many times and seriously considered with myself the varied means of searching..." and continues "...and how many there were!..."
- yet there seems to be no order of rank, though experiment comes first, followed by principle, observation and then principle, and there is no special status accorded to any of these "...varied means of searching," no words which elevate one over another.

(c) These varied means of searching lead to a series of speculative possibilities, posed as questions: "...I had for a great while turned over in my mind these questions, namely..."

¹⁵ We have not provided page numbers for the several quotations from this chapter, since the entire chapter is only three pages long.

- "...how great was the abundance of the blood ..."
- "...in how short a time that transmission was done..." and
- "...that the food that had been eaten could not suffice to supply the amount of the blood..."

(d) An absurd conclusion arises from these speculative possibilities, namely that

- "...we would have veins empty and altogether drained dry..."
- "...and arteries, on the other hand, burst open with too great intrusting of blood..."

(e) The absurdity is resolved however

- "...unless this blood should somehow flow back out of the arteries once more into the veins and return to the right ventricle of the heart..."
- "...I began to bethink myself whether it might not have a kind of movement as it were in a circle."

The structure of this passage reveals much about Harvey's experimentalism and his system of inquiry. There are many varied means of inquiry ('of searching'): specific observations, for example the great size of the heart; methods of observation, such as experimental dissection; conclusions from observation, such as the volume of blood flowing into the arteries; and, principles of interpretation, such as Nature's purpose, Nature's exquisite design and symmetry. To Harvey, empiricism cannot be divided: experiment, observation and principle contribute in like manner to our inquiries into nature. Inquiry leads to evidence (the great size of the ventricles of the heart, for example), evidence to paradox (the excess of nutriment) and paradox to absurdity (the veins drained dry). The absurdity is resolved by appeal to the observed principle of order, or circularity. Now this may be all too simple, a Whiggish reading of an already rationalized text (the disputational structure of DMC was designed to persuade a putative audience rather than record a sequence of events and results alone).¹⁶ Yet the passage sets down the elements of Harvey's way of concluding: his techniques (his many means of searching), their inherent equality, the possibilities they raise and the resolution(s) they suggest.

On reasoning from observation, from De Motu Cordis, chapter 11

In this chapter Harvey conducts six experiments to provide the evidence for his second proposition that blood flows into every part of the body, and

¹⁶ As Whitteridge has pointed out (see DMC, Introduction, pp.xiii-xxvi).

this evidence allows him to arrive at a conclusion by way of reasoning from multiple and accumulating observations, since the natural effects he wishes to define cannot be directly observed.

His account of the experiments provides great insight into Harvey's care and diligence in acquiring knowledge. Just as in DGA we can note his detailed observations, the repetitiveness of his investigations and the recontextualization of his inquiries (he calls this the Rule of Socrates, that is the examination of natural phenomena in varied arenas, such as different species, sheep, dogs, fish and so on, and in different conditions, illness, health for example), so in DMC we can note the exactness that he calls for in his 'experiments'.

In these experiments he specifies the ideal background conditions: for example, he suggests that the experiment be conducted on a "...lean man...whose veins are rather large..." (DMC, p.89), when the body has been "...heated by exercise, and a greater quantity of blood is in the extremities and the pulsation more violent..." (*ibid.*, p.90). He specifies precise experimental conditions that cannot be varied. For example, "...a tight ligature (is) one ...which is so tightly bound...that you cannot see the arteries beat anywhere..." (*ibid.*, p.89). A middling tight ligature is one "...in which the limb is compressed... but without causing pain, and such that...the arteries (can) beat a little beyond it..." (*ibid.*). For each ligature, he provides examples from common practice. A tight ligature is such as "...we use in the amputation of limbs..." and a middling tight ligature "...such...as is used in the drawing and letting of blood..." (*ibid.*). Harvey also requires precise experimental performance, for example when the tight ligature is slackened into a middling tight one it must be "...suddenly loosened..." and you, the reader or the inquirer, must "...at the very moment of slackening...carefully put (your) finger on the pulsating artery beside the ligature..." (*ibid.*, p.90). Harvey also offers suggestions as to how the best results can be obtained, for example after the ligature has been slackened it is better to wait "...ten or twelve pulses of the artery..." before examining the hand filling with blood, and if you the reader (or inquirer) make yourself the subject of the experiment you "...will perceive (the effects of the ligature) better (if your) wrist or arm has been bound in (a certain) way for some time..." (*ibid.*, p.92).

Harvey's proof scheme involves six experiments (Harvey actually incorporates all six into a single experiment) and three proofs; four experiments also include subsidiary experiments. The first five experiments consist of tightening and slackening a ligature on a man's arm. The sixth experiment opens the man's veins with a lancet. The man can be the observed subject, and can also observe the effects of the experiments for himself.

Throughout all his works, but especially in DMC and DGA, Harvey insists that evidence cannot be taken on report or on trust. Physicians and philosophers must see (in fact he means perceive through the senses) for themselves and where possible they must 'try' for themselves. This is a far cry from the program of Experimental Philosophy as developing practices whereby a scientist can repeat someone else's experiment; it comes close to being a call for 'first-person science'.

On blood coagulation from De Generatione Animalium, chapter 52

Harvey discusses whether blood is homogeneous or heterogeneous. When blood lives in the body it is homogeneous, compounded out of soul and body, but when the soul fades away and the native heat goes out, its original substance is dissolved into its former parts, that is first its gore and then into its red and white parts. The red parts that are uppermost are brightly coloured and those that are below turn black. Some parts are fibrous and some are serous. The fibrous parts bound the rest and the serous parts uphold the coagulated parts.

There is another part of the blood however which clots on top of the red parts, so that there are in fact three layers of blood. This part resembles a jelly, and is different to the other parts and the serous base. Harvey says it is more spirituous. He has two observations to support this proposition. First, Harvey notices that this third clotting part floats on top of what is thought to be the arterial blood. Second, he says that in venesection this clotting blood spurts out with a vehement force, so that we call it more spirituous. Next, he proves by an 'experiment' which involves heating the watery base that this clotted part differs from the watery base, which is cruder than the purer and more perfect spirituous blood. But the jelly which floats on the clot looks more concocted than the clotted blood. He concludes therefore that the blood decomposes into three: the jelly remains on the top, the clotted red parts stay in the middle and the watery base descends to the bottom.

He relies on detailed observations and an acute perception. He observes that there appear to be different parts and by a series of follow up observations determines that these parts are different. In fact, these observations form a neat, though not necessarily intended, pattern: the first two are exploratory observations/experiments, and the next two are confirmatory observations/experiments. Two more observations/experiments follow. He observes that letting blood shortly after eating or drinking, before digestion is complete reveals serous blood. But after fasting, the blood is thick, lacking serum, and is clotted. He observes that when the blood grows crude there is no floating jelly (that is spirituous blood) but if you heat the watery part it changes into jelly.

On the punctum saliens, from various passages in De Generatione Animalium

The three passages that deal with the *punctum saliens*, the “capering point of blood” that appear at the very beginning of Harvey’s observations of the development of the egg are amongst the most detailed and the most lyrical of his writings. He lays out in a precise, unambiguous and eloquent way what develops in the egg day by day, sometimes hour by hour, as it grows from single point of blood to a maturing chick.

Chapter 17 deals with the sudden appearance of the punctum on the 4th day. He writes, “a great metamorphosis and wonderful alteration will already have taken place, and it becomes more manifest ...from hour to hour...At that time, the foetus ...passes from the life of a plant to that of an animal.”¹⁷ He suggests to the reader, “If you want to experience this observation for yourself...you can do it if you take the very greatest care...” Harvey tries this several times for himself, perhaps even with the magnifying glass he suggests the reader use, for how else would he have the confidence to invite the reader to try it “for yourself” and be certain that the reader would observe the self-same phenomena?

Chapter 51 deals with his belief that the blood is the first genital particle and that the heart is designed for the circulation of the blood. In animals, the heart is a pump for the blood; in the embryo the *punctum saliens* performs the same function since it acts like a pump. Harvey says “...I have frequently shown this to many people...” (DGA, p.242). With respect to the blood, Harvey gradually builds up observations, each accompanied with a detailed set of descriptive statements, drawn from repeated experiences or experiments and leading to a defensible conclusion. We can see the same careful accumulation of evidence in Chapter 2 of DMC where Harvey demonstrates the forceful systole of the animal heart.

Earlier in Chapter 17 of DGA Harvey says, referring to the movement of the punctum, that “...I am quite certain from many experiments I have made...” (p. 99). He does not say what these experiments were or whether they were varied in any way, but he concludes that “...upon every touch...you will see this punctum to be in diverse ways disturbed...” (*ibid.*). He has thus conducted this experiment of touching the punctum many times and that “you,” if you try it, will get the same results as him. His confidence is assured from the multitude of ‘experiments’ he has made and is all the greater because “...many more were present with me...” (p.100). The punctum therefore has movement and sensation.

¹⁷ All quotations in this paragraph are from DGA, p.96.

Harvey says you have to touch; to observe; to sense with unaided, unmediated sense-perception. He often praises the methods of the midwives and tradesmen rather than the classical authorities, as Sydenham is said to have done as well, as in the remark attributed to him, that medicine (Physick) “is not to be learned by going to Universities, but hee is for taking apprentices ... one had as good Send a man to Oxford to learne Shoemaking as practising physick.”¹⁸

Harvey’s experimentalism is far removed from the notions of formality which some scholars see as essential to proper experiment. Dear for example requires a literal account of experiment before any “trial” can be considered an experiment,¹⁹ a requirement that Harvey would have undoubtedly rejected not least because the word of one scientist could never take precedence over the observed experience of another. Most other prominent scholars have neglected Harvey’s experimentalism altogether.²⁰ Perhaps it is the heterogeneous nature of Harvey’s experiments – from boiling eggs to ligating arteries – or their infrequent appearance in his work, or the apparent uncertainty of their status – are they no more than experiences, epistemologically equivalent to observation or are they (with the exception of the experiments on circulation) perhaps even inferior to observation? – or Harvey’s own neglect of experiment in his only considered treatment of his epistemology in the Preface to DGA that has made his experimentalism appear as several different-sized square pegs in the single round hole of a scholarly consensus which places Harvey in a tradition of Renaissance natural philosophy.

We are certainly dealing with a species of empiricism here, but of an unusual kind, given its cautionary (or even dismissive) attitude towards

¹⁸ From the diary of Reverend John Ward, compiled between 1648 and 1679, a much-discussed compendium of medical knowledge of the time; cit. in Walmsley (2008), p. 81.

¹⁹ Dear (1991).

²⁰ Walter Pagel’s two studies on Harvey (Pagel 1967, 1976) for example have only one mention of experiment, and Gweneth Whitteridge’s study of Harvey on circulation (Whitteridge 1971) contains no discussion of his experimental practice. Roger French deals more extensively with experimentalism but treats it largely as a European-wide phenomenon and spends little time on how experiment fitted into Harvey’s own investigative technique (French 1994). Steven Shapin’s introductory work on the Scientific Revolution (Shapin 1996) says nothing of Harvey’s experiments yet devotes several pages to Boyle, Descartes, Newton and Galileo and even allocates a couple of pages to Hobbes. Oddly enough it is John Henry’s study (Henry 2002), written ‘with the non-scientist in mind’ that has more to say though, unsurprisingly in an overview, he limits himself to short general summations.

experimentalism. If we consider examples that Harvey uses such as the story of the young nobleman Hugh Montgomery,²¹ the role of the sense of touch, as a necessarily 'first-person' experience, is explicit. Harvey recounts touching his live, beating heart which had been exposed by the injuries from a fall when still a child:

I immediately saw a vast hole in his chest into which I could easily put my first three fingers and my thumb. At the same time I saw just inside the opening, some fleshy, projecting part which was driven backwards and forwards with an alternating movement, and I touched it very cautiously with my hand... when I had investigated everything carefully enough, it was evident that the old vast ulcer...was covered over on the inside with a membrane and guarded all round the edges with a hard skin.²²

Harvey took the young man to see the King, Charles I, "...so that he might see this strange and wounded thing" (*ibid.*). Charles touched the boy's heart "with his hand" and "...watched the movement of the heart itself..." with Harvey. The involvement of the King in the performance of the experiment confirms the status of touch as an instrument of inquiry and the validity of its conclusion, for as Harvey writes, "...his serene Highness agreed with me that the heart is without any sense of feeling" (*ibid.*). Such accounts, combined with Harvey's frequent insistence that the reader/inquirer 'try this', 'do this', 'feel this', comprise an *embodied, first-person notion of experiment*.

2. LOCKE'S PRACTICAL EMPIRICISM

A similar effort to 'de-positivize' Locke needs to be made. We have referred previously to the received view of empiricism, as an epistemological doctrine involving sense-data impacting on a passive, blank slate or *tabula rasa* – and by extension, about the construction of scientific theories. This view may exist, e.g. in the 20th century, but the 'classical' empiricists do not seem to hold it.²³ For instance, it seems odd for someone Russell (or Husserl) would call an empiricist, to declare as Locke does that we do not know things directly but only through the mediation of ideas (*Essay* IV.iv.3). In recent years, several important scholars, including Michael Ayers and David Norton, have picked apart the label 'British empiricism'. The only true empiricist, it seems, in the sense of a thinker who holds that *nil est in intellectu quod non fuerit in sensu* is a Continental thinker, Gassendi; there is

²¹ DGA, ch. 52. See Frank (1980), p.36.

²² Harvey, DGA, ch. 52, p.250.

²³ See for a discussion Hamou (2001).

almost no continuity of ideas or reading between Locke, Berkeley and Hume (instead, they read Gassendi, Malebranche, and Bayle); in this list, the only 'English' thinker is Locke (Berkeley is Irish, Hume Scottish).²⁴ Jonathan Rée has suggested that the idea of British empiricism, which goes back to Reid and Kant, became so popular because it was claimed to be a 'national' tradition for Britain; but if we think of the Cambridge Platonists, this tradition could just as well be idealism.²⁵

However, our reasons for being a contrarian or revisionist about British empiricism are not purely contextual ones involving affinity groups or chains of influence. Just as our vision of Harvey's experiments needs to be revised, we need to have some critical, in fact historical distance towards the mainstream vision of empiricism as primarily an epistemology, a vision which then appears disembodied and false. What is epistemological and what is moral in fact are harder to separate for the early modern thinker, so that we need to get ourselves out of what Haakonssen recently termed the 'epistemological paradigm', which

sees philosophy as essentially concerned with the justification of beliefs and judgements; it understands such justification in terms of events, whether perceptive or inferential, in the mind – or, as if in the mind – of the individual person; and it tends to apply this idea of epistemological justification as the criterion for what is properly included in the discipline of philosophy.²⁶

If Harvey showed us a different picture of experiment, Locke will show us a different picture of the role of the philosopher at the heart of the Scientific Revolution.

To historians and philosophers of science, one of the single most famous passages in Locke's *Essay* is in the Epistle to the Reader:

I shall always have the satisfaction to have aimed sincerely at truth and usefulness, though in one of the meanest ways. The commonwealth of learning is not at this time without master-builders, whose mighty designs in advancing the sciences, will leave lasting monuments to the admiration of posterity; but every one must not hope to be a Boyle, or a Sydenham; and in an age that produces such masters, as the great Huygenius, and the

²⁴ See Norton (1981), pp.334, 341; Ayers (1991), vol. 1, p. 15; (1998), p.1019. For an interesting critique of the view that Locke was an 'empiricist' about ideas, see Krüger (1970/2005).

²⁵ Rée (1997), p.44.

²⁶ Haakonssen (2006).

incomparable Mr. Newton, with some others of that strain; *it is ambition enough to be employed as an under-labourer in clearing the ground a little, and removing some of the rubbish that lies in the way to knowledge.*²⁷

The 'underlabourer' passage has had an enormous impact on how Locke is viewed. For it seems to define the empiricist project as an adjacent, indeed subaltern project to the modern corpuscular reductive project (although the extent to which Boyle and Sydenham can be fit into the same programmatic box is problematic,²⁸ and by extension, Boyle, Sydenham, Huygens and Newton do not reflect the same picture of science, nor was Locke equally interested in or familiar with the work of all four). Locke will, on this view, treat the world of ideas as these great men treated the world of natural objects.²⁹ Earlier generations of Locke scholars uncritically repeated the idea that the *Essay* was a 'Newtonian' naturalization of the mind, an application of scientific method to the world of ideas, and so forth.³⁰

But if we turn to another passage, also in the Epistle to the Reader, which is less well-known to readers of Locke concerned with the history and philosophy of science, we find a very different indication, regarding both the genesis of the *Essay* and how it should be understood:

Were it fit to trouble thee with the history of this Essay, I should tell thee, that five or six friends meeting at my chamber, and discoursing on a subject very remote from this, found themselves quickly at a stand, by the difficulties that rose on every side. After we had a while puzzled ourselves, without coming any nearer a resolution of those doubts which perplexed us, it came into my thoughts, that we took a wrong course; and that before we set ourselves upon inquiries of that nature, it was necessary to examine our own abilities, and see

²⁷ Locke (1975), p. 9 (emphasis ours).

²⁸ Gaukroger (2008) discusses the shift from Draft A of Locke's *Essay* to Draft B as a move from Sydenham, for whom we have no access to underlying causes and anatomy is useless to medicine, to Boyle's more philosophical view, including the focus on the qualities; see also Walmsley (2008).

²⁹ Stephen Gaukroger suggests (discussion, 2007) that the underlabourer figure is almost a trope in the works of the period. Indeed, Boyle wrote that he was willing to "not only be an Underbuilder, but ev'n dig in the Quarries for Materials towards so useful a Structure, as a solid body of Natural Philosophy, than not to do something towards the erection of it" (Boyle [1669], p.18).

³⁰ E.g. Randall (1962), pp.595, 601.

what objects our understandings were, or were not, fitted to deal with.³¹

What is the secret here – the "remote subject" on which "five or six friends meeting at [Locke's] chamber," discoursed? A copy of the *Essay* owned by one of these five or six friends, James Tyrrell, bears in the margin, at this spot, the words "*morality and revealed religion*"³² ... The *Essay* is an investigation of the logic of ideas aiming to solve or do away with painful problems in morals and religion; it is not an investigation of ideas for their own sake, either as an epistemology or as a cognitive psychology. In addition, the project of the *Essay* is not to be understood as an ontology, if we heed some of Locke's own pronouncements on the matter: as he often says, the relevant area of inquiry for him is not the "depths of the ocean of Being" (*Essay*, I.i.7) but rather matters concerning our *conduct*; "Our Business here is not to know all things, but those which concern our Conduct" (*ibid.*, I.i.6).

In other words, Locke is less concerned with internal conceptual analyses of the mechanics of sensation and representation, and more with practical matters. Just as Harvey is not actually the 'Galileo of medicine', Locke is not the 'Newton of the mind'. We thus disagree with the view, particularly associated with Patrick Romanell, that Locke's empiricism is of a specifically medical nature or, even more broadly, that medicine structures all of Locke's thought.³³ It seems unhelpful in seeking to understand Locke's project to view it as deriving from an older medical project (for what should one make, then, of the conspicuous absence of medicine in the many pages of the *Essay*? This absence is even more striking if we contrast Locke with a roughly comparable figure, Descartes – not known as an empiricist – who granted in the sixth part of the *Discours de la méthode* that the mind is 'strongly dependent' on our temperament and the arrangement of our organs, so that our improvement – both intellectual and practical – is most likely to

³¹ Locke (1975), p. 7 (emphasis ours).

³² Cranston (1957/1985), pp.140-141; Rogers (2007), p.8. The manuscript of the *Essay* with Tyrrell's marginal annotations is now in the British Museum.

³³ Romanell (1974), p.276. Romanell (1984) offers in addition a rather tortuous account of an alternate context for the genesis of the *Essay*, partly based on a critique of Tyrrell's recollections (pp.148-149, and 203, n. 66). It may well be that Tyrrell misremembered the meeting of Locke's friends. But Romanell's main claim – that the key issue, the "remote subject," was medicine, is extremely implausible at best; his secondary claim, that Locke's 'historical, plain method' derives from the idea of 'medical histories' (*ibid.*, pp.144-147, 192-203, n.56) is at most a thin analogy or association of ideas, the evidence for which includes 'facts' such as Locke's usage of the adjective 'plain' to describe Sydenham's method of treating smallpox.

be achieved by medicine³⁴). In addition, it seems at best unclear to claim that Locke's specific brand of empiricism owes its specificity to medical thought. The question remains open, however, as to whether Locke's fundamentally practical vision coheres with a specifically Sydenhamian, anti-essentialist vision of medicine. We will first seek to make the nature of Locke's practical project more explicit, before presenting an intermediate position regarding the possibly medical character of his empiricism, in which the practical and the medical cohere.

The non-epistemological, non-ontological character of Locke's project, namely, of defusing ethical and religious tensions by examining the extent and limitations of our own powers of acting, can make his philosophy seem very 'proto-critical', in the sense of Kant's critical philosophy; indeed, when Kant distinguished between dogmatic and critical philosophy in the first of his lectures on logic in 1770, he named Locke as an example of the latter.³⁵ This examination of our abilities is meant to enable us to better "prosecute" our duties in our lifetime. As such, it coheres nicely with the fact that Locke has explicit ethico-political motivations for some of his most celebrated 'epistemological' positions, such as his anti-innatism. When he explains that it was "no small advantage to those who affected to be Masters and Teachers to make this the Principle of *Principles*, that Principles must not be questioned," since on this view they are innate (*Essay* Liv.24), he is stating a position that plays out at length in his political philosophy (innate ideas are a cornerstone of authoritarianism) and in his important pedagogical work (anti-innatism is similarly a cornerstone of any liberal pedagogical project since it rests on the belief in the malleability of the human mind, which can evolve through learning). Locke is not interested in the theory of knowledge for its own sake, or in a disembodied mind; on ethical, political and theological grounds, his investigation into the 'furniture of the mind' is meant to "examine our own abilities, and see what objects our understandings were, or were not, fitted to deal with."³⁶

Given the choice between these two hints on how to interpret Locke's vast *Essay* – the 'underlabourer' and the 'remote subject' – without wanting to practice the art of esoteric text-interpretation, it appears to us that the hidden hint is more important. For Locke to say in print that he is just the underlabourer for people like Boyle, Huygens and Newton makes good sense

³⁴ *Discours de la méthode*, in Descartes (1964-1974), AT VI, 62.

³⁵ See Haakonssen (2006), p.10 & n.17. As Locke's biographer Cranston commented judiciously, "there is something alien to empiricism in Locke's whole aim of determining *in advance* the limits of human knowledge" (Cranston [1957/1985], p.265).

³⁶ Locke (1975), p.7.

in terms of public relations; his hint, without naming the issue, that the whole book revolves around the problem of morality and religion, says something more. Furthermore, the portrait of the philosopher as underlabourer for the natural philosophers suggests a kind of naturalization of the mind which isn't really part of Locke's program (not that he rejects it out of hand, since he is also not an anti-naturalist): "I shall not at present meddle with the Physical consideration of the Mind" (*Essay*, I.i.2); any effort to "enquire philosophically into the peculiar Constitution of Bodies" is "contrary to the Design of this Essay" (*ibid.*, II.xxi.73). The corpuscularian hypothesis about the nature of underlying reality is, Locke thinks, the best bet for a valid explanation, but it is not his business!³⁷

One can contrast Locke on this issue with figures such as Mandeville, Toland or Hartley, who are materialists :

- For Toland, thought is a property of the brain; "Whatever be the Principle of Thinking in Animals, yet it cannot be perform'd but by the means of the Brain."³⁸

- For Mandeville, we are "a Compound of Body as well as Soul," but "the first is the only Part the Existence of which we are sure of." "It is utterly incomprehensible," he adds, "that when the Body is dead Thought should remain," and, referring specifically to the brain, "I can as easily conceive the Stars without a Sky as Memory without a Brain." Hence the view that "matter cannot think" is in his view "*gratis dictum*."³⁹

- In comparison with Toland and Mandeville, Hartley's materialism is both more unwieldy and more sophisticated, for in addition to the general claim that "each [human] action results from the previous circumstances of body and mind, in the same manner and with the same certainty as other effects do from their mechanical causes," he also seeks to provide a specifically 'vibratory' materialist account of mind, according to which small vibrations ("vibruncles") are impressed in the solid filaments of the nerves by external objects; these sensations are transmitted by aetherial vibration to the infinitesimal particles that make up the substance of the brain. By their

³⁷ However, see Locke (1975), II.ii.2, vii.10, and viii.11 (bodies produce ideas in us by 'impulses'). Metaphysically, corpuscularian explanations play a key role in Locke's definition of qualities (i.e. solidity is a primary quality since it still exists at the corpuscular level); biologically, they play a key role in what he assumes would be a correct theory of generation, explaining both similarity of traits and the occasional appearance of 'monsters'.

³⁸ Explicitly stated in Toland (1720), p. 15; Toland (1704/1976), letter IV, § 7, p.139.

³⁹ Mandeville (1730/1976), respectively pp.51, 159, 160, 51.

differences in degree, kind and place, these vibrations represent different primary sensations, or "simple ideas" in the brain, which can become complex ideas through associations with other chains of vibrations.⁴⁰

On the basis of any combination of Hobbes, Gassendi, Epicurus and Newton, Locke could perfectly well have gestured towards a physical account of mind, either in mechanistic and/or in substantive materialist terms, but he did not.

Granted, Locke was seriously involved with medicine (notably working with Thomas Sydenham, Richard Lower and Thomas Willis, and producing a work on respiration and the physiology of life, *De Respirationis Usus*, in 1666-1667⁴¹) and, as Peter Anstey has shown, was influenced by the methodology of Baconian natural history, but he scrupulously avoided practicing what Kant called "philosophers' medicine of the body," surely agreeing with Sydenham that "the medicine of nature is more refined than the medicine of philosophy,"⁴² much as Hume indicated that he did not wish to take the standpoint of the 'anatomist' in his science of human nature.⁴³ Not

⁴⁰ Hartley (1749), I, pp. 500, 13-16. See Guerlac (1977), p.162; Yolton (1983), pp.180-184; Smith (1987), p.124. Thanks to Jean-Claude Dupont for helpful discussions of Hartley's theory.

⁴¹ In fact, one of his earliest medical notes is a confirmation of Harvey's theory of the circulation of the blood (Bodleian MS. Locke e.4, p. 111, cit. in Walmsley [2007], p.455). It is not clear if Locke read DMC, but he took notes on Sir George Ent's *Apologia pro circulatione sanguinis* (MS. Locke f. 14, pp.30, 32, 34; f. 20, pp.174, 211, etc.), and he bought DGA in 1658, according to a note in his copy, which is now in the Locke Room of the Bodleian Library (Milton [2001], note 16). Boyle dedicated his *Memoirs for the Natural History of Humane Blood* to "the very ingenious and learned Doctor J.L." (Boyle [1684], Preface, p.1). See Wolfe (1961), Milton (2001) and especially Walmsley (2007, 2008) for a clear and fascinating perspective on Locke and medicine.

⁴² Kant (1788/1986); Sydenham, *Epistle to Dr Brady*, § 51, in Sydenham (1850), II, p.22.

⁴³ "The examination of our sensations belongs more to anatomists and natural philosophers than to moral" (*T* 1.1.2). Hume's inferentialism, according to which "there is nothing in any object, consider'd in itself, which can afford us a reason for drawing a conclusion beyond it" (*T* 1.3.12.20) also seems to set him against the dominant view of empiricism. Far from being the 'Newton of the moral sciences' that he is often claimed to be, his type of argument is essentially moral and historical. As Dario Perinetti (2005) puts it, "Empirical generalizations, or as Hume calls them, 'general rules' or 'maxims', are essentially guiding principles influencing our judgment after the model of maxims found in the writings of moralists and historians

only does Locke not seek to provide a cerebral or generally corporeal explanation of mental activity (although he used oddly familiar anti-innatist language in his notes on Willis's Oxford course in 1664, writing that "the cerebrum in infants is a *tabula rasa*"⁴⁴), he in addition incorporates almost no medical examples in his *Essay*, despite those many years of studentship and practice! This was noted rather acidly by Dugald Stewart in an entry for the *Encyclopedia Britannica*: in the *Essay* "not a single passage occurs, savouring of the Anatomical Theater or of the Chemical Laboratory."⁴⁵

One might then ask: is the underlabourer reference there in the Epistle to the Reader, *for no purpose at all*? In fact, it is possible to reconcile its presence with our claim for the *Essay*'s fundamentally moral motivation. The reference is typically taken to mean that Locke wishes to be a kind of Newton of the mind, but it can also be read as a more deflationary assertion, in keeping with Locke's desire, stated elsewhere, to rid philosophy of useless words and otiose metaphysical entities. Certainly his rendition of the underlabourer motif is less of a 'positive' claim than, e.g. Boyle's desire to build "useful structures," as seen earlier. And this vision of science is more in keeping with Locke's concern with a "historical, plain method" (*Essay* I.i.2). Hence Locke can present himself as the underlabourer of Newton or Boyle *and still be fundamentally motivated by morals and 'revealed religion'*. After all, his response to the conflicts and challenges arising in these areas is, as he stated at the close of the "Power" chapter, "only to enquire into the knowledge the Mind has of Things, by those *Ideas*, and Appearances, which *God* has fitted to receive from them" (*Essay* II.xxi.73), which for him means, more explicitly, that "my business was only to show whence men had moral ideas, and what they were..."⁴⁶ – and their limits (this last in a draft of a letter to Tyrrell).

If Locke really believed his mission in the *Essay* was to be the (positively construed) underlabourer of the great figures of the New Science, he would not declare (sounding like Sydenham but also like Pascal) that "The Workmanship of the All-wise, and Powerful God, in the great Fabrick of the Universe, and every part thereof, farther exceeds the Capacity and Comprehension of the most inquisitive and intelligent Man" (*Essay* III.vi.9). Moreover, "as to a perfect *science* of natural bodies... we are, I think, so far

of the period" (p.16) rather than expressions of laws of nature or inductive scientific observations.

⁴⁴ Locke, in Willis (1980), p.66.

⁴⁵ Stewart (1811/1842), p. 101. One of the rare cases is when Locke uses the example of whether "liquor" flows through the nerves at *Essay* III.ix.16, to convey the problem of using imprecise terms in language.

⁴⁶ Locke to Tyrrell, August 4th 1690, letter 1309 in Locke (1979), p.113.

from being capable of any such thing that I conclude it lost labour to seek after it" (*ibid.*, IV.iii.29). This combination of a lack of experimental optimism and a rather Puritan ethical conviction, that, e.g., "We are furnished with faculties (dull and weak as they are) to discover enough in the creatures to lead us to the knowledge of the Creator, and the knowledge of our duty," but not more (*Essay* II.xxiii.12), is voiced in particular cases, such as the comparable combination of skepticism and outright hostility towards microscopy in Locke and Sydenham's 1668 manuscript *Anatomia* (the text is attributed variously to each or both authors, different parts of the manuscript being in the handwriting of one or the other):

it is... beyond controversy that nature perform all her operations in the body by parts so minute and insensible that I think noe body will ever hope or pretend even by the assistance of glasses or any other invention to come to a sight of them.⁴⁷

For Mandeville, too, "Our shallow Understandings will never penetrate into the Structure of Parts of that amazing as well as mysterious Composition, the Mass of Blood."⁴⁸ The microscope is much friendlier to the iatromechanist, or the 'expanded mechanists' like Malebranche or Leibniz, than to the type of empiricist who promotes unaided sense-perception. Whereas mechanists could safely conceive that the microworld was 'machines all the way down', and thus welcome the use of the microscope as an "adding of artificial Organs to the natural" (Hooke),⁴⁹ notably in the study of generation, empiricists such as Sydenham and Locke (and Harvey) "rejected instrument-assisted sense perception."⁵⁰ Sydenham often asserts that he writes only what is "the product of observation"; in an explicitly neo-Hippocratic and vitalistic way, he says that anatomy, experiment, and vivisection will "noe more able to direct a physician how to cure a disease

⁴⁷ Sydenham/Locke, *Anatomia* (1668); Locke's 'version' is Locke ms., National Archives PRO 30/24/72/2 ff. 36v-37r., transcribed in Dewhurst (1966), pp.85-93, here, p.85; also quoted in Dewhurst (1958), pp. 7-8 and Walmsley (2008), p.70. The best sustained discussion of Locke and Sydenham's resistance to the microscope is Wolfe (1961); see also Duchesneau (1973), pp.68ff.

⁴⁸ Mandeville (1730/1976), p.168.

⁴⁹ Hooke (1665), Preface.

⁵⁰ Van Speybroeck, De Waele & Van De Vijver (2002), p.18; Singer (1959) observes that the great classical microscopists – Malpighi, Swammerdam, Hooke, Grew and Leeuwenhoek – remained without followers until the nineteenth century (p.172).

than how to make a man."⁵¹ For Sydenham and Locke, "observation without instruments [was] a moral imperative."⁵²

It would appear, then, that even if Locke is not an underlabourer seeking to provide, say, a 'Newtonian neuropsychology' of the mind (like Hartley), not an 'anatomist' in Hume's sense but rather an empiricist motivated by practical concerns, curiously, this does not rule out a role for medicine. Briefly put, Locke (and Sydenham) share a medically motivated suspicion of mechanism (this obviously does not mean that a mechanistic vision of medicine did not exist!), and a vision of medicine as *practical*, which could provide a basis for reconciling Locke the 'underlabourer' and Locke the theorist of morality and revealed religion.⁵³

Locke often praised Sydenham for his "practical" abilities, and many years after his collaboration with the latter, in an unpublished text entitled *On the Conduct of the Understanding* (1697) which was originally intended as a chapter of the *Essay*, he wrote, "were it my business to understand physick, would not the safer and readier way be to consult nature herself and informe my self in the *history of diseases* and their cures than espousing the principles of the Dogmatists, Methodists or Chymists"?⁵⁴ And this "history of diseases" is, of course, what was also called "nosology." It was Sydenham who most emphatically preconized the need for a history and taxonomy of diseases rather than a theory of their internal causal composition. Illnesses needed to be repeatedly *observed* over their duration, not explained mechanistically, with the goal of being able to delineate them into *species*: "It is necessary that all diseases be reduced to definite and certain species . . . with the same care which we see exhibited by botanists in their phytologies," he says in his *Medical Observations Concerning the History and Cure of Acute Diseases* (orig. 1676).⁵⁵

Contrary to the lawlike world of physico-mechanical Nature, the medical world must rely on a nosological method because illnesses can only be grasped by us – as physicians or knowers – phenomenally. Nature is not a monolithic entity that we can grasp in an exhaustive, reductionist fashion. Hence the nosological approach in medicine is an epiphenomenalism, since it denies that we can know substantial forms or essences. Sydenham explicitly

⁵¹ *Epistle to Dr Brady*, in Sydenham (1850), II, pp.12, 22; Sydenham/Locke, *Anatomia*, cit. Walmsley (2008), p.70.

⁵² Wolfe (1961), p.209.

⁵³ Thanks to Benjamin Hill and Jan-Erik Jones for helpful discussions on this point.

⁵⁴ Locke (1697), § 35 (emphasis ours).

⁵⁵ Sydenham, *Medical Observations*, Preface to the 3d edition, § 7, in Sydenham (1848), I, p.13.

writes in a later epistle that "the intrinsic nature of the disease – and by intrinsic I mean essential – ... is in my mind no better known than the essence of any plant or animal."⁵⁶ And further: "The investigation and illustration of primary and ultimate causes is a neglect of our capabilities, and a violation of nature."⁵⁷ Observation and experience, rather than experiment (from anatomical dissection to microscopy) should be the chief guide of the physicians, in combination with the history of diseases.⁵⁸ Since we do not have knowledge of essences, and thus essential knowledge of the "tools of nature," Locke suggests that "there is nothing left for a physician to do but observe well."⁵⁹

Yet just because Locke shares with Sydenham an emphasis on the practical, the medicine of observation and its concomitant phenomenalism, and a suspicion towards reductive mechanical science, does not mean that his empiricism is fundamentally medical, as Romanell argues.⁶⁰ On the purely biographical level, despite his having received medical training, Locke ceases to care about medicine after 1689.⁶¹ The practical (ethical) dimension and the medical dimension do cohere, but *not as experimentalism, which is to say as 'underlabourer' science*. On the conceptual level, Locke's skepticism about natural philosophy and the 'fit' between our intellects and the microworld runs much deeper: as he argues eloquently in chapter xxiii of Book II of the *Essay*, "Of our Complex Ideas of Substances," in a section entitled "Our faculties for discovery of the qualities and powers of substances suited to our state," even if we had microscopic eyes, we would be cut off from the rest of society – *again demonstrating that his chief concern is practical* :

... And if by the help of such microscopical eyes (if I may so call them) a man could penetrate further than ordinary into the secret composition and radical texture of bodies, he would not make any

⁵⁶ *Epistle to Dr Paman*, § 12, in Sydenham (1850), II, p.37; *ibid.*, § 2, p.31. See Duchesneau (1970), p.63 and (1973), p.39, for an attempt to further articulate Sydenham's position on the relation between the perceivable signs of an illness and its underlying causes.

⁵⁷ *Medical Observations*, Preface to the 3d edition, § 20, in Sydenham (1848), I, p.20.

⁵⁸ *Epistle to Dr Brady*, § 50, in Sydenham (1850), II, p.22.

⁵⁹ Locke to Molyneux, 20 June 1693, in Locke (1708), p.284. (Not included in Locke [1979].)

⁶⁰ For a more sophisticated version of the view that Locke's empiricism is influenced by medicine, see Duchesneau (1973), pp.136f. Duchesneau views the relation between Sydenham and Locke as essential in structuring Locke's empiricism, but is careful to say that "medical reflections are in no way an absolute starting-point for interpreting his theory of knowledge" (p.7, n.16).

⁶¹ Milton (2001), p.221.

great advantage by the change, if such an acute sight would not serve to conduct him to the market and exchange; if he could not see things he was to avoid, at a convenient distance; nor distinguish things he had to do with by those sensible qualities others do. He that was sharp-sighted enough to see the configuration of the minute particles of the spring of a clock, and observe upon what peculiar structure and impulse its elastic motion depends, would no doubt discover something very admirable: but if eyes so framed could not view at once the hand, and the characters of the hour-plate, and thereby at a distance see what o'clock it was, their owner could not be much benefited by that acuteness; which, whilst it discovered the secret contrivance of the parts of the machine, made him lose its use. ... if that most instructive of our senses, seeing, were in any man a thousand or a hundred thousand times more acute than it is by the best microscope, things several millions of times less than the smallest object of his sight now would then be visible to his naked eyes, and so he would come nearer to the discovery of the texture and motion of the minute parts of corporeal things; and in many of them, probably get ideas of their internal constitutions: but then he would be in a quite different world from other people.⁶²

If we had microscopical eyes, we would see inside the workings of a clock, but be unable to function socially, at a market or an exchange; we might even have ideas of the internal constitutions of things, but would be cut off from the world of other people :

even though we cut into those inside, we see but the outside of things and make but a new superficies for ourselves to stare at.⁶³

Locke is neither Sydenham's underlabourer nor the philosophical overlord of medical empiricism, but rather a practically motivated, skeptical and deflationary thinker, for whom Sydenham's epiphenomenalist nosology was methodologically significant *in practical, non-essentialist and non-experimentalist terms*.

⁶² Locke (1975), II.xxiii.12. There may be echoes of Malebranche here: "si nous avions les yeux faits comme des microscopes... nous jugerions tout autrement de la grandeur des corps" (Malebranche [1979], I, vi, § 1).

⁶³ Sydenham/Locke, *Anatomia* (1668), in Dewhurst (1958), p.8.

3. CONCLUSION

The conceptual and technical landscape of early modern empiricism is more disorderly⁶⁴ – or richer – than its disembodied, formalized twentieth century representations – whether they applaud this artefact that they have produced or not. It is not exhaustively a matter of gentlemanly trust, nor an epistemology ‘on the way’, *unterwegs* to Kant or Russell. In fact, *thinkers before Kant do not speak of ‘objectivity’ but rather of ‘impartiality’*⁶⁵; they do not separate ethical matters and epistemological matters as we would now. Rather, empiricism is a morally motivated program, and somewhat constructivist in its epistemology; in addition, it is “notoriously weak in its philosophy of experiment,” as Michael Ayers put it.⁶⁶ For Harvey, experiment is just another way of inquiry, neither privileged nor subordinated to observation or intuition. And although most of his few named and unnamed experiments may appear to us trivial or naïve (with the exception of the ligature experiment in *De Motu Cordis*) they take a proper place in his way of inquiry. Indeed, it may be that Harvey did not distinguish between ‘experiment’ and ‘experience’. Certainly the word in its early modern usage did not have the meaning it has today, that of a controlled intervention into nature with appropriate background conditions and the measurement of results separate to observation.⁶⁷

To Harvey and his contemporaries, experiment was either synonymous with experience acquired by observation or something close to it. Certainly he rarely ‘experiments’ – the ligature experiment in DMC, being the most notable and important of the few that he does conduct, and that done on a man (he preferred “country people” because their limbs were tougher). It is quite likely that he conducted the ligature experiment on himself – in DGA he applies spider’s poison to his wrist to observe its effect. However, Harvey

⁶⁴ Compare what Ofer Gal calls “Baroque Science” – <http://www.usyd.edu.au/baroquescience/>.

⁶⁵ Thanks to Dario Perinetti for pointing this out. See also Gaukroger (2005) and Shapin (1994) for a similar emphasis on civility as the basis for what we now call ‘scientific truth’.

⁶⁶ Ayers (1991), vol.2, p.159.

⁶⁷ *Experimentum* in medicine could mean a ‘recipe’ for a cure, as noted by Dear (2006), pp.114-115; Hadot (2004) claims that to Roger Bacon in the 13th century, the word meant a sort of ‘dwelling in’ nature the better to comprehend it (p.132). Harvey’s offhandedness in using the word *experimentum* suggests a commonplace event, part of his everyday scientific activities, without the fanfares that later scientists like Boyle, Hooke and Newton would use to announce and legitimize their discoveries.

does engage in vivisection but had intellectual (though not necessarily moral) misgivings about its efficacy, holding that the trauma inevitably induced was likely to render the observations and ‘results’ unreliable. It may be for this reason, that is to say, the disruptions to nature arising from human intervention, that he was reluctant too to utilize instruments in his inquiries. Neither DMC nor DGA have any examples of the use of microscopes and few examples of the use of magnifying glasses. It is of course possible that when he writes of a magnifying glass he actually means microscope, but the point remains the same.

The discoverer of the circulation of the blood, like the ‘English Hippocrates’ and the ‘Father of British Empiricism’, appears to dislike formalized régimes of experiment once they are severed from personal experience and sense-perception. One may call this “weak as a philosophy of experiment,” like Ayers, or “reactionary” in relation to existing technological possibilities of the time, as Catherine Wilson did more recently,⁶⁸ but aside from these amusing forays into normative language, what we really need to see is that the canon of empiricism is both contested from within, and more pluralistic than its common definition. After all, there is nothing innately more respectable about the view that “The subtlety of experiments is far greater than that of the sense itself” (Bacon)⁶⁹ than Locke’s view that the corpuscular level both *does not replace* the experiential level and *would lead to ethical and intersubjective difficulties* if it did. They are both species of empiricism – a more mainstream, ‘experimentalist’ doctrine (which itself can be shown to have flaws in the ointment, as in Alan Chalmers’ elegant description of how Boyle’s mechanical philosophy has very little, if anything to do with his experiments⁷⁰) and a more heterodox, ‘embodied’ empiricism. The former view belongs to the mainstream, from the Royal Society to D’Alembert; as Chambers remarked in his *Cyclopaedia*, “*Experiments*, within these 50 or 60 years, are come into such vogue, that nothing will pass in philosophy, but what is founded on *experiment*, or confirm’d by *experiment*, &c. So that the new philosophy is almost altogether experimental.”⁷¹

It is not clear to what extent this heterodox empiricism (a difficult cousin of the New Science) was seen or consciously assimilated by posterity. Harvey’s reception seems mainly to have focused on the doctrine of circulation and the extent to which it legitimated mechanism, and to a slightly

⁶⁸ Wilson (1995) describes Locke’s and other empiricist epistemologies of the period as “reactionary” (p.238).

⁶⁹ Plan of the *Great Instauration*, in Bacon (1857-1874), I, 138 / IV, 26.

⁷⁰ See the stimulating essay by Chalmers (1993).

⁷¹ s.v. “Experimental,” in Chambers (1728), vol.1, p.368.

lesser extent on his embryology and the doctrine of epigenesis. Only in the nineteenth century did the view emerge that he was the 'originator' of modern doctrines of experiment, whether quantitative, implicative (in the Paduan sense of 'try this yourself'), or 'thought experiments'. But the first-person dimension we have called attention to, is not seen. Locke's reception, like Newton's, cannot easily be reduced to a handful of factors (Voltaire, Anthony Collins and Thomas Reid are hard to reconcile with another) but to the extent that the eighteenth century (correctly) saw the relation between his anti-innatist theory of ideas and his program for educational, political and clerical reform, it grasped his heterodoxy more successfully.

Of course, Harvey, Locke and Sydenham do not stand for a coherent, systematic position, whether in medicine, natural philosophy or philosophy *simpliciter*. One can enumerate some shared characteristics, including a 'feeling for the subjective' which distinguishes them from the dissecting, anatomizing⁷² zeal of their respective contemporaries. But we do not wish to promote a unique, somewhat a-historical concept of 'medical empiricism', which would ultimately be difficult to define, as it is something of a placeholder, not to say an empty term, an *auberge espagnole*. The original medical empiricists were essentially skeptics; Sydenham is not really interested in the nature of experience itself, or in the sources of knowledge; Locke does not ground his empiricism on medicine (even if one allows for some methodological influence of Sydenham). Perhaps Harvey is the only medical empiricist, in the end. Regardless, if there is something essential in all of these figures which is alien to empiricism as we thought we knew it, maybe it is our picture of empiricism that needs changing!⁷³

⁷² Bacon, *Novum Organum*, I, § 124 in Bacon (1857-1874), I, 218 / IV, 110.

⁷³ We view this as part of a broader project to reevaluate the status of 'Life' – and by extension, empiricism in its relation to the life sciences – in the Scientific Revolution; for some hints of such a reevaluation, see Salomon-Bayet (1978) and Duchesneau (1996).

Du manque de ressort au manque d'énergie :
La « fatigue nerveuse » ou l'itinéraire d'un concept du XVIII^e au XIX^e siècle

Gérard Seignan*

RESUME. Dans l'histoire des sciences de la vie, le concept de fatigue nerveuse peut servir de révélateur. Il se dévoile au travers des représentations de la machine humaine façonnées par les physiologistes du XVIII^e siècle avant que le siècle de la révolution industrielle ne livre sa propre vision de l'altération de la puissance nerveuse. La fatigue de la volonté intègre alors la nosologie de la fatigue nerveuse et ouvre la voie à une psychophysiologie de l'effort. Les explications savantes s'affranchissent-elles pour autant de l'heuristique du manque de « ressort » pour rendre compte de la fatigue d'origine nerveuse ?

MOTS-CLEFS : Fatigue, effort, volonté, physiologie, psychologie.

ABSTRACT. In the history of the sciences of life, the concept of nerve fatigue can act as a revelator. It is disclosed through the representations of the human machine elaborated by the XVIIIth century physiologists, followed by the century of the industrial revolution which offered its own vision of the alteration of the nervous power. The fatigue of the will then become part of the nosology of nerve fatigue, and paves the way for a psychophysiology of effort. But do learned explanations free themselves for all this from the heuristics of the lack of "spirits" to account for a fatigue of nervous origin?

KEYWORDS : fatigue, effort, will, physiology, psychology.

* Docteur de l'Université Victor Ségalen - Bordeaux 2